

**Software Engineering and Management**

**Bachelor project**

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# Using internet in Car while driving

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## **Abstract**

*The purpose of this document is to complete the written part of our bachelor thesis in Software Engineering and Management. At the first part of this document a background of the project will be described. It will follow by the method section which will describe the method used for research and gathering data. At the end the Concept design of the work will be present.*

### *Key words*

*Carputer, Internet in car, conceptual design, high way, normal way, parking, countryside, Interaction tools.*

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# 1 Introduction

A brief introduction is presenting in this section. It includes Carputer, Internet functions, research and study background.

## 1.1 Background

Information technology is the fastest growing science in globalize environment. The use of internet is getting more and more popular in the world and people see how it is useful and necessary to be able to have internet connection every where even in the car while they are driving. Mostly today's vehicles are very advance and they have a lot of functionality which can make it easier for both driver and passenger to have connection to the world.

At the beginning of 2000 people start to somehow mount a computer to their vehicle. On 2006 different supplier tried to introduce a new generation of computer in car to people which calls car\_ pc or Carputer. Carputer used to have the same operative system and functionalities as a normal computer but the hardware look different and had different properties. They make the hard ware as the way which can be fit for using in the car. For example the hard disk wasn't so sensitive against movement. In general a Carputer have the features below:

- Play music from CDs, hard drive (MP3s, other compressed files) or external device (USB/PCI FM radio receiver, etc)
- Play video from DVDs, VCDs or from the hard drive (Note: Hard drives are sensitive to vibration, so driving with your Carputer turned on may shorten the life of the hard drive unless the hard drive is shock-proofed. Because laptop (2.5") hard drives are designed for such a portable device, they are generally more tolerant of shock and are an ideal choice over desktop (3.5") hard drives. Laptop hard drives are designed to endure the stress of moving and extreme conditions, unlike that of a desktop hard drive which is usually used as a stationary device, rarely if ever moved.
- GPS: Provide location tracking, route planning/navigation, etc.
- Satellite radio through external receivers. (Both Sirius and XM available)
- AM/FM Radio (There are radio tuners that can be integrated and controlled by software)
- Ease of operation through touch screen display
- Internet browsing through an eligible cell phone or wireless 802.11 connections
- Hands free cell phone control via software with Bluetooth
- Mobile office[1]

At 2008 the suppliers introduce yet another generation of Carputer with its own system. This Carputer can be used as both entertainment and internet device. The communication with this system is possible by using voice recognitions tools. A virtual agent in the system can make it easier for both driver and passenger to interact with the system by using voice [2].

## 1.2 Problem focus

According to the researches driver distraction occurs when a driver “is delayed in the recognition of information needed to safely accomplish the driving task because some event, activity, object, or person within or outside the vehicle compels or induces the driver’s shifting attention away from the driving task.”

Figure 1[3] can show how the present of different things can take the drivers attention and distract her/him. As it said inattention is the reason of most car accident. In most of the places in the world using cell phone while driving is forbidden but it will not stop the technology to introduce even more

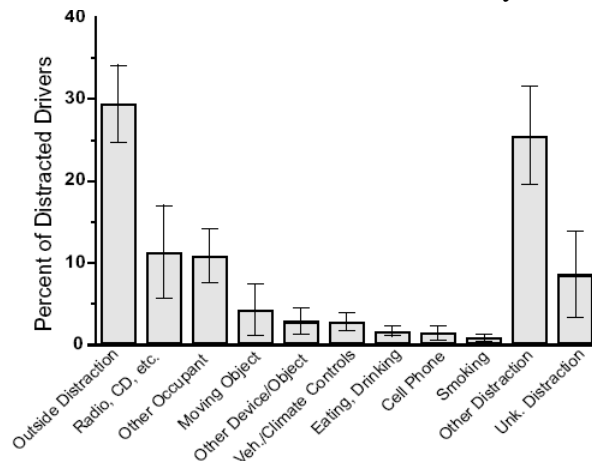


Figure 1 Overall distribution of specific driver distractions based on the weighted 1995-1999 CDS data.

disturbing functions for driver like using Carputer. Using Carputer can help driver to have access to internet which is one of the most requested functions to have from driver, but the authors of this document come up with a solution which can help drivers to use the internet functions which they need in different moods like high way, normal way, country side and parking in much more safety way. They will gather some information about how driver can interact with the system on a better way which doesn’t so much of his attention from the road and what is the most internet functions needed from driver.

## 1.3 Research question

In order to come up with a good solution which can help driver to use internet connection whole driving in a safety way, the following research questions were formulated:

1. Would you like to have Internet connection in your car? If yes why do you think that you will need it?
2. Which functions, other than drive itself, the functions that nowadays the internet can provide, you will need while **you’re driving in normal way** and how do you like to interact with those functions?
3. Which functions you may like to have **when you park your car** and how do you like to interact with those functions?
4. Which functions you may like to have **while you drive in high way** and how do you like to interact with those functions?

5. Which functions you may like to have **while you drive in country side** and how do you like to interact which those functions?
6. Do you think you would like to access to the same website via internet while drive? Or you prefer to have special website design to be suitable for drive? Why?
7. (If they answer yes for question 6, then ask if we are going to re-design the website, what can be the design requirements?)
8. As we can only provide limited information on this re-designed website to fit the drive requirement, shall we still allow the driver to access to the website on behalf of their own risk?
9. Which of the following functions that internet can provide will they more likely use?
  - \_ Radio
  - \_ GPS
  - \_ News & weather
  - \_ Searching in Google
  - \_ Sending & reading email
  - \_ connecting to other cars
  - \_ Organizing schedule
  - \_ Others
10. In a scale from 1-9 how safe is using internet while driving?

#### **1.4 Purpose**

The purpose of this study is to elicit the internet functions which drivers need in high way, normal way, parking and country side moods while they are driving. After eliciting requirements, a conceptual design will be present as a design solution for using internet functions while driving. The best way of interacting with the system will also be present in this paper.

#### **1.5 Intend audience**

The intended readers for this study are the course responsible lecturer, the project coordinator in charge for the thesis, the IT University of Gothenburg including present as well as future students and people who have some interest about internet in car functionalities.

## 1.6 Structure of the paper

The structure by which the chapters of this research paper are organized is presented in the table below. The table is to give the reader a clear overview of the themes presented in this paper and their sequence.

<b>Chapter</b>	<b>Topic</b>	<b>Brief description</b>
1	Introduction	First chapter will give the reader an introduction about this study and introduce the problem focus
2	Literature review	In this section, the literature and the prior studies report are presented that are used as references in the study.
3	Methodology	Introducing the method used for this study
4	Result finding	The result of interviews, questionnaire and the design solution for that are gathered in this chapter
5	Discussion	The reason of design solution according to the literature study will be presented on this chapter
6	Conclusion	Summary of document, problems during study and the future studies will be presented here

## 2 Literature review

In this section, the literature and the prior studies report are presented that are used as references in the study. Most of the literatures and prior studies report are made by researcher's standpoint.

### 2.1 Related research

#### □□Voice Interactive Carputer (VIC) by AiBelive Co.Ltd

VIC is the product is the world's first intelligent voice interactive on-board system. Users are able to interact with the virtual car assistant with a normal speaking tone and "ask" her to activate dozens of functions like the latest news, traffic, stock, music, movie, Internet, satellite navigation and so on. The core technology is the Hyper Perception Logic Engine developed by AiBelive. The product supports more than 20 languages, and is able to operate on Linux, Win CE and PC platforms. Without prerecording or changing user habits, drivers can operate the product simply by talking [4]. Figure 2 showing how the agent can help driver with different functions.



Figure 2: help agent

#### □□Voice Recognition by in-Car Pc Ltd

The feature called Voice Recognition, allows you to dictate text into emails or documents and also to control standard Windows programs using your voice. It can cope with up to 160 words per minute, which is much quicker than most people can type. The car is perhaps not the most ergonomic location to type long documents from, but with Dragon NaturallySpeaking all you need to do is sit back and talk. The software's accuracy is astounding, and requires only minimal training. This lets you send emails, create documents and surf the web quickly and easily, just by speaking [5].

#### □□Cell phone control and Vehicle control - CarPc by MP3Car.com

Another version of Carputer called CarPc is made by Mp3Car.com in 1998. The features of this CarPc are hands free cell phone control via software with Bluetooth, send & receive text messages via your connected cellular phone using CarPc and enhanced contact list with large pictures. CarPc has special function that can control the vehicle such as control windows and locks via relays, control Climate Control via software, control exterior show lights (under glows and accent lights) via relays and gain control of ignition timing, air/fuel maps, shift points, boost control, top speed, rev limits, etc[6].

- **G-Net vehicle PC by G-Net.com**

G-net.com is a company which delivers some of the most innovative in-vehicle computing solutions available on the market. As well as they are developing a G-Net vehicle Pc for different propose such as Consumer Automotive In-Car Computer System, Transport Truck & Commercial Service Vehicle Computer, Police / Emergency Service Vehicle Computer, Police / Emergency Service Vehicle Computer and Marine Computer System[7].

□□□**Holbrook Chuck, (2003) Input Methods for Notification Systems: A design analysis technique with a focus on input for dual-task situations**

Hobrook is talking on his Master thesis study, how to improve Carputer mp3 play. On his paper he suggests different ways that we can store Mp3 songs in Carputer and her suggest how driver can interact with Carputer's mp3 player. "It offers user programmable voice control to select common CD player options or play songs when the user names a CD and track that has been previously programmed in [8]".

- **Jane C. Stutts, Ph.D. Donald W. Reinfurt, Ph.D. Loren Staplin, Ph.D. Eric A. Rodgman The role of driver distraction in traffic crashes, , B.S.2001**

The research paper called "The role of driver distraction in traffic crashes" is written by AAA foundation for traffic safety. The goal of this project is to project is to identify the major sources of distraction to drivers and the relative importance of the distractions as potential causes of crashes. During research the authors of this document figure out what kind of event, activity, device and person that can take drivers attention while driving. [3]

### **3 Methodology**

On this chapter the methods which is going to be use in different phases of this study will be introduce.

#### **3.1 Research design**

In order to increase the understanding of the phenomenon about the study there is a need to determine whether a qualitative or a quantitative method is used. The quantitative method was originally developed in the natural sciences to study natural phenomena. Examples of quantitative methods now well accepted in the social sciences include survey methods, laboratory experiments, formal methods (e.g. econometrics) and numerical methods such as mathematical modeling. Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena. Examples of qualitative methods are action research, case study research and ethnography. Qualitative data sources include observation and participant observation (fieldwork), interviews and questionnaires, documents and texts, and the researcher's impressions and reactions [9]. Very simply put, qualitative data are words, while quantitative data are numbers.

##### **3.1.1 Exploratory research method**

As a research method, exploratory research method has both qualitative and quantitative methods including documents review, structured telephone survey and focus groups to gather data [10]. Exploratory research is type of research that conducted because problem has not been clearly defined as well as it is helps determine the best research design, data collection method and selection of subjects [11]. The process of the research method is making easy to understand the problem and define the view of the problem.

As a research method of the studies, used exploratory research method that made easy to understand the problem in deeply.

#### **3.2 Data selection method**

##### **3.2.1 Choice of interviewees**

For collecting some empirical data there is a need of using some data collection method. The method chose for this study is interview. There are 3 different ways to choose interviewees which are as below:

- Statistical sampling: Random sampling of target group
- Theoretical sampling: Choose participant with a particular property
- Critical sampling: Choose participant who belong to a particular age, gender, height etc[12]

Using Carputer is not so popular in Sweden and it is very hard to fins interviewees who have experience about using Carputer for that reason authors decided to interview people who have different experience about using computer. The participants had been categorized into four different groups:

1. Young without driving license and with internet knowledge
2. Young driver and with internet knowledge
3. Old drivers with internet knowledge
4. Old drivers without internet knowledge

### **3.2.2 Knowledge of interviewees**

The selected participants group has different knowledge under different category. The knowledge of computer, internet experience and driving experiences are main selected area that consider in this studies.

- Young without driving license and with internet knowledge -  
There are nine participants, who don't have driving licenses, represents in this group. All the participants are between 18 to 34 years old. They have good computer experience and internet knowledge.
- Young driver and with internet knowledge -  
There are nine young drivers between 18 to 34 years old represent in this group. The participants of this group have some driving experience, good knowledge of computer and internet.
- Old drivers with internet knowledge -  
There are nine participants between 35 and above years old represents this group. The basic requirements for this group should have many years driving experiences and have some basic knowledge of computer and internet experiences.
- Old drivers without internet knowledge -  
There are nine old drivers between 35 to above years old will represents this group. They have many years driving experiences but they don't have any computer knowledge or internet experiences.

### **3.2.3 Choice of mediating tool**

Mediating tool or mediating object is something which enhances reflection, discussion and brings about "focus". It can be use to describe a problem, elicit requirement, generate ideas or concepts, evaluate design solution and etc [13]. For this study a VR [14] representations will be use to enhance the interviewee's understanding about the Carputer and problem area.



### **3.3 Interview design**

Interview include of some questions. Preparing proper questions for any study is very critical. Question can be open or close. Close question have a predetermined answer format, e.g., 'yes' or 'no' and open questions do not have a predetermined format. There three kind of interview which are:

- Structured
- Unstructured
- Semi-structured [15]

The structure for this interview will be semi-structure with open question. By this way the interview will have more chance to express their ideas and opinion about questions.

### **3.4 Conceptual design theory**

Conceptual design is transforming user requirement into conceptual model which is an outline of what people can do with product and what concepts are needed to understand, how to interact with it [16]. The concept of interact with the product is depending on who will be a user, what kind of interaction will be used and what kind of interface will be used. According to Interaction design - Beyond human-computer interaction (2007) there are some key guiding principle of conceptual design such as

- Keep an open mind. Don't forget the interviewees and their context
- Discuss idea with stakeholders
- Use low-fidelity prototyping to get rapid feedback
- Iterations

The conceptual design methodology is a method of itself and having two different primitives such as Top-down primitive and Bottom -up primitive. Since this study is carry-on the high level view of the user requirements, the authors use Top-down primitive as a method of conceptual design. Top-down primitives is describes all requirements in rough to details [17].

