Untangling
Road Trip Experiences
with Connected Car

Planning and bringing it to the car

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Thesis Project Report
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Abstract

With developing technologies and growing infrastructures, connected experiences are expanding their realms towards various devices and scenarios in our lives. One of the areas, which is going under a big change due to this connectivity is the car related experiences. As connectivity is intrinsically enabler of different experiences and services, it is foreseen that it will bring a different dimension to car and driving related experiences as well.

By investigating the future trends and possibilities that connectivity can provide to car and driving related experiences, this thesis aims for imagining the near future scenarios with an explorative approach, focusing on one and addressing to the rising issues with a design proposal that is meaningful to both users and the industry.

The result, Tripcloud, contributes to the future scenario of having a road trip with the car, with a new digital platform that aims for supporting the users throughout the planning and bringing the plans into the car experience seamlessly and safely. It aims for reducing today’s existing complexity in terms of interaction and cognition to provide a better experience and avoid driver distraction. With providing organised information pieces, information exchange between people and automated links with mobile devices and car, Tripcloud offers easier an more convenient alternative for road trip planing and bringing the plans into car experiences for the near future.
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This project started with a curiosity to explore newly emerging technologies and trends around car industry. The purpose of the studies was to identify opportunities for today and future in order to find ways to enhance experiences that includes cars and driving.

The area has been narrowed down and studies have been deepened towards specific usages after broad explorations on technology, users and future trends have been framed with defining the context and the problems.

Systemic level of thinking that came with the investigation of a technology and interaction level of thinking that came from the identification of the context and problems have been merged together to design a coherent result.

The underlying reasons for the choice of topic and the methods were, to be able to investigate a newly emerging area and then, propose a design solution that; makes use of that technology, is meaningful to the user, is possible in the future and relevant to industry.
Overview

Process

This thesis consists of two fundamental parts. First part is the exploration; where the topic arising from personal interest has been investigated from a broad perspective, and second part is the design process; where more focused research and ideation took part to propose a design solution.

Overview

Design Process

The second part of the thesis which starts with a clear identification of a problem, has done individually and includes research, ideation, design and execution. Throughout the process, user behaviours and interactions, pain points, motives and conveniences for users has been investigated in-depth. Additional research had been done when needed throughout the ideation and design phase.

Exploration

First part of the project is designed to get glimpses of people’s experiences with car and to unfold the potential value that newly emerging technologies can bring to people’s experiences with car. The approach for this part of the project was explorative rather than in-depth. Various methods and tools used for bringing different perspectives to the topic and evaluating the outcomes.

Collaboration

Exploration part has been done in collaboration with another Interaction Design thesis student from the University of Southern Denmark. Throughout this exploration phase, our roles were parallel, the same as our interests for research areas.

External Tutoring

This thesis was supported by Jorge Furuya and Paulo Coelho from the Android Auto department at Google (CA), who have mentored and guided the directions of the project. They have been providing support in terms of useful methodology, feedback from the industry, as well as relevant articles and information.
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**Figure 1.1: Covered research areas**
Background

“The auto industry has been a goldmine and driving force for new technologies for over 100 years...”

(Markus Granlund, CEO of SEMCON, 2013)

...Auto industry given us freedom and mobility in a way that would have been hard to imagine a century ago. But it’s also an industry facing challenges and change all the time. This time things will change the bedrock of its business and products it creates.” (Granlund 2013)

Future Changes

Future of the automotive industry is full of changes. Many in the industry’s ecosystem consider this development disturbing, others see it as a way of creating new opportunities for innovative technological development such as autonomous cars, accident-free traffic, intelligent mobility. From a broader perspective, they have a potential to change the infrastructure of mobility for the long run. Meanwhile, they also provide different side-opportunities both for automakers, service providers and users.

I can see the clues of these early conversations about the changes in industry reports and design researches: Future by semcon, ‘Trends changing the automotive industry’ (Olsson 2013), ‘Long-run Trends in Car Use’ (International Transport Forum 2013), ‘Connected Car Study 2015: Racing Ahead With Autonomous Cars and Digital Innovation’ (Viereckl, R. et al., 2015), ‘Advancing Mobility; The new Frontier of Smarter Transportation’ (Gyimesi, K. et al., 2010).

1. THE CAR BUYER IS CHANGING. New generations which has clearly different understanding of ownership and service are about the be the drivers of the future. As this generation values access over ownership, car buyers might be service providers, rather than individuals.

2. NEW MARKETS WILL TAKE OVER. Considering the investments and potential of eastern countries, the market, so does the design and production is changing the future plans.

3. ALTERNATIVE ENERGY SOURCES are one of the biggest areas that auto makers are investing a lot to be able to shape the future infrastructures and business models as it is known that shifting from fossil fuels to clean energy is inevitable.

4. CONNECTIVITY. The number of cars with some sort of networking ability (via connecting smart phones etc.) today is small, perhaps only 8% of the global total, according to McKinsey, a consulting firm. But by 2020 around a quarter of all cars, mainly the more expensive sort, will be online. (smart phones on wheels)

5. THE DRIVERLESS CARS are the vehicles that are equipped with required technology to monitor the traffic and manoeuvre themselves while the driver is doing something else. This is the ultimate vision for connected, smart and communicative vehicle which will eventually
Driverless Cars

Big Data

Connectivity

Personal Interest

My choice of topic came from a curiosity to understand complex systems and this project initially started with an interest to explore newly emerging technologies and trends around car industry. My motives for deciding what subject I would work on during my thesis were:

- Making newly emerging concepts and technology useful for people
- Imagining future scenarios and designing for it future before it becomes reality
- Work both with systemic level and interaction level
- Be user centred but also stay relevant to the industry as well.

