



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

IMPROVING PRODUCT DESIGN USING KANO MODEL

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Manufacturing Engineering Technology (Product Design) with Honours.

by

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FACULTY OF ENGINEERING TECHNOLOGY

2016

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: Improving Product Design using Kano Model

SESI PENGAJIAN: 2016/17 Semester 1

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I hereby, declared this report entitled “Improving Product Design using Kano Model” is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor's Degree in Manufacturing Engineering Technology (Product Design) (Hons.) The member of the supervisory is as follow:

.....
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ABSTRAK

Reka bentuk produk yang berjaya adalah produk yang dapat memenuhi keperluan pelanggan dan menyelesaikan masalah pelanggan secara berkesan. Elemen utama yang menyumbang kepada penghasilan reka bentuk produk yang baik adalah memahami keperluan sebenar pelanggan dan mampu menyelesaikan masalah dengan efektif. Namun begitu, keperluan pelanggan berubah dari masa ke semasa. Produk yang tidak diubahsuai akan ketinggalan dalam pasaran mengikut perubahan zaman dan keperluan. Pengusahaan-pengusahaan tidak dapat meramal keperluan pelanggan dan menawarkan produk yang memenuhi keperluan pelanggan kerana terdapat banyak faktor-faktor ketidakpastian dalam peramalan keperluan pelanggan. Oleh itu, kajian ini telah dijalankan bagi tujuan untuk mereka bentuk semula satu produk yang lebih sesuai yang memenuhi keperluan pelanggan. Reka bentuk produk yang dipilih bagi kajian ini ialah sebuah meja belajar. Secara umumnya, projek ini dilaksanakan dengan mempraktikkan Kano Model untuk mengenalpastikan keperluan pelanggan. Hasil keputusan yang didapatkan dari soal selidik yang dipraktikkan dengan Kano Model dimasukkan dalam House of Quality untuk mengetahui kedudukan setiap spesifikasi reka bentuk yang akan menentukan fasa reka bentuk produk yang seterusnya. Hasil projek yang terakhir merupakan satu reka bentuk meja belajar baru dan mempunyai lebih banyak spesifikasi yang dapat memenuhi keperluan pelanggan. Hal ini dapat dibuktikan setelah perbandingan spesifikasi dibuat dengan reka bentuk meja belajar yang terdapat di pasaran.

ABSTRACT

A succeed product design is a product that meet customers' requirement and solve customers' problem effectively. The key element of a good product design is having a well and firm basis of capturing voice of the customer. However, customer needs change dynamically from time to time. There are many uncertainties that company could hardly forecast customers' requirement on product and offer product that fulfil customers' requirement. Therefore, this research is done to redesign a more suitable product which meets customers' requirement. Study table is the product which selected to be improved. Generally the project is conducted by implementing Kano model to identify customers' requirement on study table. This is then incorporated into House of Quality to get design specifications ranking result which will be considered into the design phase in the next stage. A new study table design came out as project result and it has more features to suit customers' needs. The current table designs are improved by new study table and it has been proved by comparing with features and specifications of current study tables.

DEDICATION

This thesis is dedicated to my beloved parents, supervisor and friends in helping and guiding me throughout the project.

ACKNOWLEDGEMENT

I would like to express thank to my supervisor Mr. Tan Hauw Sen Rimo for his help and guidance throughout the project. The completion of project would not have been possible without his guidance. I have learned a lot from him not only the way writing thesis more organized but also the way he taught me to think a problem from different perspectives. This is not only allowed me to complete the project but also benefits me in future life with a new mindset he taught.

Besides, I would also like to thank Zhen Lin Furniture & Renovation Work and the designer Mr. Patrick for willing to help in providing data which contributes to the project. They facilitate my project process and I am grateful to gain experience from them.

Also, I would like to thank my friends and respondents who help me along the way in completing my project. Last but not least, I would like to offer my sincere gratitude to my family members for mentally supporting me throughout the project. They are my motivation to complete the project.