## 4 Results

In order to elicit the function, the authors gather data from interviewees by using interview and questionnaire. In this section is describing about the analyzed data from interview result. This information is going to be used later in design solution and discussion.

### 4.1 Interview

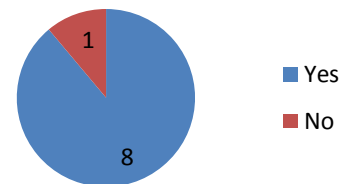
As it mentioned previously 4 different groups of interviewees have been chosen for this study. Some questions asked from each interviewees and the result of the interviews for each group had been presented below

#### 4.1.1 Old driver with internet knowledge:

The first group is old driver who had internet knowledge. Most of the people interviewed on this group were high educated and was working at IT University.

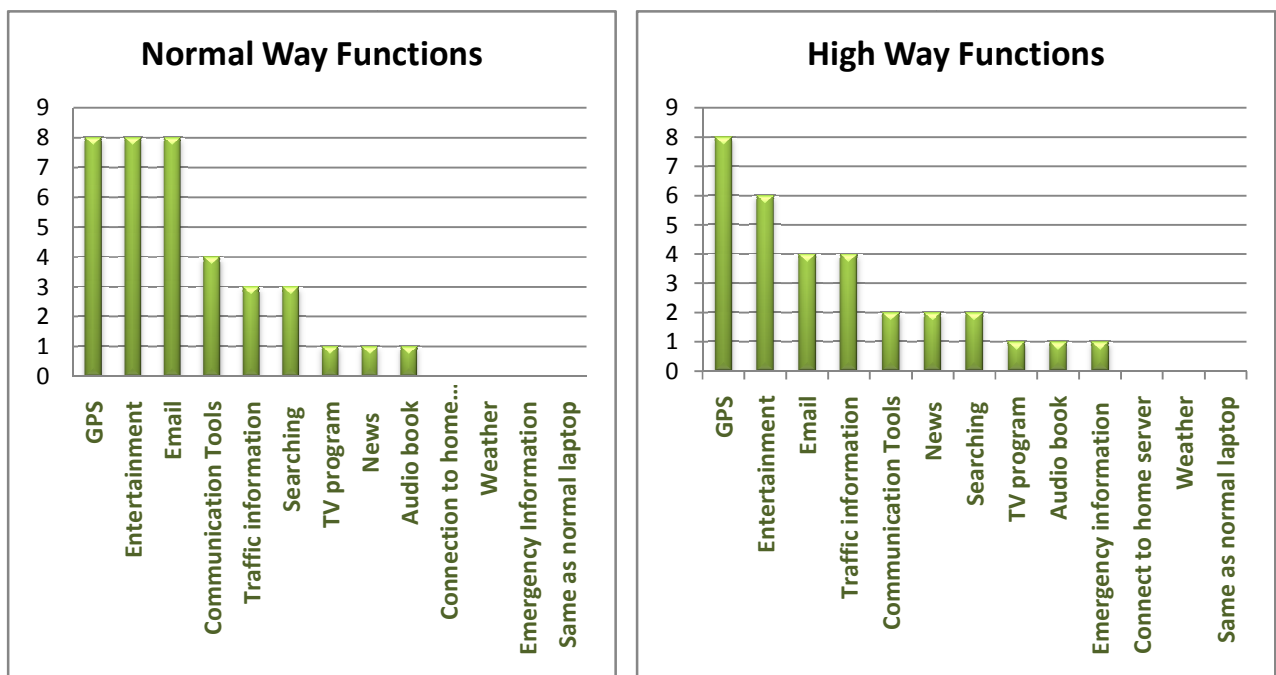
##### Internet connection in car

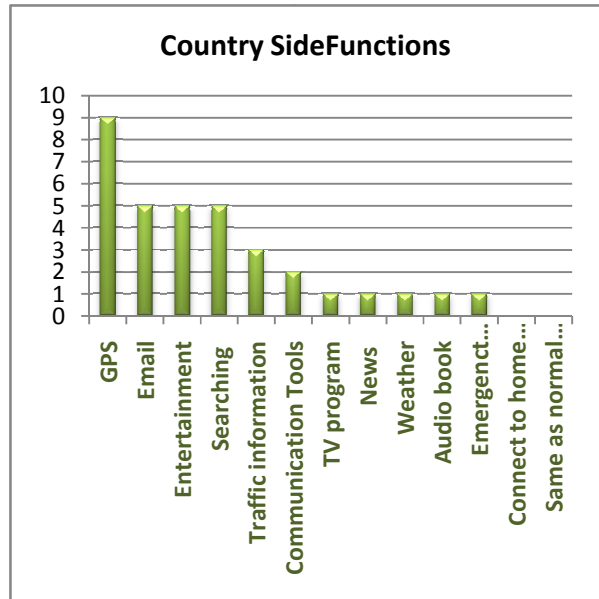
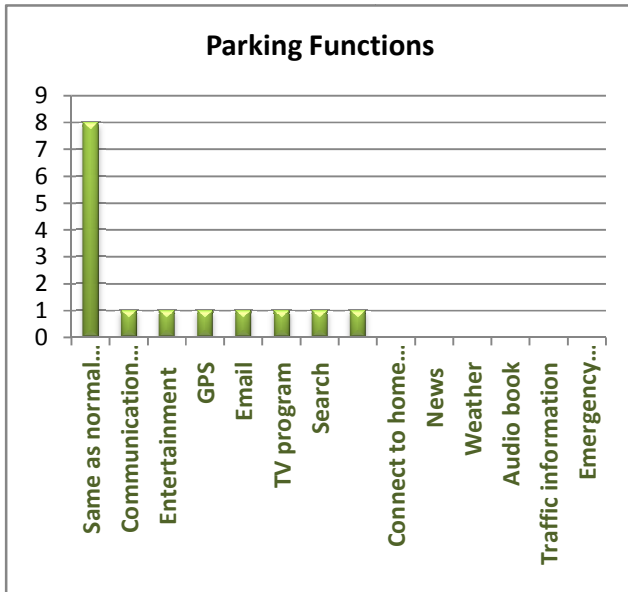
The first question was about the interviewee's opinion by having internet connection in car. 8 out of on this group really liked the idea of having internet in the car and they thought that it can help them to do some of their job on their way to work.



##### Most needed functions in different moods

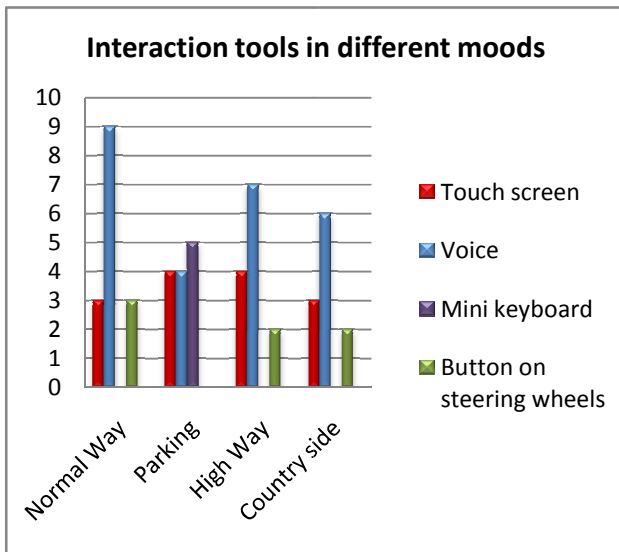
The needs of functions on different mood were different for each group of interviewees. The chart below present the different functions needed to have for this group.





### Preferred interaction tools on each mood

The chart below show the preferred interaction tools for this group on different mood. In all moods except parking mood most of the interviewees preferred to have voice as interaction tools.

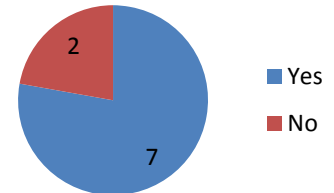


## 4.2 Young without driving license and with internet knowledge

Most of the interviewees of this group were students on IT University with different background.

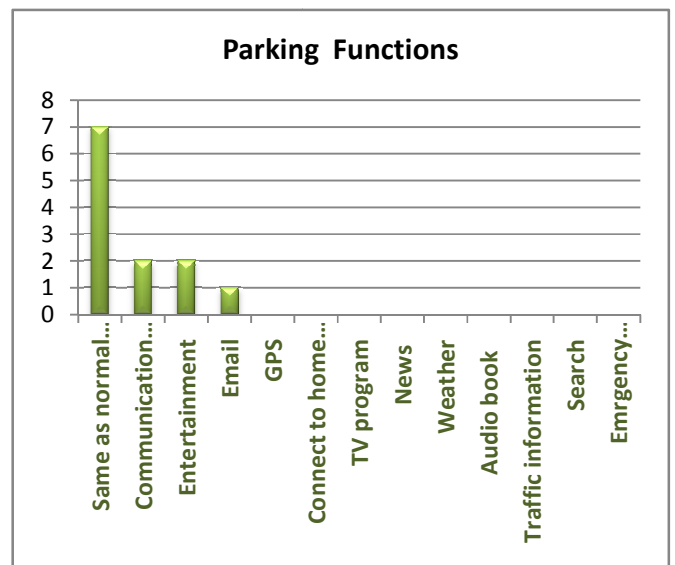
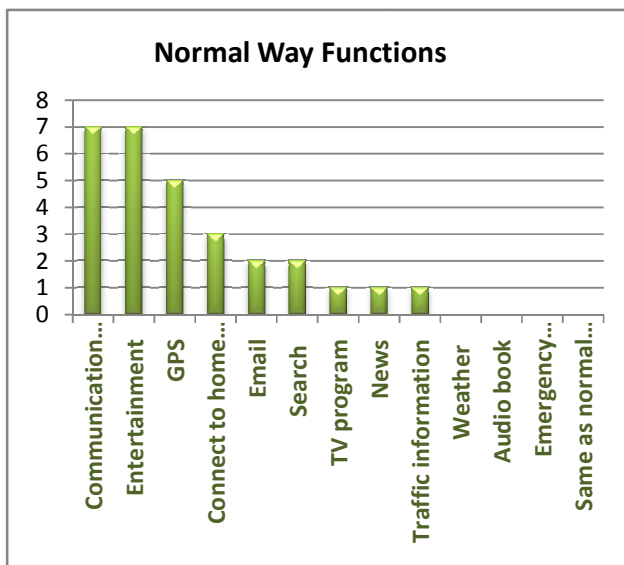
### Internet connection in car

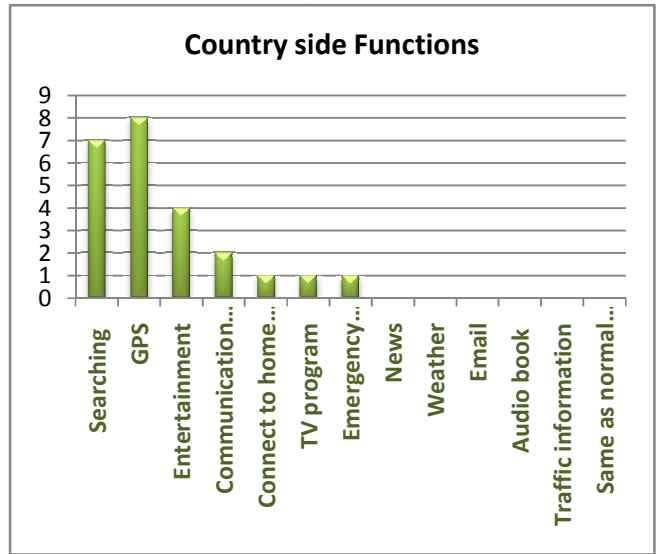
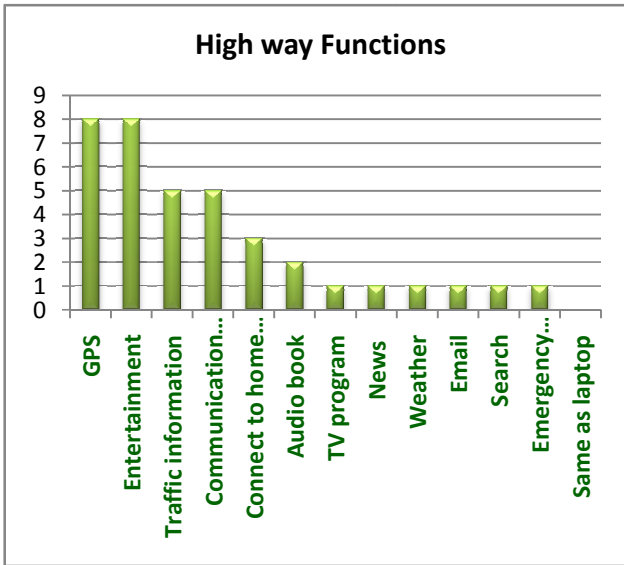
7 of 2 interviewees out of this group also had a positive view of having internet communication in the car. Even those 2 persons who weren't agreeing with this idea, they could think to use it just when they park their car. But while driving, it was very dangerous according to them.



