



Faculty of Applied and Creative Arts

**USER EXPERIENCE (UX) DESIGN OF AUTOMOBILE
DIGITAL INSTRUMENT CLUSTER**

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**Bachelor Of Applied Arts With Honours
(Design Technology)
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User experience (UX) design of Automobile digital instrument cluster

TIMOTIUS PETRUS ANAK AYI

This project is submitted in partial fulfilment of
the requirements for the degree of Bachelor of Applied Arts with Honours
(Design Technology)

Faculty of Applied and Creative Arts
UNIVERSITI MALAYSIA SARAWAK
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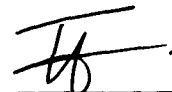
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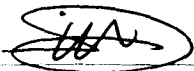
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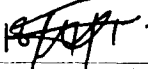
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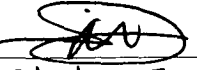
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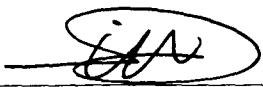
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ABSTRACT

Driving experience is one of the factor involved in buying decision especially for luxury and high-end car. Today, the advancement of automotive technology is intended to provide comfort, convenience and safety while improving performance and energy efficiency. This project is aim to design the automobile digital instrument cluster that give comfort and relaxing driving experience. The design is focusing on the interface aspect, interactivity, graphic transition, and function that is displayed on a LCD instrument panel. The prototype is designed with minimalist graphic user interface, and animated graphics which display the essential requirement of driving information. This prototype is designed with options for the drivers to reconfigure the display mode that suit their mood by choosing different colour and style. There are 3 colours option that is blue for relax mode, red for speed mode and green for eco mode. The design is focused on the interface aspect, interactivity, graphic transition, and function that is displayed on a LCD instrument panel.

ABSTRAK

Penggunaan panel digital pada dashboard kenderaan dalam industri automotif semakin berkembang. Keperluan untuk memaparkan maklumat kepada pemandu adalah semakin meningkat. Tujuan projek ini adalah untuk mereka bentuk antara muka grafik pengguna (GUI) dalam panel digital automotif bagi industri automotif tempatan. Tujuan rekaan ini adalah untuk memaparkan pelbagai maklumat penting kepada pemandu dalam ruang panel digital yang terhad. Setiap rekaan mempunyai spesifikasi yang menfokuskan jenis tipografi, penggunaan warna digital, animasi pegerakkan dan susun atur rekaan.

CHAPTER 1

INTRODUCTION

1.1 Introduction

In a direct human to human conversation, the method of communication used by people is by verbally communication and visual communication. In that case, we use an alternate way that is the use of pictures as visual references. However, in human to computer communication, most user interfaces do not interact with us visually and force us to rely on non-visual alternatives. An example is an automation and testing for graphical user interfaces (GUIs). Fast forward toward the modern society, GUI has been introduced and finally revolutionize the information technology industry. Graphical user interface (GUI) is an interface that gives it user chances to interact with an electronic device through graphical icons and visual indicators. (Linux, 2005)

GUI automation and testing usually require writing scripts to send commands to particular GUI widgets in order to operate them and verify the correctness of their behavior. We observe that these non-visual alternatives present certain limitations to GUI users as they perform various kinds of tasks. Motivated by these problems, we wonder why we cannot just use the user interface. (Chang, 2012)

A graphical portrayal of UIs can be utilized as immediate a visual reference to empowering new sorts of screenshot-driven collaborations in areas like looking, GUI design and testing, and cross-gadget data relocation. (Chang, 2012)

With the development of Information Technology (IT), computers and intelligent devices have become ubiquitous in our society. Computers and intelligent devices provide functions by running User Interface (UI) on an embedded systems. The system is present in all aspects of modern society, including the automotive industries. (Rouse, 2014)

With the existence of User Interface (UI), there is also user experience (UX) design. Both elements are crucial to a product and work closely together. In any case, regardless of their professional relationship, the roles themselves are quite different referring to very different parts of the process and the design discipline. (Lamprecht, 2017)

The automotive industries are raising their bar in technology and design to attract their potential customers to buy their product. This is due to the evolution of technology in the world, where it is getting more and more advanced day by day. Automotive companies started to implement a fully electronic digital instrument cluster panel in their new line of an automobile. (Quarterly, 2014)

With the advent of the semi-autonomous and eventually fully autonomous car, automotive UI/UX designers face new challenges. Today's consumers consider the

human machine interface (HMI) to be a major competitive differentiator. The possibilities are endless, but one thing's for sure all of this information needs an HMI design that can offer a deeply satisfying and enjoyable experience, not an information-overloaded nightmare (Foundry, 2013)

