



# **WHO IS RESPONSIBLE?**

## **SOLUTIONS TO ENHANCE DRIVING SAFETY**

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# CAPSTONE PROJECT

**With the ongoing effort to reduce texting and driving, the social aspect within the communication process requires more consideration.**

For more one decade since text messaging became normal of convenient communication tool, government, automobile, mobile device makers, service carriers have been investigating effective ways to enhance driving safety. Besides, designers and engineers are also working enthusiastically for seeking better solutions by incorporating with emerging technologies.

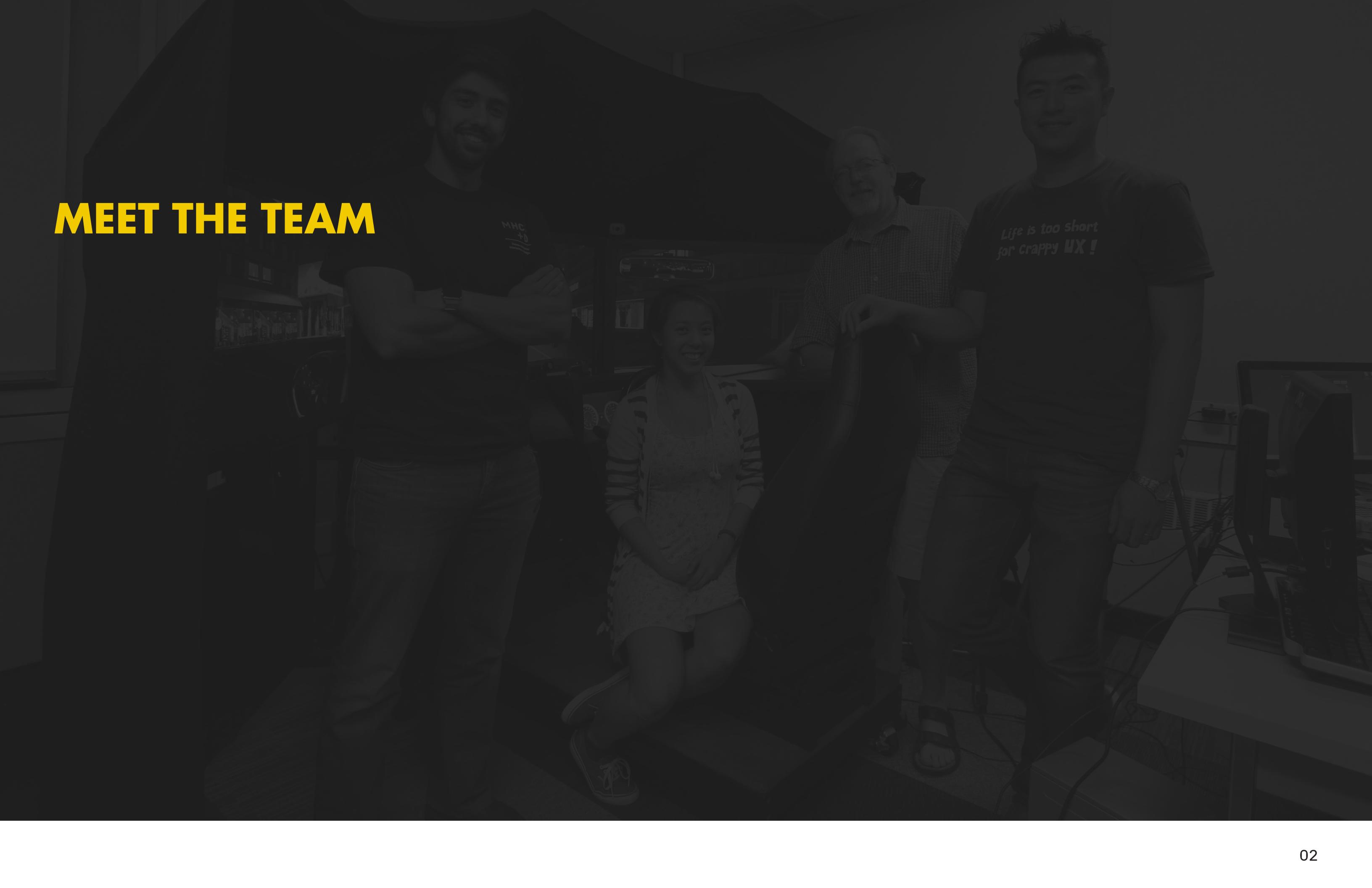
A group of four MHCI+Ders invested their endeavour and skills to tackle this subject as their capstone project. This project endured for a half of a year through 5 progressive phases. In the five phases we investigated problem space and opportunities via several rounds of secondary research with innumerable source of information on the topic surrounding distracted driving. We explored the extended dimensions across the life of a text

message in the communication loop from sending to receiving a text and iterating with replies. We verified our belief that we can reduce the texting and driving by changing the power dynamics between the sender and the recipient. We outline our key thoughts on how, in HCI level, we can utilize the social layer of the interaction in designing a compelling user experience, in order to facilitate driving safety.

We took a qualitative look at the current interaction models of texting, tested a number of different interventions related to social signaling on the sender side, as well as the voice-interactive system for the driver side.

This book consolidates the process of the project and the thoughts behind our design decisions into a designed, considered document which is optimised primarily for printing viewing. From all of us from MHCI+D program at UW, we hope you enjoy it.

# MEET THE TEAM



*Life is too short  
for crappy UX !*



# Chris Olsen

Project Manager  
& UX perspective

[@chrisolsendesign.com](http://chrisolsendesign.com)

Chris is a cross-media communicator, graduated from Washington State University with a Bachelor of Science degree in Architecture.

He has worked for several companies in different design capacities including Technical Illustrator & Graphic Designer for Hewlett-Packard; Computer-Based Training Designer, Product Designer, and Audio Designer/Composer for Microsoft; and Video Documentarian, Music Composer,

and Web Designer for his own company, Chris Olsen Design (aka CODe).

His interests have always crossed the bridge between the technical and the artistic. He is developing my user research, UX Design, and HCI skills.



# Acacio Domar

Visual Design  
& UI perspective

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Acacio has a Bachelor's degree in Architecture from the University of Washington. His experience ranges from leading teams in Europe in retail design, industrial and interior design, to starting his own company to design corporate identities, artwork and websites.

He feels it is essential to think about the human element in every design and how we act and interact with everything and everyone around us.

He skilled in project management and physical and digital prototyping. He enjoys problem solving since, to me, that is when the fun starts.

His interests include automation and the internet of things, particularly in the home, vehicle systems and product design.

Cheryl holds a Bachelor of Science degree in Human Centered Design & Engineering from the University of Washington.

As someone who explores all avenues for opportunities to learn and grow, she has had experiences in all areas of programming, user research, and interaction design. However, she has discovered her true passion is in UX design, not to mention swing dancing, longboarding, and book binding. She buffet through life with a down-

for-anything mentality, seeking to understand every nook and cranny of the world around her. Her first aspiration is to stitch the nostalgic romance of paper products back into today's digital organizational tools.

She yearns to breathe life into our zombified culture of texters and web junkies and use beautiful UX design to help us rediscover the wonders of the world in this overly-digitized era.



# Cheryl Wang

UX Researcher  
& Visual perspective

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Zhenxi holds a Master of Fine Arts degree in Multimedia Arts from Xiamen University, China. Previously he worked as project executive at Mazarine La Mode en Images Beijing, a leading design agency dedicated to luxury brands.

He is a creative designer focusing on analytical trouble-shooting and initiating problem solutions. He is skilled in visual design and multi-media production, and he is developing skills in User Research, Prototyping, and Web Design while

practicing User Centered Design. He is interested in interaction design, UX design and physical computing in the fields of internet of things, and automobile.



## Zhenxi Mi

Prototyper  
& UX perspective

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# Rohan K.

Sponsor Liaison  
& UX perspective

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An entrepreneur with a penchant for startups, he loves designing new products and solving problems. He is a strong supporter of improving lives through technology and make it a point to stay up to date with the latest trends in technology.

He is computer science engineer by education and a designer by passion. He started his career as a graphic designer and graduated to web and finally on to interaction design. In 2009, he started his own digital agency specializing in

UI design, eLearning, web design and motion graphics. After running his own business successfully for five years, he joined the Masters in Human Computer Interaction + Design program at the University of Washington to dive further into the field of user experience and usability.

He is skilled at designing and prototyping new ideas and driven by the excitement that accompanies the process of creating something new (whether

be it a product, service). He is guided by a strong sense of design and aesthetics and enjoy working in cross functional teams with multi-disciplinary talents. He looks forward to applying the skills and knowledge that he has gained as part of the program in my areas of interest, such as Internet of Things, Smart Cars, Wearables and all things mobile.

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human-computer  
interaction + design

# MASTER OF HUMAN-COMPUTER INTERACTION + DESIGN

## UNIVERSITY OF WASHINGTON

A truly interdisciplinary experience with world-class faculty and students from four departments in the cross-disciplinary group, DUB: Design-Use-Build:

Computer Science & Engineering

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By integrating several disciplines, this unique Master of Human-Computer Interaction and Design program brings together design, technology, and the study of human behavior, creating students who can work seamlessly across these fields to create innovative new products, technologies and services.

In a year-long, project-based curriculum, students learn the latest tools and techniques in user experience and interface design, prototyping, user research and evaluation. The Master of Human-Computer Interaction

and Design courses consist of both hands-on studios (often focused on industry-sponsored projects) as well as cutting-edge lecture courses. The combination of theory and practice, with emphasis on making and doing, provides a dynamic and intensive learning experience.

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# USTWO

## DIGITAL DESIGN STUDIO

ustwo is a global digital product studio launching products, services and companies that make a measurable difference to the world. Since our foundation in 2004, we've partnered with some of the worlds leading brands and have grown to four studios around the world in New York, Malmö, London and Sydney.

We champion unrivalled user experience design and best in class technical practices, but we recognise that product is so much more than either of these in isolation. For us, the magic happens when these elements come together to form a product that at it's core is centred around real human needs. And when it comes to quality, we literally wrote the book on how to deliver Pixel Perfect Precision.

We form meaningful partnerships with others, but we also recognise the value of going it alone from time to time so that we can learn from a whole

range of experiences. We put a large percentage of our profits directly back into these initiatives too, so that we can continue to innovate and learn. We also share these rewards amongst ustwobies as we recognise the value in creating opportunities for our staff and in retaining the best design and engineering talent in the industry.

Our cultural values are centred around enabling the ambitions of 200+ inspiring and talented individuals so that together we can make a measurable difference to the world. We value collaboration, fun, craft, openness and authenticity, and work as 'one team' with our clients.



**USTWO**

*AUTO TEAM*



**Tim Smith**  
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# **INTRODUCTION**

*WE ARE RESPONSIBLE*

# INTRODUCTION

**What technology is changing our way of communication and bringing challenges to our daily life? It has to be the smart mobile phone.**

Nowadays, as we are more connected than ever before via variety of mobile devices, many people tend to be very reluctant to be disconnected. A study by Kleiner Perkins Caufield and Byers showed that the average user checks their phone approximately 150 times per a day, it may not make sense to you, it's probably easier to imagine if saying that equals to about once in 10 minutes.

However, our life is not designed mobile phone friendly for us to be “always-connected”, therefore, there are many cases that we are not supposed to use our mobile phone intensively, for instance, driving a car doing tasks like browsing social media, interacting with the navigation, making phone calls and text messaging with typing.

**“ 58% of all car crashes are caused by distracted driving, and using mobile phones making up 34% of road departure accidents.”**

AAA Foundation for Traffic Safety, ‘Using Naturalistic Driving Data to Assess the Prevalence of Environmental Factors and Driver Behaviors in Teen Driver Crashes’, AAAFoundation.org, Washington, DC, 2015.

A second may not seem like much, but ...

# AT 65 MPH

A CAR TRAVELS THE LENGTH  
OF A BASKETBALL COURT  
**IN A SINGLE SECOND.<sup>5</sup>**



Texting takes your eyes off the road

**FOR AN AVERAGE OF  
5 SECONDS.<sup>6</sup>**

Pair that with the average weight of a car–

**4,000 POUNDS**

– and consider if that text is worth  
the risk of driving blindly.<sup>7</sup>

Driving is an activity that requires intensive attention from the driver, and distracted driving behaviours and habits are the primary cause of fatal vehicular accidents to the young drivers.

