



**DESIGN AND DEVELOPMENT OF ELECTRIC KETTLE  
USING KANSEI ENGINEERING AND KANO MODEL**



**BACHELOR OF MANUFACTURING ENGINEERING  
TECHNOLOGY WITH HONOURS**

**2022**



**Faculty of Mechanical and Manufacturing Engineering  
Technology**



**DESIGN AND DEVELOPMENT OF ELECTRIC KETTLE USING  
KANSEI ENGINEERING AND KANO MODEL**

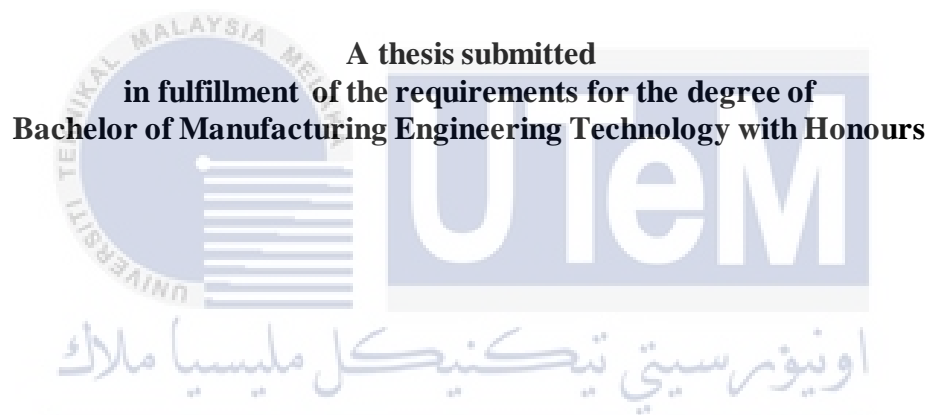
**RUHAIDA BINTI RAMLI**

**BACHELOR OF MANUFACTURING  
ENGINEERING TECHNOLOGY WITH HONOUR**

**2022**

**DESIGN AND DEVELOPMENT OF ELECTRIC KETTLE USING KANSEI  
ENGINEERING AND KANO MODEL**

**RUHAIDA BINTI RAMLI**



**Faculty of Mechanical and Manufacturing Engineering Technology**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2022**

## DECLARATION

I declare that this thesis entitled “Design and Development of Electric Kettle Using Kansei Engineering and Kano model” is the result of my own research except as cited in the references. The Choose an item. has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature

: *Ruhaida Ramli*

Name

: RUHAIDA BINTI RAMLI

Date

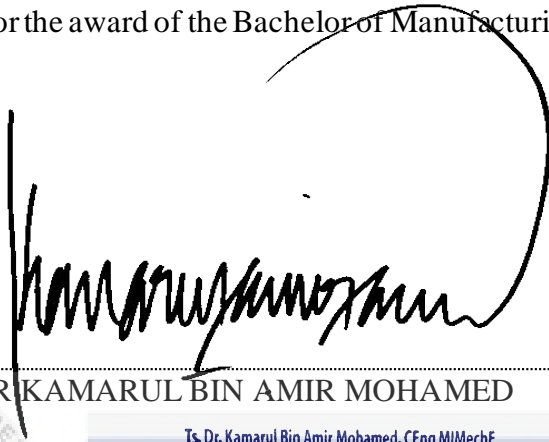
: 28/1/2022



## APPROVAL

I hereby declare that I have checked this thesis and, in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology with Honours.

Signature :



Supervisor Name : TS DR KAMARUL BIN AMIR MOHAMED

Date : 28/1/2022

Ts. Dr. Kamarul Bin Amir Mohamed, CEng, MIMechE  
Senior Lecturer  
Faculty of Mechanical and Manufacturing Engineering Technology  
Universiti Teknikal Malaysia Melaka

اونيورسيتي تيكنيكل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## DEDICATION

I completely dedicate this report exclusively to my parents, who have been my most dedicated supporters from the beginning to the end. Special thanks to Ts. Dr. Kamarul Bin Amir Mohamed, my extremely loving and responsible supervisor, who has guided me through this project. Thank you for all of your encouragement and patience in helping me get to the point where I am able to stand on. Also special thanks to all my friends who have help me to complete this project.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## ABSTRACT