From interaction design perspective, I found connectivity area interesting due to some questions like “What will connectivity of the car mean to users? What will connectivity of the user through the car mean? How these will change the experiences and interactions?”

In our daily lives we are connected through various different channels such as our smart phones, tablets, laptops and other devices which helps us decide whether to take our umbrella with us or where to eat or whom to talk to at that moment. Connectivity in general has changed how we think and how we behave with all the accessibility it provides. This led us to expect services at anywhere and anytime followed by expectations of different convenience as well. Due to these changes, interest in connected products and services, to provide a better and more personal experiences has been ever increasing in every sector.

“As we see the connectivity space evolving, what we also see is customers’ changing behaviours in many, very significant ways. Some of which make their ways to vehicles as well”

Malhotra, Senior Manager Audi Connected Vehicles, 2015

6.BIG DATA is also another important factor that most of the manufacturers are competing for value creation for different areas such as customer relations, brand awareness, product improvements, insurance pricing etc. which will change the service concept that exist today and infrastructures structures that exists today.

Connectivity is slowly jumping into the car industry and tends to become a key element when we talk about future car experiences and interactions. Now it seems like the car is the new digital arena and how it will become part of our connected life, will be the determinant of the changes industry will experience in the future.
The project started with a broad topic of “connected car” and “better user experiences it can provide to people”. My interests, so does the project was at the intersection of a new concept that came with the implementation of new technologies and possible experiences it can offer to the users. Before narrowing it down to a more specific topic, holistic understanding of the context, having primal insights and standpoints were needed in order to proceed to the next steps. The intention of the exploration phase was understanding what this technology is and then set the grounds for “what” are the opportunities for designing better experiences.

During this period, we expected to engage various people in order to gain insights on usage of car and technology, as well as their stories and driving experiences. We planned to approach the topic from various perspectives. With desktop research and user researches, we expected to contribute to our understanding of the area and broaden our horizon. When it comes to narrow down the topic, we aimed to boil down the learnings into scenarios in order to leave room for inspiration for the next steps.
The connected car is an automobile designed with direct access to the Internet, enabling automated links to all other connected objects, including smartphones, tracking devices, traffic lights other motor vehicles and even home appliances (Viereckl et al. 2015).

The connected car provides the possibility of internet-based data transfer between the car and its surroundings (everis Connected Car Report, 2015).

For over a hundred years, automobiles have been isolated machines of metal and motor with the single purpose of transporting passengers and cargo from one place to another. Over the past 50 plus years, the automotive industry has adopted electronics and information technology to meet regulatory requirements for safety, emissions control and fuel efficiency; improve diagnostics; and satisfy market-driven requirements for comfort, convenience, communications and entertainment. With the advent of a perpetually connected society, people naturally expect to expand the digital experience into their vehicles. In effect, car owners want their vehicle to become a personal node on a network of rolling, connected devices. And automakers have a complementary interest in monitoring vehicles remotely to pro-actively detect and respond to warranty and maintenance needs (Poulin 2014).
**Connectivity Architecture**

According to the Global System for Mobile Association, connectivity architectures can be defined in three categories: embedded, tethered and integrated (GSMA 2013).

For the integrated approach, the connection is made through a mobile device, but all applications and programs run on the user’s mobile device. The car hardware is only used for displaying and HMI reasons.

For the tethered solution, intelligence of the applications run in the vehicle but an external SIM is used to enable connectivity. SIM can be brought it with two ways, one is having a built in modem in the car with a SIM card slot. The other one is making use of the modem and the SIM card of user’s mobile device, e.g. smart phone.

In an embedded system, a complete communication module (modem and a SIM), is permanently integrated into the car which does not require any external device.

Although these three solution mainly serve the same purpose, which is providing connectivity, they are not completely substitute for each other. Due to the infrastructure differences they vary in terms of strength, cost and capability. In the future, connectivity can vary based on the need and they might continue to co-exist as well. (everis connected car report)

**+/-**

**Tethered solution:**
- Easier and personalised cost management for services
- More reliable and faster connection compared to external modem solutions due to the usage of the car antenna
- Better for infotainment usage (music, content streaming etc.)

**External modem**
- Easier and personalised cost management for services
- Less costly in-vehicle hardware is required
- External modem is more likely to be up-to-date

**Embedded solution**
- Vehicle centric
- Very reliable and always on
- Seamless user experience
- Does not require user setup
- Suitable for both safety and security-related services

**+/-**

**Integrated solution:**
- Can make use of most recent device and relevant network technology
- Appropriate for infotainment, access to traffic information and external navigation
- Seamless service is not guaranteed

Figure 2.1: Three ways of bringing connectivity into car. Connectivity Infrastructures is illustrated with the learnings from; Everis Connected Car Report and Current Landscape of Connected Car APIs (online presentation by Liz Slocum Jensen)
What is the value for people?

