



**THE DEVELOPMENT OF MODERN BATIK PRODUCTION  
TECHNIQUE USING CNC TO ENHANCE BATIK CANTING PROCESS**

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

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## APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of Universiti Teknikal Malaysia Melaka as a partial fulfilment of the requirement for Degree of Manufacturing Engineering (Hons). The member of the supervisory committee is as follow:



## ABSTRAK

Industri batik di Malaysia pada masa kini menggunakan teknik pengeluaran batik canting. Teknik ini digunakan untuk menghasilkan produk batik yang mempunyai pelbagai motif batik. Namun, motif batik yang dihasilkan dalam industri batik di Malaysia tidak mempunyai identiti yang unik. Teknik pengeluaran batik canting juga mengambil masa yang lama dan mempunyai kapasiti pengeluaran yang kecil. Bagi menyelesaikan masalah tersebut, kajian ini dilakukan untuk memperkenalkan teknik produksi batik canting moden bagi meningkatkan pengeluaran batik canting. Pertama sekali, motif batik yang mengikut pilihan warganegara Malaysia diperoleh dengan menggunakan teknik Kansei Engineering (KE). 20 perkataan Kansei dipilih dan dimasukkan dalam penghasilan soal selidik dan diedarkan kepada 120 responden dari pelbagai negeri di Malaysia. Tujuan soal selidik ini adalah untuk mendapatkan pendapat responden yang berkaitan dengan perkataan Kansei terhadap motif batik. Data yang dikumpulkan dari soal selidik dianalisis menggunakan kaedah Kansei Engineering dengan bantuan perisian SPSS untuk menentukan atribut dan kriteria motif batik Malaysia. Hasil kebolehpercayaan dan kesahan menunjukkan bahawa data soal selidik adalah sah dan boleh dipercayai. Hasil analisis faktor menyimpulkan bahawa Motif 2 dipilih sebagai motif batik paling afektif yang dipilih oleh responden. Data daripada analisis menggunakan perisian SPSS digunakan untuk menghasilkan motif batik Malaysia iaitu Motif 2 dengan menggunakan perisian CAD. Setelah menghasilkan motif batik dengan menggunakan perisian CAD, G-code dijana dari motif batik yang dihasilkan untuk mencadangkan teknik pengeluaran batik moden. Teknik pengeluaran batik canting moden diharapkan dapat meningkatkan pengeluaran batik canting dalam industri batik di Malaysia.

## ABSTRACT

Batik industry in Malaysia currently using batik canting production technique. The technique is used to produce batik products that has various batik pattern. However, the batik pattern that are produced in the batik industry in Malaysia has no unique identity. The batik canting production technique is also time consuming and has small capacity of production. In order to solve the problems, this research is carried out to propose modern batik canting production technique to improve the batik canting production. First, batik pattern that satisfy the preferences of Malaysia citizens is obtained by using Kansei Engineering (KE). 20 Kansei words is selected and included in the development of questionnaire to be distributed to 120 respondents from various state in Malaysia. The purpose of this questionnaire is to obtain the preferences of respondents related to the Kansei words towards the batik pattern. The data gathered from the questionnaire is analyzed using Kansei Engineering method by the aid of SPSS software to determine the attributes and criteria of the Malaysian batik pattern. The reliability and validity results show that the data of the questionnaire is valid and reliable. The results from factor analysis conclude that Design 2 is chosen as the most affective batik design chosen by the respondents. The data from the analysis using SPSS software is utilized to design the Malaysian batik pattern which is Design 2 by using CAD software. After designing process of the batik pattern by using CAD software, G-code is generated from the design to propose the modern batik canting production process. The proposed modern batik canting production technique is expected to improve the batik canting production in the batik industry in Malaysia.

## DEDICATION

For my parents,

Mohd Noor bin Ariffin and Noorriza binti Kassim,

Thank you for your moral support, understanding, encouragement.

To all my friends who always help me during the process of this study,

Thank you very much for your unconditional support.

May Allah ease everything until the end.

