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USABILITY EVALUATION OF NEW KANSEI INTERFACE FEATURE VS. EXISTING INTERFACE FEATURE IN AUTOMOTIVE NAVIGATION SYSTEM

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BY

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Thesis submitted in fulfillment of the requirement for the Degree of Bachelor Science (Environmental and Occupational Health) from the Faculty of Medicine and Health Sciences, University Putra Malaysia

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Thank you.

ABSTRACT

USABILITY EVALUATION OF NEW KANSEI INTERFACE FEATURE VS. EXISTING INTERFACE FEATURE IN AUTOMOTIVE NAVIGATION SYSTEM

ALWIS NAZREEN BIN MOHD JEFRI CHAND

OBJECTIVE: This study aims to evaluate the usability of new kansei navigation system interface features versus. Existing interface design features in automotive navigation system. **METHODOLOGY**: Study population consist of participants which are chosen using purposive sampling technique consist of male professional driver (PD) and non-professional driver (NPD) of a local University in Malaysia. A total of 60 participants ranging from 18 to 39 years old participated in this study. Participants were tested using a customized driving simulator which participant will drive according to the route shown by the GPS navigation system(GPS system based on kansei versus existing system)Drivers were tested in terms of their 1) completion time for each task given 2) the number of error produce from each task 3) the satisfaction level from each feature in the GPS system using System Usability Scale (SUS) 4) a kansei survey to measure participant understanding and perception in usability of GPS interface designs. A Counterbalance method was used in order to eliminate order biased participant. A total of 10 minutes was taken to complete the overall task. Wilcoxon Sign Rank was used to compare all objectives. **RESULT**: Result for driving completion time for both PD and NPD, shows that kansei GPS system (PD, mean = 2.49±0.66 min, NPD, mean = 2.18±0.71 min) had significantly shorter completion time (p=0.013) compared to the existing system (PD, mean = 2.75±0.66 min, NPD, mean = 2.44±0.74 min). For the number of errors, kansei GPS system showed a significantly lowered driving error (p <0.05) (PD, mean = 8.86±6.55, NPD, mean = 7.23±6.03) compared to existing GPS System (PD, mean = 13.7±7.94 NPD, mean =10.6±7.6). For the satisfaction level showed no significant different in satisfaction for kansei GPS System both (PD, mean score = 61.7±19.4 NPD, mean score = 66.58±21.9) compared to existing GPS (PD, mean score = 66.58±21.9 NPD, mean score = 63.58±20.9) (p>0.05). In term of kansei Survey, shows that there is a significantly higher scoring for kansei GPS system for both (PD, mean score = 3.6±0.99 and NPD, mean score = 3.69±1.44) compared with existing (PD, mean score =3.15±0.88 NPD, mean score = 3.68±0.18) (p<0.05). **CONCLUSION**: The new kansei GPS system performed better in reducing the task completion time, reducing the numbers of driving error and better perception on usability compared to existing GPS system. However, both professional and non-professional were satisfied using kansei and existing GPS system.

Keywords: Kansei, GPS, Simulator, Error, Completion time, Driver, SUS

ABSTRAK

PENILAIAN KEBOLEHGUNAAN REKA BENTUK SISTEM NAVIGASI BARU KANSEI BERBANDING REKA BENTUK YANG SEDIA ADA DALAM SISTEM NAVIGASI AUTOMOTIF

ALWIS NAZREEN BIN MOHD JEFRI CHAND

OBJEKTIF: Kajian ini bertujuan untuk menilai kebolehgunaan antara muka sistem navigasi kansei baru berbanding antara muka yang sedia di dalam sistem navigasi automotif. **KAEDAH**: Kajian penduduk terdiri daripada peserta yang dipilih menggunakan teknik persampelan bertujuan terdiri daripada pemandu lelaki profesional (PD) dan pemandu bukan profesional (NPD) daripada sebuah Universiti tempatan di Malaysia. Seramai 60 peserta yang berumur 18 - 39 tahun mengambil bahagian dalam kajian ini. Para peserta telah diuji menggunakan simulator memandu dimana peserta akan memandu mengikut laluan yang ditunjukkan oleh sistem navigasi GPS (sistem GPS berdasarkan kansei berbanding sistem sedia ada) Pemandu telah diuji dari segi 1) jumlah masa bagi melengkapkan mereka untuk setiap tugas yang diberikan 2) beberapa ralat hasil dari setiap tugas 3) tahap kepuasan dari setiap ciri dalam sistem GPS yang dengan menggunakan sistem *Usability Scale* (SUS) 4) Survey kansei untuk mengukur kefahaman dan persepsi peserta dalam kebolehgunaan reka bentuk antara muka GPS. Satu kaedah *Counterbalance Method* telah digunakan untuk menghapuskan giliran peserta agar tidak berat sebelah. Purata masa 10 minit telah diambil oleh peserta menyelesaikan tugas keseluruhan. *Wilcoxon Signed Rank* telah digunakan untuk menganalisa semua objektif. **KEPUTUSAN**: Keputusan jumlah masa bagi melengkapkan setiap tugas yang diberikan kedua-dua PD dan NPD, menunjukkan bahawa sistem kansei (PD, min = 2.49 ± 0.66 min, NPD, min = 2.18 ± 0.71 min) mempunyai masa siap jauh lebih pendek ($p = 0.013$) berbanding dengan sistem sedia ada (PD, min = 2.75 ± 0.66 min, NPD, min = 2.44 ± 0.74 min). Bagi bilangan kesilapan atau ralat, sistem kansei GPS menunjukkan ralat memandu menurun dengan ketara ($p < 0.05$) (PD, min = 8.86 ± 6.55, NPD, min = 7.23 ± 6.03) berbanding dengan Sistem GPS sedia ada (PD, min = 13.7 ± 7.94 NPD, min = 10.6 ± 7.6). Bagi tahap kepuasan, kedua sistem tidak menunjukkan perbezaan yang signifikan antara sistem kansei GPS (PD, skor min = 61.7 ± 19.4 NPD, skor min = 66.58 ± 21.9) berbanding GPS sedia ada (PD, skor min = 66.58 ± 21.9 NPD, skor min = 63.58 ± 20.9) ($p > 0.05$). Dari segi Survey Kansei, menunjukkan bahawa terdapat satu jaringan lebih tinggi untuk sistem kansei GPS untuk kedua-dua (PD, skor min = 3.6 ± 0.99 dan NPD, skor min = 3.69 ± 1.44) berbanding dengan yang sedia ada (PD, skor min = 3.15 ± 0.88 NPD, skor min = 3.68 ± 0.18) ($p < 0.05$). **KESIMPULAN:** Sistem kansei yang baru menunjukan prestasi yang lebih baik dalam mengurangkan jumlah masa melengkapkan tugas, mengurangkan bilangan ralat memandu dan mempunyai percepsi lebih baik dlm pengunnaan . Walau bagaimanapun, kedua-dua profesional dan bukan profesional berpuas hati menggunakan kansei dan sistem sedia ada.

Kata kunci: Kansei, GPS, Simulator, Ralat, masa Siap, Pemandu, SUS

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LIST OF ABBREVIATIONS

EOR	Eye off Road
GPS	Global Positioning System
ISO	International Standard Organization
NPD	Non Professional Driver
PD	Professional driver
SUS	System Usability Scale

CHAPTER 1

INTRODUCTION

1.1 Background

GPS navigation system in car is widely used to assist driver to their destination of an unknown route. In 2008 and 2009, 40 million of the Portable Navigation devices (PND) are being ship yearly (Statista, 2015). In 2013, it increase to 110 million and 70 million were installed straight into the car system (Statista, 2015).

Various company developer of this system have come up with the ways of improving the functionality and user experiences to be more user friendly mainly increase it usability. Nagamachi developed kansei Engineering as an ergonomic consumer-oriented technology for new product development (Nagamachi, 1995). kansei engineering aims to produce a new develop product based on the consumer's emotion and demand. Current automotive navigation systems are capable of providing reasonably accurate route but some interphase are too complicated to understand which lead to many error by user. There has been considerable human factors research on navigation systems over the past 10 to 15 years (Nowakowski, Green, & Tsimhoni, 2003).