Without anyone of them, I could not complete the project on time. Thank you.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

DC	-	Dissatisfaction Coefficient
FYP	-	Final Year Project
HOQ	-	House of Quality
QFD	-	Quality Function Deployment
SC	-	Satisfaction Coefficient
VOC	-	Voice of Customer

Chapter 1

INTRODUCTION

1.0 Overview

Chapter 1 will provide general insight to the reader on the topic which will be done in this project which is about designing a product based on customer requirement. This chapter includes problem statement, objective as well as structure of the project to give a basic idea about the project to the readers. In this chapter, the scope is also set to limit a certain extent of study which is uncontrollable. Besides, Chapter 1 comprises the structure of project as well in order to clarify how the project goes.

1.1 Introduction

Good product design is a product designed which fulfills customer needs. In simple terms, a good product performs the function that what customers exactly need. The core reason that customers usually buy a product is that they need it to solve their problem. Everyone faces problem in daily life and some of them will make an attempt to solve those problems. Therefore, product or service is there as a solution for people to solve their problems. Conversely, customers will not want to purchase that product at all if that particular product fails to meet customer requirements and unable to function as customers expected.

Therefore, it is crucial for designers to identify customer requirements in the earlier stage of product design development. The success of a company is usually dependent on its ability to provide product or service which meets customer needs. Designers need to design a product which satisfies customer based on their requirement on product specifications. However, customer need is dynamic and

varies from time to time. The designers can hardly to identify the customer requirements or sometimes they might overlook the hidden customer wants to be put into the product specifications. As a result, the product designed will fails in satisfying customer and gaining customer loyalty and next it leads to low competitiveness compared to the other competitors in the current market.

As the customer requirements are crucial in product development, designers struggle in the process of determining customer needs where they need to identify which kinds of customer needs they have to concern. This is due to each people has different needs on products and there are many uncertain issues which affect their decision on it. There are generally 2 types of customer needs, which are known and unknown customer requirements. The customer usually purchases the product with some expectations to it and expects the certain product should fit with certain features. The product is considered as a fail to them if the product lacks function that they expected yet those existing product features are not the solutions for the problem countering. On the other hand, most of the customers are unaware of what they want and all of the time they are merely want to solve their problem. Customers usually do not know what solution which helps them to get the job done and these unspoken customer needs is the key that a company should determine.

Nevertheless, a product cannot satisfy all people even though customer needs are well determined. This is because different kinds of customers have their individual preferences and different level of requirements based on their needs. This is the reason why there are usually different series launched for the same product. The markets are segmented for the product so that company can serve a higher range of customer needs and wants. For instance, a phone which fitted with better camera specifications and good speaker usually impress young people, but not for senior citizens. Therefore, some company also comes out with phone designs which ease senior citizens to use such as greater icons and text to be displayed and good accessibility.

Kano model is one of the methods which helps a company in determining customer needs and its priority. It has a special survey designation to categorize customer requirement systematically known as Kano Model Survey. This eases company to identify customer needs and give priority to each of the specifications.

By referring Kano analysis, designers can make or improve a design which can meet customer requirement.

Kano model is well recognized as a tool to gather customer requirement and many researchers adopted the Kano model into the product design. In Yadv et al study (2016), Kano model is applied to corporate customer satisfaction with the design specifications and then come out with car profile design with aesthetical aspects. Kano model is not only applicable to product design but in service field too. There is an example where Kano model has been applied in home delivery service. A study has been done to determine the relationship between service convenience and customer satisfaction by using Kano model. The finding of this study shows a positive result bias that indicates that there is an increment in customer satisfaction after improving service by applying Kano model to identify customer needs (Chang and Chen, 2011).

In this project, Kano model will be applied in the product design field to determine customer needs. A product will be selected and a new design will be made according to Kano analysis result in order to meet customer requirement and increase customer satisfaction.

1.2 Problem Statement

A good product is a product that can satisfy a customer and meet customer needs. Customers will not purchase the product if they find the product cannot meet their requirements. Therefore, it is important to identify customer needs and wants before providing a product or service. However, customer needs are dynamics and always change from time to time. Sometimes, they have no idea in what they want and this makes company difficult to identify customer needs. Company designers are difficult to determine customer requirements and in return they fail to provide a good product design which meets customer needs and satisfies customers.