### Most needed functions in different moods

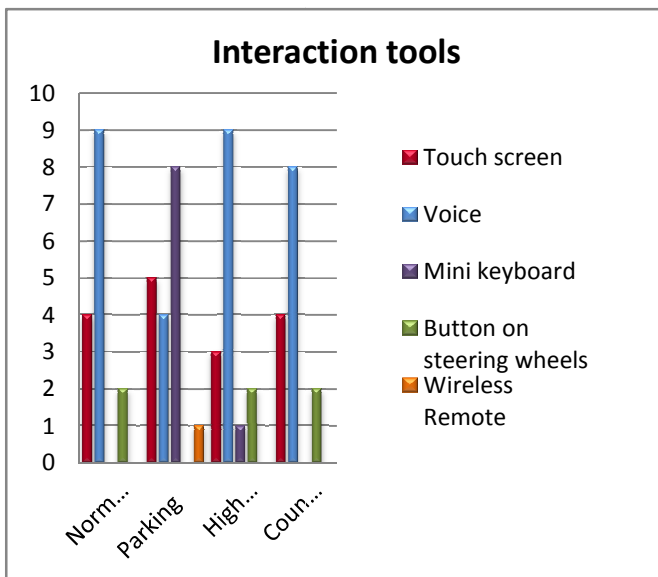
The charts below presents the most functions needed on each mood for this group. The differences need between different groups of interviewees can be seen here. This group first needed functions different from the previous one.





**Preferred interaction tools on each mood**

The preferred interaction tools to use on each mood for this group have been presented in the chart below.

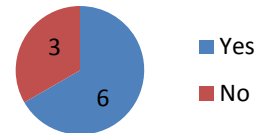


#### 4.2.1 Old driver without internet knowledge

The 9 interviewees from this group were not high educated but most of them had long experience with driving.

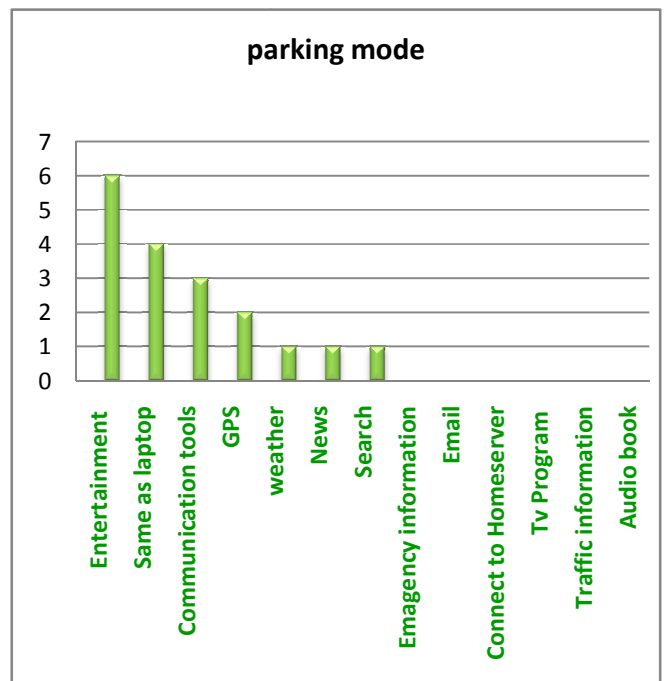
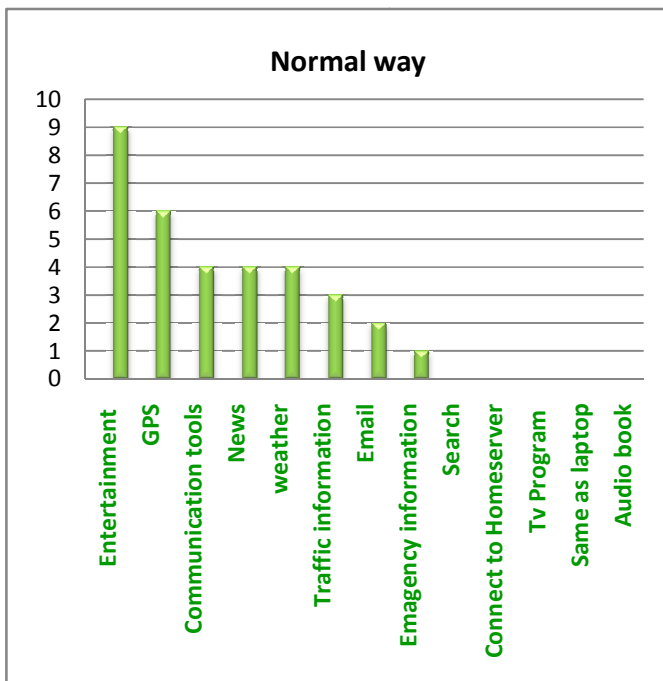
##### Internet connection in car

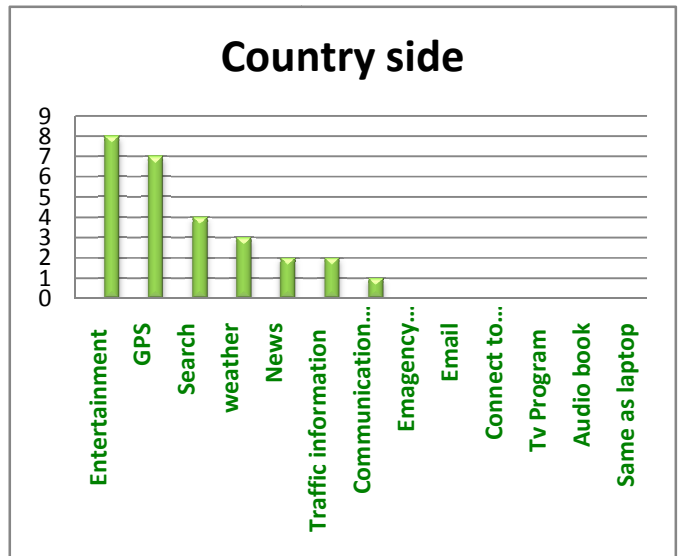
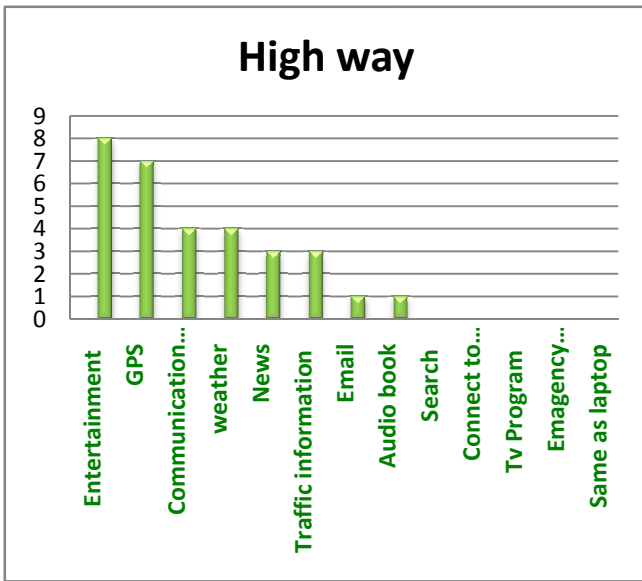
Although the people on this group didn't have experience with internet but 6 out of 9 on them was agree to have internet connection in car. It can be understandable if there are more persons in this group who doesn't like to have internet connection.



##### Most needed functions in different moods

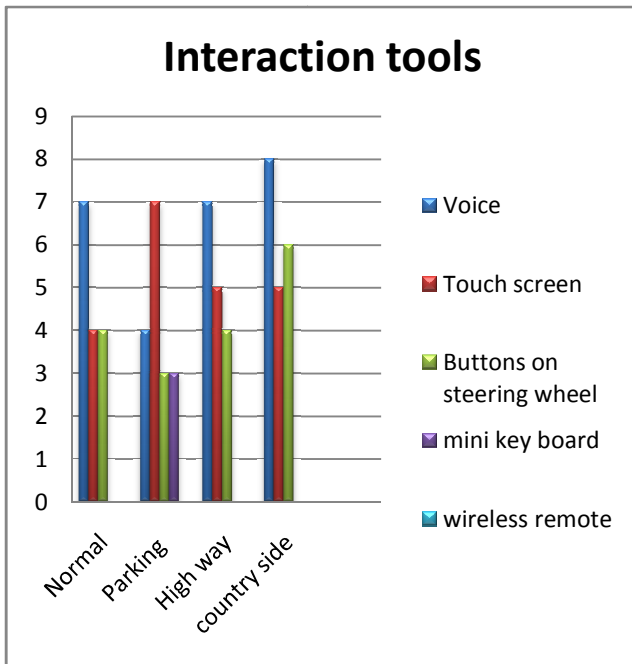
The functions needed for this group had been shown below. Because of lacking internet knowledge for examples this is not so many persons on this group who need same as normal laptop functions in Parking. And also their highest rated function to have in different mood differs from other groups.





#### Preferred interaction tools on each mood

The preferred interaction tools on each mood for this group have been presented here.

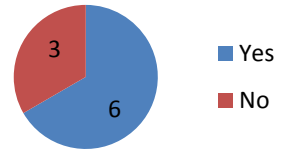


#### 4.2.2 Young driver with internet knowledge

The results of interviewing young driver with internet knowledge have been presented here.

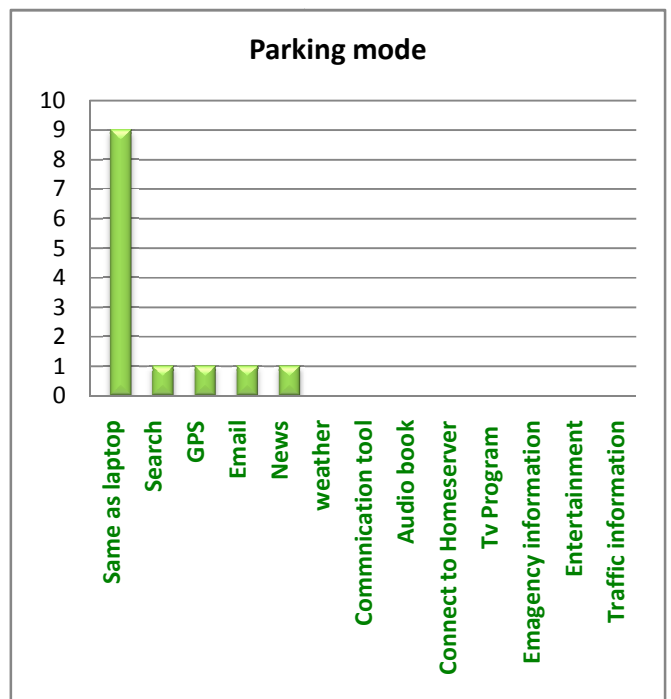
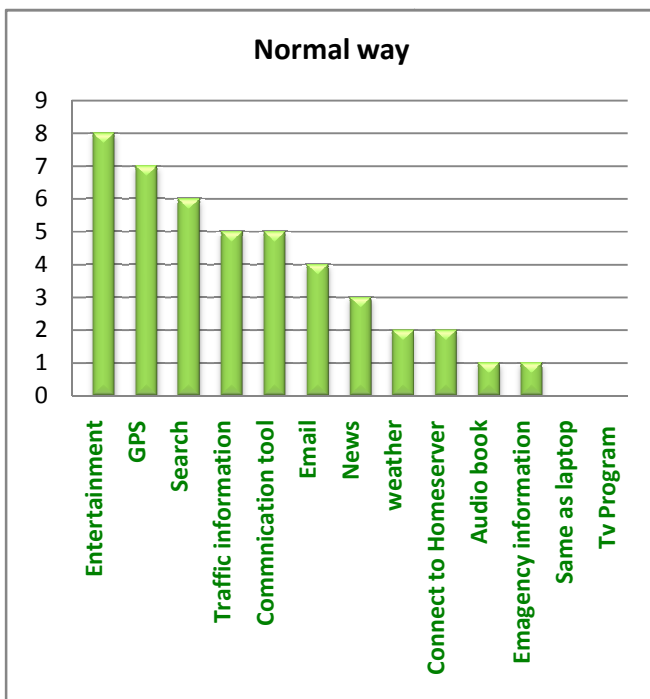
##### Internet connection in car

6 out of 3 on this group were agreeing about having internet connection in the car. Those 3 who were disagreeing and assume that it is too much and it can make the drivers life and other in his/her circumstance in danger. This is maybe because of their lack of knowledge on driving

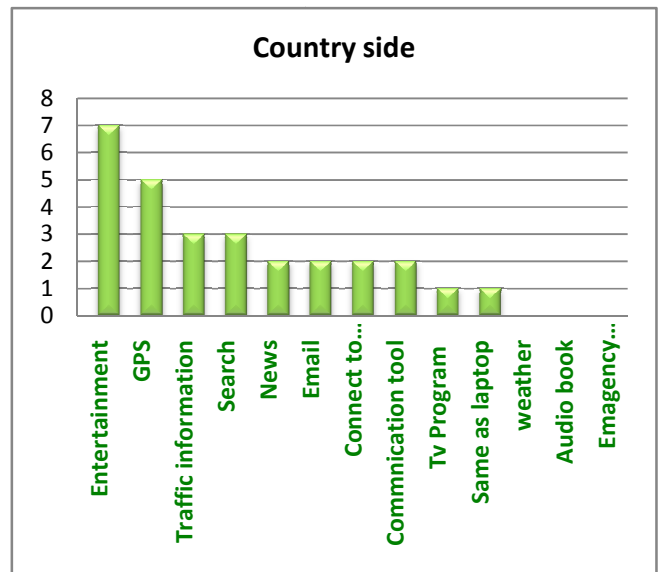
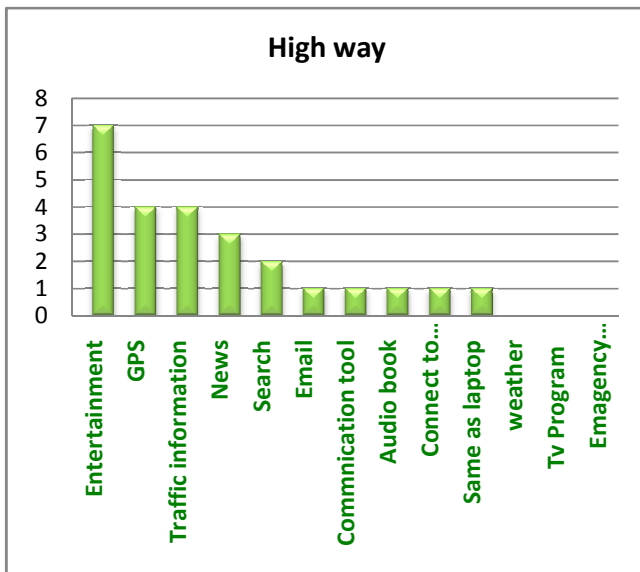


##### Most needed functions in different moods

As it shown in the charts below in all the moods the most preferred functions to have for this group is Entertainment.

