



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**INTEGRATION KANO MODEL AND QUALITY FUNCTION
DEPLOYMENT (QFD) APPLICATION FOR DESIGN
IMPROVEMENT OF AN ACCESSORIES PRODUCT CASE
STUDY: UMBRELLA**

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

by

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DECLARATION

I hereby, declared this report entitled “Integration of Kano Model and Quality Function Deployment (QFD) Application for the Design Improvement of an Accessories Product (Case Study: Umbrella)” 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 of Manufacturing Engineering Technology (Product Design) (Hons.). The member of the supervisory is as follow:

.....

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ABSTRACT

The objective of the project is to identify the current quality product and to improve the major characteristic product based on customer satisfaction through Kano Diagram. “Integration of Kano Model and Quality Function Deployment (QFD) Application for the Design Improvement of an Accessories Product” is the title of this project. This project is conducted around state of Melaka. The QFD method is the most effective methodology available for capturing and responding to the Voice of the Customer (VOC). Through both methodology, which is QFD and Kano Model the product such as umbrella were analyzed to produce the product characteristic and quality dimension. Observation and interview was done to collect the data for the research. Meanwhile, questionnaire was used to obtain the VOC of the product. Based on these data, House of Quality (HOQ) was constructed and Kano Model was plotted. Results were then being manipulated using SOLIDWORK software and the suggestions for further study were being discussed.

ABSTRAK

Objektif projek ini adalah untuk mengenalpasti kualiti produk semasa dan untuk meningkatkan ciri-ciri utama produk ini berdasarkan kepuasan hati pelanggan melalui gambarajah Kano. “Integrasi Kano Model dan Kualiti Fungsi Pelaksanaan (QFD) Permohonan Peningkatan Rekabentuk sesuatu Produk Aksesori” merupakan tajuk projek ini. Projek ini dijalankan di sekitar negeri Melaka. Kaedah QFD merupakan pengkaedahan yang paling efektif berserta sesuaian untuk merakam dan meminta maklum balas dari suara pelanggan. Melalui kedua-dua kaedah ini, iaitu QFD dan Kano Model menjadikan produk seperti payung dianalisis untuk menghasilkan ciri-ciri produk dan dimensi kualiti. Pemerhatian dan temu bual dilakukan untuk mendapatkan kehendak pelanggan pada produk tersebut. Berdasarkan data yang dikumpul, ‘House of Quality’ (HOQ) akan dibina dan Kano Model di plotkan. Seterusnya, hasil kajian dibuat dengan kaedah yang bersesuaian dengan perisian (software) SOLIDWORK dan cadangan untuk kajian pada masa hadapan dibincangkan.

ACKNOWLEDGMENTS

Alhamdulillah and Thank to Allah S.W.T. with all gracious and merciful for giving me strength and ability to accomplish this project research successfully. I would like to express my gratitude to all those who gave me the possibility to complete this thesis. I am deeply indebted to my supervisor Mr. Khairum bin Hamzah and Mr. Mohd Razali bin Md. Yunos whose help, stimulating suggestions, encouragement and guidance helped me in all the time of research for and writing of this thesis. I also would like to thanks to Assoc. Prof. Mohd. Rahimi bin Yusoff, Dean of Faculty of Engineering Technology as well as to all lectures from Department of Manufacturing Engineering Technology for all their assistances. Finally, I would like to thanks to all my colleagues. I want to thank them for all their help, support, interest and valuable hints in completing this thesis. Especially, I would like to give my special thanks to my family whose patient love enabled me to complete this work.