Current solutions for reducing distracted driving are mostly focused on putting the responsibilities to the drivers, but neglecting the fact that the communication loop can not be completed without the other side, the senders. Our perspective sees the problem as a social related issue rather than an individual behavioral or habitual issue. In addition, it can not be easily solved from only the driver's side, because even though it's seen the dangers of texting while driving, drivers are still willing to put themselves in these dangerous situations.

There is great potential for facilitating the driving safety by shifting the responsibility from the driver to the sender. In order to change our

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AT&T. (Producer). (2012). Texting & driving: It can wait. [Web Photo]. Retrieved from [http://safetymom.com/wp-content/uploads/2012/05/ATT\\_TWD\\_Infographic\\_FINAL5.jpg](http://safetymom.com/wp-content/uploads/2012/05/ATT_TWD_Infographic_FINAL5.jpg)

behaviour, the whole communication loop has to be involved.

Preliminarily we considered young adult drivers age 16-24 were our target audience, the reason was that various studies show that this specific demographic has highest risk involvement in both fatalities and crash injuries than any other age group. But as the project went on, we became increasingly realized that our solution tended to be a OS level modification of the current smartphone system, the main impact would probably lie on the sender side, so we included the peer friends, coworkers, and families of the young adult driver into our consideration. By narrowing down the target audience, we would be able to focus on the most typical scenarios that they want text, and the behavioral as well as psychological factors that motivate them to put themselves in a dangerous situation.

# **EXECUTIVE SUMMARY**

## *HOW WE GOT THERE*

Texting while driving (TWD) is a prevalent problem in today's society as we move towards a more "always-connected" world. Many owners of smartphones suffer from an automatic tendency to respond to text messages regardless of context or activity, which extends to driving on the roads. A large opportunity lies in placing part of the responsibility of driver safety onto the sender of text messages, rather than just the driver--the recipient.

Our solution--'Drive Mode'--lets senders know when a recipient is driving and defers all messages until the driver has turned off the car. By making status known, senders are more aware of the context of their recipients and can tailor texts to better suit the situation--whether it be not sending a text, waiting until after the recipient is done driving, or just to expect a later reply. These text senders can also determine when messages are important and needs to be delivered immediately, so messages a driver receives

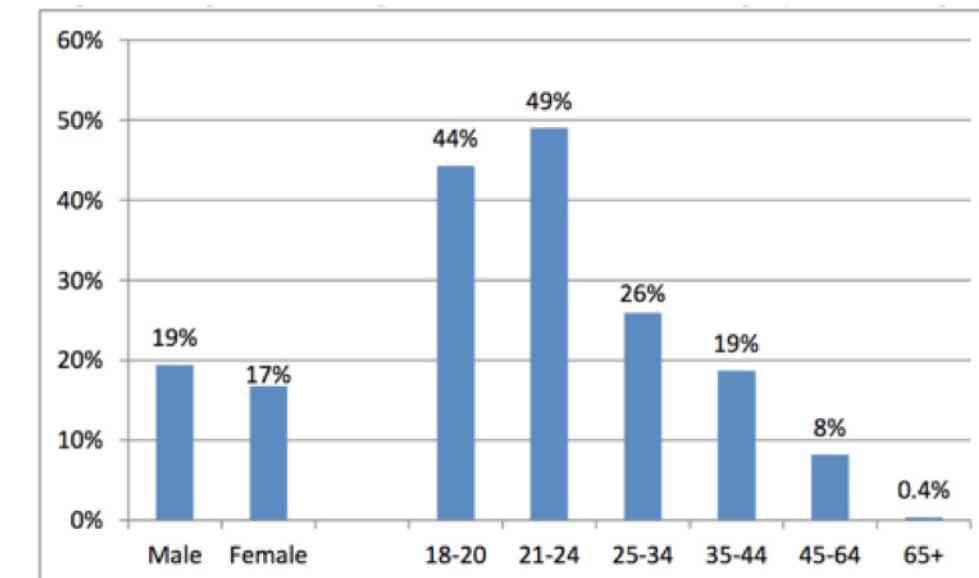
are only the ones that are important and deserve attention. By shifting responsibilities, we lessen the driver's cognitive load and inspire change by social expectations.

We ask ourselves: *How might we make texters a part of the decision making process of which text messages deserve the attention of a driver?*

# PROBLEM

## DANGERS OF TWD & PHONE USE

Phone use in the car is dangerous because it takes a driver's hands off the wheel, eyes off the road, and their attention away from driving. Texting in particular takes a great amount of cognitive load, which makes it harder for a driver to quickly and accurately respond in driving situations. The AAA Foundation found that texting increases the likelihood of an accident by 23x and that talking or listening to someone increases that likelihood by 1.3x. Additionally, the RAC Foundation has found that "when texting, a driver might present a greater accident risk than when at the legal limit for alcohol consumption or when under the influence of cannabis."



## PREVALENCE

Almost 50% of drivers under 25 report sending messages while driving and almost 30% of drivers up to age 44 report sending messages while driving. There's a reluctance to change this dangerous behavior because most drivers display an overconfidence in their driving abilities and even their texting while driving abilities. 77% of young drivers say they are very or somewhat confident they can text while drive safely even though it's been shown that teens who text while drive spend about 10% of their drive time outside of their driving lane.

## TEENAGERS

Car crashes are the leading cause of death for the ages of 5-34. In fact, every day, 1 teenager dies in a car accident directly due to phone use in the car. As novice drivers, 16 to 19 year olds are 3x more likely to be in a car accident than any other age group. This age group also texts far more than any other age group. Thus, solving the problem of texting with this age group in mind would greatly impact the number of overall death counts of all car accidents and of car accidents for this age group.

# CURRENT SOLUTIONS

A text from a person to a driver involves many different parts. The person uses their phone to send the text that is processed by a cell service, then to the phone of the driver who is in their car. In a competitive analysis, products all intervene in areas other than the original sender and their phone. These products, though numerous and varying, fail to make a large impact on the number of drivers that text on the road. Drivers feel annoyed and frustrated by the way products may intervene; and in fact, some products can even add more cognitive load to the driving experience than take load away. On top of that, in-car systems may be expensive and hard to upkeep, making it hard for outside stakeholders to ease the problem of texting while driving.

Another study looked into the more habitual behaviors associated with texting. Texters have “automatic texting tendencies”, in which sending and reading texts happen in such an automatic way that one may text

without full “awareness, control, attention, and intention” of their actions, even in dangerous situations. Furthermore, Robert Morris University says that texters connect phone numbers more to a person, rather than a place, increasing the expectations that one must immediately respond to all phone calls and messages, regardless of time, place, or activity. These studies make us wonder what would happen if we turned some of the responsibility of driving safely onto the sender of the text rather than the texter themselves.

We asked ourselves, if putting all the responsibility on the driver to be safe isn’t working, then what will? Clearly texting involves two parties, not just one. So let’s focus on the original sender and their phone, where there has yet to be any attempted interventions.

# **CONFIRMING DIRECTION**

## *LEVERAGING SOCIAL TIES*

During our Subject Matter Expert(SME) interview with Dr. Linda Boyle, one experimental research drew our attention. Another solution that is being implemented is the TeenSafe Driver Program by American Family Insurance. This program puts a Drivecam into the car of teen drivers and will record the actions leading up to “events” in which risky driving behavior is detect. Teenagers and their parents can access the videos and will receive a score on the teen’s driving performance. TeenSafe has shown to be very effective in changing driver behavior. One major change was seatbelt usage. At the start of the study, only 20% of the teenagers used seat belts. By the end, 96% of the teenagers wore their seat belts. Additionally, there was a 61% drop in risky behavior among these teen drivers after the intervention.

NHTSA reports that the primary reason to send a text message is level of importance. More people read (10%) texts than send (6%) texts.

We are aiming to explore the opportunities of leveraging social signaling, with which we are trying to shift the responsibilities of safer texting from the driver to the sender, in order to alleviate the social and cognitive burden drivers are encountered with. Our design would help the driver to have the incoming information filtered by the sender by provide an option of deferring messages.

RAC FOUNDATION: ‘THE EFFECT OF TEXT MESSAGING ON DRIVER BEHAVIOR A SIMULATOR STUDY’, 2008  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION(NHTSA), ‘NATIONAL PHONE SURVEY ON DISTRACTED

DRIVING ATTITUDES AND BEHAVIORS’, 2011

AD COUNCIL, 2011

THE AAA FOUNDATION, ‘2014 TRAFFIC SAFETY CULTURE INDEX’, 2015  
INSURANCE INSTITUTE FOR HIGHWAY SAFETY (IIHS), ‘FATALITY FACTS: TEENAGERS 2012’, 2012  
CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC), ‘WEB-BASED INJURY STATISTICS QUERY AND  
REPORTING SYSTEM (WISQARS)’, 2007

# **INVESTIGATION**

*WHAT ARE WE SOLVING*

# INVESTIGATION

As the project started with initially, it was proposed as working with cars and HMI(Human Machine Interface), in order to redesign the car instrument cluster. However, it was such a huge area to start with, so it was narrowed down to distracted driving. After went through some of the common activities that might be involved in interrupting the driver's focus on driving, these activities include navigation, infotainment, co-passenger communication, and other external communication such as making phone calls and texting, etc.

AAA study shows that texting and navigation have the most cognitive load comparing to other in-car activities. Therefore, we saw a great potential to alleviate the cognitive load by incorporating technologies and some successful interaction models that applied on other fields. The competitive analysis and secondary research led us to the conclusion that all the current technology solutions are very likely to add more cognitive load, for

example the synthetic voice reader, HUD (Head Up Display), touchscreens, buttons on the steering wheel, sensors and siren, etc.

Therefore, we decided to another perspective to look at the problem space, that was, trying to understand the underlying human behaviours and the prevalent social norm of interpersonal communication in the digital age.

**We dived into both secondary research and primary research with two main questions in our minds:**

- 1) How do we suspend/mitigate/defer/filter social interaction during driving in a way that heavy social media users will accept?**
- 2) Can some of the responsibility of phone interaction safety while driving be acceptably transferred from the driver to the sender of text or phone messages?**

# SECONDARY RESEARCH

We started our research in the Winter quarter with several rounds of secondary research. Our first pitch completed in the first weeks of Spring quarter were scaffolded by research studies done by AAA, the National Highway Transportation Safety Association (NHTSA), the National Safety Council (NSC), and the National Governor's Association (NGA). Since that time, we have found that there are innumerable sources of information on the topics surrounding distracted driving.

We all acknowledge that texting while driving is a dangerous activity, from the secondary research, we learned the extent of its prevalence and the true fatal nature. The studies show that teenagers are especially prone to being in car accidents and several studies have been completed analyzing recordings of these novice teen driving behaviors. Most famously, both American Family Insurance and the AAA Foundation conducted studies in which DriveCam videos showed that these teenagers could be easily

distracted by simple things like tuning the radio or putting on lipstick, which puts themselves and others in dangerous situations<sup>[1]</sup>. 40% of these teens, and 44% of adults, say they've been in a situation where they or someone driving used a cellphone in a way that put themselves in danger<sup>[2]</sup>.

[1] AAA Foundation for Traffic Safety, 'Distracted Driving Among Newly Licensed Teen Drivers', [AAAFoundation.org](http://AAAFoundation.org), Washington, DC, 2012.

[2] Pew Research Center, 'Adults and Cell Phone Distractions', Pew Research Center, 2010.

## SME INTERVIEW

One source of several papers is Dr. Linda Ng Boyle, a professor here at the University of Washington (UW), who is in charge of the Human Factors and Statistical Modeling Lab. In order to get richer knowledge on this subject, we reached out to Dr. Linda Ng Boyle and conducted a SME interview with her, the finding helped us to refine our research scope as well as the research questions within that scope, and direct our secondary research towards the right resource.