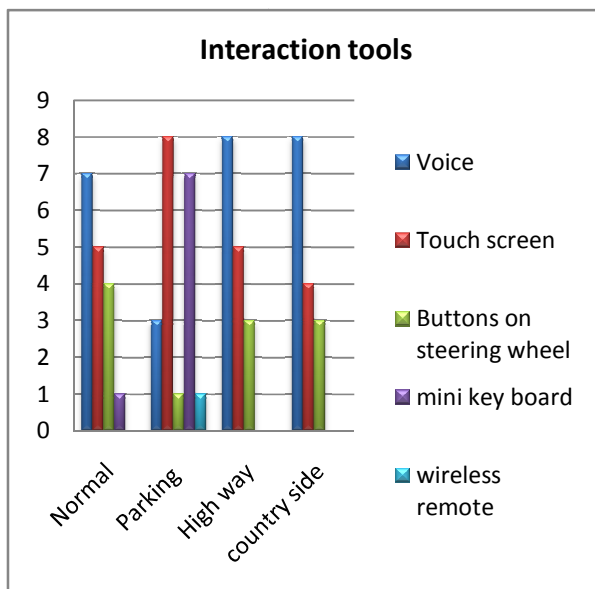






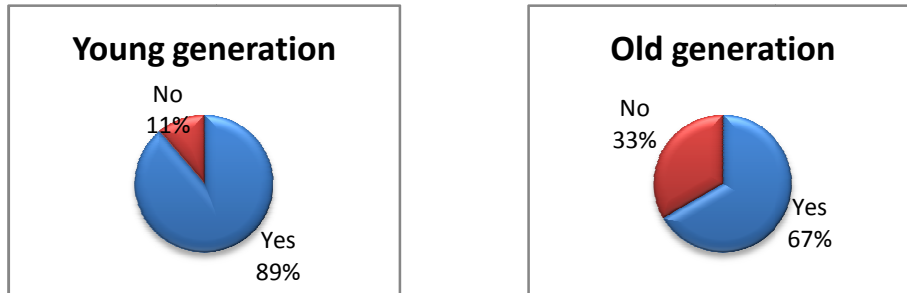
#### Preferred interaction tools on each mood

Voice in this group has the highest priority and there are one more interaction tools in this group which wasn't in other groups and this is using wireless remote



#### 4.2.4 Having special designed web site for drivers

One of the questions asked from interviewees was about having special designed web site suitable for driver. Among all young interviewees 89% of the young was agree to have special design for driver while he is driving and old generation 67 % was agree.



The interviewees had different requirements for new web design. Good usability, more icons instead of text and good navigation between windows were the requirements which all group of interviewees wanted to have. A list of all the other requirements mentioned by different groups has been presented below:

- Big buttons
- More icons
- No pictures
- No commercial
- Like cell phones website
- Headline of the news
- Simple usability
- Adaptive from normal site size to screen size
- Not so much colors
- Easy access to sub functions
- Less text
- Big buttons
- Like WAP design

For getting know about the exact re-design requirements in each group see Appendix A.

### **4.3 Questionnaire finding**

A questionnaire from Chalmers vehicle and traffic safety center sends to those interviewees who had driving license. This questionnaire is going to help better for analyzing the data from interviewees. Some personal questions like the age of interviewees, gender, relationship status and the model of their car have been asked. In different section of this questionnaire some questions about car safety issues asked which is not so relevant to this paper research but it can be useful for future research on this area. The result of those sections of questionnaire which is more relevant to this study has been presented on this sub section.

#### **4.3.1 Old driver with internet knowledge**

Almost all of the persons in this group were high educated and they were working with IT technology. Some of them were married and had children who needed to leave and pick up from school every day. Because of their work they used to have a lot of nomadic devices. Mostly cell phones, laptop, MP3 and PDA. Sometimes they used them singly and sometimes more than once at one time. All of them had GPS and traffic information system in their car. Some of them used to connect their nomadic device to their GPS. Having nomadic devices had good impact in most of this group's life. According to this group these devices make the peoples life more and easier. A device in the car which can have the same functions as their nomadic device was a very good idea and they can think to use an interactive interface in car and operate their nomadic devices through it instead of operating them separately. By this way the usage of nomadic devices will be more for this group and they will use them more than before. On this group we had only one person who was completely disagree for having internet connection or any complicated device like carputer in car and it was because of that she had 3 children and she felt that this is very annoying to have other distracting things in the car than the children.

#### **4.3.2 Old drivers without internet knowledge**

Most of the driver in this group had long driving experience and they were very careful drivers. They were against anything which distracts drivers during driving. They weren't use to use that many nomadic devices. For most of them cell phone was the only nomadic device which they used. According to this group using any distracting device during diving was a bad idea and even some of them turn off their cell phone when they are driving .They think that people in this world is getting more and more into technology and they have no time any more to enjoy the world around them which is one of the impact of using nomadic devices. The most important functions in car for this group were those which can help them to drive more carefully. GPS was one of the information systems which mostly had in their cars. Most of them could think to use a device with internet functions while driving if and only if they can interact with that by using voice. On this group there were some persons who don't care about how much a car has been updated with technology.

#### **4.3.3 Young driver with internet knowledge**

The drivers in this group had good internet knowledge but not that much long driving experience. Most of them were single. This group is using lot of nomadic device like MP3, cell phone, laptop, PDA and PSP than other groups. According to this group using these devices make peoples life easier and this is the only impact of using these devices. By having these devices they can be more available and can have contact with those they need every where they want to. They would like to have an interactive interface in car and operate their nomadic devices through that one. For this group like the old driver without internet knowledge the functions which can help for car safety is also important to have. Most of the people in this group do their best to drive carefully. GPS was one of the devices they have in their car and they used to connect their other devices to that. For this group having a device like Carputer in the car can create a good image about that certain car company. It can show how that car company update their product according to technology and peoples need. And it means that they will definitely buy a car which has new technology instead of the one which doesn't.

#### 4.4 Design solution

This section will describe the conceptual design of the new version of Carputer as an output of interview result.

According to system, after login to the system driver can see main window (figure 3). The main menu of this window is represented by Icons, since this is one of major requirement from drivers. Driver has an opportunity to choose interaction way with the system by clicking right bottom icon. Driver can interact with a system by using voice or touch screen while driving. Each window has a navigation function that make easy to use for drivers while they are driving. The main menu window is showing the icon of main internet functions such as E-mail, Navigation, Search, Turn to normal computer, Pay Parking Fee, Communication and Entertainment

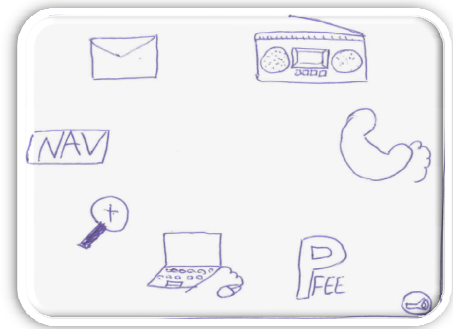


Figure 3: Main window

Communication is one of major internet function that interviewees request. By clicking communication icon on main menu, driver can see figure 4 Communication window. Left side of the communication window has a favorite list from contact people Driver can maintain own contact list and change status of the Messenger or phone by using Icon in button part of the window.

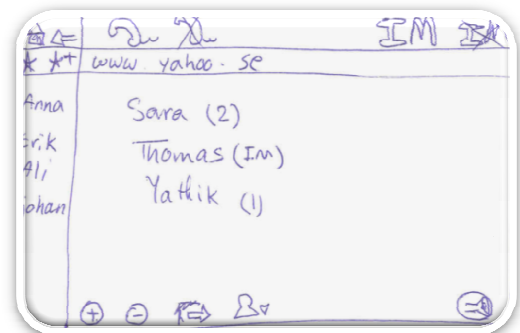


Figure 4: communication

Figure 5 is showing how to add a new person to contact list. In communication main window is showing how many miss call and instance message that driver receives and when did it get. If the driver clicks on one of instance message then he can see figure 6, which is showing the name of the person, when he send a message and message.

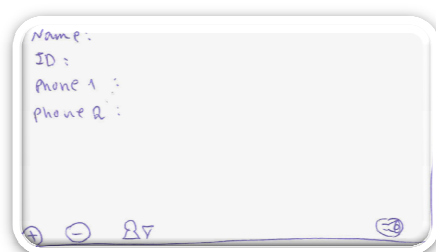


Figure 5: Add contact

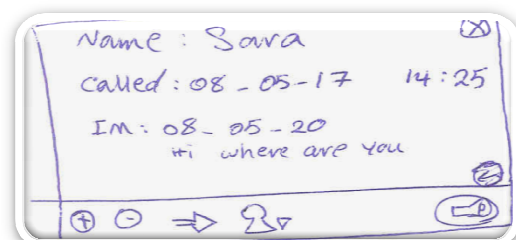


Figure 6: Miss call

If driver need to make a call or send a message then have to click on contact person name with all details and he can choice the way he need to contact person by using I phone or send a message. See figure 7. As an example driver needs to make a call to Sara then he can click on her name and he can see her contact numbers and messenger IDs in another window. Driver can make a call to her by clicking on her number or start chat by using Skype.



Figure 7: call window

On line Navigation is a most important function for drivers that he can use while driving. If driver click on NAV icon on main menu, he will get a new window with different functions. First of all driver can add where he need to go with which mode such as shortest way. After adding destination driver can see weather, Traffic information and Emergency information around 10km area on the right side of the window. Figure 8 is show the navigation window.

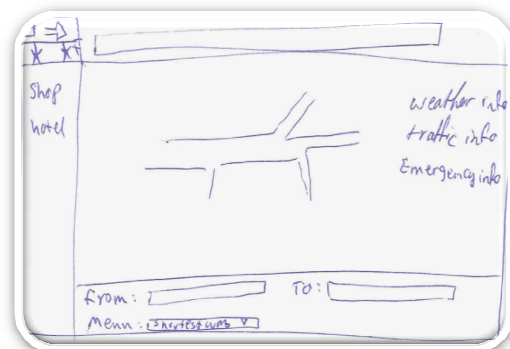


Figure 8: Navigation System

Pay parking fee through internet, is a new function for Carputer. Driver can use this function before come to parking place. First driver search where he need to park, when he come close to parking place system can see parking machine number and it automatically fill a form as figure 9 under driver advice. After fill a form driver can pay through online for parking place. The system can project parking ticket to windscreen.

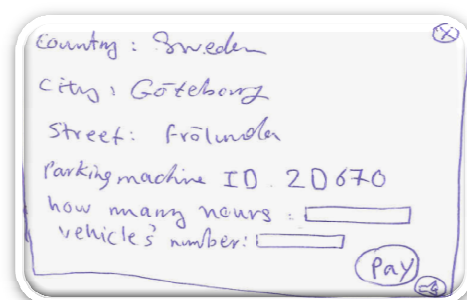


Figure 9: Paying parking fee

Email is one of interesting function that driver can read and send emails while driving. Driver can interact with the system by using voice. The system has an agent, driver can interact agent by using voice. The agent can read and write documentation for drivers. Figure 10 is showing how would like that Email home page. On the left hand side driver can add his favorite emails account. If he clicks on Gmail account he can see inbox of the account.

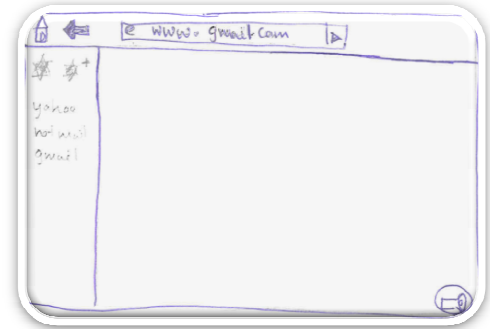


Figure 10: Email window

Figure 11 is showing about inbox of mail account. Left side of the inbox is having a menu bar with functions that need to write and read mails such as compose mails, sent, Draft and trash. If driver need to read mails, then agent open a mail and start to read. Even agent read a mail for drivers there is a screen that driver can read mails while driving. Figure 12 is showing read mail window. This window contains Headline of email and message as well as driver can take some action on that mail such as reply forward or cancel. Figure 13 is showing how to compose a mail.



Figure 11: Gmail inbox

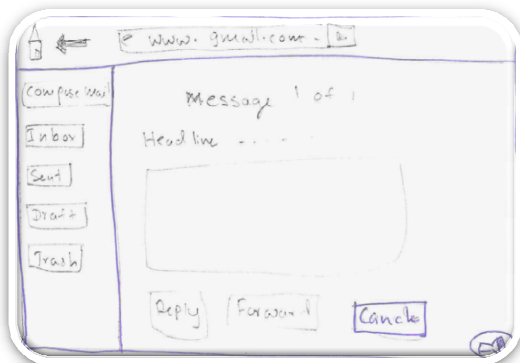


Figure 12: Read email

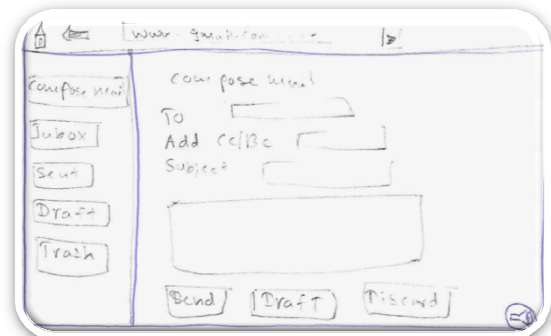


Figure 13: compose email

Figure 14 is showing Search window. Driver can interact with this system with just voice. Driver can tell to agent find a information. As an example he can tell to find information about Eurovision song contest 2008. Agent will read all information for driver. Driver can assess to Google or other search engines and find information that he need by the help of agent.