Traditionally, in-vehicle systems are considered as stand-alone devices, where each function (e.g. ACC, Navigation system, Radio etc.) is implemented in a separate physical component with its own human machine interface (HMI). However, as the number of in-vehicle functions increases this approach quickly becomes unfeasible, for economical as well as for practical and ergonomic reasons. The vehicle cockpit cannot become the cockpit of an airplane or it becomes too complex to use and too distracting. Moreover, it should not be forgotten that the majority of vehicle drivers are not trained like, for example, pilots (Amditis, 2005)

The integration between the Graphic User Interface (GUI) and User experience (UX) design with the human machine interface (HMI) in automobile instrument cluster is one of the fundamental parts in the automotive industry with the target to attract customers and it user based (Continental, 2014)

1.2 Instrument Cluster in Malaysia

In Malaysia, the automotive industries of the local car manufacturer such as Perodua and Proton not yet embracing the digital instrument cluster in their automobile development. Thou, they are slowly changing the usual all analog gauges, to a mixture

of both analog and digital. The latest automobile that has been released by Proton, that is Proton Persona is the sample of the mixture of both analog and digital instrument cluster. In the near future, there are still hope that the local automotive industries will start to embrace and develop a fully digital instrument cluster for their future vehicles.

1.3 Research Statement

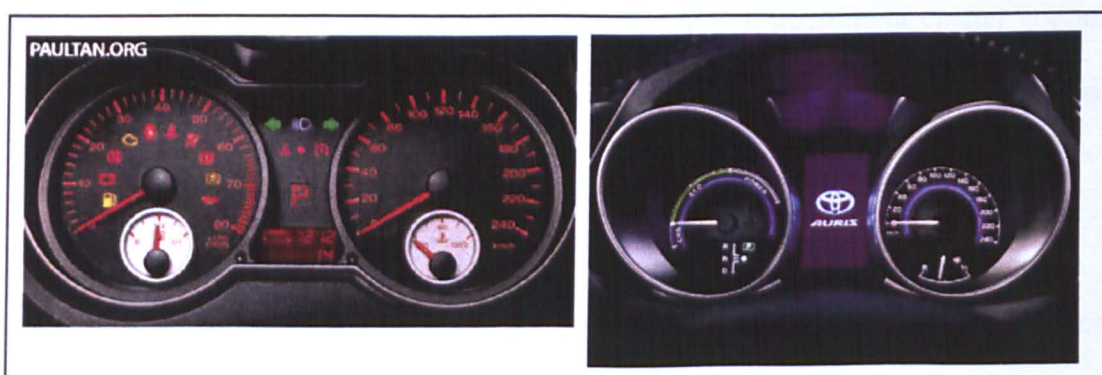
Prior studies show it is focused on developing a new digital instrument cluster that enables proper information perception for drivers. Technology breakthroughs and new possibilities of digitally displaying information create a need for investigating a new design. New technology enables more functions for the user. The user demands need to be investigated and the instrument cluster needs to be adapted based on the market demand. With the ongoing integration of advanced computer systems into vehicles, the interface within is becoming more complex. As the prime target of interaction between driver and car system, these HMI demand great care and attention from automotive manufacturers, and that include designers. (Ustwo, 2014)

The automotive industry has started to bring in-car HMI up to speed due to the not meeting consumer demand in respect of technology. The pervasive and distributed computing, affordable and accurate sensors for measuring physiological and mechanical systems, and the notion of networked objects that integrated with the internet has played a part. (Ustwo, 2014)

Digital instrument cluster is getting more acknowledge in the next generation automobile. For some, this makes come as a shock at first, since digital instrument

cluster need a high-end CPU and software than the average analog panel, with a large LCD panel, are one of the basic requirement. Digital instrument cluster are reusable as it has the same hardware across multiple different automobiles and Graphical User interface. Other reason why digital instrument cluster is better, it is attractive. The graphical user interface can be redesign with a catching graphics and features. Thus, designing a graphical user interface for automotive digital instrument cluster is one of a focus point in attracting the target audience to buy the product. The right move is for everyone to move to digital multifunction cluster (Ziegler, 2016)

To drive safely, a driver must remain focused on the task of driving. However, other objects can and do demand a driver's attention. For example, one object in the vehicle cab consistently distracts a driver from the road: the instrument cluster. Safe driving means the driver spends as little time as possible looking at the cluster. Thus, the instrument cluster must display vehicle vital signs in an intuitive and immediately recognizable fashion. Many automakers are migrating to digital instrument clusters to reach that goal. At the same time, they're finding the panels cut costs and add some attraction to market appeal.