Consumer's preferences and market demand are essential factors for product's success. Thus, in achieving its success, a product should have design that could fulfill consumer's expectation. Based on the issues, the purpose of this research is to accomplish electric kettle product as stipulated by Kansei. Using the Kansei Engineering concept, this study was carried out to improve the design of an electric kettle in order to help satisfy the needs of consumers. Kansei Engineering was used to capture and translate the elements of design into consumer perception known as Kansei words. The dominant Kansei words that influence customer satisfaction will become design priorities in the future product development. Three main goal for this study and research, are to study the customer preferences towards the product design and characteristic using Kansei Engineering tools and Kano model, to investigate the customer requirement of product based on customer feeling and emotions to the characteristic of electric kettle product embedded with Kano model and to develop 3D prototype of electric kettle based on customer preferences using Kansei Engineering Method (emotion) embedded with Kano model (Satisfaction). The goal of this study may be accomplished by using a questionnaire survey to collect consumer data. Questionnaires 1 and 2 will be used in this study, which will include a total of 100 participants. SPSS statistical software will be used to analyze the data collected. The Pearson correlation will be applied to analyze the correlation between the Kansei for design attributes and Kano for product functionality. The result of this research finds that Kansei words represent customer's desire in designing electric kettle; safe, lightweight, durable, and simple while electric kettle's functional requirements; easy maintenance, easy operated, boil dry protection, automatic shutoff, easy operated, concealed element, and part touch water non-plastic. The Pearson correlation was used to analyze the elements that customers require in an electric kettle. Based on the study's goal, a Pearson correlation analysis was performed between the Kansei word and the Kano questionnaire of the design profile. Overall, there is a high correlation between kansei words and the design of the electric kettle which indicates that if we design an electric kettle with all of the Kansei words, the new design of the electric kettle will meet the needs of the customer. However, the correlation of Kano and Kansei reveals a weak negative association, indicating that the existing market for electric kettles is relatively satisfied, since there is no need for considerable increase in functionality. Afterwards, the outcomes will be represented using Kansei words acquired from a questionnaire survey and analysed data derived from customer input using Pearson's correlation. All Kansei words that have passed all validation methods will be transformed into a final design of electric kettle that meets the needs of the customer.

**Keywords:** *Electric kettle, Kansei engineering, Kansei word, Kano model, SPSS software, Pearson correlation*

## **ABSTRAK**

Keutamaan pengguna dan permintaan pasaran adalah faktor penting untuk kejayaan produk. Oleh itu, dalam mencapai kejayaannya, produk harus mempunyai reka bentuk yang dapat memenuhi jangkaan pengguna. Berdasarkan isu, tujuan penyelidikan ini adalah untuk mencapai produk cerek elektrik seperti yang ditetapkan oleh Kansei. Dengan menggunakan konsep Kansei Engineering, kajian ini dijalankan untuk menambah baik reka bentuk cerek elektrik bagi membantu memenuhi kehendak pengguna. Kansei Engineering digunakan untuk menangkap dan menterjemah elemen reka bentuk kepada persepsi pengguna yang dikenali sebagai perkataan Kansei. Perkataan Kansei yang dominan yang mempengaruhi kepuasan pelanggan akan menjadi keutamaan reka bentuk dalam pembangunan produk masa hadapan. Tiga matlamat utama untuk kajian dan penyelidikan ini, adalah untuk mengkaji keutamaan pelanggan terhadap reka bentuk dan ciri produk menggunakan alat Kansei Engineering dan model Kano, untuk menyiasat keperluan pelanggan produk berdasarkan perasaan dan emosi pelanggan kepada ciri-ciri produk cerek elektrik yang tertanam. dengan model Kano dan untuk membangunkan prototaip 3D cerek elektrik berdasarkan pilihan pelanggan menggunakan Kaedah Kejuruteraan Kansei (emosi) yang dinamakan dengan model Kano (Kepuasan). Matlamat kajian ini boleh dicapai dengan menggunakan tinjauan soal selidik untuk mengumpul data pengguna. Soal selidik 1 dan 2 akan digunakan dalam kajian ini yang melibatkan seramai 100 orang peserta. Perisian statistik SPSS akan digunakan untuk menganalisis data yang dikumpul. Korelasi Pearson akan digunakan untuk menganalisis korelasi antara Kansei untuk atribut reka bentuk dan Kano untuk kefungsiian produk. Hasil kajian ini mendapati bahawa perkataan Kansei mewakili keinginan pelanggan dalam mereka bentuk cerek elektrik; selamat, ringan, tahan lama dan ringkas manakala keperluan fungsi cerek elektrik; penyelenggaraan mudah, mudah dikendalikan, perlindungan kering mendidih, tutup automatik, mudah dikendalikan, elemen tersembunyi, dan bahagian air sentuh bukan plastik. Korelasi Pearson digunakan untuk menganalisis unsur-unsur yang diperlukan oleh pelanggan dalam cerek elektrik. Berdasarkan matlamat kajian, analisis korelasi Pearson dilakukan antara perkataan Kansei dan soal selidik Kano profil reka bentuk. Secara keseluruhannya, terdapat korelasi yang tinggi antara perkataan kansei dan reka bentuk cerek elektrik yang menunjukkan bahawa jika kita mereka bentuk cerek elektrik dengan semua perkataan Kansei, reka bentuk baharu cerek elektrik akan memenuhi keperluan pelanggan. Walau bagaimanapun, korelasi Kano dan Kansei mendedahkan perkaitan negatif yang lemah, menunjukkan bahawa pasaran sedia ada untuk cerek elektrik agak berpuas hati, kerana tidak ada keperluan untuk peningkatan yang ketara dalam fungsi. Selepas itu, hasil akan diwakili menggunakan perkataan Kansei yang diperoleh daripada tinjauan soal selidik dan menganalisis data yang diperoleh daripada input pelanggan menggunakan korelasi Pearson. Semua perkataan Kansei yang telah melepasi semua kaedah pengesahan akan diubah menjadi reka bentuk akhir cerek elektrik yang memenuhi keperluan pelanggan. **Kata kunci:** *Kejuruteraan Kansei, kata Kansei, emosi, sentimen, Model Kano*