Image of Dr. Linda Ng Boyle  
UW Today. (News). (2012). USDOT awards \$3.5 million for UW-based regional transportation center [Web Photo]. Retrieved from <http://www.washington.edu/news/files/2012/01/boyle.jpg>

>



**“ Everybody thinks that they are a better driver than the other person. Males think that they are way better drivers than females do.”**

-Dr. Boyle

**“ Linda Ng Boyle joined the faculty as an Associate Professor in the Fall 2009. Prior to this appointment, she was an associate professor at the University of Iowa and a senior researcher at the U.S. Department of Transportation - Volpe Center. Dr. Boyle’s research centers on driving behavior, crash countermeasures, crash and safety analysis, and statistical modeling. Her research work has also been funded by the US DOT, NIH, and the National Academies - TRB.**

Dr. Boyle is an associate editor for the journal Accident Analysis and Prevention and serves on the Transportation Research Board committees on Simulation and Measurement of Vehicle and Operator Performance and Statistical Methodology in Transportation Research. She also co-organizes the International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design.”

Introduction from the website of College of Engineering, UW. Retrieved from <http://www.ce.washington.edu/people/faculty/faculty.php?id=5>

# CAR SIMULATOR



Our team was lucky enough to get a tour of Boyle's lab and get her input on how to test and research distracted driving. Her lab has a simulator that includes a car seat, pedals for gas and brake, a digital dashboard, and a stand that can hold a small tablet to simulate tasks or a GPS on. She made a comment that sometimes drivers automatically go for a seatbelt and it would be interesting to put a seatbelt on the seat.

It faces 3 large screen monitors that show a simulation of a driving car. Sitting on the dash is an eye monitor with a camera. Another camera is set up near where the rearview mirror would be.

The simulation is controlled by a set of computers that sits on a desk behind the simulator. Linda says this set up cost them \$60,000, \$10,000 for the recording devices, and a \$6,000 maintenance fee. Boyle has conducted in-car tests, but she says she avoids testing real

distracted driving incar because it puts those in and around the vehicle in danger. There's no real way to give heuristics to distraction yet, but the AAA Foundation has done numerous studies that aim to define indicators for cognitive distraction.

# SPONSOR INPUTS



On ustwo's official blog, there are a series of five blogs talking about the future design for in-car HMI. They have done a large number of research on the information in car and the interface that manages the cluster of the rich information. In addition, they are also trying to bring UCD thinking into their solutions and suggestions, in order to envision the future user experience in our cars.



## Tim Smith

Tim is a design specialist at ustwo with ten years of visual design experience and 14 awards and honours to his name (although 13 of those awards were made up by himself).



## Harsha Vardhan

Harsha is an interaction and service designer with a background in industrial design and engineering. He is a graduate from the Copenhagen Institute of Interaction design (CIID) and the Indian Institute of Technology (IIT), Delhi.



## David Mingay

David has over 15 years experience in digital design, spanning a wealth of industry verticals, engagement types and user touch-points. After graduating from Northumbria University with a design for industry degree, he immediately jumped into the digital world of set-top boxes, CD-ROMS and kiosk design.

# COGNITIVE LOAD OF IN-CAR ACTIVITIES

Many different modes of interaction are being employed in an attempt to create no-look systems. Touch systems attempt to utilize large knobs<sup>[3]</sup> that are so easy to find and manipulate so that the driver does not need to look to use them. These implementations can wind up being many steps for the driver (turn the knob until “texting” is heard, then turn it to choose read or send, etc) and a distraction in themselves<sup>[3]</sup>. Voice driven systems are popular<sup>[4]</sup> and are successful in widely varying degrees--Toyota’s system

causes the same cognitive load as talking to a passenger<sup>[5]</sup>, whereas interactions with Apple’s SIRI causes quite a bit more cognitive load than texting<sup>[4]</sup> (see Figure 1).

[3] A. Rydström, P. Bengtsson, C. Grane, R. Broström, J. Agardh and J. Nilsson, ‘Multifunctional systems in vehicles: a usability evaluation’, The Fourth International Cyberspace Conference on Ergonomics, Sweden, 2005.

[4] AAA Foundation for Traffic Safety, ‘Measuring Cognitive Distraction in the Automobile II: Assessing In-Vehicle Voice-Based Interactive Technologies’, AAAFoundation.org, Washington, DC, 2014.

[5] AAA Foundation for Traffic Safety, ‘Mental Workload of Common Voice-Based Vehicle Interactions across Six Different Vehicle Systems’, AAAFoundation.org, Washington, DC, 2014.

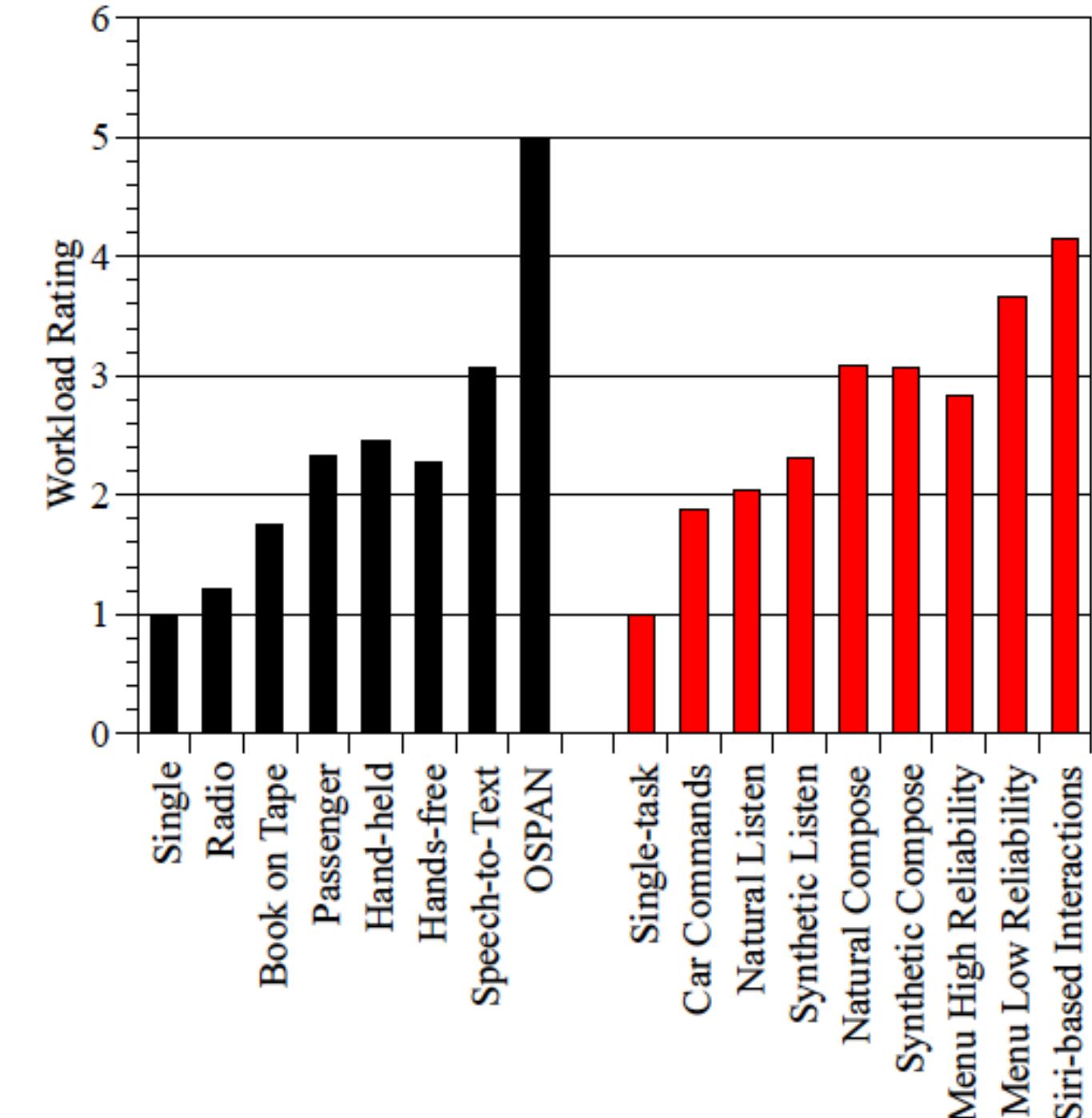


Figure 1

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Retrieved from AAA Foundation for Traffic Safety, ‘Measuring Cognitive Distraction in the Automobile II: Assessing In-Vehicle Voice-Based Interactive Technologies’, AAAFoundation.org, Washington, DC, 2014.

# TARGET AUDIENCE

Our topic aims to reduce dangerous behaviors correlated with texting while driving, which means our general target audience can potentially be all vehicle drivers who also own a mobile phone. However, due to our time and finance constraints, we narrow our focus to the most endangered group of drivers--ages 16 to 24.

Both in academia and industry, various studies have been done to investigate the traffic accident risk rate among different demographics. The data from these studies place drivers aged from 16 to 24 at the highest risk involvement in both fatalities and crash injuries than any other age group<sup>[6]</sup>. For these drivers between age 16 to 24, the statistics show that the fatality rate per 100,000 population was higher for males than for females. Injury rate based on the same scale was higher for females than males<sup>[6]</sup>. However, we don't consider the gender difference as our primary concern to distinguish our target audience demographics.

Although our target participants are focused on the 16-24 year-old demographic, the solution will be generalizable to the drivers from different demographics.

We will also include the parents of young drivers and insurance companies into our consideration as indirect stakeholders. Parents are of course concerned about the safety and well-being of their children. Many parents pay for the car insurance bills, and enhancing their children's driving safety is a high priority. By adding insurance benefits to drivers, parents of these drivers and drivers who have to pay for their own insurance will be more willing to adopt our solution.

From the other side of the communication process, another indirect stakeholder is the sender of text messages. We assume that these texters care about the safety of the driver, the recipient. No matter what our solution will be, there will be a strong impact to the sender's behavior accordingly.

[6] National Highway Traffic Safety Administration, U.S. Department of Transportation, 'A Compilation of Motor Vehicle Crash Data from the Fatality Analysis Reporting System and the General Estimates System', 2008.

## CURRENT SOLUTIONS

### Wheel Watcher

A hardware solution that monitors when users take their hand(s) off the wheel and sounds a siren. People do not like this because it is annoying.

### Katasi Groove

A system that includes a reward system attractive to teens, giving them points when they employ good driving habits. Not widely used - reward system ineffective with teens.

### Verizon Safely Go Sprint Drive First AT&T Drive Mode

Each from phone service providers, stop texting functions when the phone gps indicates movement faster than 15 mph. People don't download the apps, systems not used.

### Drive ID

A software/hardware solution that detects which half of the car the phone is on, thereby allowing most passengers to continue texting while the driver cannot. Doesn't help the passenger behind the driver, expensive.