Picture 1: The current existing Analog of the instrument cluster.

1.4 Research Question

The research will be based on these question:

1. How does graphical user interface affect user experience?
2. How will the graphical user interface impact the target audiences?

1.4 Purposes/Objectives of the study

There are three objectives to be achieved at the end of the study:

1. To study the Graphical User interface in the automotive instrument cluster.
2. To identify the feedback on the existing design of the Graphical user interface of

instrument cluster.
3. To validate how far the GUI can be very effective at attracting audiences.

1.6 Significance of the research

The significance of the research is design a specific Graphical User Interface GUI that is used for automotive digital instrument cluster. A good Graphical user interface GUI design is important as it is one of the selling points of an automobile. Besides that, the user experience UX design of a digital instrument cluster is one of the focal point of the research. This is due to test the usability of the interface based on the requirement of an interface design.

A working interface without an attractive GUI design and a proper user experience UX design can't attract the user based to have interest to use the digital instrument cluster. The overview of automotive industry, the digital instrument cluster

has start to be widely develop by top automotive companies. The company such as BMW, Mercedes Benz, Audi and Tesla is among the company that has design their own digital instrument cluster. Each of them has a specific interface design and functionality which is appealing to their market and target audiences.

The Local automotive companies such as Proton and Perodua have not implemented a fully digital instrument cluster in their automotive design. Thus the significance of the research to design user experience UX design of digital instrument cluster for the local automotive companies. The design is specific to its GUI and the flow of the system component of the digital instrument cluster.

1.7 Research scope

The examination degree will be studied in the current design of analog instrument cluster and digital instrument cluster from manufacturers such as BMW and Audi. In term of motion and transitional animation also been done as it impacted the whole design. The research focus is also given on the user experience UX design as to test the usability of the current design and the final design. A definitive goal of this research how the design will affect the user experience. Thus, throughout all of the scope, it can be determine the driver excitement in using digital instrument cluster as their daily user interface.

1.8 Limitation of the Research

Most research has their limitations and that includes this research as well. The limitations will affect the outcome of the research. The first limitation that may be facing is that the whole research is more focus to the Graphical User Interface GUI. It is more to the layout, and design-wise of the digital instrument cluster of an automobile. The design is created based on an ideal system and layout which will also research and plan.

Secondly, due to the focus is on the graphic user interface design, the methodology test are done based on the UX of the GUI design of digital instrument cluster video simulation. This is also due to the limitation of software availability to run the mock-up.

Besides that, with the limitation of available developing software, the design is limited to the overall mock-up of the idea and design. The outcome will be a simulation and only available to be built using adobe after effect, adobe Photoshop, adobe illustrator, cinema4D and Maya.

Finally, the research limitation is having to research the currently available digital instrument cluster which is not available in Kuching, Sarawak. The most automotive company has no digital instrument cluster in their vehicles in Sarawak.

1.9 Conclusion

To conclude, GUI has been introduced and finally revolutionize the information technology industry. Graphical user interface (GUI) is an interface that gives it user chances to interact with an electronic device through graphical icons and visual indicators. GUI and digital instrument cluster are close related.

In addition, most instrument cluster in Malaysia automotive company especially the local automotive companies such as Proton and Perodua not yet use digital instrument cluster in their vehicles. Most automobile still uses the traditional analog instrument cluster which is lacking on function if compared to the digital instrument cluster.

The essential point of this study is to the graphical user interface in the digital instrument cluster. The research is based layout, typography and the use of color in graphical user interface. After the design research, the feedback on the existing design of the Graphical user interface of the instrument cluster. The validation of the research can be seen from how far the GUI can be very effective in attracting audiences.

Overall, a specific outline is prepared on this research which is compulsory and it start with the introduction of the research, which briefly explain on the position of user experience UX design and the digital instrument cluster. Meanwhile the research statement, state the purpose of the research and the signification behind the research study. The research question, touches on the problem statement of the research. It is the question asked when conducting the research. Among the question is how does

graphical user interface affect user experience and how will the graphical user interface impact the target audiences?

Besides that, the objectives of the study is a target to be achieved at the end of the study. Among the objective is to study the graphical user interface in automotive instrument cluster, to identify the feedback on the existing design of the graphical user interface of instrument cluster, and to validate how far the GUI can be effective at attracting audiences. Next is the significance of study which explain in detail about the justification on the important of graphical user interface design in automotive digital instrument cluster. Finally is the limitations of the research. The research has it very own limitation as the digital design is limited focus on the graphical user interface GUI design.