## ACKNOWLEDGEMENTS

In the Name of Allah, the Most Gracious, the Most Merciful

First and foremost, I would like to thank and praise Allah the Almighty, my Creator, my Sustainer, for everything I received since the beginning of my life. I would like to extend my appreciation to Universiti Teknikal Malaysia Melaka (UTeM) for providing the research platform.

My utmost appreciation goes to my main supervisor, Ts. Dr. Kamarul bin Amir Mohamed for all his support, advice, and inspiration. His constant patience for guiding and providing priceless insights will forever be remembered.

Last but not least, I want to express gratitude to my beloved parents, En. Ramli Bin Din and Pn. Rahmah Binti Daud, for their support and encouragement throughout my life. My everlasting gratitude to all of my siblings for their enduring love, support, and prayers. I would like to express my gratitude to my dear friends for their endless encouragement and help. Finally, I want to express my gratitude. Thank you to everyone who has helped, supported, and inspired me to pursue my studies.

## TABLE OF CONTENTS

	<b>PAGE</b>
<b>DECLARATION</b>	
<b>APPROVAL</b>	
<b>DEDICATION</b>	
<b>ABSTRACT</b>	ii
<b>ABSTRAK</b>	iii
<b>ACKNOWLEDGEMENTS</b>	iv
<b>TABLE OF CONTENTS</b>	v
<b>LIST OF TABLES</b>	viii
<b>LIST OF FIGURES</b>	x
<b>LIST OF SYMBOLS AND ABBREVIATIONS</b>	xiv
<b>LIST OF APPENDICES</b>	xv
<b>CHAPTER 1 INTRODUCTION</b>	<b>1</b>
1.1 Introduction	1
1.2 Background	1
1.3 Problem Statement	4
1.4 Research Objective	5
1.5 Scope of Research	5
1.6 Summary	6
<b>CHAPTER 2 LITERATURE REVIEW</b>	<b>7</b>
2.1 Introduction	7
2.2 Expression and Term in Kansei Engineering Context	7
2.2.1 Kansei	7
2.2.2 Analysis of the word	8
2.2.3 Kansei information processing	8
2.2.4 Introduction of Kansei Engineering	9
2.2.5 Kansei Engineering from A Historical Perspective	10
2.2.6 Basic of Kansei Engineering	10
2.2.7 Methodology of Kansei Engineering	11
2.2.8 Kansei Engineering Method and Different Types of Kansei Engineering	11
2.2.9 Kansei Dimension	15
2.2.10 Methodology of Kansei Engineering	17
2.2.11 Advantages of Kansei Engineering	22