From behavioural perspective, connectivity has a great influence on defining our interactions and usage patterns of products and services. This means that it is an important factor to address today’s and future users. Anupam Malhotra, manager of connected vehicles at Audi of America, also emphasizes that the 70% of the customers in the next few years will be X and Y generation and connected lifestyle is given for them.

He emphasizes that connected car is a game changer, and as connectivity remains extremely meaningful to younger groups, this lifestyle has to be reflected in vehicle as well.

So when we talk about the value for users it is about enhancing the experience and providing convenience of having information to hand, continuing your ‘connected’ experience from the home and the phone into the car.

What is the value for industry?

Soon, every aspect of vehicular transportation will be controlled by telematics and information technology and the connectivity (Viereckl et al. 2015). Providing connectivity and applying intelligent technologies to cars comes with a lot of positive impressions for the car and software industries, which makes a lot of companies to invest on new concepts. On one hand it will trigger a fierce competition, on the other hand it will also provide new possibilities both for industries and users. This will allow consumers to employ new applications for different needs (Gyimesi et al. 2010).

In order to meet the demands, provide more convenient or personalised experiences to new generations and benefit from the new communication channel with the customers, connectivity stays highly relevant. Based on Advancing Mobility report by IBM, auto buyers of near future will come to regard the car as a bundle of services, rather than a package of hardware, which will as a consequence, increase the importance of digital experiences.

People

- Improve the driving experience [1]
- Improve operational performance [3]
- Enhance the driving experience [4]
- Create a better user experience [3]
- Provide better user experience [1]
- Improved infotainment experiences [4]
- Personalisation through applications [2]

[2] Advancing Mobility by IBM Institute for Business

Figure 2.2: Areas that users value in the near future

Industry

- Data gathering on vehicle usage [3]
- Maintaining brand awareness [3]
- Meeting regulatory demands [3]
- Offering enhanced vehicle related services [2] (E.g. remote diagnostics, preventive maintenance, early warning)
- Creating a unique customer relationship [3]
- Building an on-going relationship w/ customer [3]
- Address to a bigger audience [1]
- Developing new models of mobility [3]


Figure 2.3: Areas that industries value in the near future
My Vision for Connected Car

Based on the papers, reports and studies, it is obvious that cars being connected will provide lots of benefits. It will make the roads safer, driving easier and travelling more convenient. It will enable seamless experiences by creating a channel to bringing in-car experiences outside and outside experiences into the car. With internet connectivity, vehicle to device connectivity and connectivity with service providers, car can offer better experiences to users. I found this area to be more about providing convenience, comfort and new ways of interaction.

Positioning

There is no doubt that the technology and investments behind car’s connectivity as well as the advantages of it, will be huge. When car becomes our next connected device, the infrastructure of the connectivity will be bigger and more complex than today’s connected devices such as our phones, watches, thermostats, refrigerators and so on. Even though the complexity makes it unique amongst other things we use everyday, I believe it will still be just one of our connected devices that we use to make our lives easier.

Role

With in this framework, it is possible to say that connected car concept is more of a medium to provide solutions and create better scenarios. It will not be the experience itself. Instead it will be the enabler of experiences that we would want or need.
Exploratory Research

Interviews & Journey Mapping

Interviews and journey mapping were chosen as the first form of user involvement. With nine participants including car owners, car users and non-drivers, interviews have been conducted with the main focus of “the communication”, later elaborated with three questions regarding the

- communication between people in the car, e.g. chat, decision making about destination, music, route etc.
- communication between vehicles e.g. communicating with other cars through the car itself and through mobile devices.
- communication with the car (drivers/passengers interacting with the car)

For the journey mapping, the same participants were asked to tell one of their memorable driving experience in three steps; before, during and after. Capturing the details of driving and driving related experiences was the main purpose of the activity.

Figure 2.6: Journey mapping with users

Main Learnings

In many scenarios whether it is about daily usage or long drive experience, flexibility and convenience were the keywords for both drivers and passengers. The less they put effort, the happier they were. This was also related with time efficiency, especially for drives related to daily activities. The more time people spent on interacting, changing, deciding etc., the less they were satisfied with the experiences.

Among the ones who picked up a long trip experience for the journey mapping, it was found that planning causes all of them some difficulty and stress. Also getting ready for the journey, collecting information and keeping everything in mind was a pain point for the participants.
Brainstorming

A follow-up brainstorming session (on the left) was held in order to speculate and interpret the insights derived from users. In this phase, the method has been used as a tool to expand the topic first with turning the insight into “How might we” questions.

A quick ideation session on each how might we question, has been done and the outcomes have been clustered to create directions and narrow down the topic.

Brainstorming and ideation helped us to approach to the topic in a creative way and see the glimpses of what can be done in the field. As we stayed directly relevant to the insights, outcomes were representing potential solutions to the problematic areas which also helped us to narrow down the topic based on the saturation of the area and personal interests of ours.

Main Learning

Outcomes of the brainstorming have been clustered in four categories; Entertainment, Navigation, Safety and Comfort. Among the four categories, Navigation has been chosen as the main focus with two sub areas; Navigation for daily usage and Navigation for long distance. The outcomes of ideation session played an important role on making this decision.
Future Trend Analysis

In order to recognize the upcoming user lifestyles and behaviours, a future board where future trends and lifestyles were represented, has been created. New generations’ mindset, transportation, urban life styles and technological developments were the main focuses while doing the research. For a better understanding of the drives that will be influential, various future trend reports have been reviewed. For this particular project, next 5 years has been chosen as the time frame.