## **PRELIMINARY HYPOTHESIS**

**What if we shift some responsibility for  
the driver's texting behavior onto the  
sender instead of the receiver?**

## PRIMARY RESEARCH

**"If you knew your recipient was driving, would that change your texting behavior?"**

Yes

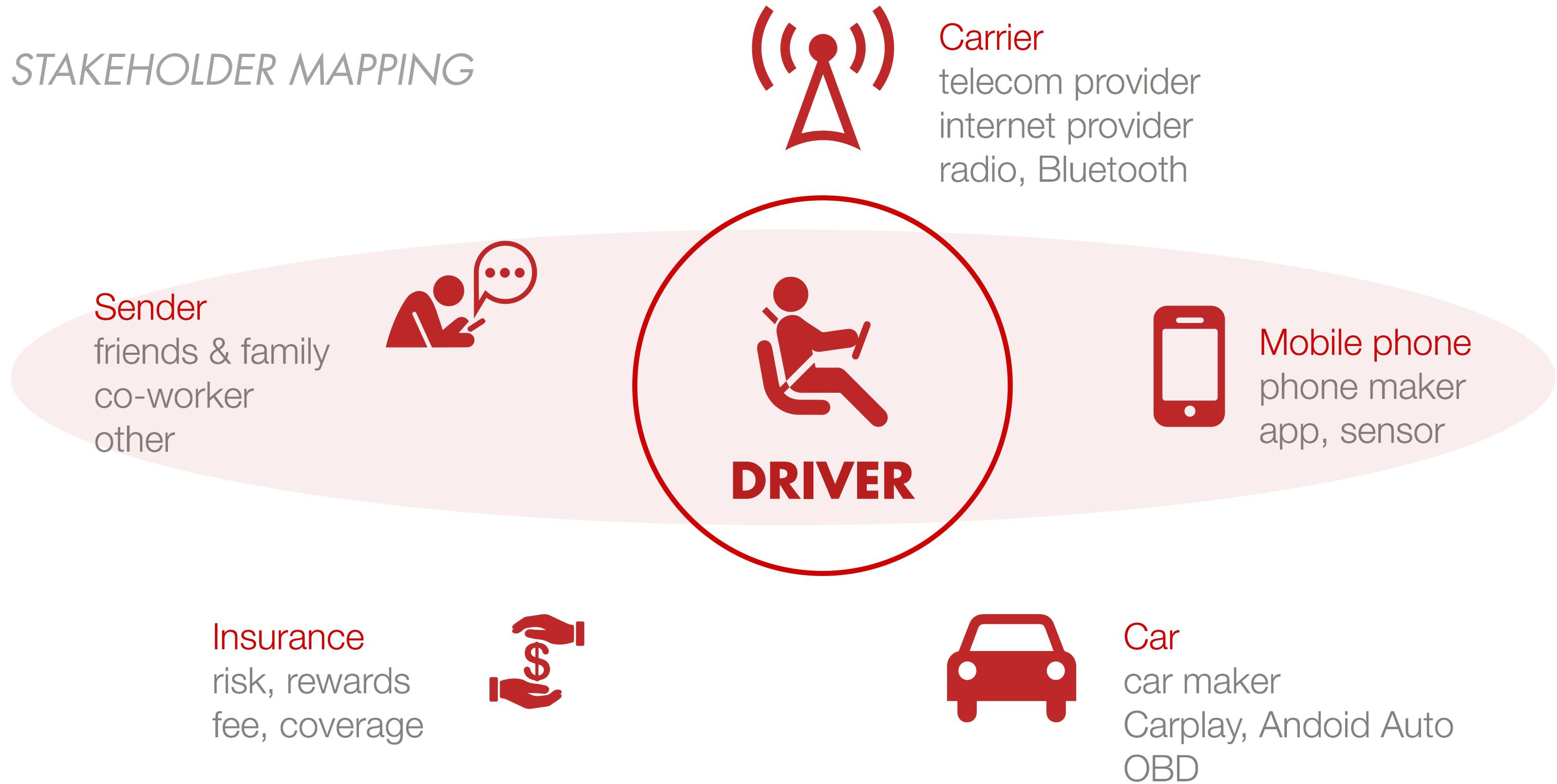


No

# IDEATION

*WHAT CAN WE DESIGN*

## STAKEHOLDER MAPPING

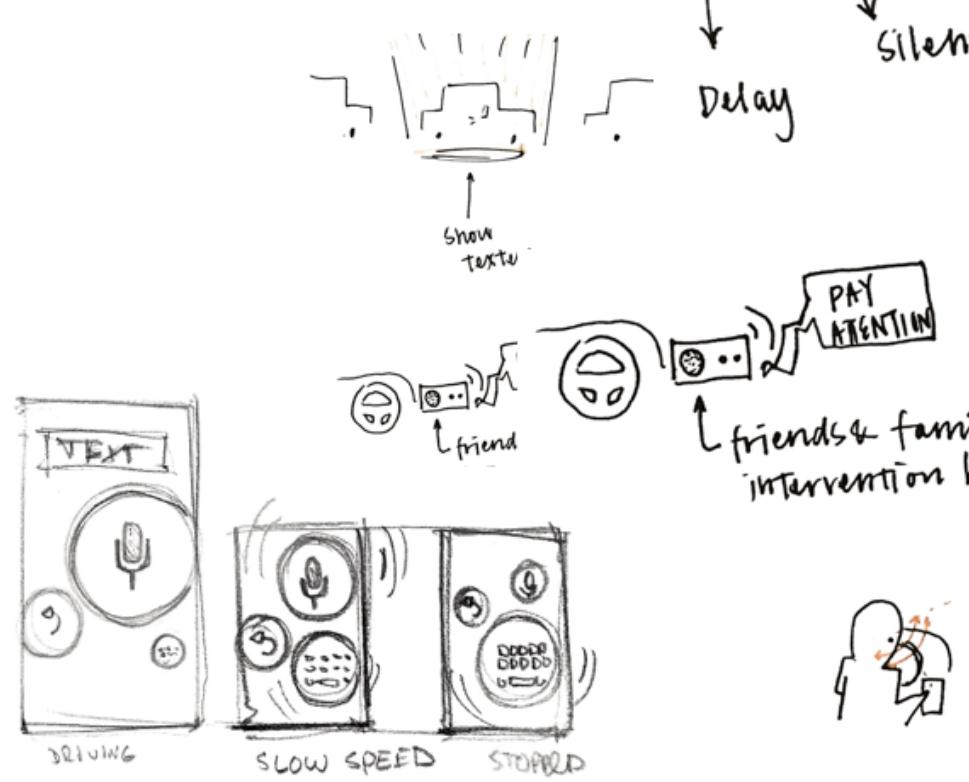
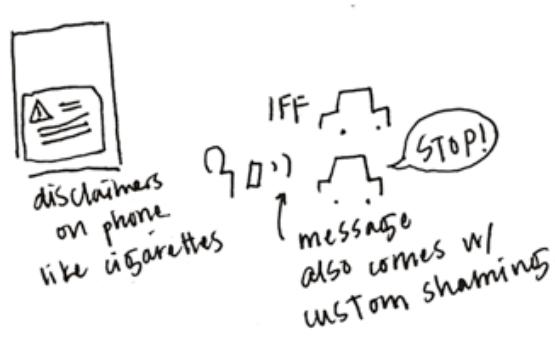
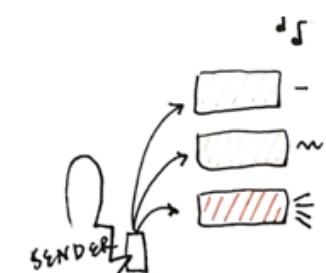
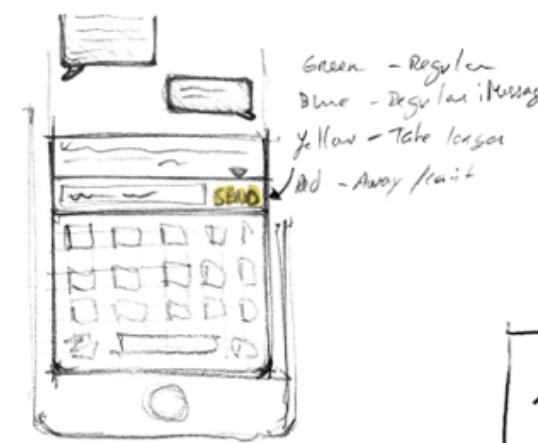


## SKETCHING

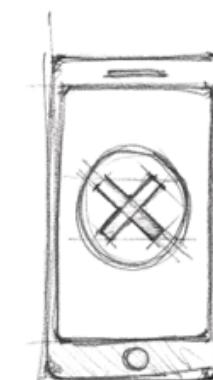
Profile locked until person unlocks it.



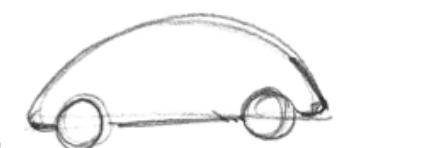
lights up.



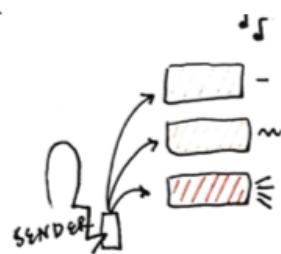
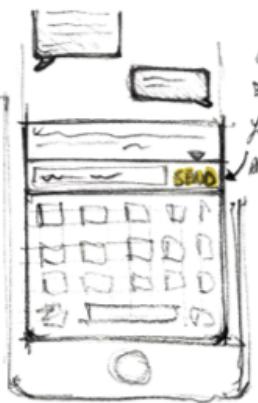
eyetrack  
to see distraction level



IF TWD  
They have to do a fear factor challenge when they get out



## Sender | Carrier | Recipient

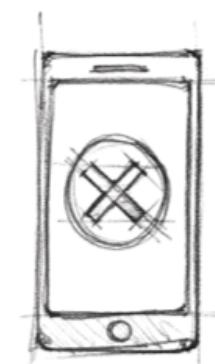


### Social signaling

The sender will be notified with recipient's status, driving or not driving.

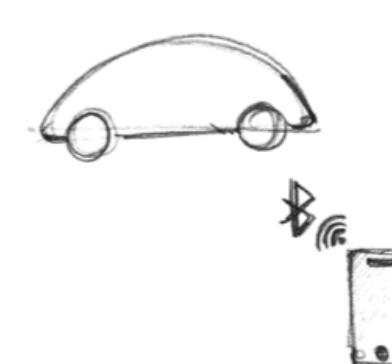
### Reply with templates

Preset templates such as "I am driving, get back to you later", takes one click to reply.



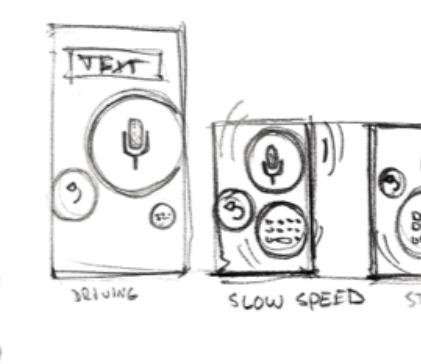
### Disable service

Phone auto detects if driving, turn off the texting service.



### Bluetooth

Phone pair with car, then car can sense driver's presence.



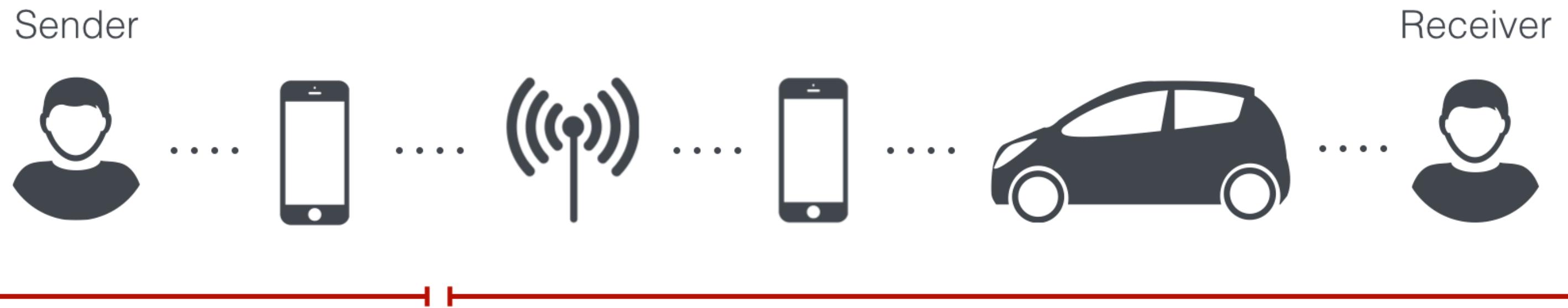
### Adaptive UI

Phone UI changes with the speed.



### Rearview mirror

Show notifications on the rearview mirror.