The ISO 9241 standard on Ergonomics of Human System Interaction (Part 11 1998) defines usability as the extent to which a product service or environment can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use. ISO standards for software quality refer to this broad view of usability as quality in use, as it is the user's overall experience of the quality of the product (Bevan, 2008) .

Usability is a component of user experience which made up of 6 basic building blocks which is usable, useful, desirable, findable and credible which will result in enhance the user experience. Usability evaluation is a combination of factors to measure all factors including intuitive design which is a nearly effortless understanding of the architecture and navigation of the interface, ease of learning, how fast a user who has never seen the user interface before can accomplish basic tasks, efficiency of use, how fast a user can complete a task, memorability, whether a user can remember enough to use it effectively in future visits, error frequency and severity which measures how often users make errors and how serious they are while using the system and finally, subjective satisfaction which takes into account how the user likes using the system. There are several safety and usability guidelines for in-vehicle navigation systems have been developed (refer to UMICH website) for all available guidelines.

1.2 Problem Statement

Navigation apps are now becoming another increasingly number of user in 2013 which was 68.6 million (Statista, 2015). Increasing number of user means there is also a possibility of high accident rate that could cause by this navigation system itself. In United Kingdom, Reports of 300,000 motorist accident were cause by navigation system system mainly causes by distraction of user from focusing on driving (Mirror, 2010). Distraction while driving such as looking at navigation system screen for a long time that leads to a condition called Eye off Road (EOR). This condition happened because either the user are confused of the features of the navigation system design or any other error made which is not user friendly to user.

Problem arising with usability usually related to visual demanding interpretation of any interface. A well-designed navigation system can prevent wrong turns, reduce travel times, and might decreased some of the driver's workload. However, poor usability can misdirect drivers, increase driving workload, and lead drivers to make unsafe manoeuvres. To improve this problem, there is possibility to incorporated kansei in a navigation system to improve it effect the completion time and errors made during driving compare to the existing interface which will also improve the satisfaction and perception in usability of the new design.

1.3 Study Justification

Until today there is no research which incorporates kansei into a navigation system interface which could theoretically improve usability. This study is to compare and test the usability of the new kansei navigation system interface with existing navigation system. By doing this we can compute all the dependent variable and come up with a conclusion so that this new design can be further developed.

There are also issue on crashes induced by in-vehicle navigation system that tasks are that are visually demanding, such as reading detailed maps (Green, 2000). So, it is important to find a better alternative in designing navigation system. By comparing the new kansei design interface with the current interface, we can observe how ergonomic method (kansei) could improve the usability of navigation system.

1.4 Conceptual Framework

Usability is a component that could enhance user experience 3 main factors contributed design factor, environmental factor and individual factor.

For design factor, visible language is used to communicate message or context (Ring, 1996). Navigability provides direction for user to navigate through an interface. Readability is display must be easy to identify and interpret. The colour of the design should be appropriate and to emphasize important information, identify structures and portray object which could reduce error in interpretation and enhance memorability. Emotion based on kansei engineering method is also a new method to enhance a design. It can be obtain through various kansei methods such as obtaining kansei word and using it to describe what a user would feel in using a system.

For environmental factor, in a book multiple user interface book that 4 of this which is portability, attentiveness, manageability and learnability affect usability as well (Ahmed S & Javahery H, 2005). Portability is the ease of movement of device across different platform which could be software and hardware. Attentiveness on how a user could remain focus on features to complete a task within a time period. Manageability and learnability influence the ability of one to manage and to learn to execute task effectively.

For individual factor, according to (Wirtz, Jakobs, & Ziefle, 2009), age have been recorded to have influence the usability, younger person perform better than older person in term of testing. Physiological state of a person could also influence the performance when using a device. Example a person who is stress, drunk and fatigue may influence the outcome of performance of usability. Human perception and their behaviour will influence the way they use and interpret the data. The conceptual framework is as in Figure 1.1.

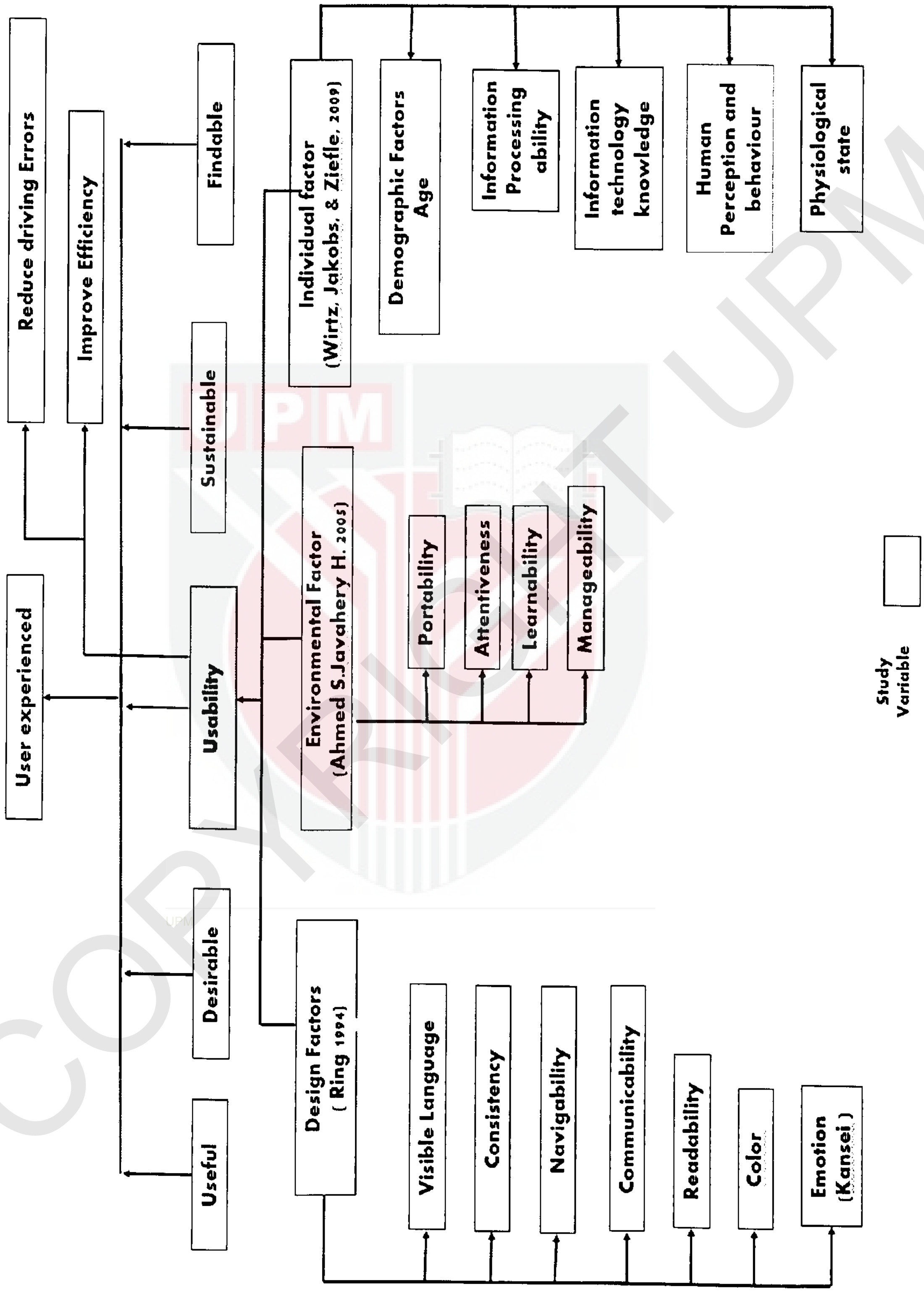


Figure 1.1 Conceptual framework

1.5 Research Questions

Questions arise from this research are as follow:

1. What is the difference of completion time between kansei and existing features in GPS navigation system device among professional drivers and non-professional driver?

2. What is the difference of the number of errors made by professional drivers and non-professional driver between kansei and existing features in navigation system device?

3. What is the difference of satisfaction level between kansei and existing features in navigation system device among professional drivers and non-professional driver?

4. What is the difference of kansei survey between new and existing features in GPS navigation system device among professional drivers and non-professional driver?

1.6 Study Hypothesis

1. There are significant difference of completion time between kansei and existing features in GPS navigation system device among professional drivers and non-professional driver.