Main Learnings

The big picture we created with future trends and researches indicates that connectivity between devices and platforms will be the infrastructure of future products and services. As the services will be continuous, on demand and personal, people will be in expectation of boundless access and assistance whenever they want and wherever they are. This empowerment will enable people to embrace every unknown and help them deal with everything in a short period.

Based on the future trend reports, it is also possible to say that people will travel more than they do now in 5 years (LHBS 2015). While the big portion of it will be by plane, substantial increase in instant trips to close cities, nearby attractions and road trips are also expected to happen more frequently.

Figure 2.8: Future trends board

Figure 2.9: Summary of outcomes of the future trends board

Figure 2.10: Synthesis of the Future trends research. Influential Reports: PSFK The Future of Travel 2015, PSFK The Future of Travel 2016, LHBS The Near Future of Travel 2015, Hyper-connected Travel and Transportation in Action
Personas & Storyboarding

After a broad research to understand the limitations and possibilities, creating personas and storyboards has been chosen as a tool to synthesize and visualize the learnings and outcomes so far. This was the last activity for the exploration sprint and set the foundations of the decision of the topic for me. Four stories and four personas have been created by taking the user studies, future trends and brainstorming into consideration. The four personas have different backgrounds and characteristic, and the four scenarios representing a day in their lives have different themes.

Outcome

All off the scenarios we created were quite interesting and inspirational. While some of them were more about marketing and service creation, some others were more about interaction and design. Among the four scenarios “Conveniences for Trip Planning” seemed like an opportunity to me, so I decided to focus on that area.

The most influential question that helped me decide was;

WHY IF OUR CAR KNEW WHERE WE WANTED TO GO?

The factors I considered while narrowing my topic down were; technology that can leverage the existing experiences, problems that users have mentioned and my personal interest in topic.

Future of commuting experience  Syncing daily activities with car  Conveniences for trip planning  Connected services on the go

Figure 2.11: Personas, stories and the relevant outcomes of the brainstorming session.

Figure 2.12: Factors considered for narrowing down the topic.
1. Am I going to the right?
2. How much is it going to cost?

Pocket Navigation

Big Answers?

How would you like to receive the information?

As it unfolds...

Airbnb address

Facade

Ferry Tickets

How would you like to find/capture information?

When I get closer to a location, would you like to
send me the airbnb to?

I would like airb&b’s &

Sense

My intent is...
Providing better experiences to car users was the initial and the fundamental goal for the project. Starting with investigating new technologies, pursuing emerging trends and understanding user scenarios, the project had a bottom up approach for the exploration part in order to get a better grasp of the topic. After identifying the possible design areas and focusing on one, next question that needed to be answered was “How?” . To be able to address that, I shifted the approach from bottom-up to top-down. Following this shift, more specific research was needed to get specific insights form people in order to form a design proposal relevant to the problems.

User-centered design approach, has created the backbone of the design process. For this part of the project, observations, engagement of various people, prototyping and testing the prototypes were expected. Getting specific insights from people to find answers to “How?” questions through out the process and using feedbacks as an evaluation tool has been planned.
Primary Research

Scope

Under the “trip experiences with a car” topic, the design process had its focus on people’s behaviours, interactions and perceptions which created the foundation of the research phase. With help from ethnographic research methods, the research for this thesis included a digital probe, Q&A session with participants and observation within the relevant areas of the subject. In order to see the relations and have more clear understanding of the findings, the research has been framed with the relations of three factors; people, object, data.

Intention

The primary research intended to look at scenarios in depth and identify the user problems faced throughout the process. I was mainly interested in capturing the small details about the usage of existing technology and the car in the context of trip planning and implementation of the plans. A qualitative approach was chosen to create the best in-depth understanding of users’ behaviours in the context, and to dig deep into the “how” questions relevant with the area. The key objectives of the primary research were;

- Getting specific insights
- Getting behaviour patterns
- Validating the problem area
- Developing design principles

Before Trip

Digital Probe + Q&A session

In order to collect data on how people plan their trips, an online activity has been created and sent to 6 people of different ages and backgrounds.

Through the digital probe, people were asked to plan an imaginary trip for a weekend. They answered the questions related to;

- How they get the idea or the inspiration?
- How they figured out where to go and how to spend their time?
- How they organise the collected information and the plans?
- How they got prepared for the trip?
- How they brought the information into the car or the navigation system?

Participants were asked to document the process with photos and screen-shots. Later on, a quick Q&A session was held to talk about the specific points of the outcomes.
Main Learnings

While analysing the outcomes, I came across with two types of behavioural pattern;

1. Planning everything ahead, and knowing what to expect

2. Not planning in advance, keeping the excitement with being spontaneous

While first type of people were marking restaurants, places to visit and things to do on map or taking notes on their mobile devices, second type of people preferred receiving less information beforehand and liked being independent.

There weren’t significant problems for the second type of people at this stage as they didn’t put much effort on planning and bringing plans into the car. However, for the first type of people, the process was effortful. They check the possible destinations from online maps, websites, applications and forums for location, images and comments that will help them to decide and create their plans. They put quite amount of effort on collecting information. At bringing them in car phase, people either printed the required information or they brought them in digitally, on their phone in the form of notes or marked locations with the intention of checking them whenever they need.