## Our Focus

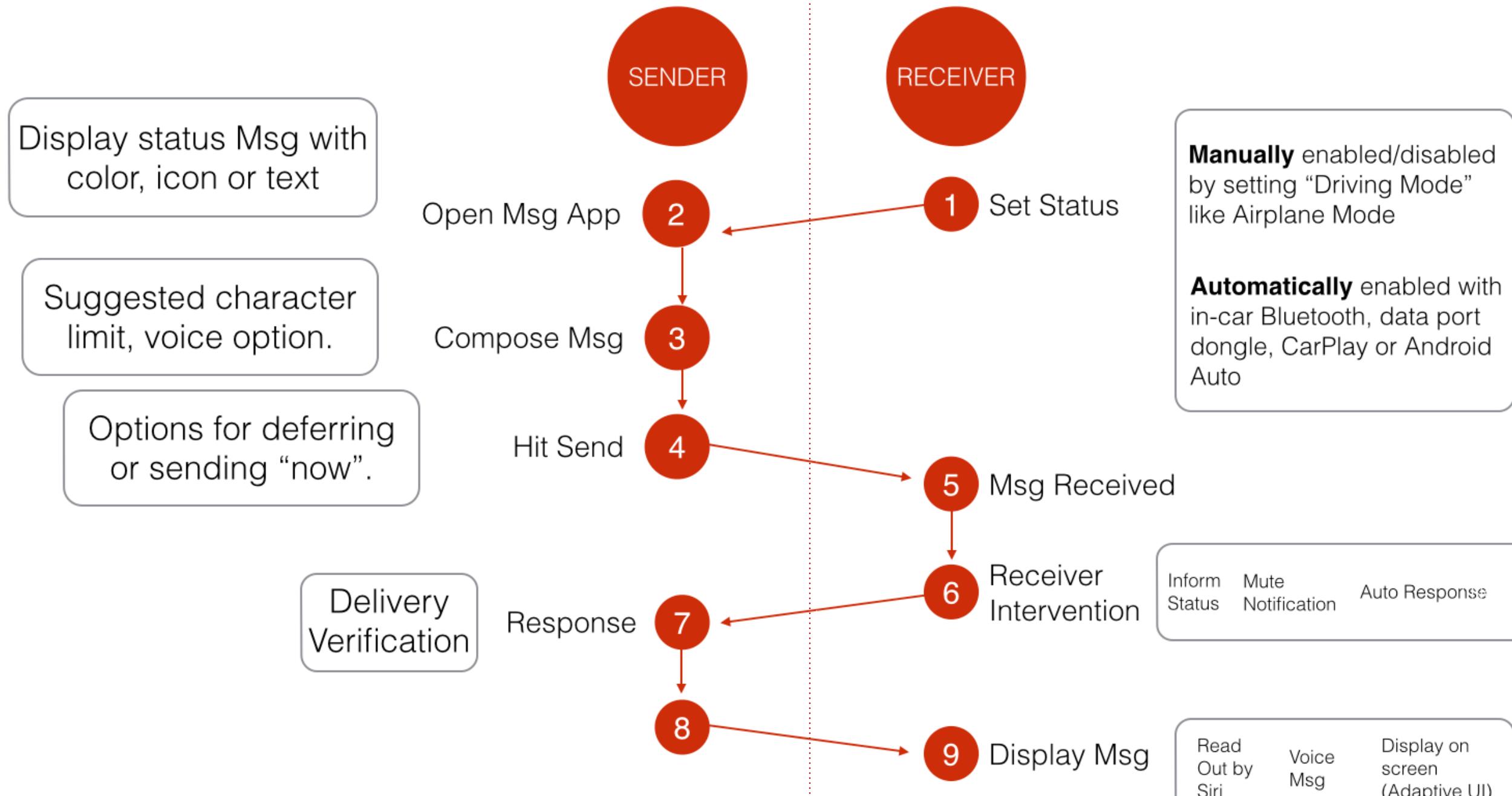
Verizon Safely Go      TextArrest  
Sprint Drive First      Safe Driver  
AT&T Drive      ZoomSafer  
DriveSafe.ly Pro

Apple CarPlay  
Android Auto  
DriveID  
Navdy

Katasi Groove  
Wheel-Watcher

# **REFINEMENT**

*HOW TO DESIGN BETTER*

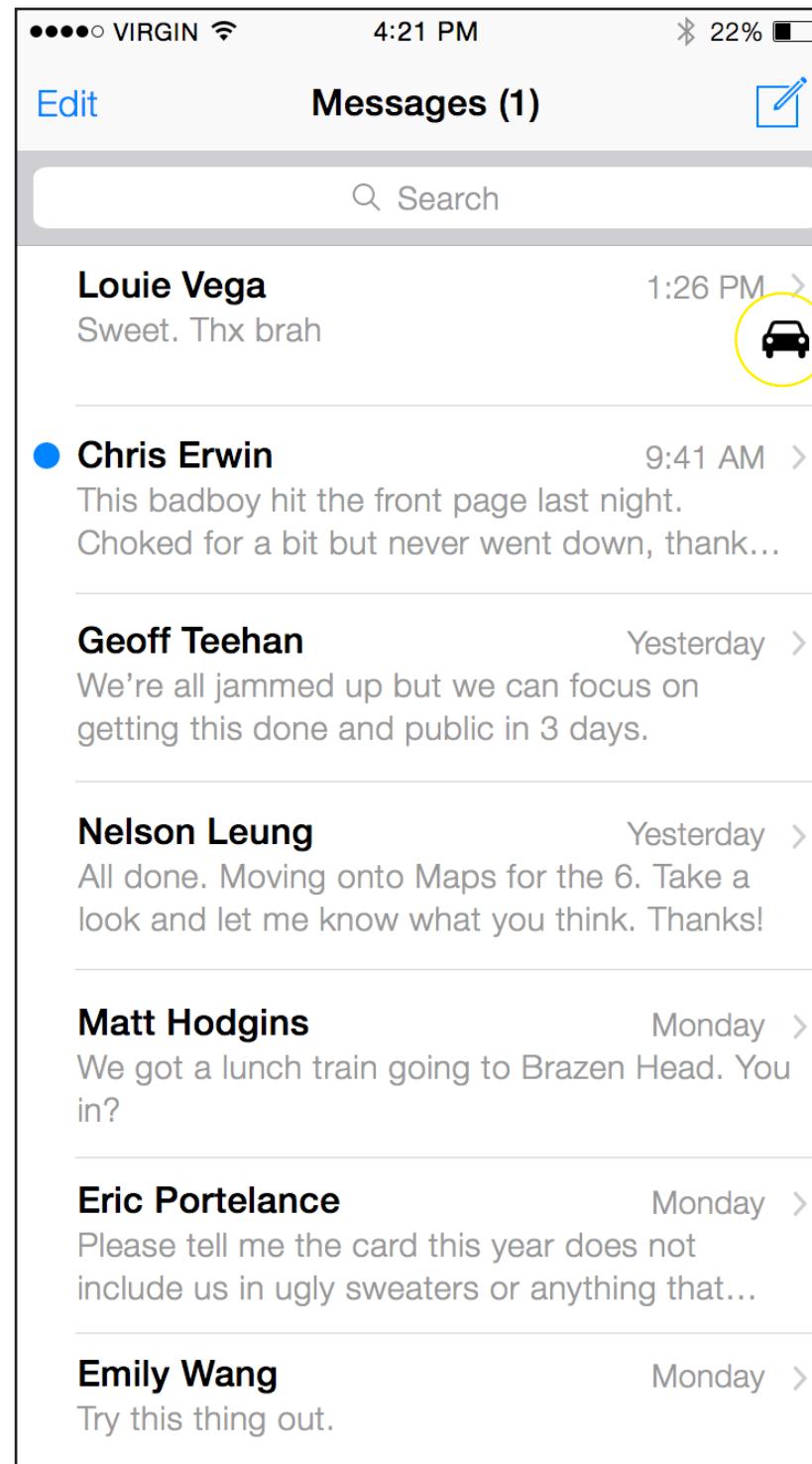


# SCOPE

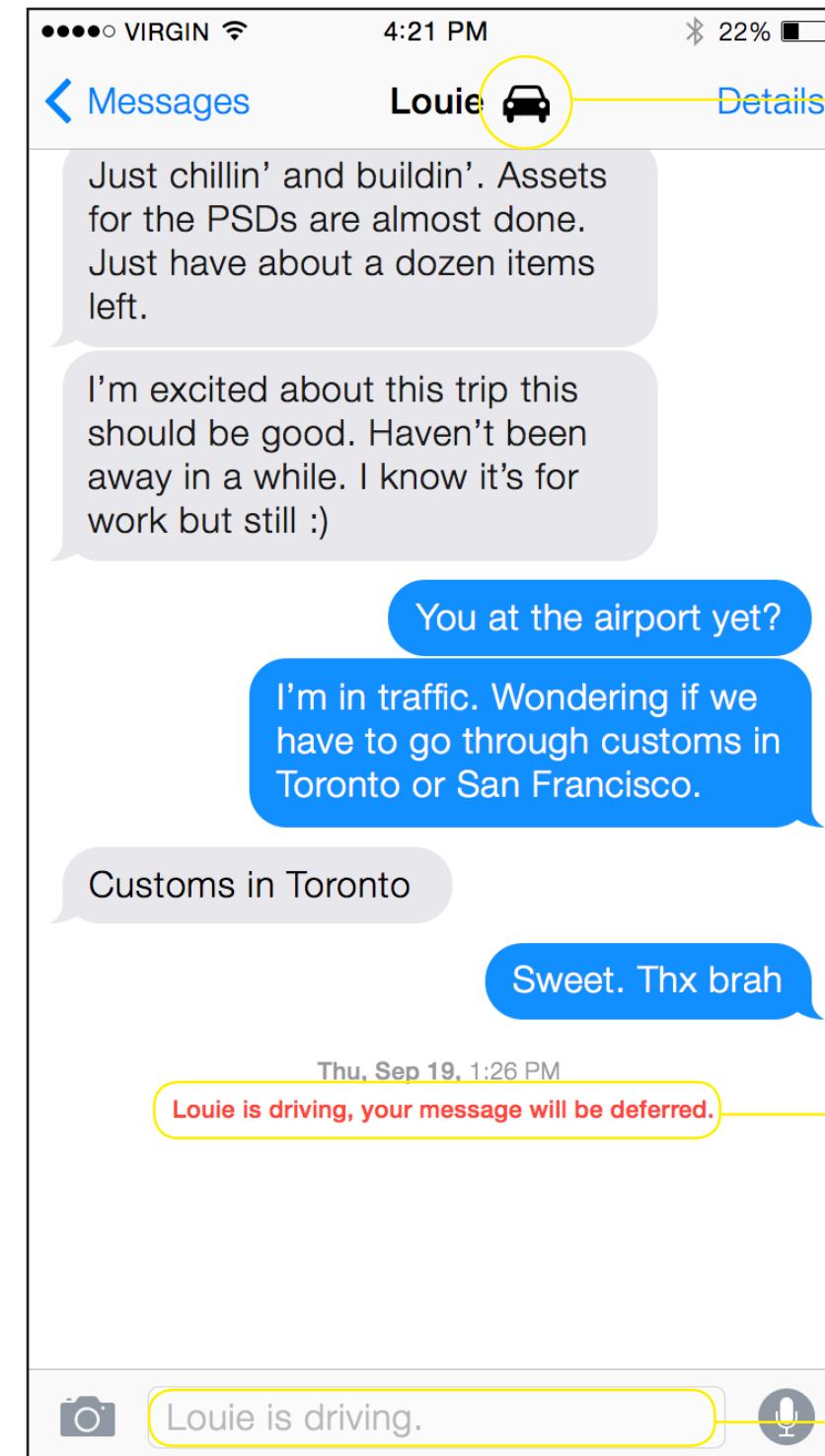
Focus					
Delivery	Phone App	Phone OS	Carrier	Car OS	Ext. Hardware
OS type		iOS	Android	Windows	
Connection		Bluetooth	Dongle	CarPlay	Android Auto
Text app	WhatsApp	WeChat	iMessage	Google Hang.	FB Messenger