2. There are significant difference of the number of errors made by professional drivers and non-professional driver between kansei and existing features in GPS navigation system navigation system device.

3. There are significant difference of satisfaction level between kansei and existing features in GPS device among professional drivers and non-professional driver.

4. There are significance different of in perception in usability between kansei and existing features in GPS device among professional drivers and non-professional driver.

1.7 Study Objective

To evaluate the usability of new kansei navigation system interface features vs. existing navigation system interface features.

The specific objectives are as follows:

1. To determine the difference of completion time between kansei and existing features in GPS navigation system device among professional drivers and non-professional driver.

2. To determine the difference of the number of errors made by professional drivers and non-professional driver between kansei and existing features in navigation system device.

3. To determine the difference of satisfaction level between kansei and existing features in navigation system device among professional drivers and non-professional driver.

4. To determine the difference of kansei survey between new and existing features in GPS navigation system device among professional drivers and non-professional driver.

CHAPTER 2

LITERATURE REVIEW

2.1 Usability evaluation in automotive navigation system

Current automotive navigation systems are capable of providing reasonably accurate and reliable door-to-door guidance. Market predictions suggest by 2009, 25% of the vehicles produced will have navigation systems (Richardson & Green, 2000). A well-designed navigation system can prevent wrong turns, reduce travel times, and hopefully, alleviate some of the driver's workload. However, poor usability can misdirect drivers, increase driving workload, and lead drivers to make unsafe manoeuvres.

Usability testing identifies the struggle people use in the product and help make recommendation and improvement (Najmeh Ghasemifard, 2015). There has been substantial human factors research on navigation systems over the past 10 to 15 years inventory of current technology (Nowakowski et al., 2003). Unfortunately, even with all of the research, guidelines, and feedback from several generations of products on the market, many basic safety and usability problems still seem to re-occur, and the need for an awareness of these problems and product usability testing is greater now than ever before.

There are 3 types of usability model developed as shown in Figure 2.1:

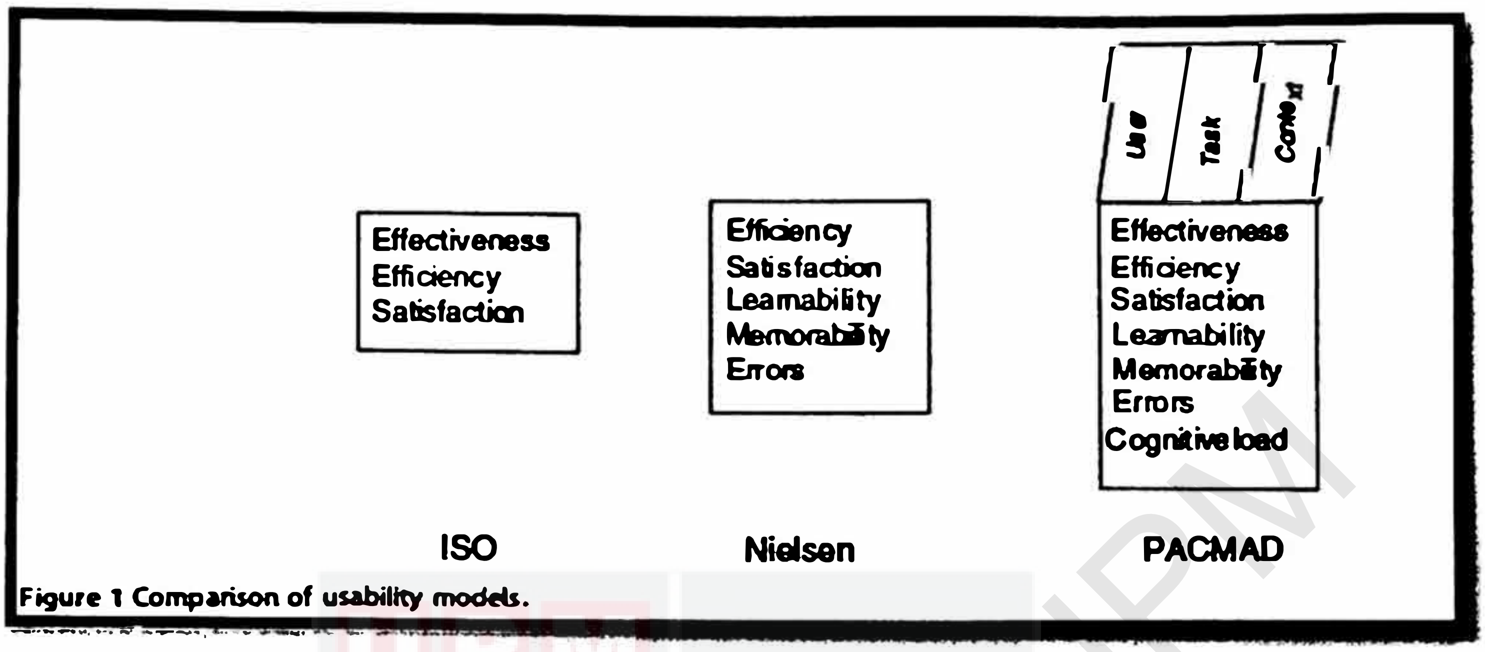


Figure 2.1: Usability Model

Each of this model assess specific measurable attributes. The ISO have identified 3 important factors in usability which is efficiency and satisfaction .The PACMAD and Nielsen 1993 usability model identifies 3 important factors to address which can affect the usability of a mobile application that is efficiency, errors and satisfaction. Efficiency is addressed in all three model such scenario is the task completion time (Rummel, 2014).

The PACMAD usability model extends the description of errors which first proposed by Nielsen, to include an evaluation of the errors that are made by participants. Usability in use and flexibility in use are measured by efficiency (time of completion), error and satisfaction. The relative importance of these measures depends on the purpose for which the product is being used (Bevan, 2008). For example, navigation system needs to be fast and no error in order for user to complete the journey.

Usability will ultimately contribute in the user experience of a product. User experience is defines as all aspects of the user's experience when interacting with the product, service, environment or facility (Bevan, Carter, & Harker, 2015). User experience is still a concept that is being debated, defined and explored by researchers and practitioners (Law, Roto, Vermeeren, Kort, & Hassenzahl, 2008).

However, it is clear that this concept is already an important part of the evaluation of usability and will become more important in the future. The new evolution for improving user experience is now taking place which user emotion is taken into consideration in designing a system or features.

2.2 Kansei Interface versus Existing Interface

Understanding human feeling and impression on a product is important to understand what the user. Kansei Engineering which is founded by Professor Mitsuo Nagamachi of Hiroshima is a method to design and develop a way to understand this emotion of a person and incorporate into a product (Nagamachi, 1995). Kansei Engineering targets to improve human well-being by looking into physiological and psychological aspects (Lokman & Nor Laila, 2006).

Studies have shown that kansei engineering works very well in design field. Mazda Miata have been one of the earliest product which have been integrated with kansei element which have proven significantly on sale of the car which turns to be world bestselling light weight. In terms of improving usability of navigation system it is still very new. Since there is rising use of navigation system, it is important to have look into the possibilities of incorporating kansei into navigation features which would improve the usability of the system (Lee & Lin, 2014). Existing features have several problem identified in previous study for navigation system and one of it is the complexity of understanding a system (Brown & Laurier, 2012).

CHAPTER 3

METHODOLOGY

3.1 Study Design

This study is a comparative Cross-sectional study. Data collection was done in the Occupational Safety and Health Laboratory. A simulator was used to collect data and 2 set of questionnaires which were System usability scale (SUS) and Kansei Survey.

3.2 Study Location

The study was conducted in the Occupational Safety and Health laboratory in Faculty of Medicine and Health Science, University Putra Malaysia. It was conducted in a room equipped with the driving simulator.

3.3 Sampling Method

3.3.1 Study population

This study was conducted among students and staffs of University Putra Malaysia, Serdang Selangor. The total respondents involved in this study were 60 and they were divided into 2 groups which were professional driver and non-professional driver. The respondents were selected randomly within the inclusive criteria. The inclusive criteria of the respondents were as follows:

i. Male
ii. Age between 18 to 39 year
iii. Non-professional driver have driving experience at least a year and have use in car navigation system at least 1 times in lifetime
iv. Professional driver must have occupation as a driver in UPM and have at least one time experience using the navigation system.