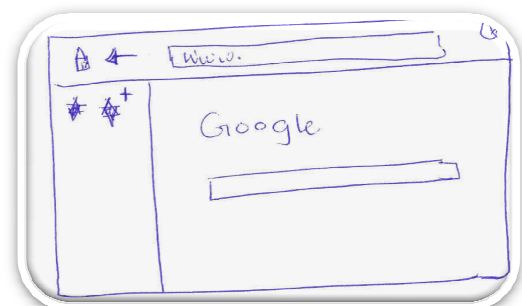


Figure 14: Search

## 5 Discussion

This chapter aims to compare the result finding with the theories that presents beginning of this paper. It will also answer about the design solution of this work. The discussion of this interview will show how theory corresponded to practice and how it can help to come up with a new design solution.

### 5.1 Comparing Different group of interviewees

As it mentioned previously in chapter 3 four different groups of interviewees had been chosen to interview. The differences of their relationship status, age, educate and knowledge makes them to have difference requirements but most of the people in the same group almost had the same requirements. In this chapter the comparison between different groups of interview will be presenter.

#### 5.1.1 Old and Young driver with internet knowledge

The old and young driver with internet knowledge and their requirements in different mood will be discussed. The comparing chart for these two groups can be found in Appendix B.

#### Different functions in different mood

In normal way for old driver with internet knowledge GPS, entertainment and email has the highest priority which it doesn't for young driver. As we see here the older driver doesn't like so much to be distracted while they are driving comparing with young driver. The young driver would like to have access to all the possible internet function while they are driving compare with old driver. In parking mood all of the young drives prefer to have the same function as a normal laptop while one of the old driver prefer to have access to just one internet functions. In High way for old driver using GPS has the highest priority while young driver entertainment has high priority and it shows how having long experience and short experience of driving can affect the requirements of people. In country side we can see big different between these two groups preferred functionality. GPS has the highest priority for old drivers while young driver requesting Entertainment. In both high way and country side one of the young driver can think himself to use the same functions as normal laptop which can make the driving very hard and it will be very distracting for driver.

According to Jane C. Stutts, Donald W. Reinfurt, Loren Staplin and Eric A. Rodgman Young drivers (under 20 years of age) were the most likely to be involved in distraction-related crashes. Furthermore, certain types of distractions were more prominent in certain age groups: adjusting the radio/cassette/CD among the under 20-year-olds; other occupants (e.g., young children) among 20-

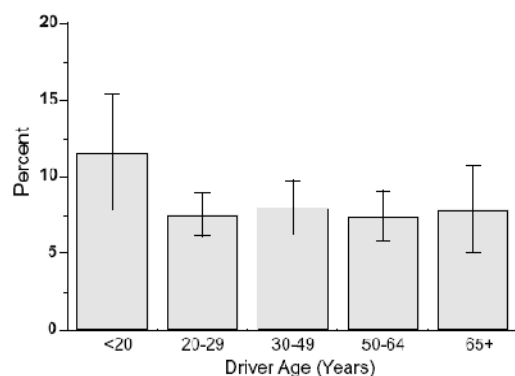


Figure 14 Percentage of drivers identified as distracted by age group.



29 year-olds; cell phone use among 30-49 year-olds; eating and drinking among 50-64 year-olds; and outside objects and events, as well as “other distractions,” among those age 65+ [18]. Figure 14 can show the percentage of distraction on different group.

### **Interaction tools**

Using voice as interaction tools has highest priority for old driver but young driver having low priority for voice. On the other hand for young driver using touch screen and steering wheels button also can be possible while it is not possible for many of the old driver.

#### **5.1.2 Old driver with and without internet knowledge**

The function which request from old drivers with and without internet knowledge will be presented here. For the more information can find in Appendix C.

### **Different functions in different mood**

The differences between these two groups are very big. For example for old driver without internet knowledge, entertainment has highest priority while for old driver with internet knowledge entertainment, GPS and email has the same priority. Old driver without internet knowledge doesn't have so big need of sending and receiving email or searching on internet. In parking mood Old driver with internet knowledge prefer to use separate function like entertainment instead of using normal laptop which in old driver with internet knowledge normal laptop functions is an obvious thing. In high way GPS has highest priority for old driver without internet knowledge. On this mood the needs of old driver without internet knowledge is almost the same as the normal way. Because of having driving experience it is obvious that the functions needed on Country side for old driver without internet knowledge is getting different. The usage of interviewees with driving experience is getting presented below.

### **Interaction tools**

Voice is a popular interaction tools between these two groups. The most important different is that the driver without internet knowledge doesn't need any wireless keyboard for interacting. Actually most of them don't like to have same function as normal laptop and were satisfy with some simple functions.

## 5.2 Conceptual Design as design solution

For drawing the conceptual design the steps mentioned in chapter 3 was performed and a design which presented at sub section 4.3 presented.

### 5.2.1 A design for High way, Normal way and Countryside mood

As an output of this study, the conceptual design solution which can prevent to distract the driver as much as possible. According to the interviewee's need of internet functions in the car, most requested function for normal way, countryside and highway have been elicited from the list of all functions. According to the interview result a top-down design strategy used for designing the conceptual design. Figure 14 can show how the main window and its sub windows had been connected to each other.

One of the most appreciated ways of designing for all the interviewees was using icons instead for text. As a result of user requirement, authors use some understandable icons instead of text. Having good usability was also one of the important requirements for the system. Navigation between windows made in an easy way. The functions which are having high priority are showing on a main window.

The voice is a first option for interacting with the system but can also be possible to interact with the system by using touch screen. Touch screen can be used for those who think that this is annoying to interact with the system by using voice when someone else is in the car.

### 5.2.2 Parking mood Design

Most of the interviewees preferred to have access to the same functions as a normal laptop in parking mood and use wireless keyboard as interaction tools. It can be possible for them to have access to the other functions same as they use in other mood too. They are able to interact with the system by using voice, touch screen or wireless key board, all depended on how the driver want to use the system in parking mood and which functions he/she preferred to use. Using the same functions as normal laptop in the other three moods (Normal way, high way and countryside) was a very bad idea which can be dangerous for both driver and the other people according to the interviewees. To make it impossible for driver to have access to the same functions as normal laptop, the authors took a strategy which can stop the driver to use the "same as normal laptop functions". A sensor will be mounting in the screen which can sense how long times the driver keep looking at the screen. If during 2 minutes he /she look three times at the screen less than 5 seconds, then the system will go back to the main menu.



Figure 14: A top-down design strategy

## **6 Conclusion**

The purpose of this study was to come up with a concept design for internet functions which can be use while driving. During chapter 5 had been discussed that 75% drivers would like to have internet connection in their vehicle and they prefer to use voice as an interaction tools for interacting with the system. Different groups needed different internet functions while they were driving. After analyzing the result of the interviews some main functions picked up to use in main window which were Communication, GPS, Entertainment, Search, Email, parking fee and same as normal laptop functions.. Most of the interviewees wanted to use voice as the first priority and touch screen as second priority for interact with the system. A top-down primitive concept design method had been chosen to design the conceptual model. During study a lot of data had been gathered from the different group of interviewees which was very helpful to come up with a design which is both simple and useful for driver.

### **6.1 Further research**

The technology will grow more and more and no one can stop it although someone using that can hurt people. Categorizing a bigger group of participant in 4 different groups can help to elicit much more requirement for driver. This design can be good to use but it need more research on that. For example it can be good to take a function and try to use it in laboratory and see how easy the driver in each mood can use these functions.

### **6.2 Problems**

On each study the researchers can face a lot of unpredictable issues. One of the problems in this study was that we didn't have access to a lab to be able to test the system. As a major problem that we force that hard to find old people who don't have internet knowledge. The old interviewees were from 34 up even though it was hard to find someone who was less than 60 without internet knowledge.

## 7 Reference

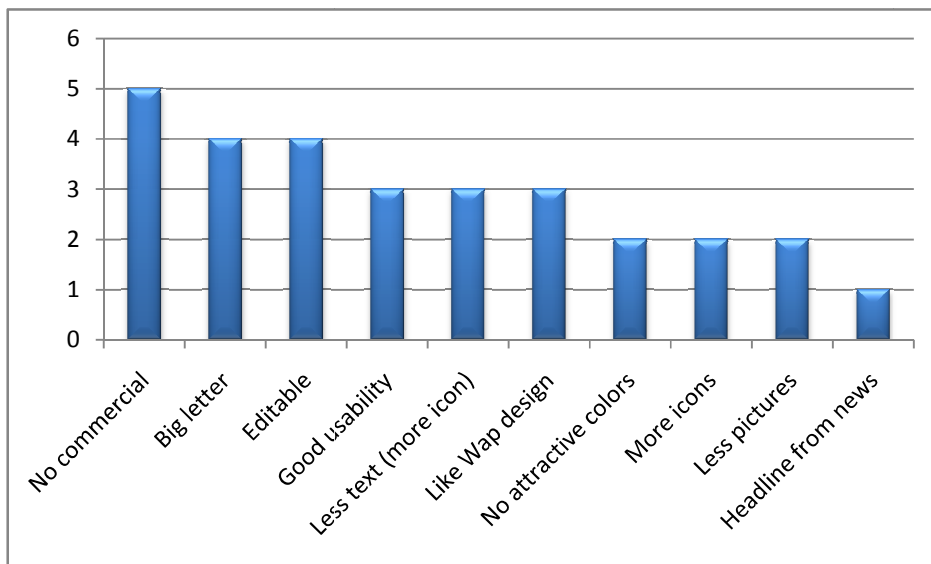
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## Appendix

### Appendix A

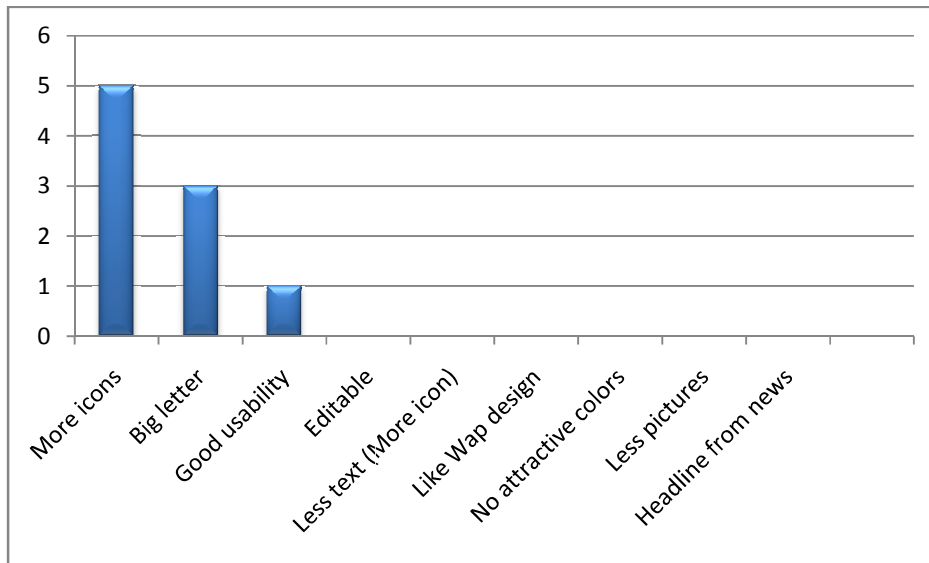
#### Re-design requirements from young driver with internet knowledge

- No commercial
- Big letter
- Editable
- Good usability
- Less text (more icon)
- Like WAP design
- No attractive colors
- More icons
- Headline from news



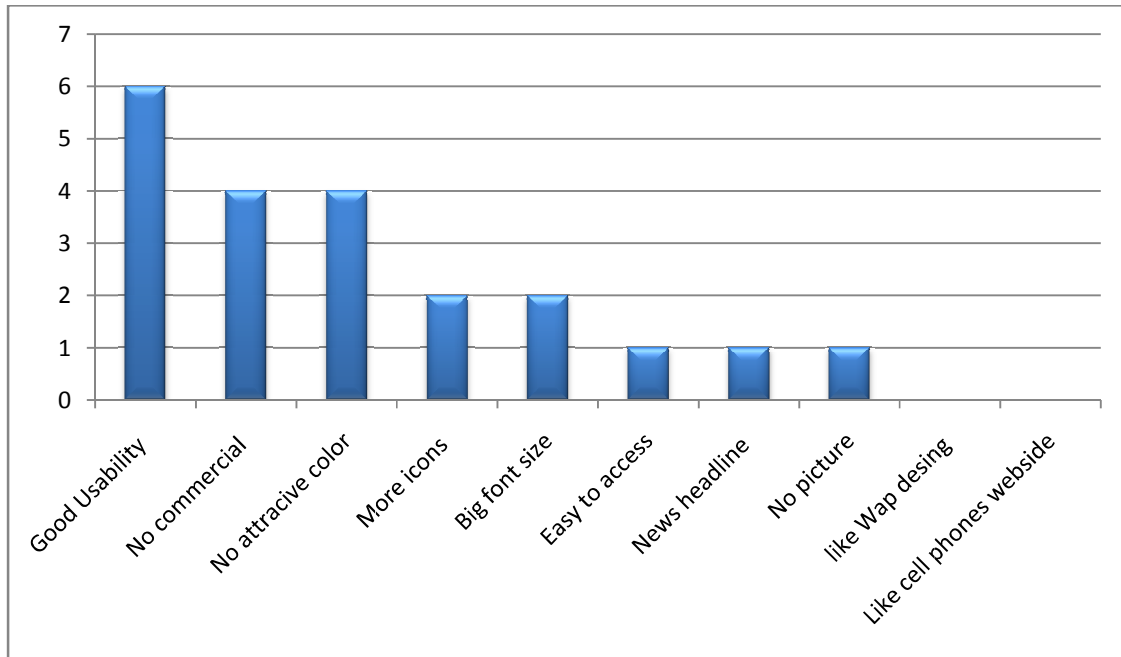
## Re-design requirements from Old drivers without internet experience