Sincerely,

Khairul Nazemin Bin Mohd Yaaziz

DEDICATIONS

This thesis is dedicated to my parents, Mohd Yaaziz bin Bakar and Minah binti Abdullah, my brothers, sisters and other family members who provide a loving, caring, encouraging, and supportive atmosphere. These are characteristic that contribute to the environment that is always needed to achieve the goals ahead.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

QFD	-	Quality Function Deployment
VOC	-	Voice of Customer
PDCA	-	Plan, Do, Check and Act
PD	-	Product Development
SD-Scale	-	Semantic Differential Scale
SMB	-	Semantic Description Environment
ISO	-	International Organization for Standardization
CRs	-	Customer Requirement
CS	-	Coefficient of Cause Satisfaction
DS	-	Coefficient of Cause Dissatisfaction
HOQ	-	House of Quality
TQC	-	Total Quality Control
SQC	-	Quality Control Statistic
CAD	-	Computer Aided Design

DFMEA	-	Design Failure Modes and Effect Analysis
QPT	-	Quality Planning Table
AHP	-	Analytical Hierarchy Process

CHAPTER 1

INTRODUCTION

- **Introduction**

The quality of a product has become the key factor of the most important competitive in manufacturing which is used for strategic tool in supporting continued success and products development. Customer satisfaction and production life cycle are seen as the key differentiator and have become the key element of a product or service.

Psychological and physical variable which correlate with both variables depend on the condition of satisfaction rate and satisfaction behavior such as return. Customer choice may be changing according to the level of satisfaction that can be changed by other options in which customers can make comparisons to other products within the products organization.

To solve the problem of customer needs, quality function deployment (QFD) can be the option as the most effective method to capture and respond to the voice of customer (VOC). Usually customers do not want a technological innovation that does not

benefit the consumers, but every technological innovation that is produced due to customers demand and provides convenience to customers is the reason why the main function of QFD was introduced. QFD is considered unique because the process is driven by customer needs. Therefore, to determine what customer really wants requires the information collected.

Meanwhile, to get more thorough information about the customers' need, Kano model is adopted for the integration of QFD to strengthen the power of information further. Kano model is more emphasized in the theory of customer satisfaction and product development. It sure comes to products and services in accordance with the requirements of accuracy and dynamic view of the customer. There are three Kano models: performance, threshold, and fun. In order to generate competitive products, it is necessary to meet the basic properties because properties can maximize the basic performance characteristics.

- **Problem Statement**

Umbrella is a basic requirement when it rains and summer. But users always have trouble opening Umbrella after the rain while in the car. As a consumer, to choose a good umbrella is difficult because there are a lot of choices available in the market. Due to a lot of competitors have been producing umbrella, this makes consumers face difficulties in choosing the best umbrella to fulfill their satisfaction. In addition, there are several things that did not fulfill the criteria needed by customers such as design, brand, the material used, size, and the concept of the product. In order to study the problem further and to improve the criteria of a product, QFD methods and Kano Model method are applied in order to conduct the VOC analysis.

- **Objective**

The main objectives of this project are:

- To define and understand about Kano Model and Quality Function Deployment (QFD).
- To generate specifications for umbrella using Kano Model and QFD.
- To design umbrella based on specifications by using Kano Model and QFD generated.

- **Scope of the project**

The scope of this project focuses on new design for umbrella, focusing on the development of integrative approach between QFD and Kano Model. The literature studies are divided into four parts including the high concept, QFD, Kano Model and Kano Model integration into QFD. This study focuses on identifying the research gaps, particularly in three areas, including the optimization of QFD model, quantifying the strong integration of Kano Model and Kano Model to QFD. Besides, the scope of this project also set a target to set up a prototype to enable the customer to see how this project works.

1.4 Summary

This chapter introduces the background of the project and is actually based on the problems of this study. In addition, the objectives and scopes of this project also explained the operation of the project. All useful quality improvement also can affect the

employee satisfaction.

CHAPTER 2

LITERATURE REVIEW

- **Introduction**

In this chapter, a comprehensive literature review is to explore the theme of domain comprehensive study on the comprehensive theories including research and development, books, journals, theses, technical documents, case studies, and online library. In general, the purpose of this study is to encourage the development of early understanding on the quality of various aspects such as benchmarking studies prior to research and analysing critical segment of the body of published knowledge through classification and summary. This chapter will describe the topics of product design development (PDD) which is related to the quality such as QFD methodology, Kano Model, and other relevant quality topics. QFD methodology and Kano Model will be emphasized more since the study is conducted in a quality function deployment manner. QFD will describe more in the definition of that phase, the history of the development of QFD, QFD process, the benefit of implementing QFD, the implementation of QFD, and the relevant topics related to QFD.