The exclusive criteria were as follows:

i. Do not have experience in using navigation system.
ii. Do not have driving licence
iii. Under 18 years old
iv. Blind
v. Do not have computer knowledge

3.3.2 Sampling Technique

Purposive sampling is the sampling method used in selection of respondent. The list of male students and staffs were obtained from the administrative department. Those who met the inclusive criteria for professional driver were randomly selected to participate in this study.

3.3.3 Sample Size

The sample size estimation was calculated by using the following formula:

$$n = \frac{2\sigma^2 [(Z_{1-\alpha} + Z_{1-\beta})}{(\mu 1 - \mu 2)^2} \qquad \text{(Equation 3.1)}$$

Where,

n = Minimum sample size required

($\mu 1$-$\mu 2$) = Difference in the task completion time in seconds (0.3)

σ = 80% power of detecting the increase is desired with a 5% level of significance (1.02667)

The minimum sample size (n) calculated was 30. The value was multiplied by 2 for two different groups of respondents. Thus, the total sample size population is 60.

3.4 Variables

The independent variables in this study were as follows:

i. Socio Demographic factors (age, driving experience, race, education level and income)

ii. Driving Group (professional and non-professional drivers)

iii. Driving condition

The independent variables in this study were as follows:

i. Driving Errors

ii. Time taken to complete task

3.5 Instrumentation

3.5.1 Driving Simulator

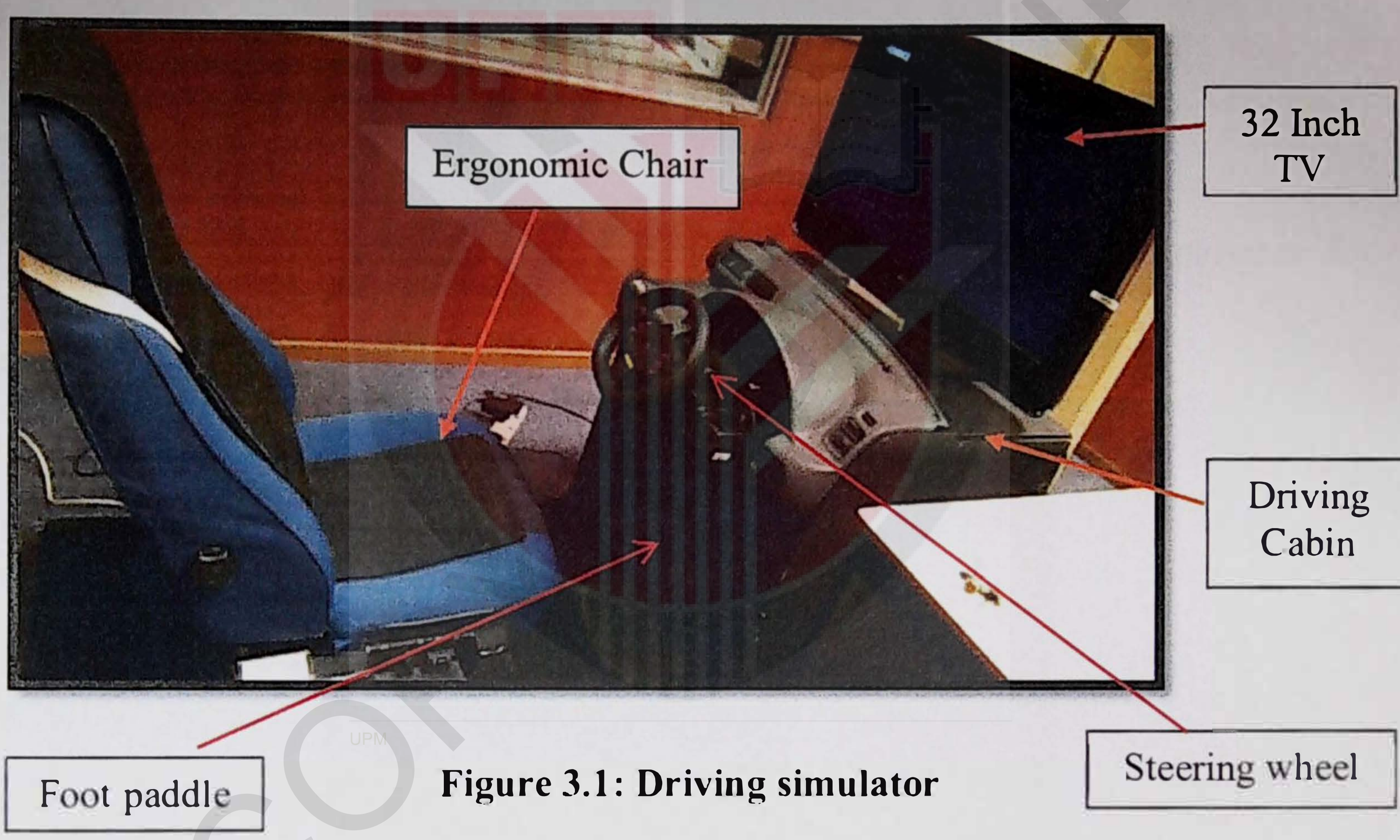


Figure 3.1: Driving simulator

3.5.2 Tablet (Samsung Galaxy Tab 10.1)

The tablet is a display animation of navigation system for participant to navigate their way in the simulator route to complete the task. It acted as a real GPS navigation device.

Figure 3.2: Samsung Galaxy Tab 10.1

3.5.3 Software

- **3D driving School software:** It simulates real life driving experience for participant to drive.