# **PROTOTYPES**

*TOUCH THE DESIGN*



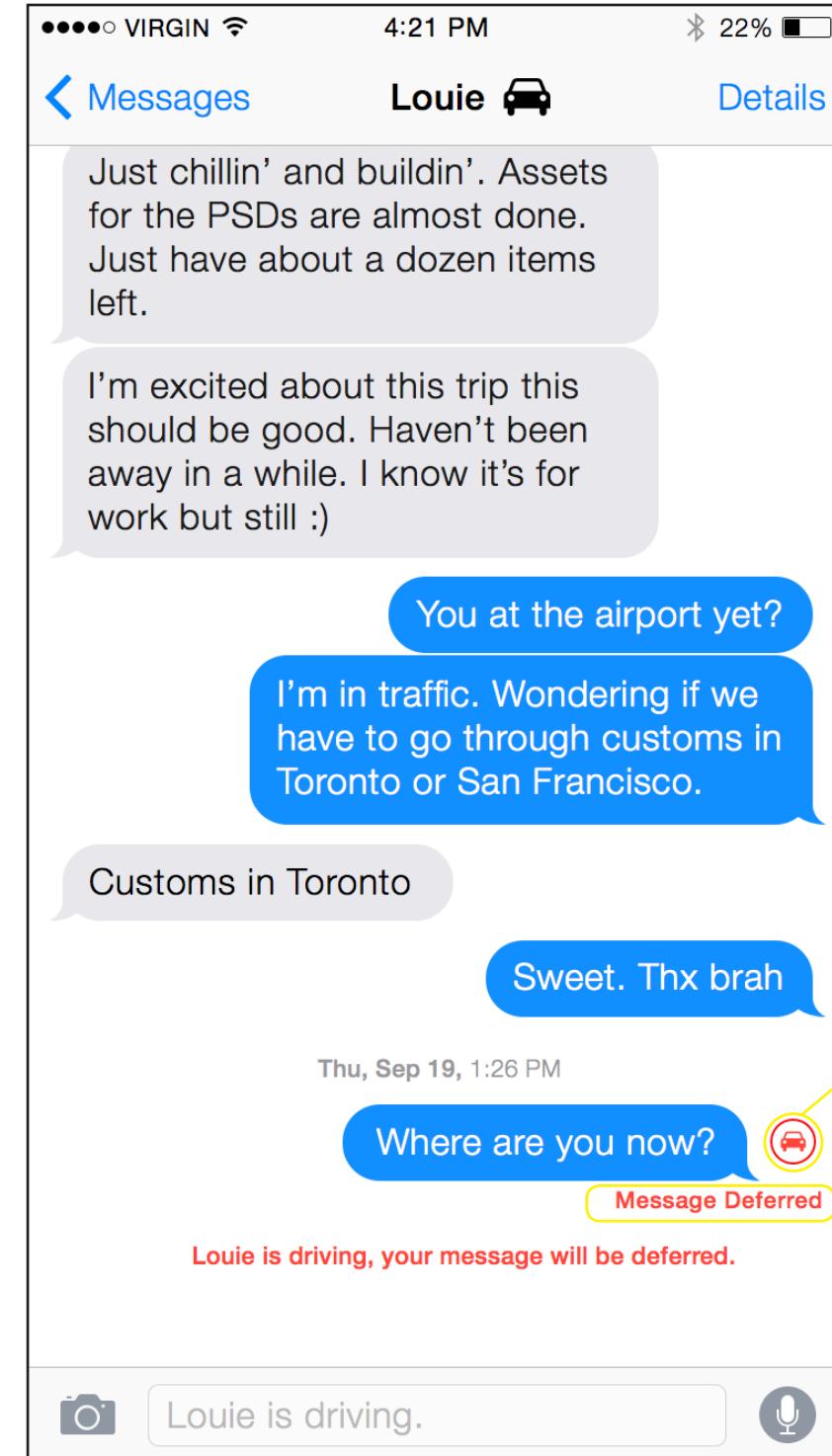
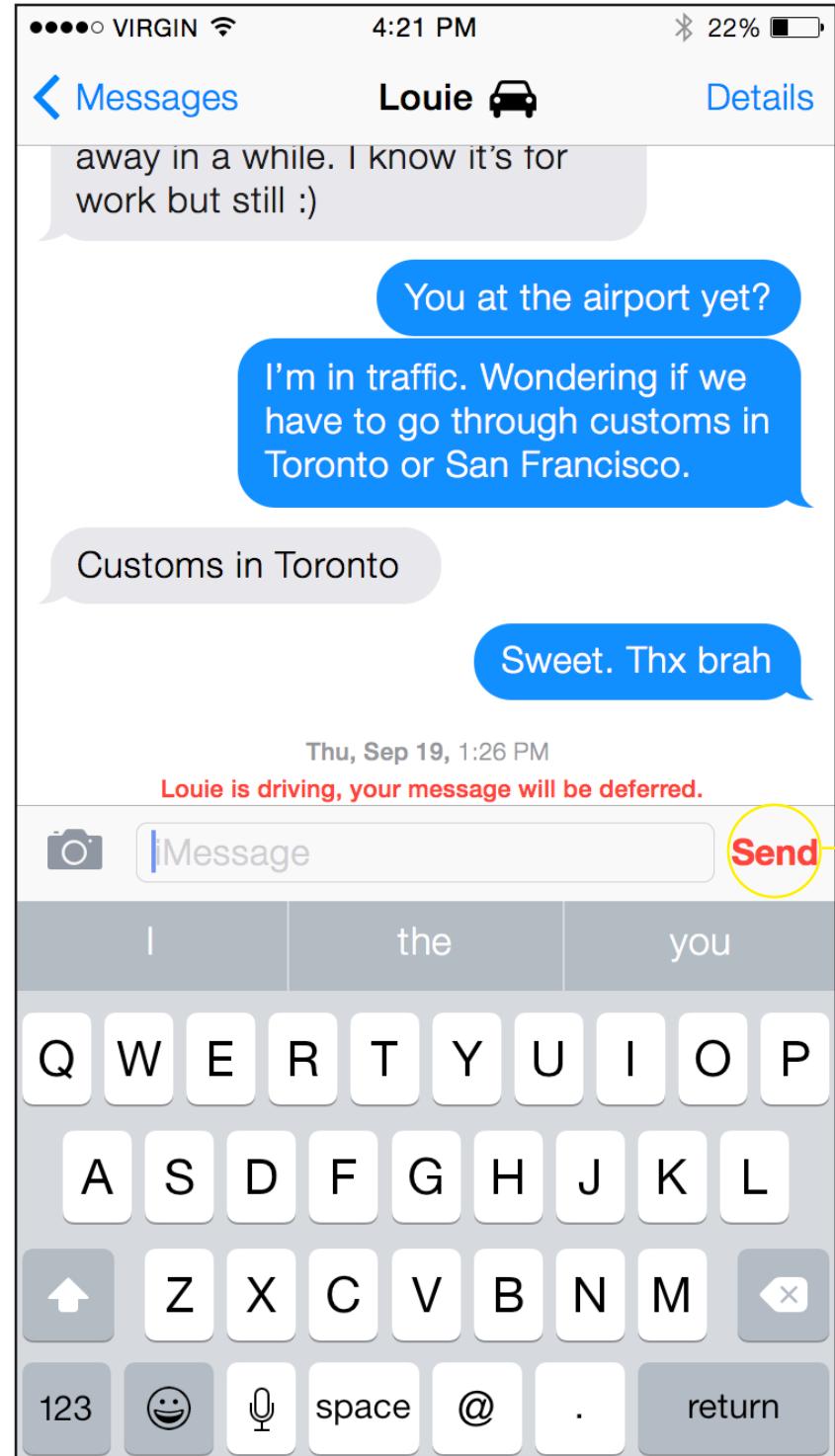
Car icon: the icon that is showed in the inbox screen indicates the contact of this message thread is driving.

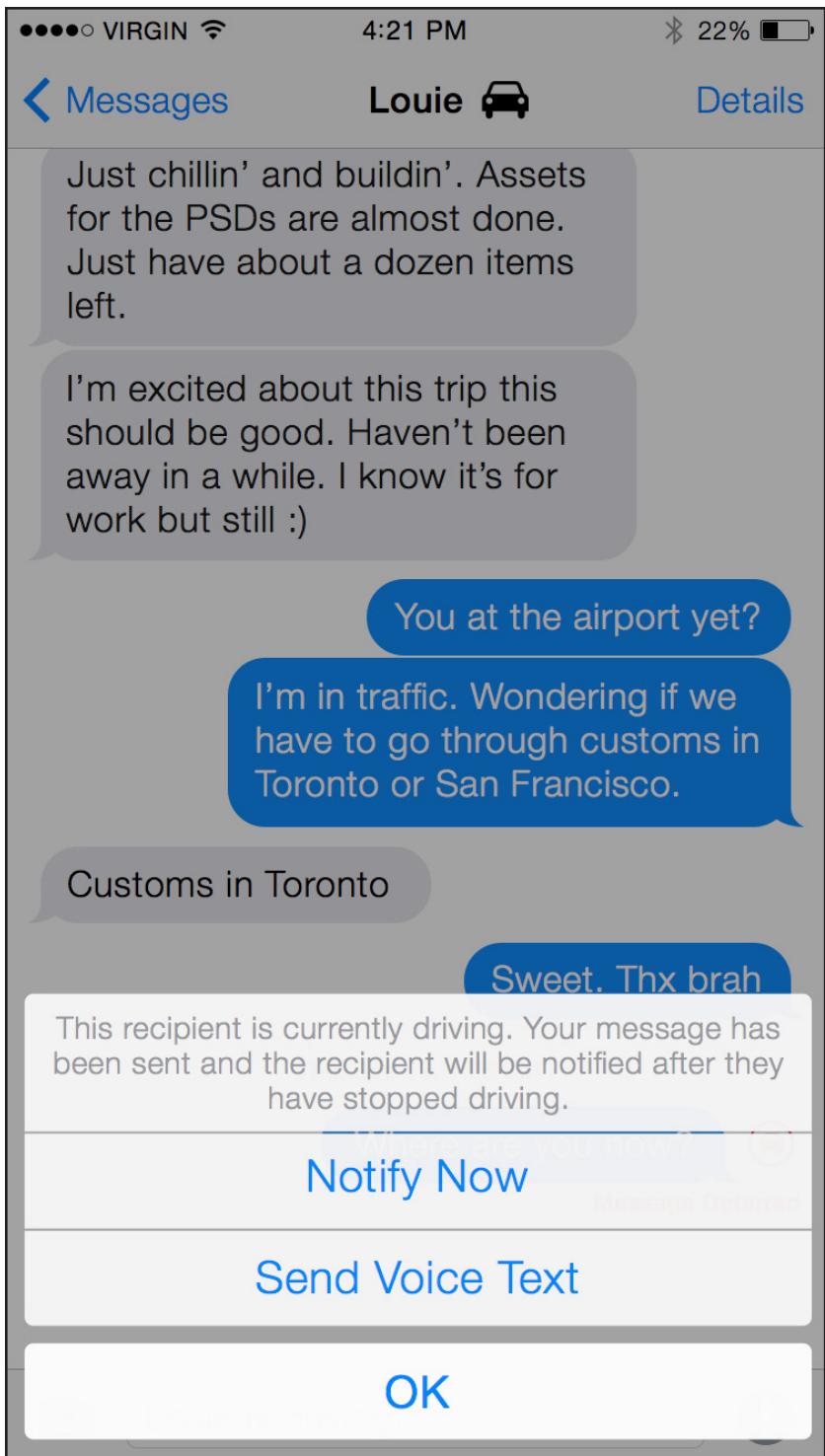


Car icon: the icon that is showed in the inbox screen indicates the contact of this message thread is driving.

Micro-text: a piece of text that says the contact of this message thread is driving, your sending messages will be deferred.

Placeholder-text: a piece of text that says the contact of this message thread is driving.





## DEFERRED MESSAGE

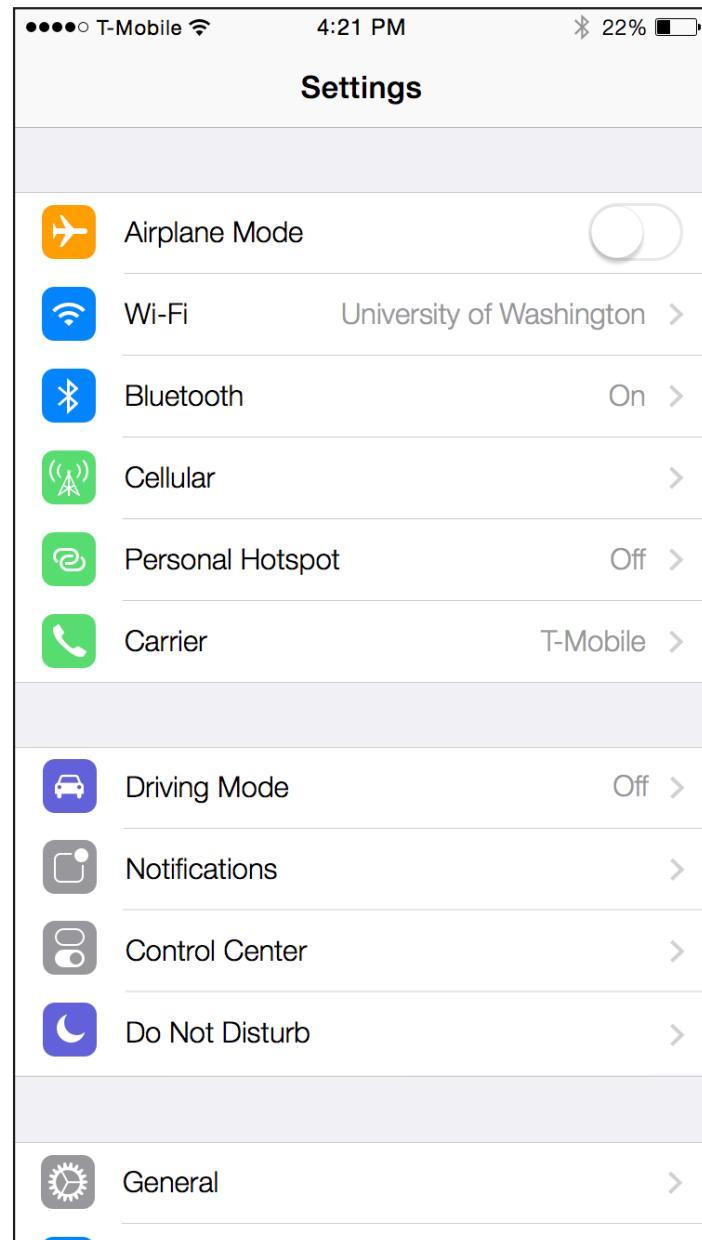
When the recipient is driving, the message will be deferred till when the recipient has done driving. The sender can access an option list that explains how deferred message works, and the options of notify now and send voice text.