- No Commercial
- Big letters
- Good usability
- More icons



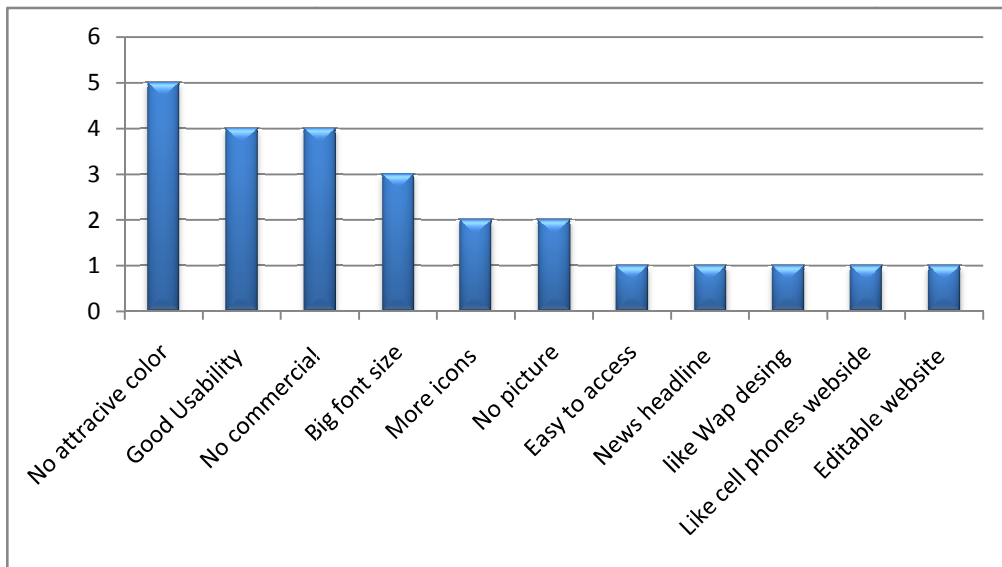
## Re-design requirements from Old driver with internet experience

- Good Usability
- No commercial
- No attractive colors
- More Icons
- Easy to select
- No text (Just Icons)
- Big letter
- Like Wap design
- No picture
- News headline



## Young generation without driving license requirements

- Big buttons
- More icons
- No pictures
- No commercial
- Like cell phones website
- Headline of the news
- Simple usability
- Adaptive from normal site size to screen size
- Not so much colors
- Less text
- Ability to change front size
- Easy access to different functions