2.2.12	Kansei Product	23
2.3	The Kano Model	23
2.3.1	Kano's model of customer satisfaction	24
2.3.2	Fundamental Kano Model Concept	24
2.3.3	Advantages of Kano Model	25
2.3.4	Application of the Kano Model Analysis	26
2.4	Summary of Literature Review Based on Kansei Engineering (KE)	1
2.5	Summary	1
<b>CHAPTER 3            METHODOLOGY</b>		<b>2</b>
3.1	Introduction	2
3.2	Planning of Study	2
3.3	Phase I Study and Research	5
3.3.1	Study and Research about Kansei Engineering	6
3.3.2	Product Selection	6
3.3.3	Collect Product Sample of Electric Kettle in Current Market	7
3.3.4	Classify the Element of Product /Collect Kansei word	7
3.4	Phase II The Preparation and Calculation stage	8
3.4.1	Construct Questionnaire 1	8
3.4.2	Distribute Questionnaire 1	9
3.4.3	Obtaining Product Information	11
3.4.4	Construct Questionnaire 2	11
3.4.5	Distribute Questionnaire 2 and Analyse Data Collected	12
3.4.6	Standard Deviation and Correlation Evaluation	14
3.4.7	Categorize The Customer Demand	18
3.5	Phase III The Classification and Verification	19
3.5.1	Morphological Chart	19
3.5.2	Sketch The Model	21
3.5.3	Generate New Design	21
3.6	Summary	22
<b>CHAPTER 4            CONCLUSION AND RECOMMENDATIONS</b>		<b>23</b>
4.1	Conclusion	23
4.2	Developing Questionnaire	24
4.2.1	User Requirement for Preliminary Survey	24
4.2.2	User Requirements for Main Survey	25
4.2.3	Design Preference	26
4.3	Results and Analysis for the questionnaire 1 (Preliminary Survey)	27
4.3.1	Section A (Demography)	27
4.3.2	Section B - Product Background	31
4.3.3	Section C (Consumer Perception)	33
4.3.4	Section D (Design Profile)	34
4.3.5	Market analysis	35
4.4	Result and Analysis of the questionnaire 2 (Main survey)	39
4.4.1	Demographic Characteristic	39
4.4.2	Section 2 (Rating Preferences for Design of Electric kettle toward Kansei Word)	45
4.4.3	Section 3 – Kano questionnaire.	65

4.4.4	Identification of Kano Model Attribute	65
4.5	Kano Results	65
4.6	Data Analysis	66
4.6.1	Cs- Coefficient	68
4.6.2	Correlation Analysis	70
4.7	Morphological Chart for Electric Kettle	87
4.8	Design Development	90
4.8.1	Design Concept	90
4.8.2	Selection For Final Design Using the Pugh Matrix	93
4.8.3	3D Prototype	95
4.9	Summary	95
<b>CHAPTER 5 CONCLUSION AND RECOMMENDATIONS</b>		<b>97</b>
5.1	Conclusion	97
5.2	Recommendations	98
<b>REFERENCES</b>		<b>100</b>
<b>APPENDICES</b>		<b>103</b>



## LIST OF TABLES

<b>TABLE</b>	<b>TITLE</b>	<b>PAGE</b>
Table 2.1	The Summary of Literature Review Based on Kansei Engineering (KE)	1
Table 4.1	Analysis of 100 respondents education background	30
Table 4.2	The gender of respondents	40
Table 4.3	The age of respondents	41
Table 4.4	The occupation of respondents	42
Table 4.5	The respondent's price preferences	43
Table 4.6	The respondent's first preferences toward electric kettle	44
Table 4.7	The type of electric kettle's material respondents often used	45
Table 4.8	Result of Kano questionnaire	67
Table 4.9	Result of Kano CS coefficient	69
Table 4.10	Shows the correlation between Kansei's word for Design A.	71
Table 4.11	Shows the correlation between Kansei's word for Design B.	72
Table 4.12	Shows the correlation between Kansei's word for Design C.	73
Table 4.13	Shows the correlation between Kansei's word for Design D.	74
Table 4.14	Shows the correlation between Kansei's word for Design E.	75
Table 4.15	Shows the correlation between Kansei's word for Design F.	76
Table 4.16	The correlation between Kano and Kansei words for product Design A	77
Table 4.17	The correlation between Kano and Kansei words for product Design B	79
Table 4.18	The correlation between Kano and Kansei words for product Design C	81
Table 4.19	The correlation between Kano and Kansei words for product Design D	82
Table 4.20	The correlation between Kano and Kansei words for product Design E	83