1.3 Objective

The general purpose of this project is to redesign a more suitable product for customers' requirement. New product design will be made by applying Kano model to determine customer needs. Specific objectives will be stated as the following:

- To determine customer needs and requirement using Kano model
- To interpret the voice of customer into product specification using House of Quality
- To come out with new product design

1.4 Scope

In this project, Kano model survey is used to identify customer needs. Product design process has 3 main sections which are analysis (gather information), define the concept (comes out with a new design) and synthesis (apply and examine design). In this project, the first 2 sections (analysis and define concept) will be done instead of applying and examining the design. Other than that, there will be only 1 type of product selected to be designed in this project. The manufacturing process of the new design as well as financial and cost analysis of the design or its sustainability will not be discussed in this project. There is only the first phase out of four in House of Quality will be performed as this project is limited to redesign the product instead of taking manufacturing process and costing into consideration. The result of Kano model is applied to the House of Quality phase to improve the product design but quality improvement will not be discussed in this project.

1.5 Structure of Project

The organization structure of the report is shown in Table 1.1. The summary table below is made in order to clarify readers on the project process.

Table 1.1: Organization Structure of Project for Final Year Project

Chapter 1	Introduction	Explanation on the study of the main topic which is improving product design using Kano Model.
	Problem Statement	The description of the problem existing in determining customer needs process and brings out the issue.
	Objective	Set the study goals to avoid the study out of topic.
	Scope	There is a certain extent of study that has no control that we have to set a scope to limit the study. A scope is set and anything out of the scope will not be accomplished throughout the study.
Chapter 2	Literature Review	The literature review will be done to deepen the understanding in the field and ease the establishment of the theoretical framework and methodological focus.
Chapter 3	Methodology	Brief the methods and tools used in the project to come out with a design.
Chapter 4	Results and Discussion	All results include Kano analysis and House of Quality will be defined and comes out with a new design.
Chapter 5	Conclusion and Recommendation	Describe the goal achieved and recommendation for future study will be made.

Chapter 2

LITERATURE REVIEW

2.0 Introduction

Chapter 2 provides an overview of previous research concerning the project. This chapter includes information about product design concept and Quality Function Deployment as well as the Kano model concept. The literature review is conducted based on the relevant journals, case studies, and books published in the recent years. At the end of this chapter, the literature review will be narrowed down to the work measurement method which will be applied to the study later.

2.1 Product Design Concept

Product design is the whole process of generating new idea or concept about the product until the production of the product and an improvement will be made continuously. According to Reid and Sanders (2012), product design is the process of defining the product characteristics or features. Product design will solve user's problem and always adaptive to the ever-evolving world. Companies nowadays recognize the importance of product design which meets customer demands and there are many solutions are made to improve product design to satisfy customers. The development of most product design usually consists of certain steps as the following:

1. Idea Development
2. Product Screening
3. Preliminary Design and Testing
4. Final Design

The development of product design begins with an idea. An idea often originates from problems in daily life and a product is designed to satisfy customer need. The idea is evaluated and a screening process is usually done after the process of idea development. This is then followed by preliminary design and testing. Marketing testing and prototype analysis are conducted in this process and final design of the product is determined and produced (Reid and Sanders, 2012).

2.2 Voice of Customer

In product design process, identifying voice of customer is crucial to create a product which meets customer requirement. Voice of customer is customer need and requirement to define a problem clearly. According to Cudney and Furterer (2012), Voice of Customer (VOC) is an expression for listening to external customer requirements for the product or service. Found and Harrison (2012) suggested a similar opinion that VOC is customer expectation on product or service provided. Collecting the VOC is important to understand customer demands and if possible, identify those requirements even that the customers unaware. Lacey (2012) found out that customer voice is directly related to customers' willingness to purchase, impart positive word of mouth and can influence their initiative in participating in marketing research. A literature review also shows that satisfied buyer will be more likely to repurchase compared to those who are dissatisfied (Kaura, 2013). This shows many researchers recognize the importance of customer requirements and there is a trend which emphasizes on customer needs researches in recent years. For instance, Lacey (2012) and Chakraborty and Sengupta (2013) study on the relationship between customer satisfaction and their service field and examine the effect of customer voice contributes to service field. Kaura et al. (2013) also study on the effect of service quality on customer satisfaction in banking field to meet their requirement. Meanwhile, there are also several studies about identifying customer needs in product design development were done. Realizing the importance of customer needs, Gangurde and Akarte (2013) study an approach to generate mobile phone design based on customer requirements. Cudney and Furterer (2012) collect several case studies in product design and the studies concern mainly in determining voice of

customer in the process of developing product design. This indicates that the capturing of VOC is paid concern recently in product design or service field as well as marketing field.