Besides the differences, both types have valued the recommendations from friends while deciding where to go and non of them used any kind of application through out their deciding and planning periods.
During Trip

Observation

As J. Blomberg said on ethnographic field methods "The ability to observe and record ongoing activities becomes more critical to the success of the endeavour."

A group of 3 adults (1 female, 2 male) that are having a weekend trip from Ankara to Cappadocia with a car had been observed for 3 days. The focus for the observation was on the following experiences;

- how people actually bring the information in the car
- how people interact with the car and devices in terms of finding different destinations throughout the journey
- how the communication and decision making patterns were shaped in the group

While the group is travelling, my primary role was to observe, and document the communication and user interactions with car and devices, related to the trip.

Figure 3.4: Scenes from observation
**Main Learnings**

Observation has provided valuable insights about 'during the trip' part of the experience and created connection between planning and implementing part with contextual clues.

During the trip mostly driver or the person next to the driver seemed to be responsible for the plan. They interacted with the devices and the car. That excluded the other passengers on the back seat and made it troublesome for them to contribute and provide input.

Even if people had plans on where to go, they had trouble finding the place on the navigation device several times. They either struggled with it for a while or used the device that they have found or saved the information to find the address or the way.

Internet connection was the most used channel for the information and way finding. Websites and applications like Foursquare, Google Maps, Wikitravel and Trip Advisor have been used for decision making on the go.

Plans needed to flexible. Based on various factors such as instant weather changes, road and traffic situation, getting hungry, getting tired, etc. people changed the next destination they are about to visit. In such cases, decision making took quite a lot of time, triggered intensive use of mobile devices and required attention of everyone.

![](image)

**Figure 3.5:** The places visited during the trip
Problem Re-definition

Framing the problem

The topic of planning a trip includes various layers and sub-layers. In order to understand the problems, I used the same factors; people, object, data, as a template to see the connections between factors clearly while re-defining the problems. I also included a timeline that consists of three steps “planning, in-between, during the trip” as course of events also plays an important role on understanding cause and effect relation.

Design Problem

![Figure 3.6: Visualisation of the problematic areas](image)

Technology

![Figure 3.6: Visualisation of the problematic areas](image)

Main Problem

The user research and market research have shown that existing tools fail to support people both before and during the trip phase.

It is also evident with the findings that existing applications fail to support people in some cases such eliminating confusion, engaging people with the service, providing seamless experiences and reducing driver distraction.

When thinking about the whole process, the platform needs to be redesigned considering these concerns and the new connectivity infrastructures. So the main direction here is designing on connectivity, designing for better future experiences.

When we think about our cars, they are actually isolated machines that we control only when we sit on the seat. Even if the car was one of the most used “device/machine/object” while having a trip, it was totally isolated from the data that has been collected before and used along the trip. And because of that, sometimes people improvise, use other channels and devices to work around. (E.g. printing, taking a screen-shot, taking a photo etc.). In that case the concept of car being our next connected device becomes valuable to link the two phases and becomes enabler of better experiences.

‘It is now evident that if you are using a mobile phone while driving you are approximately four times more likely to be involved in a crash than a driver who is not using a phone. This risk appears to be similar for both hand-held and hands-free phones, because it is the cognitive distraction that is an issue, not only the physical distraction associated with holding the phone.’ (GSMA Connecting Cars: The Technology Roadmap) Driver distraction is the most important problem of the scenario. However with having proper tools to plan and proper channels, to bring in the plans, better experiences can be drawn.
AIM

As it can be understood from the Figure 9, this project aims for reducing the risks of driver distraction that comes from today’s device interactions by making the planning of a trip easier, safer and seamless. It is also important to mention that, this project started with the vision of designing better future experiences with newly emerging technologies and imagines the requirements to embody the expected results.

Figure 3.7: Visualisation of the before and during the trip scenario

Figure 3.7: Visualisation of the aimed scenario
Research Synthesis

User studies in the form of digital probe and observation have provided a more comprehensive understanding of the audience, problems and design context. While making sense of the outcomes, several insights based on the user research have emerged. See the appendix for detailed break-down of the findings.

Need for Reducing Confusion

One of the most common situations that I observed throughout the research was that people were getting lost easily when they were looking for information for the trip they were going to have. The reason is that they were collecting information from a wide range of sources such as websites, digital maps, traveller blogs, forums, social media, face to face conversations etc. which creates a bunch of disorganised information. In that case there was an obvious need for reducing the confusion in order to help people while searching and collecting information.

Need for Reference

Most of the participants that were involved in the digital probe have taken other people’s comments and suggestions about the trip into consideration whether it is over internet or face to face. Due to the fact that internet provides easy access to any kind of information, people valued the comments and recommendations of others that they reached through online platforms regardless of knowing them personally or not. Supporting that finding, it has been established that travellers take advantage of Web 2.0 and consult social media when planning their vacations (Gretzel, 2006; Gretzel & Yoo, 2008). Increasingly, travellers are turning to online user-generated content available through social media to obtain information prior to their vacations, particularly online travel reviews, believing them to be trustworthy and useful (Pan, MacLaurin & Crotts, 2007; Litvin, Goldsmith & Pan, 2008; Xiang & Gretzel, 2010; Yoo, Lee, Gretzel & Fesenmaier, 2009; Dickinger, 2011).

