



KEY ELEMENTS OF INTERFACE DESIGN FOR
WASHING MACHINE BASED ON USER'S
PREFERENCES
A CASE STUDY IN MALAYSIA

BY

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ABSTRACT

Washing machine plays an essential and pivotal role in our daily modern lives. Washing machine have great impact generally, socially and economically on Malaysian people. Washing machine is one of the great inventions of the industrial revolution. It was named 12th most important invention by Tesco Mobile UK. Socially it contributed in our daily washing routines saving time and effort. It promoted cleanliness and hygiene and has profound impact transforming women's lives enabling them entering the workforce. Economically washing machine is on top three most important households in Malaysia according to national Census 2010. Washing machine design trends have been rapidly changing since the beginning of its invention that support assorted washing techniques and methods. As a result, washing machine interface design become more complex, difficult to operate, hard to understand. Washing machine interface design become problematic with big many modes, features added to the panel or dashboard. Many features are unnecessary and create confusion between users. The interface design can be more user friendly and easier to understand and operate, needed to be simplified. Interface design principles were gathered through literature review based on interface design experts' key elements of interface design as a result key element are 1) functions, 2) design, 3) operation, 4) design approach. A survey has been done on a sample of 300 washing machine users located in Kuala Lumpur using data collection, key elements of interface were identified as a result based on 1) functions, 2) user preferences. Line up study of 14 current washing machine interface design in the market has been done to observe, analyze, compare between existing interface designs to come up with design key elements as a result. Based on 1) design, 2) functions, 3) operation. Over all findings shows that there are key elements that required for washing machine interface design resulting in making interface design more user friendly with primary functions and tasks based on Malaysian user's preferences. A proposed interface design is validated using task analysis approach by industrial designer experts. Research have important value in adding new information about interface design key elements for washing machine based on user's preferences and in relation to interface design principles by experts.

Keywords: Washing machine, Interface Design, Functions, Human centered design, Interface principles.

مُلخَص البَحْث

للغسّالة دور مهم جدًا في حياتنا اليومية، وتأثير بالغ على الشعب الماليزي اجتماعيًا واقتصاديًا؛ إذ تُعدُّ من أهم اختراعات الثورة الصناعية، وقد احتلت المرتبة الثانية عشرة بين الاختراعات الصناعية حسب Tesco Mobile UK، فاجتماعيًا عزّزت الغسّالة عادات النظافة اليومية، ووفّرت الوقت والجهد، وكان لها تأثير بالغ من خلال تغيير حياة النساء وتمكينهنّ من دخول سوق العمل، أما اقتصاديًا فتُعدُّ ثالث أهم الأدوات المنزلية في ماليزيا وفق الإحصاء الوطني لعام 2010، وقد تغيّرت تصميماتها تغيُّرًا متسارعًا منذ اختراعها إلى أن صارت تدعم تقنيات الغسيل وأساليبه المختلفة، وبدت واجهات الغسّالات أكثر تعقيدًا وصعوبة في فهم آلية تشغيلها، فقد كثرت الوضعيات والميزات المضافة إلى لوحة التشغيل التي تُربك المستخدم ويراهها لا داعي لها، في حين أن اللازم أن تكون واجهة الغسّالة أكثر سهولة استخدامًا وفهمًا، وعليه؛ جُمعت مبادئ تصميم واجهات الغسّالات استنادًا إلى آراء الخبراء، وتبيّن أن العناصر الأساس لتصميم واجهة الغسّالة هي: الوظائف، والتصميم، والتشغيل، ومنهج التصميم، وجرى مسح بياني لعينة من 300 مستخدم في كوالالمبور؛ لتحديد العناصر الأساس للوحة التشغيل بناء على الوظائف وتفضيلات المستخدم، ودُرس 14 تصميمًا لواجهات الغسّالات المتوفرة في السوق؛ للمقارنة بينها، والتوصل إلى تصميم عناصر أساس بناء على الوظائف والتصميم والتشغيل، وقد تبيّن من النتائج أن هناك عناصر أساسًا مطلوبة لتصميم واجهة الغسّالة تجعله أكثر سهولة في الاستخدام مع توفّر وظائف رئيسة حسب تفضيلات المستخدم الماليزي، كما جرى التحقق من التصميم المقترح لواجهة الغسّالة باستخدام نهج تحليل المهمة من خبراء التصميم الصناعي، ولهذا البحث أهميته وقيّمته المضافة من خلال المعلومات الجديدة عن العناصر الأساس لتصميم واجهة الغسّالة بناء على تفضيلات المستخدم ومبادئ التصميم لدى الخبراء.