## NOTIFY NOW

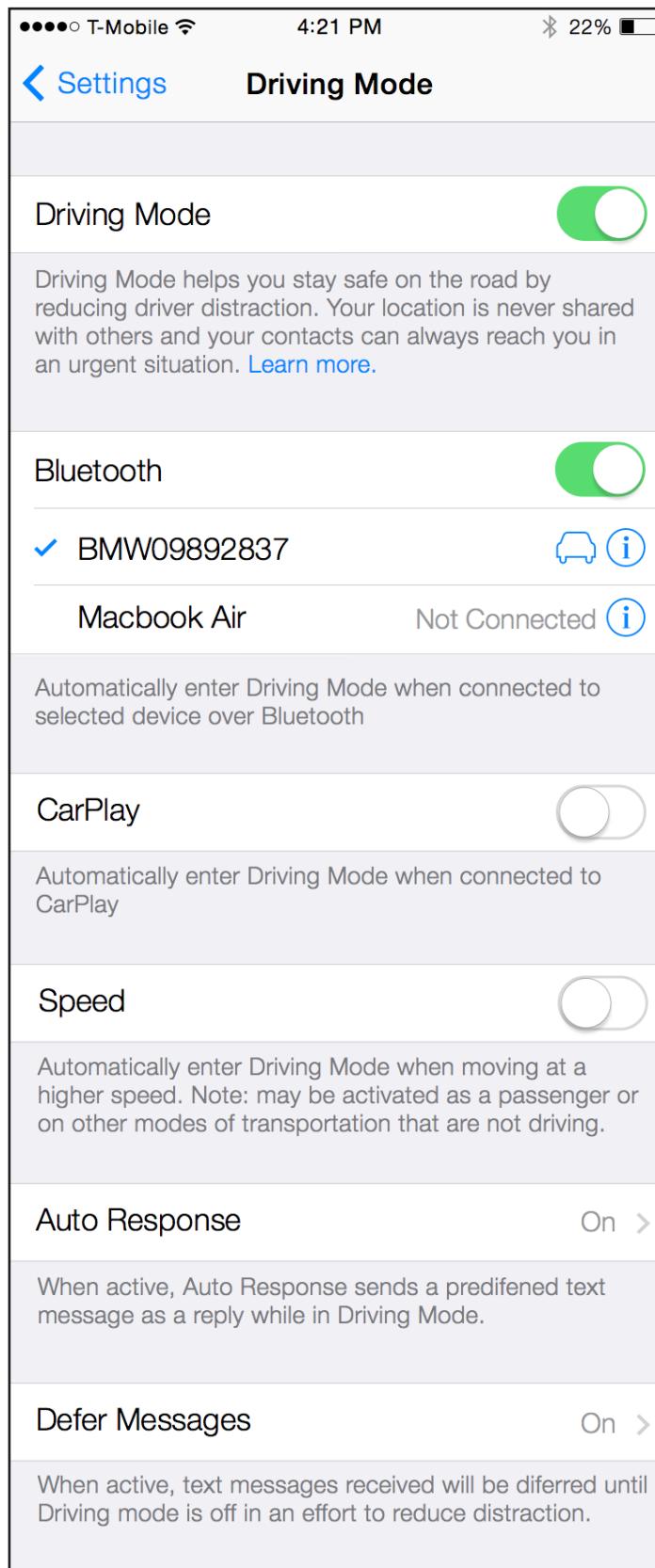
If the sender decide to notify the recipient of the message now, the sender can tap on the deferred message icon and choose notify now in the pop up option list. By choosing this option, the recipient will be notified immediately as how the phone was set. And the recipient will interact Siri to reply the message with hands-free.

## SEND VOICE TEXT

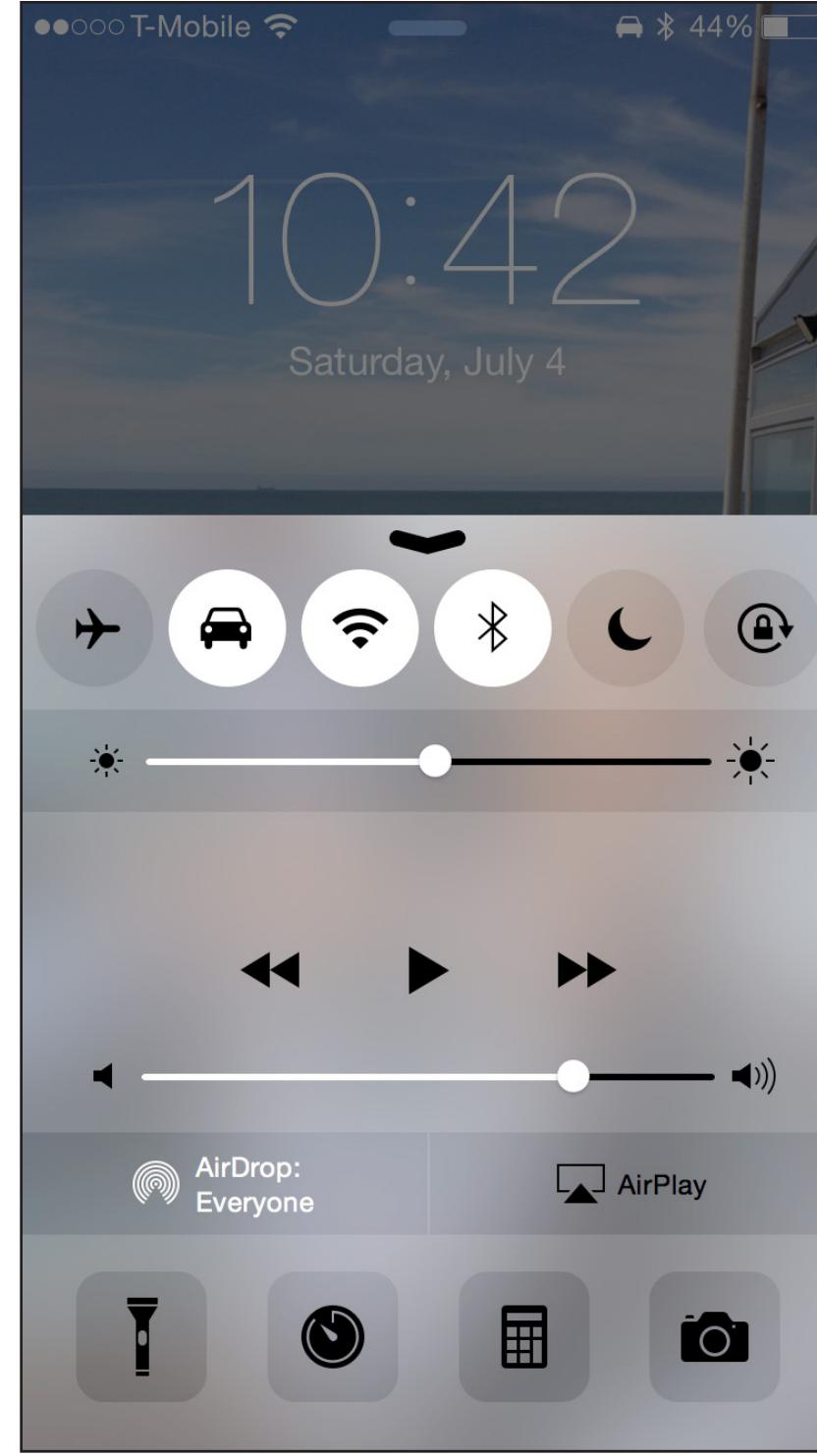
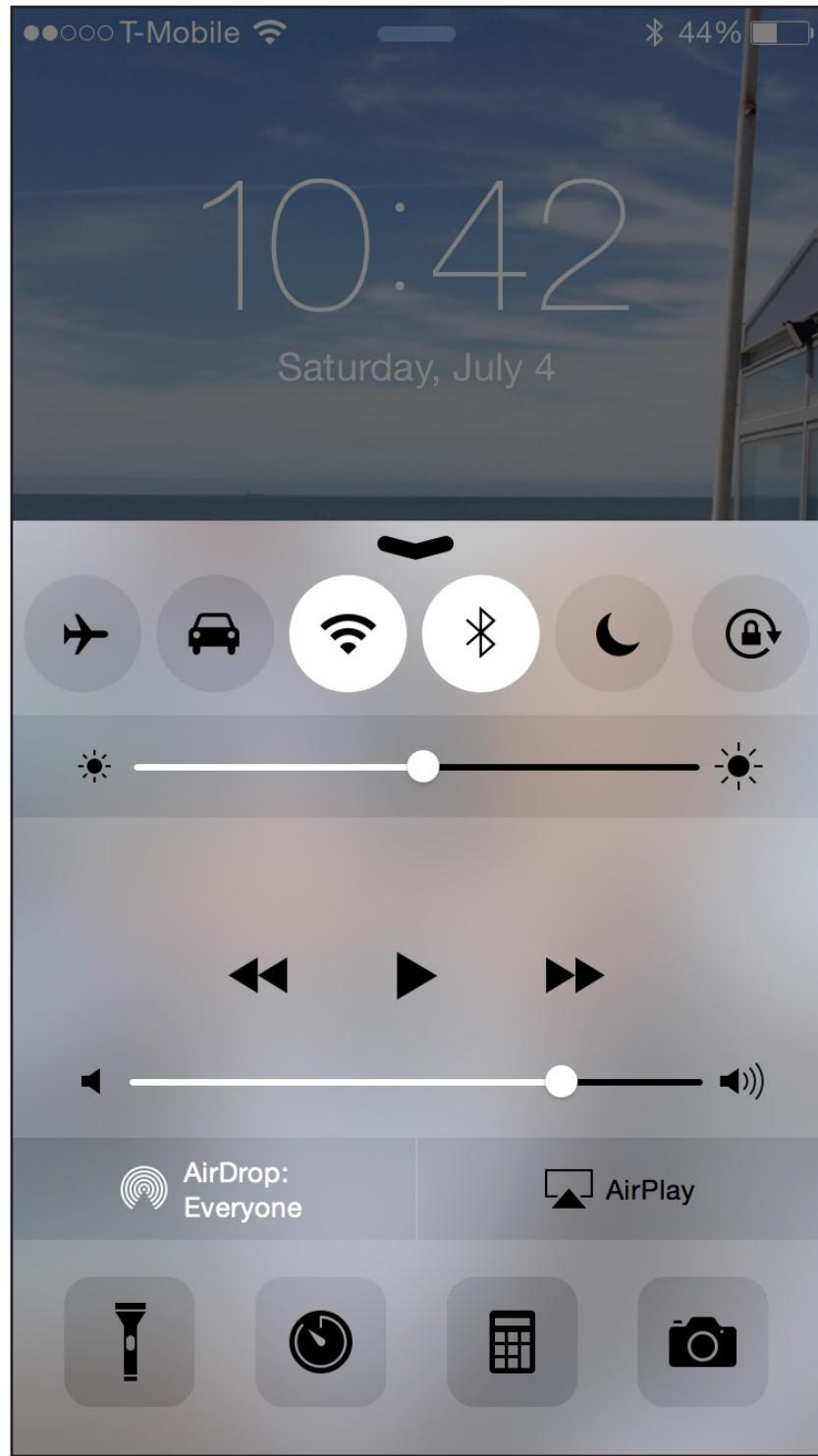
Voice text is a new feature updated with iOS 8, it allows user to send an audio clip in iMessage. The recipient can play back to listen and speak to reply.