2.3 Quality Function Deployment

Quality Function Deployment (QFD) is a method developed in 1960's by Professors Shigeru Mizuno and Yoji Akao which transform voice of customer to engineering specification. Bu and Park (2016) views QFD as a tool to translate voice of customer in product development which can satisfy customer needs. Altun et al. (2016) characterize that QFD is a well-established methodology used in new product development to ensure the product design development process is driven by customer requirements. Zadry et al (2012) and Jaiswal (2012) also describe that QFD is an effective method to segment customer requirement according to product qualities.

2.3.1 Mechanism of Quality Function Deployment

According to Jaiswal (2012), a comprehensive QFD generally provides four phases which are product planning, product design, process planning and production planning or process control. Product planning phase involves building a House of Quality (HOQ), a matrix form as a tool to translate product technical requirement to establish a relationship between customer and technical requirement. The second phase will be the product design which involves the translation of technical requirement to key part characteristics in the system. It is then followed by process planning stage which identifying the process operations to achieve the key part characteristics. The last phase will be production planning process which establishing process plan and controlling the operation.

Pande et al (2014) state a similar opinion and break into more details on the initial stage of QFD. He states that there are two core concepts in the

QFD which are QFD cycle which has 4 broad phases and prioritization and correlation as depicted in Figure 2.1.

1. QFD Cycle
 - a) Translate voice of customer and competitor analysis into product features
 - b) Translate product features into specifications
 - c) Translate the product features into process performance features
 - d) Translate product design requirement into process specification

2. Correlation and Prioritization
 Analysis the relationships among needs, features and requirements by using matrix

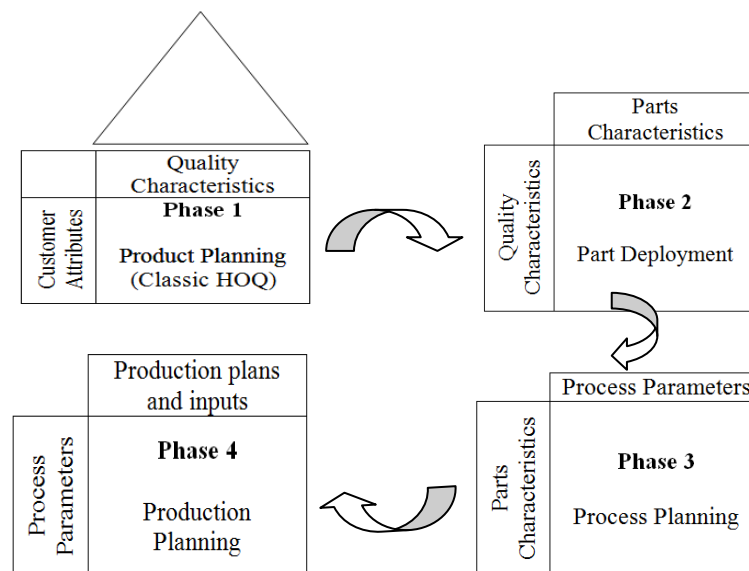


Figure 2.1: Complete Quality Function Deployment Phases

According to the study of Jaiswal (2012), QFD method includes building one or more matrices which are usually known as “Quality Table”. House of Quality (HOQ) is a tool in matrix form used in QFD. It exhibits VOC on the left-hand side of the matrix called “Whats” and matrix beside it is the important rank value for each VOC. The top horizontal rows called “Hows” which are the ways to achieve the requirements. There is a top roof known as “Correlation Matrix” which functions as determining the

relationships between technical requirement elements. QFD matrices also comprise matrixes which involving the prioritization of technical requirement and customer competitive assessment as well as technical competitive assessment. The following is Figure 2.2 which depicts HOQ form.

