

Development of the Android Based – Ergonomic Interface Design for the Electrical Car

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Abstract. Currently, the Android technology has been developing well. This technology was mostly used for software applications in the telecommunication field. It contain three functions that are as the operation system, middleware system, and application system. This paper present use of the android technology to design the ergonomic interface for an electrical car in order to more efficient, more effective and more comfortable in use. A concept of user centered design and ergonomics principle are used as basis to develop the interface. Paper based survey was conducted to identify the user criteria of design. And axiomatic design method was used to determine ergonomic design parameters that satisfying the criteria. Usability analysis statistical test used to test the hypothesis. The results of this study is a design of ergonomic and usable interface of the electrical car that satisfying customer needs.

Keywords: Android, Electric Car, UCD, Axiomatic, Ergonomic, Usability

1. INTRODUCTION

Technological developments in the world increased more competitive, not only in industry, but also in the field of education. One of them is Android. This technology is an operating system for mobile devices developed based on Java and Linux 2.6 (Di Marzio, JF, 2008, p.6). Its development is usually done for software and hardware applications in digital telecommunications. But in this study, android was used for controlling and monitoring an electrical car by means of an interface display. This interface must be informative, clear to be understood, and comfortable for users so that it becomes more efficient and effective (Ramayah et al. 2006 and Lee et al. 2005).

The problems are that the existing interface display has still more delays and difficult to be understood fastly what display inform. So user experiences confusion in use. As a result, the display is not usable to operate well and also uncomfortable and unsafe. Chiew and Sali (2003) mention that some criteria should be consider as a success of the design. They are easy to learn, well-organized content, navigation and clear links and also good performance.

Thus objective of this study is to analysis and develop an ergonomics and usable interface design for electrical car by using android operation system. This design will be developed base on the User Centered Design (UCD) concept for satisfying user criteria.

2. RESEARCH METHOD

2.1 Survey

Paper based survey was conducted in this study to identify customer criteria for designing the android-based electrical car interface. A questionnaires was developed and deployed to potential respondents. Their age is in range between 17 to 30 years old. And all respondents have a good experience to drive.



it can save time. And durable means the interface can be used for long periods. It is suitable with the user's need that requiring the design can be used lasting.

3.2 Proposed design of Interface Design Android for Electrical Car

The five customer criteria broken down into some functional requirement until the design parameters can be properly assigned as shown in table 2 – 6 and figure 2-5.

Table 2. Good Performance of Interface Design Android Electrical Car

Code	Customer Attribute	Code	Functional Requirement	Code	Design Parameters
CA 1	Good Performance	FR 1	Increasing effectiveness in the use	DP 1	Good quality interface
		FR 1.1	Providing work function properly	DP 1.1	Optimize designing screen
		FR 1.1.1	Easy understand and easy to use	DP 1.1.1	Ergonomics menu of the display that appear
		FR 1.1.1.1	Adjusting main function menu on electrical car	DP 1.1.1.1	Monitoring and Remote
		FR 1.2	Giving suitable layout display	DP 1.2	Ergonomics interface layout
		FR 1.2.1	Easy to search and easy to use	DP1.2.1	Have good interaction
		FR 1.2.1.1	Adjusting each pages menu	DP 1.2.1.1	Standard design from each pages
		FR 1.2.1.1.1	Provide pages needed	DP 1.2.1.1.1	Display application will be appear
		FR 1.2.1.1.1.1	Having start menu, choice menu, and main menu both a function	DP 1.2.1.1.1.1	4 display
		FR 1.3	Minimize error or losing	DP 1.3	Have security system
		FR 1.3.1	Provide menu display	DP 1.3.1	Registration Menu
		FR 1.3.1.1	Display menu sign in/sign up	DP 1.3.1.1	Account and security password

Table 3. Convenience in use of Interface Design Android Electrical Car

Code	Customer Attribute	Code	Functional Requirement	Code	Design Parameters
CA 2	Convenience in use	FR 2	Optimize interface function	DP 2	Less bad respond
		FR 2.1	Specify the interface layout.	DP 2.1	Proximity, similarity, symmetry, and continuity

Table 4. Interesting Design of Interface Design Android Electrical Car

Code	Customer Attribute	Code	Functional Requirement	Code	Design Parameters
CA 3	Interesting Design	FR 3	Provide a desire in using	DP 3	Interface design has a unique and striking design.
		FR 3.1	Gives the color composition and layout	DP 3.1	Basic colors virtual design (Taha, Zahari et al. 2012)
		FR	Selection of items images on	DP 3.1.1	The existence in color and layout



The result shows that the null hypothesis is accepted. It means the propose design of interface has satisfied the customer looks for such that this design can be applied in the real electrical car.

Design performance (Table 2) includes designs that are customized with a user needed to get good quality interface in increasing effectiveness in use. Function displayed is to monitor and to remote (DP 1.1.1.1). Beside that to get good quality interface must be have an ergonomics layout to meet with the function requirement of suitable design. The design paramaters to get suitable design is the adjusted layout become 4 display (DP 1.2.1.1.1). And to get good security system to minimize error, the design parameters have an account member and password so the interface making menu sign (DP 1.3.1.1) .

Design convenience (Table 3) includes comfortable design with design parameters are proximity, similarity, symmetry, and continuity (DP 2.1) to specify interface layout so that the interface is not bad respond and can optimize a function. Interesting design (Table 4) includes have a good impression as well as not boring with design parameters are use of basic colors for virtual design (DP. 3.1). The use of color variations are also considered. The existence in color and layout are harmless (DP 3.1.1).

Simple design (Table 5) will provide easiness to think for user so it should be developed base on the common an electric car android features. The design parameters is like speedometer (DP 4.1) , standard symbol (DP 4.2), additional features (DP 4.2.1), and remote control (DP 4.2.1.1). That is to equip feature in function requirement. Durable design (Table 6) includes a good integrated system of menu so that the design parameter of interface is compatible menu system program (DP 5.1). It means by developing the program, the interface can be used for a longer.

3.3 Result of Validation

Result of Marginal homogeneity test is in Table 7. This validation is to test the hypothesis at 5% of significant level that is no different between the developed design parameters and customer requirements of interface design.

Table 7. Stuart Maxwell test of Marginal Homogeneity results

User's requirements	z values
Performance	0,768
Convenience in use	0,285
Interesting Design	0,547
Simple Desih	0,166
Durable	0,546

p> 0.05

4. CONCLUSION

It is concluded as follow:

1. Design of interface design android electrical car which is developed based on customer needs are performance, convenience in use, interesting design, simple design, and durable.
2. Performance have a design parameters is monitoring and remote (DP 1.1.1.1). Beside that to get good quality interface must be have an ergonomics layout to meet with the function requirement of suitable design. The design paramaters to get suitable design is adjusting layout become 4 display (DP 1.2.1.1.1) And have an account member and password so the interface making menu sign (DP 1.3.1.1) . The design parameters convenience in use is proximity, similarity, symmetry, and continuity (DP 2.1). Interesting design includes design parameters are use of basic colors for virtual design (DP. 3.1). The use of color variations are also considered. The existence in color and layout that harmless (DP 3.1.1). Simple design have a design parameters is like speedometer (DP 4.1) , standard symbol (DP 4.2), additional features (DP 4.2.1), and remote control (DP 4.2.1.1). Durable includes a good integrated system of menu so that the design parameter of interface is compatible menu system program (DP 5.1).
3. According to validation test, a design of interface valid to satisfied customer criteria at 5% of significant level.

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