Table 4.21 The correlation between Kano and Kansei words for product Design F 85

Table 4.22 The Summary for Kansei or Categorization for Product Design Attribute 86



## LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 1.1	Shows Example of Electric Kettle in the Market	2
Figure 2.1	Shows The Thematic Map of Kansei Information Processing	8
Figure 2.2	Shows The Kansei Engineering System (KES)	9
Figure 2.3	Shows The Principle of Kansei Engineering (KE)	12
Figure 2.4	Shows The Example Proposed Model For Case Study	20
Figure 2.5	Kano's model of customer satisfaction	24
Figure 3.1	Framework of study	4
Figure 3.2	Shows the Framework of Product Development in Phase I	5
Figure 3.3	Shows Framework of Product Development	8
Figure 3.4	Introduction	10
Figure 3.5	Section A (Basic Information)	10
Figure 3.6	Section B (Main Question for Product Prefer)	10
Figure 3.7	Example of 7-grade SD serial numbers	11
Figure 3.8	Example Questionnaire 2 survey	12
Figure 3.9	Kano Model Diagram	12
Figure 3.10	Framework of the products classification method	14
Figure 3.11	Data collected from questionnaire 2 in excel format.	17
Figure 3.12	Example input data for variable view in SPSS statistic software	17
Figure 3.13	Example input data for data view in SPSS statistic software	18
Figure 3.14	All input need for data analysis	18
Figure 3.15	Framework of product development in Phase III	19

Figure 3.16 Example of Morphological Chart for a Chair	20
Figure 4.1 Electric kettle design in current market	26
Figure 4.2 Analysis gender of 100 respondents	27
Figure 4.3 Analysis age of 100 respondents	28
Figure 4.4 Analysis race of 100 respondents	28
Figure 4.5 Occupation background analysis of 100 respondents	29
Figure 4.6 Education background analysis of 100 respondents	30
Figure 4.7 The income classification of 100 respondents	31
Figure 4.8 The number of electric kettle own by 100 respondents in their house	31
Figure 4.9 The price preferences on electric kettle from 100 respondents	32
Figure 4.10 The basic electric kettle's style preferences from 100 respondents	32
Figure 4.11 100 respondents priority purchase decision	33
Figure 4.12 The condition of the electric kettle that attract respondents to buy	34
Figure 4.13 Analysis of five Kansei words that represent customer	35
Figure 4.14 Analysis of electric kettle that most customer prefer for Design A	36
Figure 4.15 Analysis of electric kettle that most customer prefer for Design B	36
Figure 4.16 Analysis of electric kettle that most customer prefer for Design C	37
Figure 4.17 Analysis of electric kettle that most customer prefer for Design D	37
Figure 4.18 Analysis of electric kettle that most customer prefer for Design E	38
Figure 4.19 Analysis of electric kettle that most customer prefer for Design F	38
Figure 4.20 Six samples of electric kettle design respondents preferred	39
Figure 4.21 Gender analysis of 100 respondents	40
Figure 4.22 Analysis age of 100 respondents	40
Figure 4.23 Analysis Occupation of 100 respondents	41



Figure 4.24	Analysis on 100 respondents Price preferences	42
Figure 4.25	Analysis on 100 respondents's first preferences	43
Figure 4.26	Analysis on the type of electric kettle material of	44
Figure 4.27	Rating for safety features for Product A	45
Figure 4.28	Rating for lightweight features for Product A	46
Figure 4.29	Rating for durable features for Product A	47
Figure 4.30	Rating for Modern and Stylish features for Product A	47
Figure 4.31	Rating for simple for Product A	48
Figure 4.32	Safety for Product B	49
Figure 4.33	Lightweight for Product B	49
Figure 4.34	Durable for Product B	50
Figure 4.35	Modern and stylish for Product B	51
Figure 4.36	Simple for Product B	51
Figure 4.37	Safety rating for Product C	52
Figure 4.38	Lightweight rating for Product C	53
Figure 4.39	Durable rating for Product C	53
Figure 4.40	Modern and Stylish rating for Product C	54
Figure 4.41	Simple rating for Product C	55
Figure 4.42	Safe rating for Product D	55
Figure 4.43	Lightweight rating for Product D	56
Figure 4.44	Durable rating for Product D	57
Figure 4.45	Modern and Stylish rating for Product D	57
Figure 4.46	Simple rating for Product D	58
Figure 4.47	Safe rating for Product E	59