Need for Balancing Planning

“I would check the forecast first. Then I would do some research based on my interest such as historical places, tourist attractions, and things that I would enjoy like where can I have a good or traditional meal. I would make a list of them and mark the places on the map and print some of them to bring with me. I enjoy learning as much as possible about those places beforehand” - Tunay (participant)

“I don’t like being so strict about planning, it kills the joy” - Ilker (participant)

The preparations people make in advance in this context is highly subjective and depends on people’s perspectives and expectations. As it can be understood from the user quotes, some like knowing what to do and what to expect, some others like being free and exploring on the go. The level of planning diverses from one person to another and the main underlying reasons are their characters, motivations and the type of the vacation. The behaviours people exhibit can be imagined as a scale; on one edge stands strictly...
planning everything, on the other edge not planning at all. Both extremities have different consequences relevant to planning and driving.

Not planning at all and affordability that comes with technology triggers drivers to interact with car interface or another mobile device on the go which causes driver distraction even if they are not aware.

On the other hand while planning every destination in advance makes it easier and smoother, it requires so much effort in the planning and bringing it into the car phase. Also having everything planned might have negative effects on the level of enjoyment.

Consequently it is obvious that people should plan their trips but considering both situations, it is important to respect the natural differences in preparation phase and trying to balance the enjoyment and safety at the same time.

**Engagement**

Another aspect I tried to explore during the research was how to engage people to a platform where they can manage their intended trips easily. For the purpose of getting inspiration and information, there were quite amount of blogs, applications and websites that people used. Although there were a considerable amount of applications for creating itineraries, non of the participants mentioned using an application for creating one. When asked ‘Why?’ the main reasons were:

- Having limited, fixed and stereotypical content
- Finding it useless for car ride as it will only stay in the platform they created the itinerary
- Not liking fixed plans
- Not being familiar with such applications

So for the project, it was important to pay attention to these reasons to increase the level of engagement.

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**Constraints**

After the problem redefinition and research synthesis, I made use of C.O.D. exercise where I defined the Constraints, Objectives and Directives of the project. The outcomes of the exercise was quite useful in terms of helping me to keep the limitations and priorities in mind.

**CONSTRAINTS**

- Distraction

**OBJECTIVES**

- Reduce interacting with the car’s infotainment system or other mobile devices on the go for way-finding, make it seamless.
- Reduce the effort and the cognitive load of planning a trip
- Simplify the interactions

**DIRECTIVES**

- Offering a seamless experience to the users
- Designing for connectivity between devices and car
Creative Process

Throughout the creative process, which consists of ideation, user involvement, prototyping and testing, several tactics based on the insights derived from literature and user research have been developed to fulfil the goals.

Ideation Workshop

To kick off the creative process, an ideation workshop has been held with 6 participants. With the question of “how might people want to collect and receive trip related information”, 6 cards that include different types of information bits have been handed out to people to start with. Every participant had gone through all information type and drawn the way they have imagined to collect the information. The same process had been repeated for how they wanted to receive those collected information bits as well.

Figure 4.1: Ideation workshop and the outcomes
Outcomes

After the workshop, I have gone through the ideas participants have generated and clustered them to see the main themes and trends.

One of the clusters that I found interesting and valuable to pursue was the one that has been named as "Information Packages", the idea of having all the relevant information in a compact form. "Information Packages" has arose several times in different forms (e.g. collecting tokens, message in a bottle, collecting pebbles, having the photo of the place that directs you to the there) and it came almost natural to people to collect a defined unit to manage them easily afterwards when they have multiple. Based on the people’s perception and the potential to address the "Confusion" as the research finding, I decided to keep the idea of creating "Information Packages".

Considering the findings on people’s "need for reference", relevant ideas have been clustered under “creating user generated content”. Ideas such as platooning, receiving collections of others, people following others’ traces, hearing recommendations while walking in the city, imagining coffee shops as touch-points for information, gave me inspiration to create an open online platform where information, experience and ideas can be followed and exchanged.
Early Prototypes

Following the ideation, two low-fi paper prototypes have been created to set the foundation of initial concepts and see people’s comments and reactions on the ideas. These were prototypes for creating a dialogue with the users and to see how the ideas will resonate.

The side purpose of the prototypes was also to find out the right balance for how much of a trip should be planned at once to avoid distraction but still keep it enjoyable for people.

Paper Prototype 1
Information Pool

First prototype has been based on collecting information packages and organising them. This prototype has been done in order to define what could be an information package and how they should be organised. For this prototype various websites people used to use (foursquare, trip advisor, facebook, airbnb etc.) has been created and the specific informations have been attached on the websites. Every information piece; texts, images, location pins designed as elements that can be dragged and dropped to a platform -a blank paper- and then several ready made templates (organising info day by day, based on the purpose accommodation, location, food, activity, based on grouping the areas and tracks) have been offered to people to organize the collected elements.

The purpose was to give people freedom to choose anything from any source they want.

OUTCOMES

People were more into inspiration and exploration at first step and rather than having well structured template of the plans, they wanted to store the informations in a sorted way and be flexible about the sequence.

I realized that providing people with a platform that they can store the information worked pretty well. Having the platform where they can drop everything was useful but as the sources were still as many as it was before, the aim for eliminating confusion was not fully achieved. So the sources needed to be defined as well just like information packages.