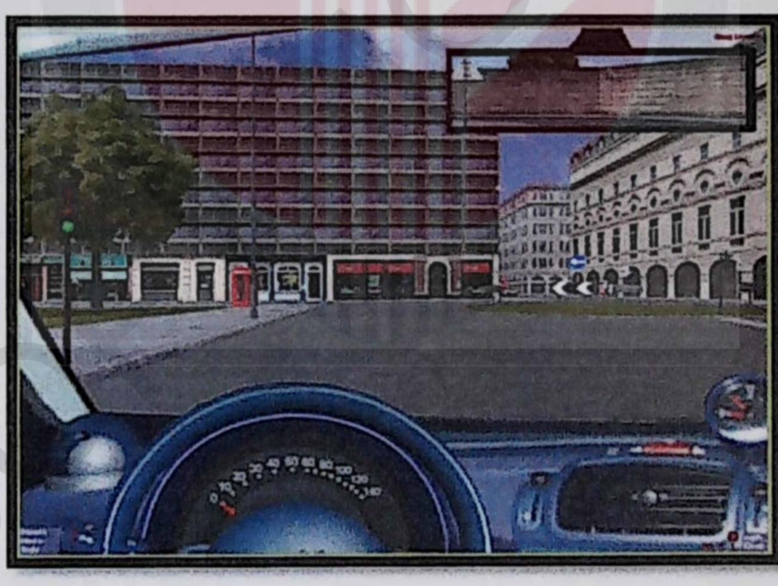


Figure 3.3: Driving simulation software

- **Navigation system Interface**

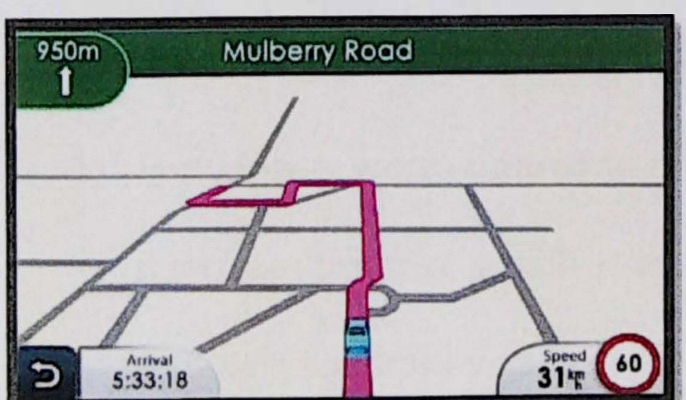


Figure 3.4 : Existing Feature

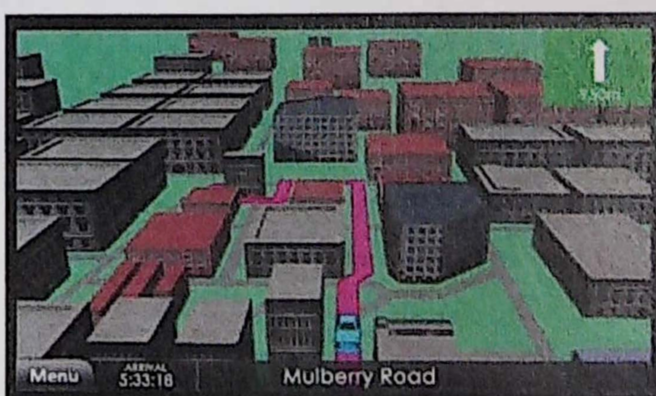


Figure 3.5 : Kansei Feature

- **Screen Recorder**: To record computer screen for data analysis

3.5.4 Questionnaire

3.5.4.1 Kansei Survey

Kansei survey was used based the determination of salient variables related to automotive navigation user interface research survey for Malaysian consumers (Mohamed, Shamsul, Rahman, Jalil, & Said, 2015) which measure perception of related to safety and usability. Kansei survey can be referred in Appendix I.

3.5.4.2 System Usability Scale (SUS)

System usability Scale was used to measure end test on subjective assessment on usability (Brooke, 2013). It consists of 10 questions, where odd number questions were positively worded and even numbers were negatively worded. System usability Scale questionnaire can be referred in Appendix II.

3.6 Data Collection Technique

3.6.1 Testing in driving simulator

1) Participants were required to evaluate 2 different types of navigation system interface features which were kansei interface feature and the existing interface features by using a driving simulator and sets of questionnaires.

2) Participants were given a chance to familiarize themselves with the driving simulation software and driving equipment for 5 minute before starting.

3) First Phase started off by the driving simulator, participant drove a car according to specific routes displayed by the by the navigation system interphase on a smartphone to complete the testing.

4) Participants need to follow direction show by navigation system until finish of the route.

5) Participants were required to answer System Usability Scale (SUS) questionnaire and followed by Kansei Survey.

6) After completed all of the above procedure, participants started the final phase of testing by using different navigation system interface.

7) Participants were required to answer System Usability Scale (SUS) questionnaire and followed by Kansei Survey for different navigation system interface.

3.6.2 Measurement of Driving Errors

The method used to measure the numbers of driving errors made during each testing was generated by the driving simulation software itself. The driving simulation software automatically recorded all the errors made during driving and produced a number and types of driving error. For example error of not turning the signal or traffic light offense. Figure 3.6 showed lists of errors generated by software.

```
Give-way faults:
      right before left...............: 0
      give way to traffic ............: 0
      priority to traffic turning l/r.: 0
      stop-sign.......................: 0

Ignoring red traffic light............: 0
Driving too fast......................: 6
Ignoring pedestrians..................: 0
Wrong turns...........................: 0
Wrong signalling......................: 9
Ignoring traffic signs................: 0
Inadequate traffic observations.......: 2
Basic faults..........................: 2
```

Figure 3.6: Lists of errors generated by the simulation software

3.6.3 Measurement of time taken to complete task

The completion time was measured by using screen recorder that recorded the duration of the testing from stating point until finishing point in the simulation software according to route given.

3.6.4 Measurement of Satisfaction level

All participants were required to answer System Usability Scale (SUS) questionnaires which tested participant's satisfaction level on the tested GPS navigation system.

3.6.5 Measurement of perception on usability to participant

To measure the perception on usability of each type of GPS navigation system used by participant, a kansei survey contains specific description that had been design to describe the GPS navigation system in terms of specific kansei words which emulate the emotion of a person

3.7 Quality Control

Counterbalance Method was used to eliminate the order bias in groups. The tests were conducted in a controlled environment where a real driving experience such as control lighting, noise level, and familiarisation were stimulated with simulator.

3.7.1 Pre testing Questionnaires

6 subjects (Based on 10% of total sample size of 60 respondents) were given pre-test for the questionnaires to be used in this study. The reliability test was done by using Crobach's Alpha and the result was 0.856.

3.7.2 Pre - testing of driving simulator

A pre-testing of driving simulator was carried out for about 5 to 10 minutes for each respondent before starting. This was done to let the respondents get familiar with the driving equipment, software and its controls.

3.7.3 Environmental condition

The temperature of the study room was maintained at 24 – 25 ^{0}C. The average carbon dioxide (CO_2) level was around 488ppm which was below the Indoor Air Quality (IAQ) standard of Department of Occupational Safety and Health Malaysia (2005). This was to avoid the environmental factors from affecting physiological state of the respondent.

3.8 Data Analysis

The data obtained in this study was analysed using the Statistical Package for Social Science (SPSS) software version 22. The types of statistical test performed in this study were as in Table 3.1.

Table 3.1: Statistical Analysis

	Objective	Test
1.	To determine the difference of completion time between kansei and existing features in GPS navigation system device among professional drivers and non-professional driver	Wilcoxon Signed test
2.	To determine the difference of the number of errors made by professional drivers and non-professional driver between kansei and existing features in GPS navigation system device	Wilcoxon Signed test
3.	To determine the difference of satisfaction level	Wilcoxon

	between kansei and existing features in GPS navigation system device among professional drivers and non-professional driver	Signed test
4.	There are significance different of kansei survey between new and existing features in GPS navigation system among professional drivers and non-professional driver	Wilcoxon Signed test

3.9 Ethic's Approval

The procedures and approaches used by this study had been approved by the Board of Ethic, Faculty Medicine and Health Science, University Putra Malaysia (approval letter UPM/TNCPI/RMC/1.4.18.1 (JKEUPM)/F2 dated on 30th of December 2015). Before the test started, the participants were briefed on how the test will be run and how they should react to the situation.

Written consent (refer Appendix III) were obtained after the respondents had agreed to volunteer for the test. General procedures were briefed to the subjects during a short familiarization and learning period on the simulator. This testing did not pose any significant health or physical threats to the respondents. Every safety measures during testing were always be a priority but the potential for anything to happen were not ruled out. It was necessary to be prepared for such as having emergency contact in case of emergency. Participants were allowed to withdraw from study if they were feeling uncomfortable during the experiment.

CHAPTER 4

RESULTS AND DISCUSSION

Data Collection was conducted among professional and non-professional driver in Occupational safety and Health laboratory in Faculty of medicine and Health Science.

4.1 Background of Respondents

4.1.1 Socio-demographic information

The respondents involved in this study consist of 60 professional and non-professional drivers who work or study in University Putra Malaysia. The socio-demographic information of respondents was summarized in Table 4.1.

Table 4.1: Socio-demographic information of respondents

Factors	Category	N (%)
Age	19 - 21	33
	22 – 24	17
	30 - 32	12
	33 – 35	25
	36 - 38	12
	39	2

Factors	Category	N(%)
Education level	Sijil Pelajaran Malaysia (SPM)	50
	Degree level	50

4.1.2 Background Information on experience in using GPS

The data on the types of GPS used and the previous experience in using GPS were collected and recorded as in Table 4.2.

Table 4.2: Types of GPS used and the previous experience in using GPS

	Category	N (%)
Types of GPS	Android based GPS	57
	Existing design	37
	In-car navigation mounted type	7
Experience in using GPS	2 – 3 years	88.3
	1 year	11.7

According to the result, most of the participant used android based GPS such as waze (N=34), followed by existing design (N=22) and In-car navigation mounted type (N=4). 88.3 % of participant had the experience between 2-3 years of experiences in using GPS devices and remaining 11.7% had only 1 year experience in using GPS.

4.2 Difference between task completion time for professional driver and non-professional drivers on each features

Table 4.3: Completion time between kansei and existing features in GPS device among professional drivers and non-professional drivers

Groups	Total (N)	Mean Difference ± SD		Z - Value	P - Value*
		Existing	Kansei		
Professional Drivers	30	2.75±0.66 min	2.49±0.66 min	-2.477	0.013
Non-Professional Drivers	30	2.44±0.74 min	2.18±0.71 min	-2.477	0.013

*Wilcoxon Signed Rank: Significant at P<0.05

The first objective was to determine the difference of completion time between kansei and existing features in GPS device among professional drivers and non-professional driver. The result in Table 4.3 showed significance different between the kansei feature and existing feature (p<0.05) for both professional and non– professional drivers.