Figure 4.48	Lightweight rating for Product E	59
Figure 4.49	Durable rating for Product E	60
Figure 4.50	Modern and Stylish rating for Product E	61
Figure 4.51	Simple rating for Product E	61
Figure 4.52	Safe rating for Product F	62
Figure 4.53	Lightweight rating for Product F	63
Figure 4.54	Durable rating for Product F	63
Figure 4.55	Modern and Stylish rating for Product F	64
Figure 4.56	Simple rating for Product F	65
Figure 4.57	Kano category obtain from main questionnaire survey data	66
Figure 4.58	The electric kettle Design A	71
Figure 4.59	The electric kettle Design B	72
Figure 4.60	The electric kettle Design C	73
Figure 4.61	Electric kettle Design D	74
Figure 4.62	The electric kettle Design E	75
Figure 4.63	The electric kettle for Design F	76
Figure 4.64	The Summary for Functional and dysfunctional correlation	87
Figure 4.65	The Morphological Chart for electric kettle	89
Figure 4.66	Design Concept 1	91
Figure 4.67	Design Concept 2	92
Figure 4.68	Design Concept 3	93
Figure 4.69	The Final Design Selection using the Pugh Matrix Approach	94
Figure 4.70	Rendering image of the final design of electric kettle	95

## LIST OF SYMBOLS AND ABBREVIATIONS

KE	-	Kansei Engineering
NPD	-	New Product Development



## LIST OF APPENDICES

APPENDIX	TITLE	PAGE
APPENDIX A	Gantt Chart	103
APPENDIX B	Preliminary Survey	104
APPENDIX C	Main Survey	114
APPENDIX D	Correlations	122
APPENDIX E	Hand Sketching for Idea Design Concepts	126
APPENDIX F	Engineering Drawing of the Final Design	129
APPENDIX G	BDP Thesis Status Verification	133
APPENDIX H	Tumitin Result	134



# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

This chapter will provide the introduction of the Kansei Engineering and product design selected. In addition, it also provides an overview of the project's background such as problem statement, objectives and also the scope of the study as a guidance and to restrict the ranges of this project conduct, the problem statement and the scope of research have been clarified to avoid deviating from the main focus also the project's goal.

### 1.2 Background

Before the company knew how to gain client sense of satisfaction a few years ago, most designers usually perform their own conceptual design. Unfortunately, the design does not receive widespread approval in the marketplace. Furthermore, product designers are having difficulty getting a better understanding of users' specific sentiments (Lokman, 2010). When seeking for new opportunities and markets, change is an inevitable reality that product development teams must embrace in order to keep their products relevant and competitive. Indeed, one can observe many examples on the market of products and their constituent features evolving over time. This is done not just to satisfy needs and requirements, but also to accommodate different consumers' perceptions and emotions, which may vary based on their respective markets. As product lifecycles shorten, it becomes imperative to consider change strategies and product evolution in order to supply essential product capabilities to targeted markets at specific times (Simeone et al., 2019).

Since consumers' sentiments are more difficult to measure compared to demands, which are easier to explain. Kansei engineering is used as a method for identifying

customers' feelings and impressions about a product. Kansei with the engineering realms to penetrate people's Kansei into product design so that the products can trigger emotional responses and satisfy users. The appeal of Kansei Engineering is that it presents a systematic way of collecting and understanding people's feelings and perspectives toward certain products through a series of physiological and psychological measurement and scientific methods (Schütte et al., 2004). This Kansei method is very useful as understanding and integrating the voice of customer have become an indispensable part in new product development (NPD) process. Nowadays, companies focusing only on functionality and usability may not gain competitive advantages because consumers buy products not only for basic function and usability, but also for product's emotional aspect. In this respect, Kansei Engineering (KE) has been developed to help designers to link between consumers' emotional response and design properties of a product. KE identifies the relational rules between design elements of products and uncertain human sense and feeling. KE can be used to extract decision rules between consumer feelings (Kansei) and product (Akgul et al., 2017).