As a result of the testing, visuals, text and location had to be linked together to create a standard information package that provides enough information at different stages of the process such as getting inspired (mostly visuals), getting convinced(mostly texts), finding the place (address). As long as they are linked, lots of the steps and effort people put at different stages will be eliminated.

STACKING INFO
+ STANDARD UNITS

Figure 4.2: User involvement with paper prototype 1 and 2
Paper Prototype 2
Blogging on maps

In order to create a dialogue on user generated content, I created a prototype where the idea of travel blogging occurs on an online map. The purpose of the prototype was to bring together the sources so people interact with them on one platform and provide people with functions to exchange their trip experiences as well as required information for the trip such as location, images, comments etc.

The imagined platform consists of trips of others in the form of a route on the map and their experiences attached to that specific route in the form of text and visuals. People were able to reach others’ experience, select one of the routes and follow it throughout their journey. The purpose was to create ready made trips for travellers and make the planning as easy as possible, almost like one click.

Outcomes

People were checking blogs of travellers to get practical, contextual information, get to know their experiences, ideas, and stories. The outcomes of these actions serves for inspiration, being convinced and confirmation. So following people’s personal stories excited the users. However when it comes to following the itinerary that someone else had made had created a conversation on the feeling of fulfilling a task one after the other. Despite the fact that user generated content was helping in terms of “reference” and ready made itineraries reduced the confusion and searching for information period considerably, it needed to be more flexible. During the conversations several users came up with the idea of being able to pick and mix the locations on different routes. Further conversations revealed that picking and mixing from other people’s routes or itineraries had negative effect on reducing the confusion.

USER GENERATED CONTENT
Feedback

A feedback session was held after Midway presentation where I presented my initial concepts and directions. Having to present to different people helped me understand things that needed clarifying. It was a good way to process the topic again, and triggered useful discussions on how to move on.

Focusing on online platform and user generated content, the motivations that increase the contribute of people to such platforms have been researched after the feedback session. Among the published papers, (Wang & Fesenmaier 2003, Teichman et al. 2015, Dholakia et al. 2003) several key points have been highlighted which could be used to increase the engagement of people to use such platforms.

- Leaving room for self presentation
- Creating inter-personal communication channels
- Contribution facilitation

Considering required time for the prototyping and testing, one of the key points, leaving room for self presentation, have been prioritised to develop the concept further.

Reflection

As the need for balancing planning still haven’t been addressed, I went back to the observation that has been done with people on a trip. While going through the notes and video material with balancing planning in my mind, I tried to find a reasonable time frame for planning that will be short enough to avoid feelings like completing a long to do list and long enough to cover a period of time so that interactions with the device/s are defined, less frequently and less distractive.

While going through the observation materials, I realised that it was almost natural to talk about the plans during meal times. Breakfast and lunch were the times that the basis of morning and afternoon plans were formed.

PLANNING PARTS OF THE DAY

LEAVING ROOM FOR SELF PRESENTATION
FINDINGS

REDUCING CONFUSION

REFERENCE

ENGAGEMENT

BALANCING PLANNING

TACTICS

STACKING INFOS & STANDARD UNITS

USER GENERATED CONTENT

LEAVING ROOM FOR SELF PRESENTATION

PLANNING PARTS OF THE DAY

USER GENERATED CONTENT

LEAVING ROOM FOR SELF PRESENTATION

PLANNING PARTS OF THE DAY

USER GENERATED CONTENT
Storyboarding

Based on the tactics, I created a storyboard to clarify the flow of the events and interactions. It helped me to define the touch-points of the process and the service.

at home - Searching

At this stage people do a general search on where to go or if they decided, they look for getting ideas on which places to visit.

at home - Start Collecting

At this stage people are convinced about the place and ready to collect information packages (cards) that they are willing to visit during their trip. They go to the platform and create a board for their trip and start collecting the cards.

Organizing the day

This stage is designed to happen before leaving for the next destination. People will go to the application on their phone and go into the board that they created for the trip. At this point the platform offers two alternative ways of decision making. One is that they can pick from the mini routes that the platform generates out of the cards they picked up automatically for a certain part of the day. The other one is that they can select the cards manually from the board for a certain part of the day one by one.
Contribution

If people discover or visit a place that is not on the platform they can take pictures instantly, mark the location, write information about the place and submit directly. This process can be done later that day or even after the journey as long as they have the required information pieces to create the card.
Prototyping and Testing

In order to test the flow with people and get feedback, I first did the wire framing and then turned them into a click-able prototype. With the first iteration of the prototype people were; checking overview of some cities around them, then picking one, and see all the cards and routes people have shared so far, create a trip board, select cards or routes, and before driving, they select one of the routes from the trip board or combine some cards to create a time period.

Figure 4.4: Screen flow of the first prototype

Figure 4.3: User testing of the first clickable prototype
Learnings

Elements “cards, routes, boards” needed to be introduced to people clearly without creating confusion.

Visual language is important in order to distinguish elements

One of the elements -cards or routes- should be eliminated to simplify the interactions and learning

In order to reduce the click count as much as possible, and help people in decision making, first page should have a neutral categorization on its own.

Figure 4.4: Outcomes of the user testing
Result

Concept

Throughout this project I aimed for exploring a technology and related trends to propose a design solution that can enhance existing interactions, as well as help expanding and imagining the near future scenarios that those developments can enable. As technology and connectivity evolves, we expect new features and services to ease our lives and take some burden away from us or simply make our lives easier. In that case I started with some questions in mind which are;

What if our car knew where we wanted to go?