The completion time for kansei in both professional driver and non-professional drivers took much lesser time to complete then the existing design with the mean time of 2.49±0.66 minutes and 2.18±0.71 minutes respectively. This is because the features in kansei were easy to understand and participants had more confident with less confusion and doubtful (Tsopra, Jais, Venot, & Duclos, 2014).

Kansei feature was also easy to identify building, junction, roundabout and road, which made it possible to complete the task in a short period of time as less time was taken to interpret the conditions (Quaresma & Moraes, 2010). It took longer time for some participants as previous study by (Quaresma & Moraes, 2010) showed the participants did unnecessary activities such as they were distracted by the environment.

4.3 Difference between number of errors made for professional driver and non-professional Driver on each feature

Table 4.4: Result of number of errors made in each task

Groups	Total (N)	Mean Difference ± SD		Z - Value	P - Value*
		Existing	Kansei		
Professional Drivers	30	13.7±7.94	8.86±6.55	-3.381	0.001
Non-Professional Drivers	30	10.6±7.6	7.23±6.03	-3.361	0.001

*Wilcoxon Signed Rank: Significant at P<0.05

The second objective was to determine the difference of the number of errors made by professional drivers and non-professional drivers between kansei and existing features in GPS devices. Errors were measured by using points. Higher points indicated higher errors while lower points indicated lower errors.

The result showed that kansei scored a significant lower point for error for both the professional driver and non-professional drivers with error points of 8.86±6.55 and 7.23±6.03 respectively. The significant difference was observed in kansei and existing features. Outcome for lower error in kansei was obtained because of its features which focused on reducing the error by having a visually recognized and easy to identify sub-features such as 3D buildings.

Participants said "This kansei features is easily recognizable and also very responsive". On the other hand, the existing features does not display enough information for the participant to make a decision which resulted in more error due to its complexity (Brown & Laurier, 2012). The errors that occur were probably because the users did not feel confident and were disturbed when the GPS navigation system device did not give any indication whether they were going on the right way towards their destination (Al Mahmud, Mubin, & Shahid, 2009).

4.4 Difference between satisfaction level of professional driver and non-professional drivers on each feature

Table 4.5: Result of System Usability Scale (SUS)

Groups	Total (N)	Mean Difference ± SD		Z - Value	P-Value*
		Existing	Kansei		
Professional Drivers	30	66.58±21.9	61.7±19.4	-0.985	0.324
Non-Professional Drivers	30	63.58±20.9	66.58±21.9	-0.514	0.611

*Wilcoxon Signed Rank: Significant at $P<0.05$

The third objective was to determine the differences in satisfaction level each of the features for professional and non-professional driver. A System Usability Scale (SUS) was used to gather data based on 10 questions that would describe the satisfaction for usability of user.

The results showed no significant difference between the satisfaction level scores between two groups. Higher score indicated high satisfaction on the usability of the features while lower score indicated lower satisfaction level. Scores of kansei features for professional driver showed a lower score compared to the existing feature. This was probably because of certain parts of the feature were not as what they preferred in a GPS navigation system. For example, there was no indication of traffic light in junctions.

On the other hand, the non – professional drivers felt this kansei feature was very interesting because it gave more information for them to interpret more reliable drive on the road. However, both features have areas which influenced the satisfaction because different part of the interface may be judged differently (Bangor, Staff, Kortum, Miller, & Staff, 2009). In term of the measurement of satisfaction of usability, SUS questionnaire still is a top choice compare to others (Jarrett, 2015).

4.5 Differences between kansei survey of professional drivers and non-professional drivers on each feature.

Table 4.6: Result of Kansei Survey

Groups	Total (N)	Mean Difference ± SD		Z - Value	P – Value*
		Existing	Kansei		
Professional Drivers	30	3.15±0.88	3.6±0.993	-0.985	0.001
Non-Professional Drivers	30	3.68±0.18	3.69±1.44	-0.514	0.002

*Wilcoxon Signed Rank: Significant at P<0.05

The fourth objective was to determine the differences between kansei survey of professional drivers and non- professional drivers on each feature. The kansei survey was develop based on salient variable to integrate the concept of usability using kansei engineering in automotive navigation interface which was used to measure how user perceive usability for automotive navigation user interface.

The result showed that both professional drivers and non – professional drivers had a significant difference in term of how users perceived the system respectively. The kansei showed higher scoring than the existing features. This indicated that the kansei feature was more findable, noticeable, useful, recognizable, interpretable, understandable, distinguishable, and readable based on the salient variable study to compute those words to shows that how kansei feature perceive the system as it was much easily interpreted by participant. (Mohamed et al., 2015)

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Result for driving completion time for both professional drivers (PD) and non-professional drivers (NPD) showed that Kansei GPS navigation system (PD, mean = 2.49±0.66 min, NPD, mean = 2.18±0.71 min) had significantly shorter completion time (p=0.013) compared to the existing system (PD, mean = 2.75±0.66 min, NPD, mean = 2.44±0.74 min). For the number of errors, Kansei GPS navigation systems showed a significantly lowered driving error ($p < 0.05$) (PD, mean = 8.86±6.55, NPD, mean = 7.23±6.03) compared to existing GPS navigation system (PD, mean = 13.7±7.94 NPD, mean =10.6±7.6).

For the satisfaction level showed no significant different in satisfaction for Kansei GPS navigation system both (PD, mean score = 61.7±19.4 NPD, mean score = 66.58±21.9) compared to existing GPS navigation system (PD, mean score = 66.58±21.9 NPD, mean score = 63.58±20.9) ($p > 0.05$). In term of Kansei Survey, shows that there is a significantly higher scoring for Kansei GPS navigation systems for both (PD, mean score = 3.6±0.99 and NPD, mean score = 3.69±1.44) compared with existing (PD, mean score =3.15±0.88 NPD, mean score = 3.68±0.18) ($p < 0.05$).

In conclusion, the new Kansei GPS navigation system performed better in reducing the task completion time, reducing the numbers of driving error and easily distinguish features compared to existing GPS navigation system. However, both professional and non-professional showed no different in satisfaction level between features.

5.2 Recommendations

Some part of this existing feature can be improve. Usability evaluation enable to detect what we could add to improve or solve problem of the feature. In terms of the features itself, several thing can be added to the system based on participant preference such as traffic light indicator, voice guidance, incoming traffic indicator, a more accurate building structure, pathway of road much more visible. These are overall comments that were received from the participants during testing.

In terms of the material of study, a better setup of the simulator and software was highly recommended to create a much real like driving experience with up to date hardware and equipment. The animation duration for navigation system can be lengthened for a better experience for participant for them to judge it more accurately. Besides, methods to assess the usability should cover more parameter such as memorability, and learnability.

The limitations of this study is because we are comparing the newly develop kansei and the existing design which does not have much reference or previous study to support outcome. However, this study could be uplift by upcoming research on this topic which will enlighten the subject itself and also improve the finding.

REFERENCE

Al Mahmud, A., Mubin, O., & Shahid, S. (2009). User experience with in-car GPS navigation systems: comparing the young and elderly drivers. *Proceedings of the 11th International Conference on Human-Computer Interaction with Mobile Devices and Services - MobileHCI '09*, 1.

Bangor, A., Staff, T., Kortum, P., Miller, J., & Staff, T. (2009). Determining What Individual SUS Scores Mean : Adding an Adjective Rating Scale, *4*(3), 114–123.

Bevan, N. (2008). Classifying and selecting UX and usability measures. *International Workshop on Meaningful Measures: Valid Useful User Experience Measurement*, *11*(June), 13–18. Retrieved from http://141.115.28.2/cost294/upload/523.pdf#page=15

Bevan, N., Carter, J., & Harker, S. (2015). Iso 9241-11 revised: What have we learnt about usability since 1998? *Lecture Notes in Computer Science (including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *9169*, 143–151.

Brooke, J. (2013). SUS : A Retrospective, *8*(2), 29–40.

Brown, B., & Laurier, E. (2012). The normal natural troubles of driving with GPS. *Proceedings of the 2012 ACM Annual Conference on Human Factors in Computing Systems*, *M*, 1621–1630.