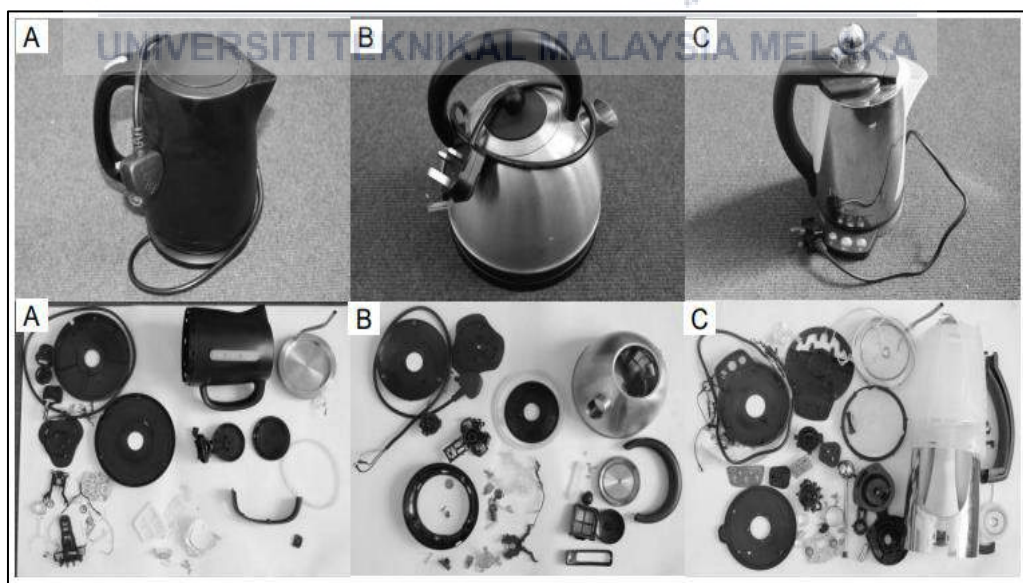


Figure 1.1 Shows Example of Electric Kettle in the Market (Gallego-Schmid et al., 2018)

An electric kettle is a water heating appliance with a self-contained heating unit that shut off when the water reaches boiling point or a predetermined temperature below 100°C. It contrasts to the stove top kettle, which is less energy efficient and takes longer to boil the same volume of water as the electric kettle (D. M. Murray et al., 2016). Water boiling kettles are used in our everyday lives. They are popular tools for boiling water and are very easy to use. Kettles today, with the help of modern technology, can boil water within. However, electric kettle design has remained fairly static for many years. This is partly due to the heating element contained in many kettles being as optimised as it can be within reasonable constraints. In order to attract clients, the market for household appliances has recently evolved and vendors. There are beginning to label their products as "smart." These appliances frequently include additional features such as improved quality of life, faster operation, and more preprogrammed settings. This has not, however, affected the main body of the kettle and is often located on the baseplate that is used in wireless kettles. Kettle design has also trended towards producing larger kettles in terms of volume. For example, modern kettles are holding upwards of 1.5 litres, and in some cases, as much as 2 litres which can lead to even more water being wasted by those who habitually overfill (D. Murray et al., 2015). Based on previous research, there are so many design of electric kettle in the market nowadays. However, not all designs are successful in achieving consumer expectations and satisfaction. So, for this study and research, the new electric kettle design will be designed utilising the Kansei Engineering approach based on customer expectations, emotions, and feelings. Consumers will be able to get the benefit from this study and research as this study and research will allow consumers to express their thoughts and expectations about their own product design.

### 1.3 Problem Statement

Companies must locate the best design product for their customers. Companies should allow users to choose their own desired aspects to include in the design of the electric kettle. This objective may be met by incorporating Kansei engineering into the product development process. Kansei Engineering is a constructive product development approach that translates consumer perceptions, feelings, and demands about existing products or concepts into design solutions and specific design parameters. This approach may break down a targeted product concept into a more detailed concept and is then expanded to several levels and interpreted in terms of the product design's physical characteristics. As nowadays, electric kettles are one of the most important appliances to have in house. The electric kettle ownership and thus kettle load demand is also growing worldwide. Users are constantly looking for an electric kettle that will meet and satisfy their requirements, but sometimes the product sold in the market may fail to fulfill their expectations because of some problem or issues such as:

- The improper product development technique used by company and might cause the buyer upset and unsatisfied with their purchased. This is partly due to the certain element contained in kettles being as optimised as it can be within reasonable limits (Kumar, 2014).
- Most companies produce product's designs based on their own preferences, without considering the emotions and expectations of their customers which may result in the product launch not being supported by users since it does not meet their expectations (Kumar, 2014).
- Most designer focused on function and sometimes the product's design produced do not consider the safety of the user, which may harm the consumer (Norris & Wilson, 1997).