2.2 Product Design and Development (PDD)

According to Brown and Eisenhardt (1998), the increment of production capacity of consumer products during recent decades is never seen before. The changes indirectly

impact shorter life cycles of a product. Stated that shorter life cycle of a product leads to shorter development time of a new product and also customer's demand arises due to the improvement on the knowledge of highly advanced product. Another impact on a new product is it become mature and as a constant tool in the sector quality Plan-Do-Check-Act (PDCA)-circle (Deming, 1986).

Few years ago, product design and development process that focused on defining the characteristics should be suitable with the product in order to make the correct response to a certain functional specification. Product development (PD) process is a sequence of step that transforms a set of input into a set of output (Karl and Steven, 2012). PD process is a sequence of activities or steps that an enterprise employs to conceive the design and commercialize a product. Some organizations may follow the detailed development process.

2.2.1 Generic Product Development Process

Figure 2.1 shows the common PD process that consists of six phases. The process starts with activity planning. This phase begins with the assessment of technology developments, opportunity identification, and market objectives (Unger and Eppinger, 1985).

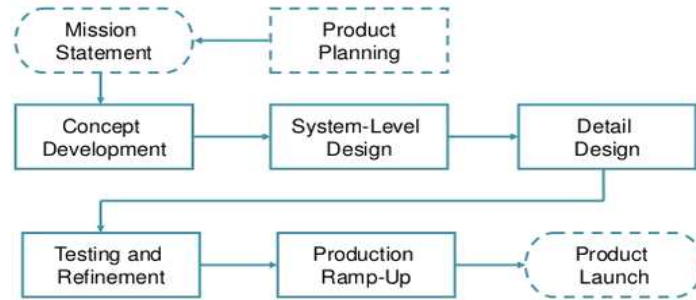


Figure 2.1: A generic product development phase (Karl and Steven, 2012)

Next stage is the concept development. In this phase, the needs of a market to identify the concept of a product are generated and evaluated. The criteria of the product concept include the description of a function, form, and the features for the next product. The concept of generation includes a mix of external search, creative problem solving within the team, and systematic exploration of various solution fragments generated by the team. The result of this activity is usually a set of 10 to 20 concepts, each typically represented by a sketch and brief descriptive text. To generate the concept, they usually use brainstorming, functional decomposition, and diagram.

A system-level design is a phase that defined the product architecture, decomposition of the product into subsystem and components, and preliminary design of the main components. Production plans system and final assembly are usually defined in this phase as well.

The detailed design is a phase that includes a complete specification of the geometry, materials and tolerances of parts in the product, and the identification of all of the standard parts to be purchased. Three critical issues are considered throughout the PD process and finalized in this phase:

- Materials selection
- Production cost
- Robust performance

Testing and refinement phase involve the evaluation of multiple preproduction versions of the product that is valid for market requirements. Alpha prototypes are usually built with the same geometry and material properties as intended for the production version of the product but they are not fabricated with the actual processes in the production. Alpha prototype is tested to determine whether the product fulfils the customer needs. Beta prototypes are usually built with real parts supplied by the intended production processes and they are tested by customers in their own environment (Unger and Eppinger, 1985).

2.2.2 Method that can be used in Product Design and Development

Many ‘technology ready’ techniques and tools are currently used. The comprehensive and simultaneous conception of product development process entails specific design and development techniques that permit in managing the relevant information. These techniques can be classified into two broad groups (Matzler and Hinterhuber, 1998).

Constantly shifting the trends of customer demands require new or improved tools integrating with affective aspects into the product development. Such methodologies are:

- Semantic Differential Methods (Osgood *et al.*, 1957)
The Semantic Differential Scales (SD-Scales) are a political instrument to measure the effective impact of political streams on the citizen’s mind. This tool can also be used in a modified version for product development.
- Conjoint Analysis (Green and Srinivasan, 1978)