Green, P. (2000). Crashes Induced by Driver Information Systems and What Can Be Done to Reduce Them. *Society of Automotive Engineers Conference Proceedings*, 27–36.

Jarrett, C. (2015). SUS : a good enough usability questionnaire.

Law, E., Roto, V., Vermeeren, A. P. O. S., Kort, J., & Hassenzahl, M. (2008). Towards a ahared definition of User Experience. *CHI 2008 Proceedings - Special Interest |Groups*, 2395–2398.

Lee, Y. J., & Lin, C. J. (2014). Usability evaluation and investigation of subjective satisfaction of the online publishing software interface. *Innovation, Communication and Engineering - Proceedings of the 2nd International Conference on Innovation, Communication and Engineering, ICICE 2013*, *2014*, 501–504.

Lokman, A. M., & Nor Laila, N. (2006). Engineering Emotional Usability in E-Commerce Website: The Kansei Approach. *Proceedings of the International Conference on Business Information Technology, BIZIT, 2006.*

Mohamed, M. S. S., Shamsul, B. M. T., Rahman, R., Jalil, N. A. A., & Said, A. M. (2015). Determination of salient variables related to automotive navigation user interface research survey for malaysian consumers. *Advanced Science Letters*.

Nagamachi, M. (1995). Kansei Engineering : A new ergonomic consumer-oriented technology for product development, *15*, 3–11.

Najmeh Ghasemifard, M. S. A. R. R. K. V. A. (2015). A New View at Usability Test Methods of Interfaces for Human Computer Interaction. *Global Journal of Computer Science and Technology*, *15*(1). Retrieved from http://computerresearch.org/index.php/computer/article/view/1126

Nowakowski, C., Green, P., & Tsimhoni, O. (2003). Common automotive navigation system usability problems and a standard test protocol to identify them. *ITS-America 2003 Annual*, (3). Retrieved from http://umich.edu/~driving/publications/ITSA-2003-Christopher.pdf

Quaresma, M., & Moraes, A. De. (2010). The Usability of Data Entry in GPS Navigation Systems. *3rd International Conference on Applied Human Factors and Ergonomics (AHFE)*. Retrieved from www.ahfe2010.org

Ring, G. (1996). The Role of Graphics in User Interfaces, 7–10.

Rummel, B. (2014). Probability Plotting : A Tool for Analyzing Task Completion Times. *Journal of Usability Studies*, *9*(4), 152–172.

Tsopra, R., Jais, J.-P., Venot, A., & Duclos, C. (2014). Comparison of two kinds of interface, based on guided navigation or usability principles, for improving the adoption of computerized decision support systems: application to the prescription of antibiotics. *Journal of the American Medical Informatics Association : JAMIA*, *21*(e1), e107–16.

Wirtz, S., Jakobs, E., & Ziefle, M. (2009). Age-specific usability issues of software interfaces. *Proc. 9th International Conference on Work With Computer Systems (WWCS)*, 2–10. Retrieved from http://www.humtec.rwth-aachen.de/files/_2wo0019__agespecific_usability_issues_of_software_interfaces_1.pdf

Appendix I

PART A : DEMOGRAPHIC INFORMATION/ MAKLUMAT LATARBELAKANG

(Please circle one/ Sila bulatkan jawapan)

Gender/*Jantina*	Male *(Lelaki)*			Female *(Perempuan)*	
Ethnicity/*Bangsa*	Malay *(Melayu)*	Chinese *(Cina)*	Indian *(India)*	Others (please state):__________ *(Lain lain)* *Sila nyatakan:*__________	
Age Range (years)/ *Julat Umur (tahun)*	19-21, 33-35, 48-50,	22-24, 36-38, 50+	25-27, 39-41,	28-30, 42-44,	31 – 32, 45-47,
Marital Status/ *Status Perkahwinan*	Married (*Berkahwin*)	Single (*Bujang*)		Divorced (*Bercerai*)	
Religion/*Agama*	Islam *(Islam)* Hinduism *(Hindu)*	Christianity *(Kristian)* Others (please state) :__________ (*Lain lain/Sila nyatakan*):__________		Buddhism *(Buddha)*	
Education Level/*Taraf pendidikan*	SPM/STPM Bachelor`s *(Ijazah Sarjana Muda)*	Certificate *(Sijil)* Master`s *(Ijazah Sarjana)*		Diploma *(Diploma)* Phd	

Income and Occupation/*Gaji dan Pekerjaan*	< RM 1000 RM 1000-1500 RM 1501-2000 RM 2001-2500 RM 2501-3000 RM 3001-3500 RM 3501-4000 RM 4001-4500 RM 4501-5000 RM 5001-5500 RM 5501-6000 RM 6001 – RM 9000 RM 9001 – 10,000 RM10,000+ Please state your occupation : *(Sila nyatakan pekerjaan anda):* ____________________________

PART B : BACKGROUND INFORMATION ON GPS

What is the specific type of GPS device that you have been using / used before?
(*Apakah jenis peranti GPS yang sedang anda gunakan/pernah gunakan?*)

Garmin

Papago

Lokatoo

Android based GPS (Example: Waze)

Blackberry GPS

Apple phone based GPS

In Car GPS / *Sistem GPS dalam kereta*

Others / *Lain lain*

How long have you been using GPS devices?
(*Sudah berapa lamakah anda menggunakan GPS?)*

< 1 year (Kurang dari setahun)

1 - 2 years *(tahun)*

2 - 3 years *(tahun)*

3 - 4 years *(tahun)*

4 - 5 years *(tahun)*

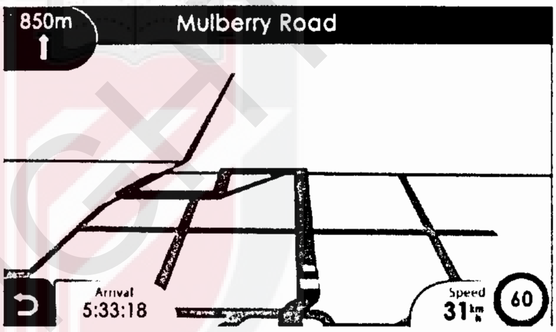
More than 5 years *(lebih dari 5 tahun)*

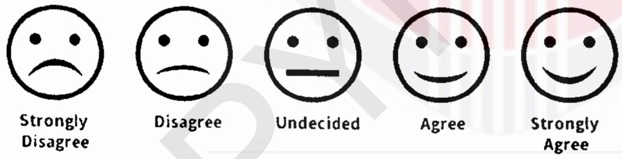
How often do you have to drive in traffic conditions similar to Kuala Lumpur or any other major cities in Malaysia?
(Berapa kalikah anda perlu menghadapi keadaan trafik lalulintas yang hampir sama dengan Kuala Lumpur atau mana mana bandar utama di Malaysia?)

- Nearly every day *(hampir setiap hari)*
- 2-3 times a week *(2-3 kali seminggu)*
- 4-5 times a week *(4-5 kali seminggu)*
- A few times in a month *(hanya beberapa kali sebulan)*
- A few times in a year *(hanya beberapa kali setahun)*

PART C : GARMIN DESIGN FEEDBACK

Please evaluate the GPS design based on the criteria below by ticking the appropriate box *(Sila nilaikan rekabentuk GPS dengan menggunakan kriteria di bawah, di dalam kotak yang sesuai)*



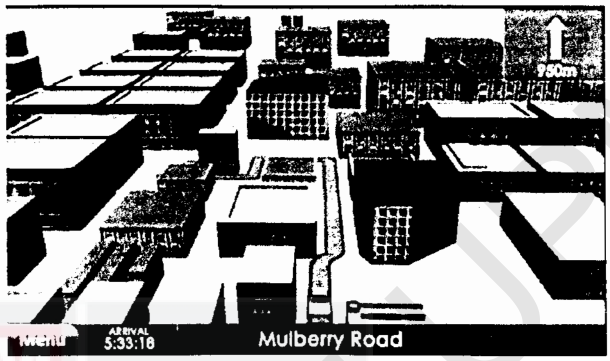


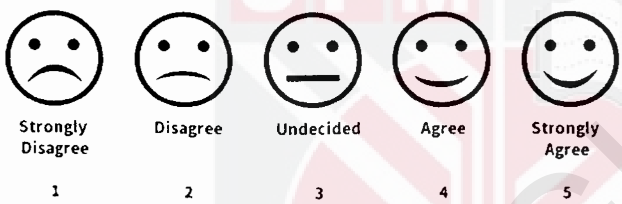
Are all the information and icons : ***(Adakah semua maklumat dan ikon di paparan)***					
1. Easily differentiated? *(Mudah dibezakan?)*					
2. Easily found and located at the expected region? *(Mudah dicari dan berada di tempat sepatutnya?)*					