How can trip planning and bringing the plans into experience be easier?

Tripcloud aims for enhancing road trip experiences by untangling the problematic parts of planning the trip and bringing the plans into the car. The concept, which has been created with the questions above in mind, imagines a future scenario that is built on;

An online platform where not only the experiences but also required information can be shared between users

Making use of the collected information directly thanks to the automated links between devices and car, in other words the connected cars.

Tripcloud

Tripcloud is a platform that provides conveniences to the users in terms of planning and realising a trip through the combination of a website and mobile device applications.

Main Page

The main page that users land on is consciously designed to be as neutral and functional as possible to all kinds of users. For example, the ones that already decided where to go, can directly zoom in to the area to see more pins or type in the name of the place that they want to check. For the ones that haven’t decided yet and are looking for inspiration, most popular places are already marked on the map to help them get started. Additionally, there exist a colour coding for different categories;

History, Nature, Fun, Culture, Relax

which are also reflected on the pins as a single colour or combinations of colours based on the content.

The purpose of the colour coding is to help people to create a quick connection or give an inspiration to get started, let people have an idea of what to expect at that place and make it easier to filter the cards based on their interest roughly.

I believe the map and the colours
Cards are the core elements in terms of user interface for this concept. They are the information packages that are created by users and consist of photos, location information of the places, information about the creator of the card, description and comments. Average time that travellers have spent at that location is also saved and used on the cards to show the approximate time to spend there.

When users type in a city, region or a specific location, the cards that have been created for that place appears in a row. The pins on the map and the cards are linked. As users scroll the cards, pins also change according to the them.

One of the factors that people value the most for decision making is visual information, so the photos including the name of the places have been brought to forefront while designing the cards. More information about the place appears after clicking on the cards.

Figure 5.1: Final design, main page

Figure 5.2: Final design, card information
My cloud

On this platform users can create and save the cards that they have chosen for the trip in the form of a folder like clusters. My cloud part is where all the trips that have been created so far is stored. The user can go into one board, go through the cards he or she collected and send one or more of them to the car directly before leaving.

Time Bar

Time bar is an indicator of the average time that the cards that are selected to be sent to the car requires. It also includes estimated travel time between the selected cards as well. It appears when the user is in the board, selecting the cards to send the car, and helps the user planning / organizing by providing an overview on time. The user can pick only one card and send the car or can plan the entire day at once and then send.

Car interface

Considering the driver distraction risks, interactions with car interface, have been kept at minimum. Once the user gets in the car, interface shows the card that has been chosen for that time period. As soon as user confirms, the route generated for that card is shown on the screen. It is a regular navigation interface. Additionally, users can see the time and distance left until the next point and to complete the selected card/s.

Figure 5.3: Final design, my cloud page

Figure 5.4: Final design, time bar

Figure 5.5: Final design, car interface
Profile

On the Tripcloud platform, there is also a profile page that consists of user’s personal information and the titles that he/she has gained. Below the personal information card, there is a button where users can contribute to the platform by creating a new card.

Beneath them there is an area where shared visits and created cards area shown. The user and the others that follow him/her, can see how many cards that have been visited and shared or how many new ones that the
Reflection

As mentioned before, this project started with a curiosity to explore newly emerging technologies and trends around car and driving. The purpose of the studies was to identify opportunities for today and future in order to find ways to enhance experiences that includes cars and driving. Looking back from interaction design perspective, I find the topic quite relevant and interesting in the context of graduation project. One of my motivations was that, the topic is quite relevant to the industry, it includes complexity and addresses quite amount of people in real life.

Having a strong interest on one subject was really a push for me to dig deep and explore further. It helped me to get quite a lot of information on different levels -interaction, service, system- and from different perspectives-users, technology, industry. As an interaction designer, I really learned a lot from the overall process in terms of organising different activities, organising the information and most importantly organising my thoughts. Reading “How to make sense of any mess” from Abby Covert also helped me to get better understanding of dealing with complex situations.

One of the biggest challenges I had in the exploration part was not knowing what exactly I was looking for. Even though it was the nature of the approach that I chose -to unfold the pain points and possibilities through the exploration phase- dealing with a broad topic from various perspectives in the beginning was a bit challenging. I tried to put down all the possibilities before making a choice. The topic could have been narrowed down earlier in the exploration phase.

Throughout the project I got lost several times, changed the path and postponed the decisions because of not feeling that I know enough to make a decision. What I realised is that, if everything is apparent, decision becomes mundane. As designer I learned that I should trust my intuitions sometimes and take initiative to proceed.

Another thing I learned from the creative part of the process is that, trying to solve every problem is a blockage in front of the project and creativity. As I focused on creating the whole platform, things got complicated quickly. At this stage, doing a prioritisation activity was quite important and helped me a lot in terms of organising my mind and my works.

Comparing with the other projects that I have done, I can say that this project was the one that I involved users the most. With different research, ideation, creative development and testing activities. I got valuable feedback and insights from various people which helped me both to expand and narrow down the topic from time to time. In the end, I wish I also could have made a functional prototype of the final design and see how it resonates with people to use the platform, send information between the mobile devices and the car.
References


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