الكلمات المفتاحية: غسالة ، تصميم واجهة ، وظائف ، تصميم محوره الإنسان ، مبادئ واجهة.

APPROVAL PAGE

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CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

Washing machine industry has an economic impact on Malaysian market. Large home appliances have seen significant development in the Malaysian market despite of the harmful effects of economic forces in or outside the country. According to Growth from Knowledge (GFK) retail audit findings, a household in Malaysia purchased nearly 264,000 units of washing machines through retail stores and outlets in the first five months of 2013 reflecting the growth in sales volume and value by 11 and 15 percent. Based on a necessity in today's modern society, the demand for these appliances is still active despite a relatively high level of penetration in local households.

In the line of modern market demand, more manufacturers expand their line-up of washing machines to allow the consumers to select the type of washing machine between a wide variety of features and designs. Additionally, encouragement to get the washing machines with a reasonable price that open more competition between brands in general and more challenges among the consumers. According to the Malaysian star online magazine on copy came up with an article titled "Japanese MNC targets aggressive growth in Malaysia"(2013), Japanese companies like Panasonic Malaysia launched series of 6 washing machines featuring innovations with modern design as an example of this. This study focuses on washing machine user's preference on washing machine interface design.

1.2 BACKGROUND STUDY

Washing Machine

The washing machine existed a long time ago; thus, it didn't exist as a machine more as a process. Humans since the beginning of time pursue their needs of having clean clothes as much as possible. It is built inside pure human nature (*Fitra*) to clean things and to make sure that things around them are hygienic to be used or consumed beforehand. This topic will explain more about the development of washing machine including the process of washing clothes using washing machine design trend.

Washing machine plays an essential and pivotal role in our modern daily lives. Washing machine design trends have been rapidly changing since the beginning of its invention. Human evolves to lean towards fabric care and hygiene rather than "just clean". Therefore, washing machine designs later include technologies that support different washing techniques and methods. These improved designs eventually developed various interactions existing between users and products. In another word, the user experience contributes to the development of washing machine from time to time until now. Washing process has changed throughout the time. Earlier, people had to soak their clothes in soap water for hours together, then scrub the stubborn hard dirt, rinse it and then dry the clothes. Drying also took days together people would hang their clothes leaving the job to nature to finish it facing the risk of having a bad weather. However, with the introduction of washing machines, washing the clothes became easier. The washing machine would dry it up to 80 % that's what makes it celebrated it's not only the washing, but the secondary drying happens along in the process. Earlier, people used to clean their clothes by hitting them on hard rocks or scrubbing them with sands and wash away the dirt in rivers, seas or lakes. They used fat from animals as a

bowl of soup to clean their clothes. Additionally, the first washing machine was called the scrub board which is merely a cutting board where people must use their hand to wash the clothes. However, through the research, there is a doubt that the function of washing machine did not use until the year of 1797.

Washing machines have two types: front loading and top loading washing machine. Washing machine chronology goes back to 1851 when American James King discovered and created the first washing machine to use a drum. However, it was still hand powered and did not work by itself. Then in 1858, William Blackstone of Indiana built a washing machine for his wife. This washing machine removed and washed away dirt from the clothes. This was the first official washing machine that could be used at home. In 1908, Hurley Machine Company of Chicago invented the Thor machine. This was the first washing machine that was electric-powered and had a galvanised tub and an electric motor. The previous washing machines had heavy, cast-iron mechanism mounted on the tub lid. This made the washing machine heavier and bulkier.



Figure 1.1 Washing Process; Previous In 1797 and Presently 1969
Source (Istoc, 2016)

Interface Design

Washing machines interface design had developed based on human needs and demands. Technology and its constantly rapidly changing habits were the critical element accountable for changing washing machine form, functions and interface design. Thus, with the evolution of washing machine technologies, interface design has become crucial when it comes to producing washing machines. Washing Machine interface design reflects the cleanliness and freshness of laundry through its graphical user interface. Animations and images reminiscent of clothes washing illustrate the different steps, for example rinsing water or washing machine drums that are spinning. The various cycles are selected via a touchscreen display, a knob or logos with the icons showing images taken from the laundry context, thus easing recognition and navigation. Additional cycles are always added as features.