To enable Drive Mode, user just need to go through a one time setup to establish the BlueTooth connection between the car and the driver's phone.



When the Drive Mode is enabled, user can access more customizable option in details, such as privacy control, multiple cars management, and options for non-iPhone user to share the status by sending auto-reply messages.



User can also toggle the Drive Mode by pressing the button in the control center, like what they usually do with airplane mode.

# EVALUATION

WHAT USER SAYS

# ANSWERING QUESTIONS

In the evaluation phase, we carried out three different primary research, with these research, we were trying to answer the questions that we had when we were designing our solution.

There are four main questions we were asking again and again were:

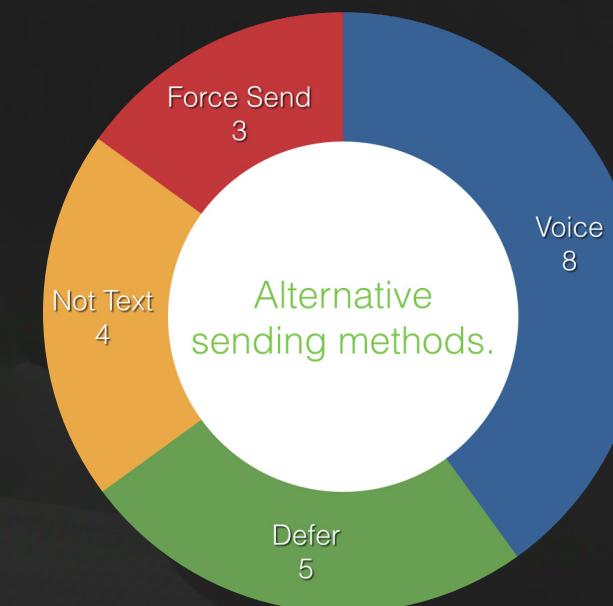
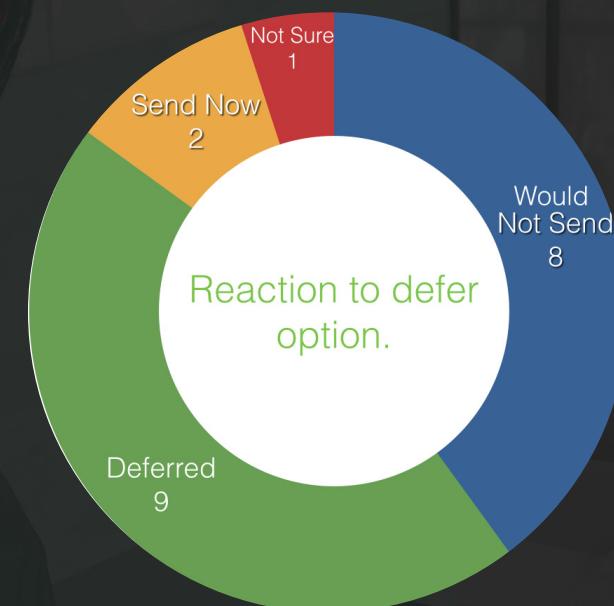
- 1) Are users OK to share their driving status?
- 2) Do people care about helping drivers be safe?
- 3) Does shifting the responsibility of safer texting away from the driver lessens the overall load on the driver?
- 4) Are there instances where text messaes need to be delivered immediately?

We did a Guerilla research with 10 participants, it was relatively informal so we didn't take it into account for the final result. However, it gave us some useful insights that could guide our first design. Most importantly, the research showed that 9 of 10 participants said sharing driving status was OK for them, it firstly proved our core idea of sharing driver's status will work.

After that we had a usability testing research with 20 participants, we walked them through different scenarios and paper prototypes. In this section, we focus on the sender side.

Finally, we carried out a usability testing research with 5 participants, we tasked them to interact with our interactive prototypes while driving a car simulator.

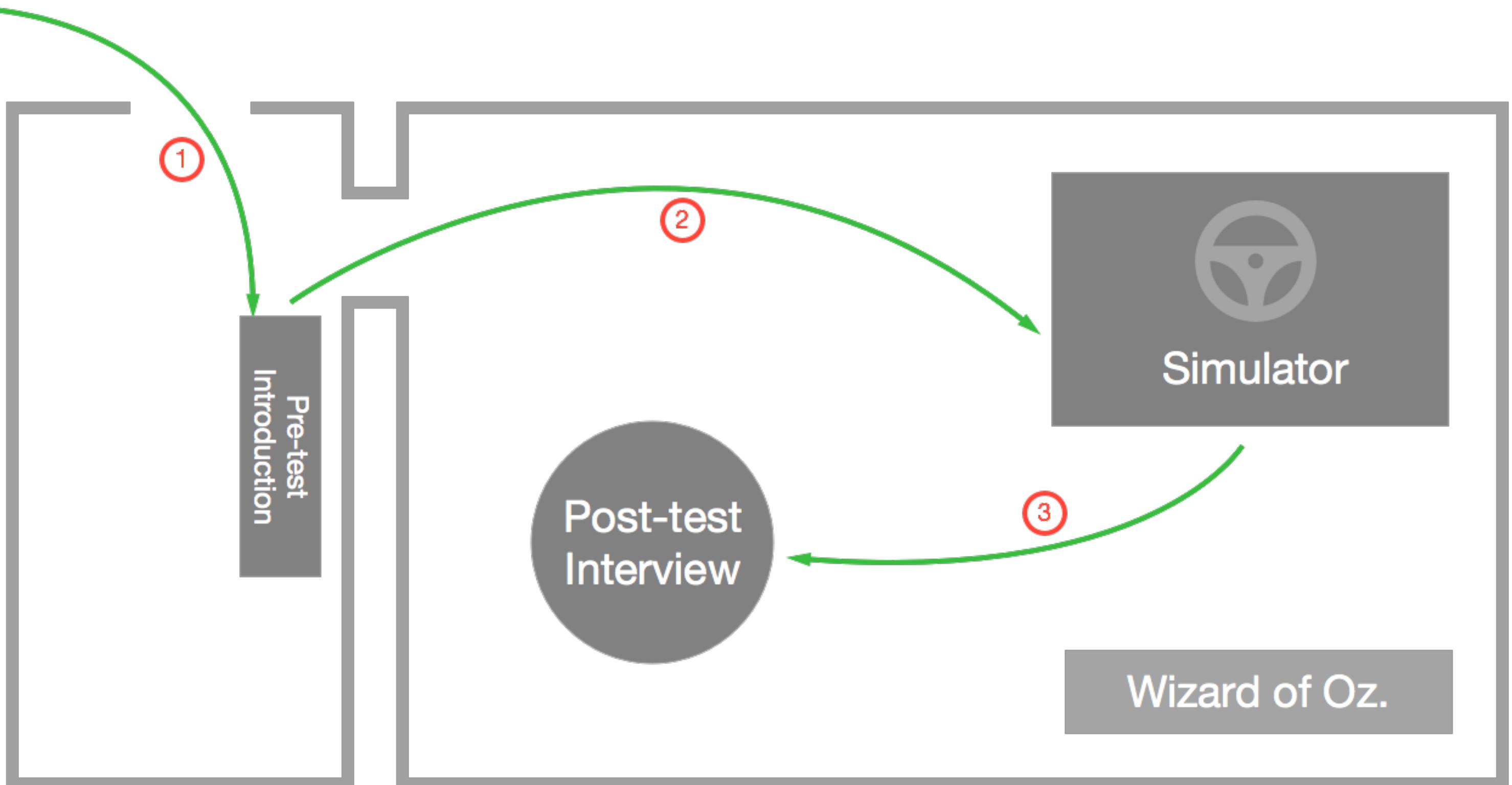
## PAPER PROTOTYPE TESTING



20 Participants, 8 F /12 M  
Average age is 20.6, age ranges from 18-24

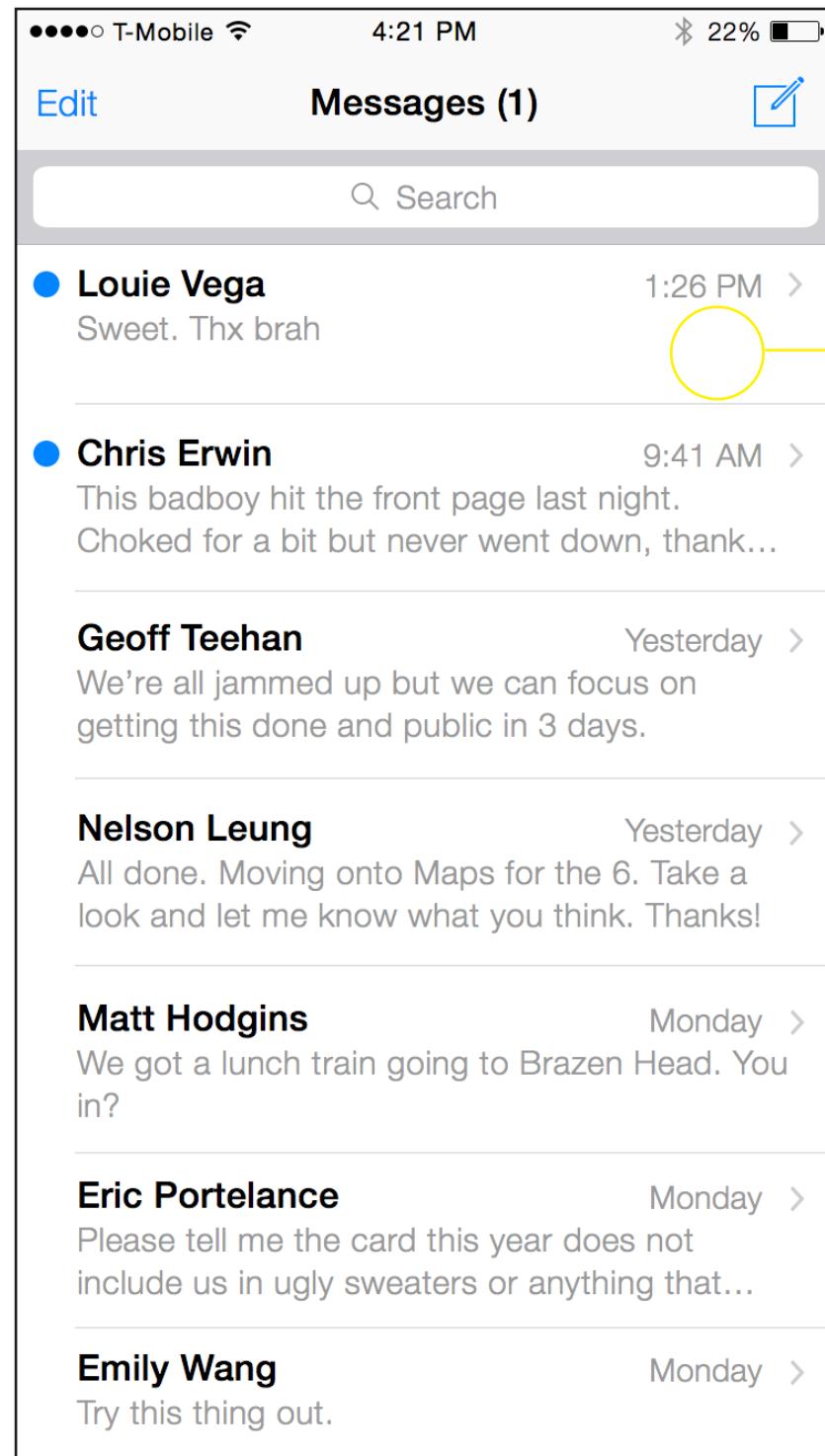
# CAR SIMULATOR & INTERACTIVE PROTOTYPE TESTING

3 Camera Setup  
Simulator Running  
User / Prepared Phone



# **IMPROVEMENT**

*OUR POLISHED DESIGN*



We removed the car icon because our research showed that the icon was very confusing to the user, and it might be used for evil.



We also removed the car icon next to the recipient's name because many participant thought that was an emoji.

**The project will be continuing...**