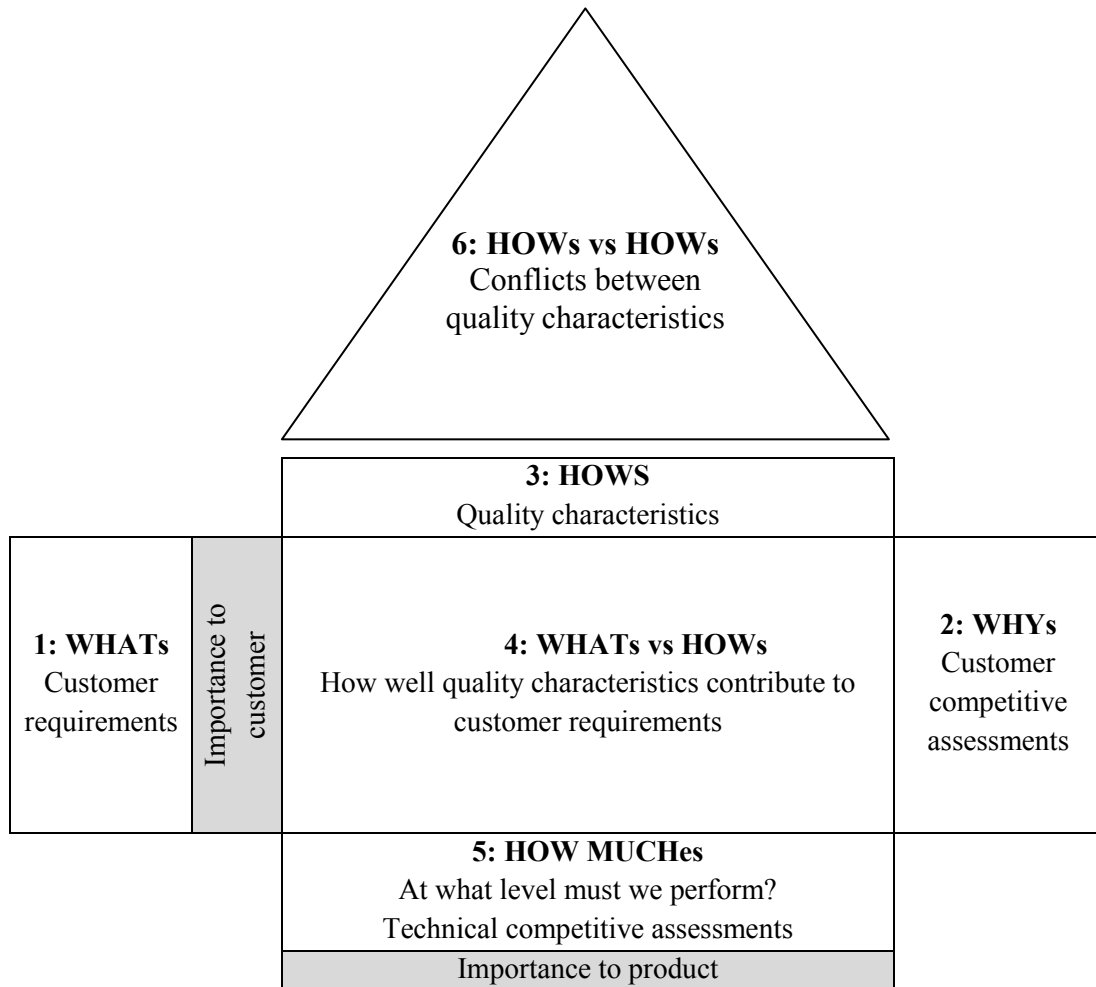


Figure 2.2: House of Quality

2.3.2 Application of Quality Function Deployment

QFD is originally introduced for the product design in manufacturing field to serve a purpose which produces a product that meets customer needs (Jaiswal, 2012). Nevertheless, it can be widely used in many fields other than applying in manufacturing field itself nowadays. There is a trend in conducting researches about the application of QFD in different fields such as