3. Easily recognized? *(Mudah dikenali?)*					
4. Can be noticed easily *(Boleh diperhatikan dengan baik?)*					
5. Useful for the driver? *(Berguna untuk pemandu?)*					
6. Easy to read? *(Mudah dibaca?)*					
7. Operation easy to guess *(Mudah diteka penggunaannya?)*					
8. Can be operated quickly, without reading or looking at labels? *(Mudah digunakan dengan cepat, boleh digunakan tanpa melihat ATAU tidak perlu membaca label?)*					
9. Easily seen and clear *(Mudah dilihat dan jelas?)*					
10. Easy to understand? *(Mudah difahami?)*					
11. Cannot be confused *(Tidak mudah dikelirukan)*					

PART D : KANSEI FEEDBACK

Please evaluate the GPS design based on the criteria below by ticking the appropriate box *(Sila nilaikan rekabentuk GPS dengan menggunakan kriteria di bawah, di dalam kotak yang sesuai)*





Are all the information and icons : ***(Adakah semua maklumat dan ikon di paparan)***					
1. Easily differentiated? *(Mudah dibezakan?)*					
2. Easily found and located at the expected region? *(Mudah dicari dan berada di tempat sepatutnya?)*					
3. Easily recognized? *(Mudah dikenali?)*					
4. Can be noticed easily *(Boleh diperhatikan dengan baik?)*					
5. Useful for the driver? *(Berguna untuk pemandu?)*					
6. Easy to read? *(Mudah dibaca?)*					
7. Operation easy to guess *(Mudah diteka*					

penggunaannya?)					
8. Can be operated quickly, without reading or looking at labels? *(Mudah digunakan dengan cepat, boleh digunakan tanpa melihat ATAU tidak perlu membaca label?)*					
9. Easily seen and clear *(Mudah dilihat dan jelas?)*					
10. Easy to understand? *(Mudah difahami?)*					
11. Cannot be confused *(Tidak mudah dikelirukan)*					

Appendix II

System Usability Scale (SUS)

ID Peserta: _____ Reka bentuk:________________________________Tarikh:_____/___/___

Skala Kebolehgunaan Sistem

Arahan: Bagi setiap pernyataan di bawah, tandakan satu kotak yang menggambarkan reaksi anda terhadap reka bentuk sistem navigasi yang diuji hari ini

		Sangat tidak setuju	Tidak setuju	Neutral	Setuju	Sangat Setuju
1.	I think that I would like to use this type of design for navigation system frequently. (Saya rasa ingin menggunakan reka bentuk sistem GPS ini dengan lebih kerap lagi .)	☐	☐	☐	☐	☐
2.	I found this design unnecessarily complex (Saya mendapati sistem GPS ini sangat complex)	☐	☐	☐	☐	☐
3.	I thought this design was easy to use (Saya beranggapan sistem GPS ini mudah digunakan)	☐	☐	☐	☐	☐
4.	I think that I would need assistance to be able to use this design (Saya memerlukan bantuan dalam menggunakan reka bentuk sistem GPS ini)	☐	☐	☐	☐	☐
5.	I found the various functions in this design were well integrated.(Saya mendapati semua fungsi sistem GPS ini berkait antara satu sama lain)	☐	☐	☐	☐	☐
6.	I thought there was too much inconsistency in this design. (Saya mendapati sistem GPS ini tidak konsisten)	☐	☐	☐	☐	☐
7.	I would imagine that most people would learn how to use this system design very quickly (Saya merasakan ramai orang akan belajar menggunakan sistem GPS ini dengan cepat)	☐	☐	☐	☐	☐
8.	I found this design very cumbersome/awkward to use .(Saya mendapati sistem GPS ini kekok dan rumit)	☐	☐	☐	☐	☐
9.	I felt very confident using this type of design Saya merasa sangat yakin menggunakan sistem GPS ini.	☐	☐	☐	☐	☐
10.	I needed to learn a lot of things before I could get going with this type of design.(Saya perlu banyak belajar menggunakan system GPS ini sebelum saya mampu mengendalikannya)	☐	☐	☐	☐	☐

Sila berikan sebarang komen berkenaan sistem ini :

This questionnaire is based on the System Usability Scale (SUS), which was developed by John Brooke while working at Digital Equipment Corporation. © Digital Equipment Corporation, 1986.

Appendix III

JAWATANKUASA ETIKA UNIVERSITI UNTUK PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM)
UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG, SELANGOR, MALAYSIA

BORANG B1: PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1. TAJUK KAJIAN

Penilaian kebolehgunaan sistem navigasi dalam rekabentuk muka kansei dibanding dengan rekabentuk muka sistem sedia ada.

2. PENGENALAN

Kajian ini dilakukan bagi tujuan membandingkan kebolehgunaan sistem navigasi kansei yang baru dan juga sistem yang sedia ada.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Anda perlu menjalani 2 sesi simulasi pemanduan dengan arahan yang telah ditetapkan dan selepas setiap sesi tersebut anda perlu melengkapkan 1 set soal selidik yang diberi oleh penyelidik.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Anda tidak boleh menyertai kajian ini jika :
a) Tidak mempunyai lesen memandu
b) Tidak mempunyai pengalaman dalam menggunakan sistem navigasi
c) berumur bawah 18 tahun

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

a) KEPADA ANDA SEBAGAI PESERTA?

Anda dapat menyumbang kepada pembangunan sistem ini melalui data yang dikumpul ketika sesi pengujian ini nanti.

b) KEPADA PENYELIDIK?

Penyelidik dapat memprolehi data bagi penambahbaikan sistem in di masa hadapan dan berharap dapat meningkatkan kualiti sistem navigasi.

6. ADAKAH IA BERISIKO?

Tidak. Sebelum kajian ini dijalankan semua sistem dan peralatan akan diperiksa bagi memastikan tiada apa-apa kerosakan. Kajian ini sendiri tidak memberi sebarang kesan kepada kesihatan kerana hanya melibatkan pengunaan angota badan secara sangat minima dan selamat.

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Sebarang maklumat diri tidak akan didedahkan dan akan kekal rahsia

8. SIAPA YANG SAYA PERLU HUBUNGI SEKIRANYA SAYA MEMPUNYAI SOALAN TAMBAHAN SEMASA MENGIKUTI PENYELIDIKAN INI?

Anda boleh menghubungi

1) Alwis Nazreen (Penyelidik) – 0142325820

2) Prof Madya Dr Shamsul Bahri Hj Mohd Tamrin (Penyelia Penyelidik) - 0173134792

Sila tandatangan di sini sekiranya anda telah membaca dan memahami kandungan halaman ini

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9. PERSETUJUAN

Saya... No Kad Pengenalan. .... beralamat.. ....dengan ini bersetuju untuk mengambil bahagian secara sukarela dalam penyelidikan yang tersebut di atas *(kajian klinikal/percubaan ubat-ubatan/rakaman video/kumpulan sasaran/temuduga/ soal selidik).

Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi metodologi, risiko dan komplikasi (seperti tertulis pada Helaian Penerangan Responden). Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberi sebarang alasan.Saya juga memahami bahawa sebarang maklumat yang berkaitan identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yang melibatkan saya.

I setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan dalam apa jua bentuk penerbitan atau pembentangan. (sekiranya berkaitan).

*potong yang tidak berkenaan

Tandatangan .... (*Responden*)

Tarikh :...

Tandatangan .... (*Saksi*)

Nama :...

No. K/P: ....

Saya mengesahkan bahawa saya telah menerangkan kepada responden ini sifat dan tujuan penyelidikan yang tersebut di atas.

Tarikh ....

Tandatangan .... (*Penyelidik*)