Washing machine interface is in washing machine panel or dashboard, it is usually a combination of illustrations, functions, features, operating manual, physical buttons or display screens. Interface design focus on maximizing usability and user experience. The goal of user interface design is to make the user's interaction as simple and efficient as possible, in terms of accomplishing user goals (user-centered design). Good user interface design facilitates finishing the task at hand without drawing unnecessary attention to itself, influencing how the user performs certain interactions and improving the aesthetic appeal of the overall design; design aesthetics may enhance or detract from the ability of users to use the functions of the interface. The design process must balance technical functionality and visual elements to create a system that is not only operational but also usable and adaptable to changing user needs.



Figure 1.2 washing machine interface design source (<https://blond.cc/work/ripple-washing-machine/>)

Chapter one aims to draw a clear overview; history line-up of the research, the current situation of washing machine roles for the user which would help in understanding Malaysian user preference on washing machine interface design. This chapter will help introduce how the users see and apply the importance of washing machine in their daily life by analysing the aim, objectives, problem statement, research questions, limitations of research and structure analysis.

1.3 PROBLEM STATEMENT

Washing machine interface design is complex, complicated with many features, modes. Washing machine interface design is difficult to understand and to operate by users. No information and data regarding washing machine interface design principles.

1.4 STUDY AIM

This research aims at proposing key elements of washing machine interface design based on Malaysian users' preferences.

1.5 RESEARCH OBJECTIVES

- To investigate current existing washing machines in Malaysian market and its functions, specifications and characteristics.
- To determine Malaysian user's preference for washing machine interface design.
- To integrate interface design principles and key elements into washing machine.

1.6 RESEARCH QUESTIONS

This research will aim at answering the following questions:

- What are the existing washing machines line up and its specifications, characteristics?
- How are Malaysian users' preferences effect washing machine interface design?
- How are key elements of washing machine shape interface design?

In a more recent study of washing machine interface, this study will look at the washing machines sold in Malaysia between 2010 and 2015. Furthermore, this research will also focus on Malaysian capability and ability to use the interface of the washing machine. It is hoped that at the end of this study, we will be able to understand more about reasons interface of the washing machine becomes more complicated. Furthermore, it aims to get the guideline for interface design of washing machine. So that the guidance can help the design company to create washing machine that is appropriate for users.

1.7 RESEARCH QUESTIONS AND OBJECTIVES RELATION

Table 1.1 Research questions and objectives relation

RESEARCH QUESTIONS	RESEARCH OBJECTIVES	METHOD
Q1- What are the existing washing machines line up	RO1- To investigate current existing washing machines	Line up study
Q2- How are Malaysian users' preferences effect on washing machine interface design?	RO2- To determine Malaysian user's preference for washing machine interface design	Survey questionnaires
Q3- How are key elements of washing machine shape interface design	RO3- To integrate interface design principles and key elements.	LR Line up study

1.8 LIMITATION OF RESEARCH

This research has few limitations. Essential information about new washing machine interface design was hard and difficult to obtain as such information is patent and under ownership of big manufacturers and corporates. References and previous studies on washing machine interface design are insufficient and limited. Therefore, only customers, user's survey, feedback and testimony along with interface expert's opinion and principles were main source of information.

1.9 SUMMARY

This chapter a brief history of washing machine was explained and how washing machines have impacted our lives socially, economically. Washing machine interface design have changed with technology making interface design more complex. This chapter explained how washing machine interface design become more complicated. Washing machine interface design become difficult to operate by users too. Research problems were identified along with research questions. The relation between research questions and objectives were established. The aim of this research is to propose key elements of interface design. Understanding Malaysian users' preferences on interface design, interface design principles for washing machine and investigating current washing machines as objectives to this research.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter addresses existing studies that have been conducted on the definition and main concepts of interface design. This chapter will highlight the brief history of a washing machine and interface design of washing machine. This chapter will explain principles of design, interaction design, interface principles, human-centred design and user-centred design concerning washing machine interface design.

2.2 BRIEF HISTORY OF WASHING MACHINE

With the development of commercial electricity, household appliances began to rise in the early 20th century. That includes washing machine that gains its fame in the mid-1930s as full electrical home-appliance. The earliest recollection of the device or tool explicitly invented to help washing was a dolly designed by the ancient Egyptian. Henceforth, various means were created to laundry. It was not until the ridged washboard by Nathaniel Briggs was established in 1797 America. In Asia and Africa, such appliance is still being widely used by low-income citizens or paid laundry person. In 1782, an English inventor created a rotary washing drum, and by 1851 James King invented the first hand-powered washing machine with a rotating drum but then patented by Hamilton Smith in 1858. Figure 2.1 shows the timeline of the washing machines development.