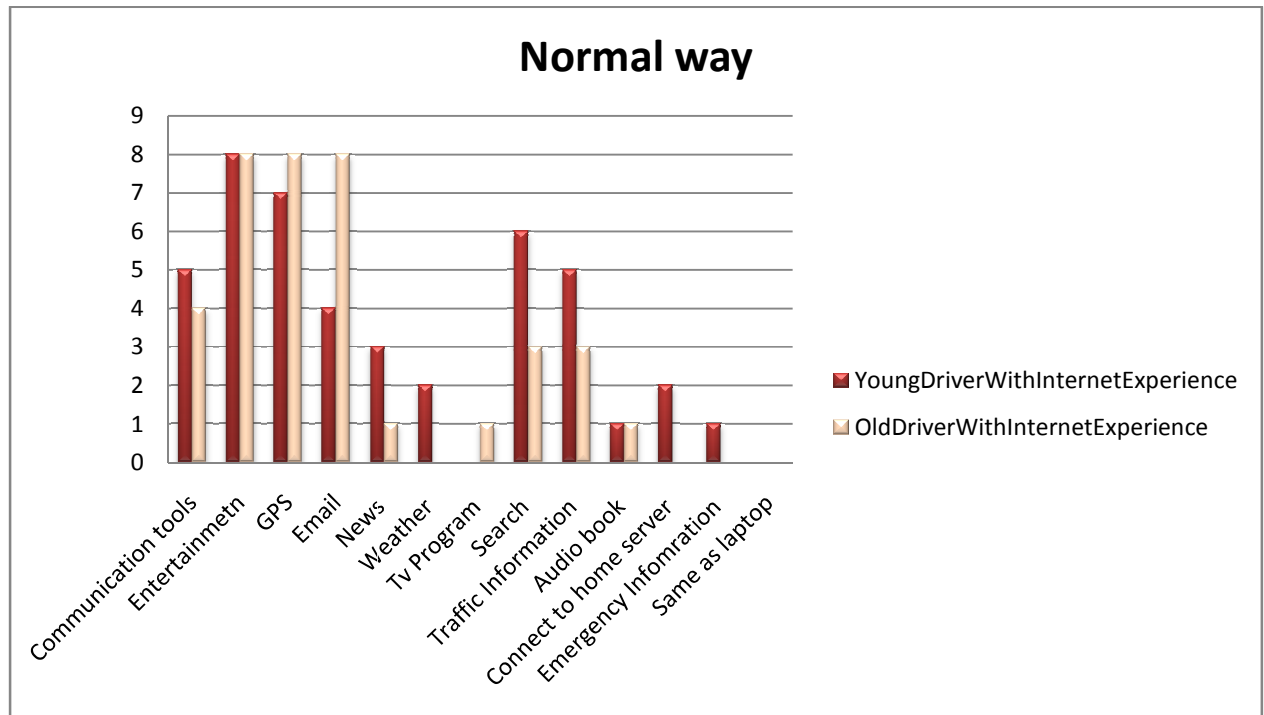




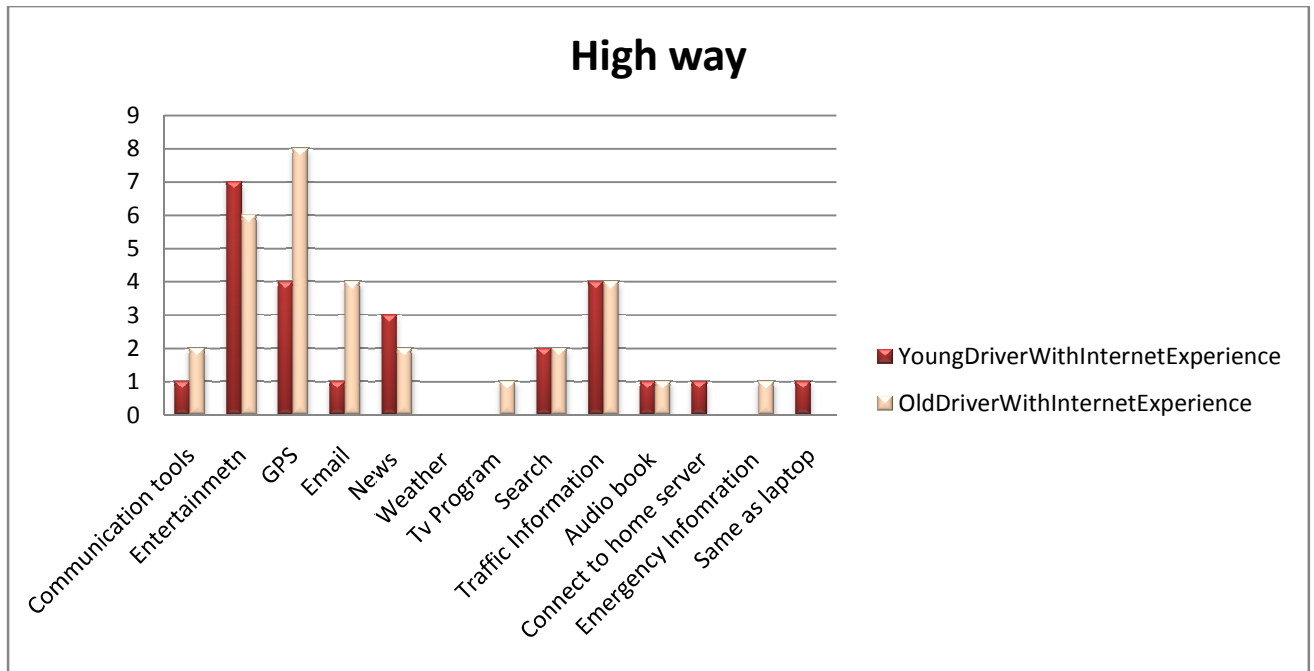
## Appendix B

### Comparing between old and young driver with internet knowledge

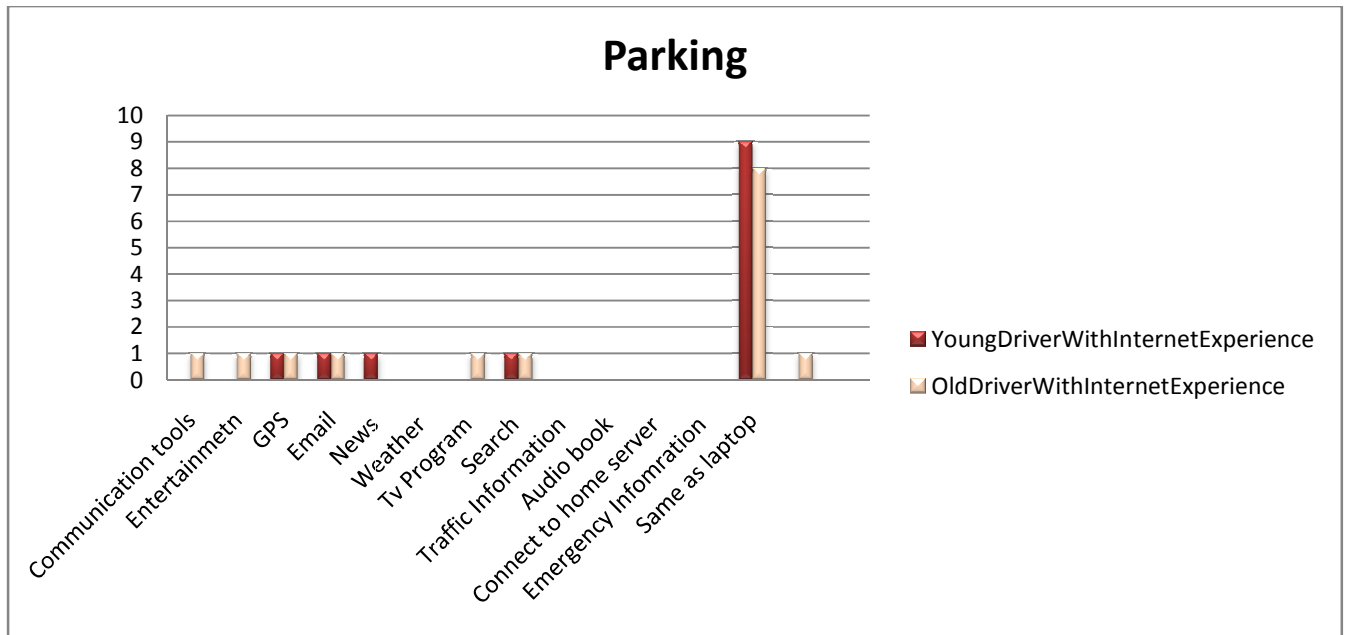
#### Normal Way



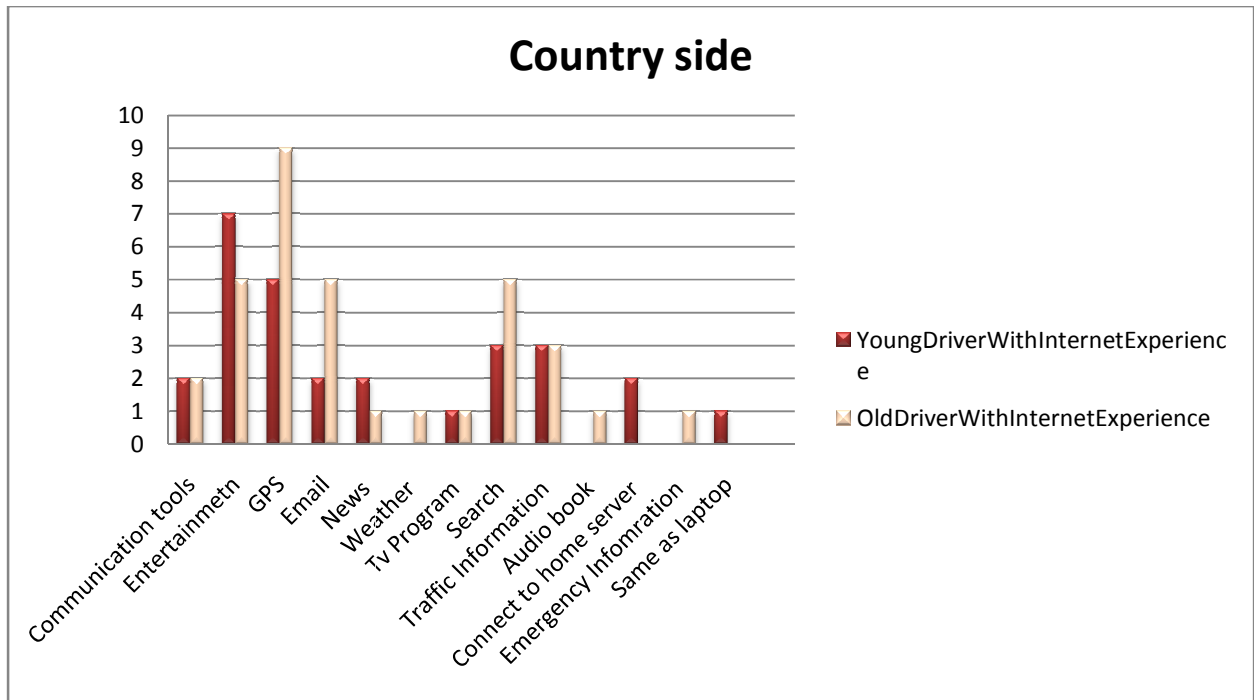
# High Way



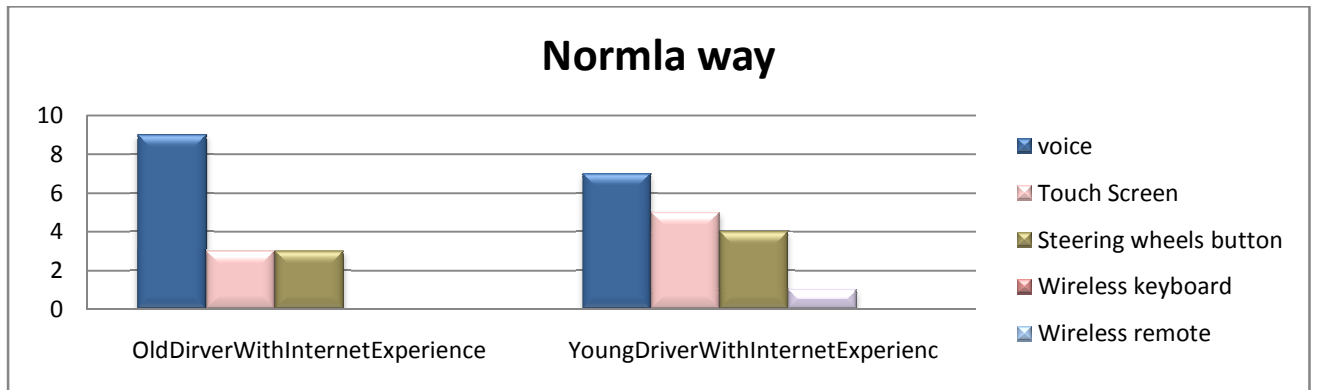
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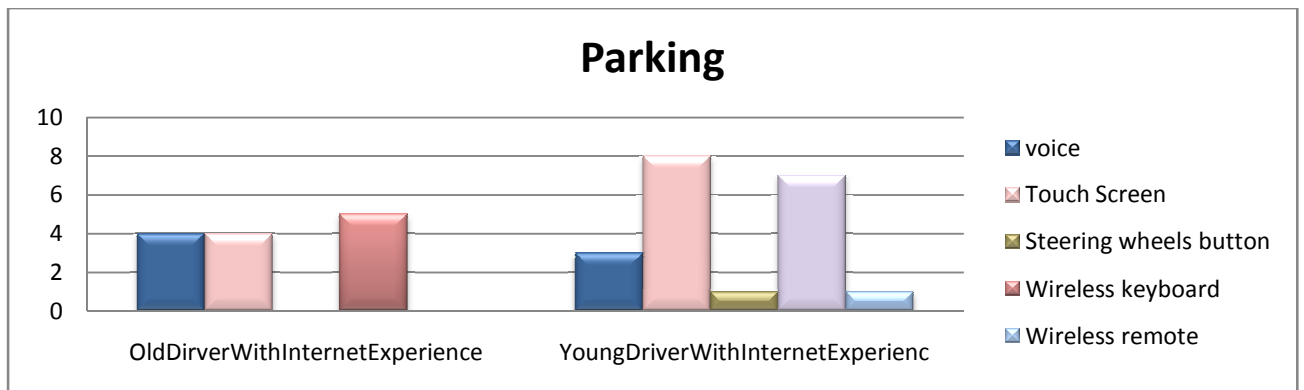
# Country Side



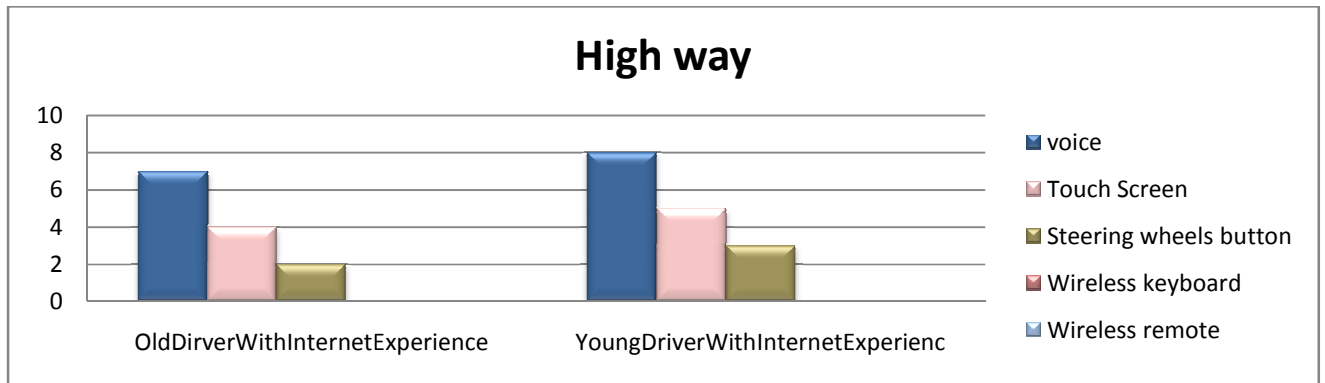
### Interaction tools in Normal Way



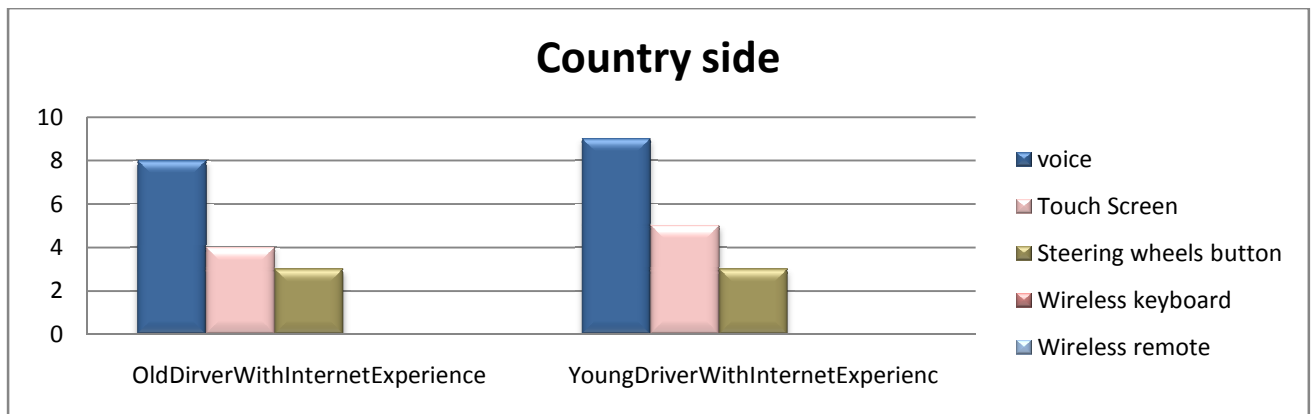
### Interaction in Parking



### Interaction tools in high Way



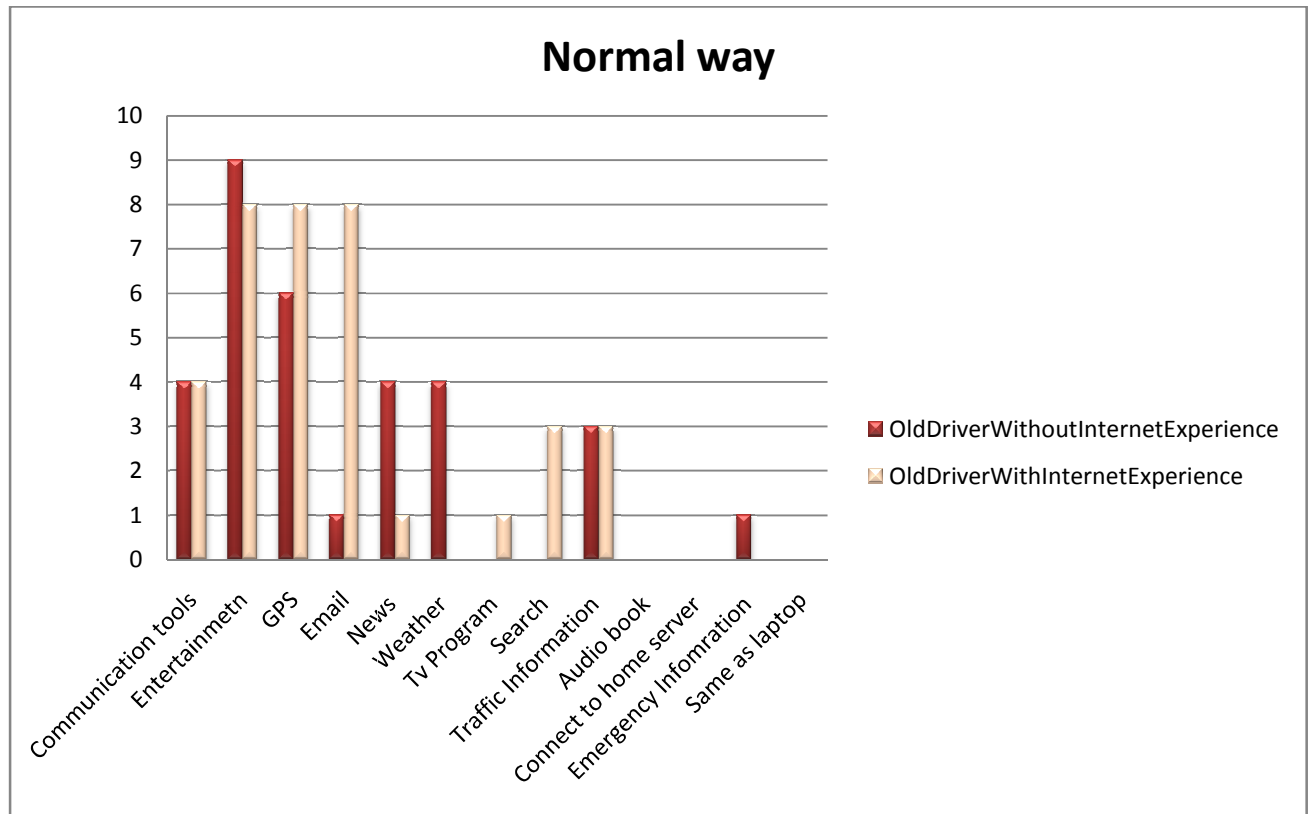
### Interaction tools in Country side



## Appendix C

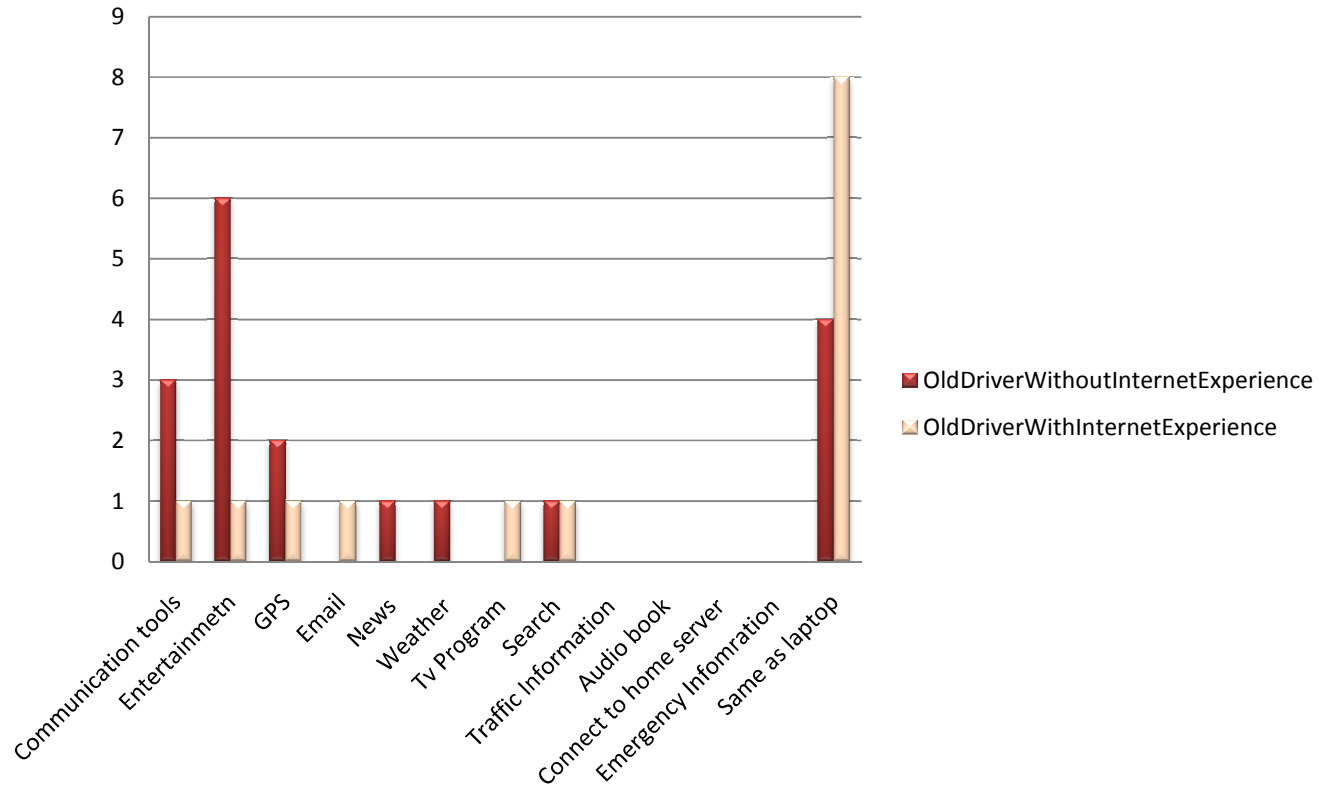
### Comparing between Old driver with and without internet knowledge

#### Normal Way



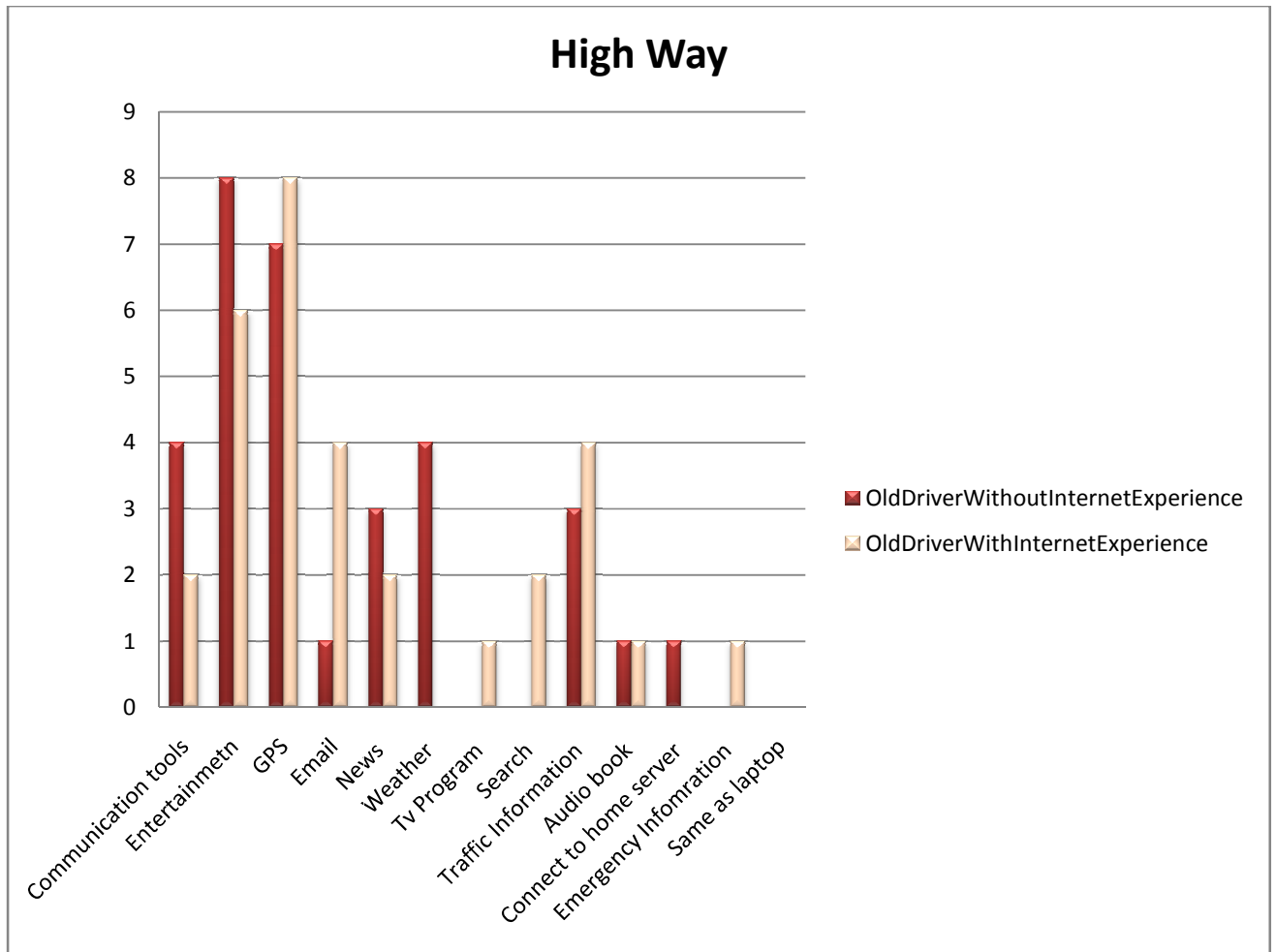
#### Parking

## Parking

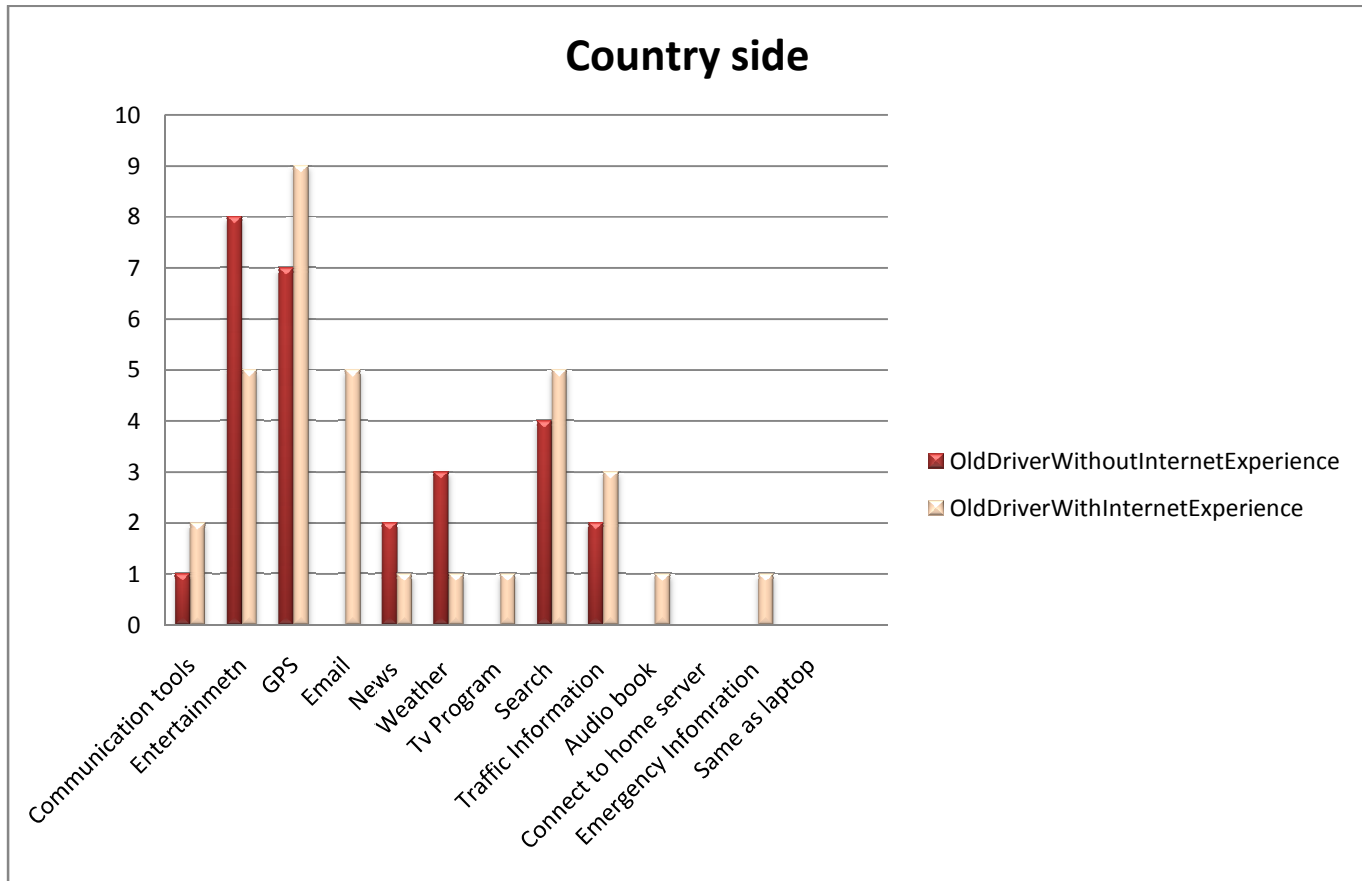




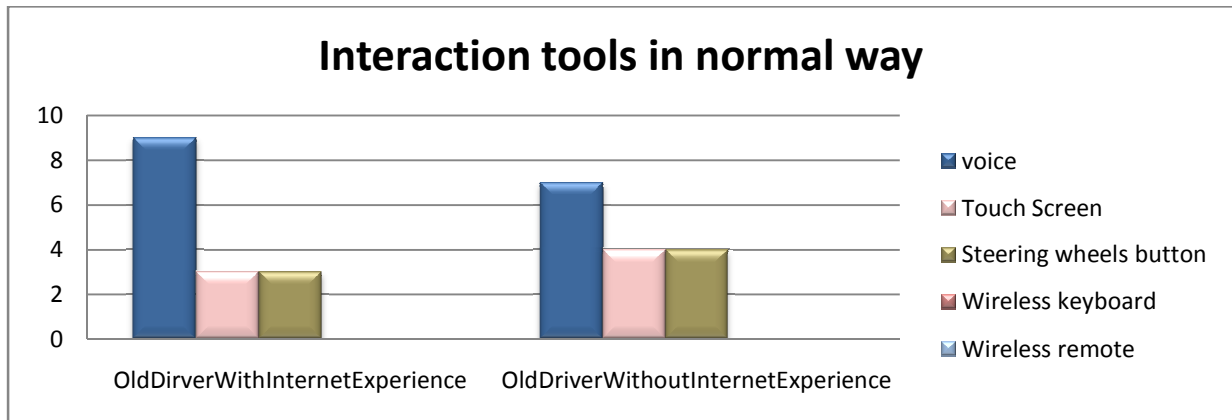
# High Way



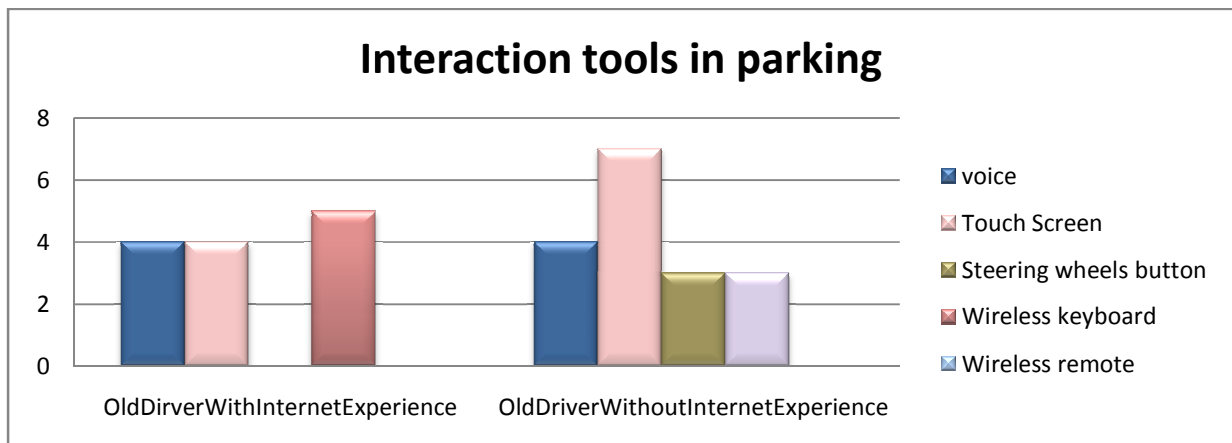
# Country Side



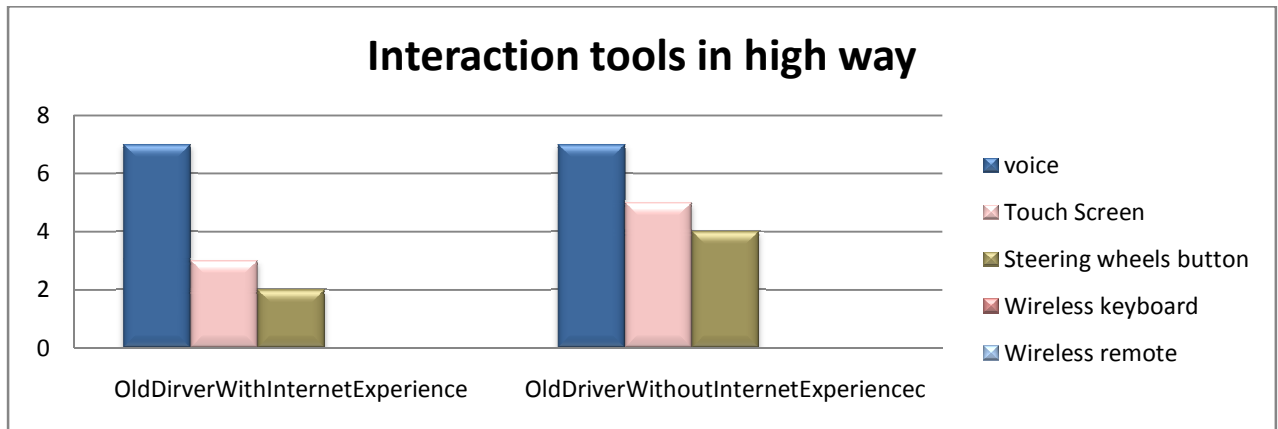
### Interaction tools in Normal Way



### Interaction in Parking



### Interaction tools in high Way



### Interaction tools in Country side