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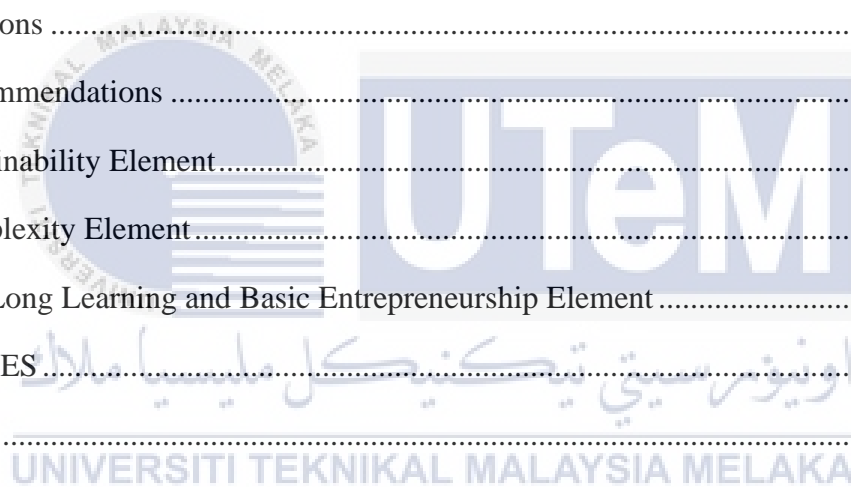
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## LIST OF ABBREVIATIONS

CAD - Computer Aided Drawing

CNC - Computer Numerical Control

EFA - Exploratory Factor Analysis

KE - Kansei Engineering

SD - Semantic Differential

SPM - Sijil Pelajaran Malaysia

SPSS - Statistical Package for the Social Sciences



# CHAPTER 1



## 1.1 Background

In Javanese, "Batik" means "drawing." It is derived from the word "tik," that means dripping or writing points. It is also derived from the word "Ambatik," that is defined as "a cloth with several tiny dots" (Madzar et al., 2014). In other words, batik is an art which are produced using wax on a piece of cloth using several techniques and countless eye-catching design. Batik has been one of the historical arts and local tradition in Malaysia for quite a long time. Generally, batik is produced into 'kain sarong' in the former times. Nowadays, various products such as clothes, scarves, handkerchiefs, women accessories are produced using batik.

In Malaysia, batik industry is mostly found in Kelantan and Terengganu. Batik industry has grown from small scale industry into a valuable textile industry and becomes the heritage of Malaysia. Batik design has traditionally been created in the past using batik block techniques, batik screen techniques and batik canting techniques that demonstrate impressive look on fabric (Samin et al., 2018). These batik production techniques have been practiced by local artisan for a long time and has produced outstanding design on batik products.



Kansei Engineering (KE) was adapted in this research to obtain the most suitable batik design to be manipulated. According to Lokman (2010), KE is a platform that integrates Kansei with engineering disciplines in order to achieve products that satisfy the needs and preferences of customers. The utilization of KE in product design has been done by numerous previous researches. Study conducted by Razza & Carlos (2015) analyzed the affective attributes of disposable razors and how customers respond to product characteristics through KE. Meanwhile, Mouta et al. (2017) conducted a study on the application of Kansei technique as a tool to determine the physical interpretation of rubber keypads.

There is numerous previous research that conduct study on modernizing the batik production techniques. These studies mostly designing automated batik machine that implementing Computer Numerical Control (CNC) system approach. These studies focus mainly on improving the batik production techniques in various aspects. Fauzan et al. (2019) conducted a research on the development of CNC-based batik plotter machine to prevent the scarcity of batik artisan and produce high quality batik in much shorter time. Meanwhile, a research conducted by Sudiarso (2018) focus on implementing a batik machine using CNC application to increase batik production capacity that can meet batik rising demands nowadays. Furthermore, Wibisono et al. (2016) conducted a research with the objective to develop stamped batik design software, along with the steps involved and data that further used to implement batik design on moving module machines.

## **1.2 Problem Statement**

Batik industry in Malaysia generally has some challenges that need to be overcome to improve the batik production process. The challenges that faced by the batik industry has been an issue for the batik industry and it has affected the overall production of batik in Malaysia.


The batik pattern in Malaysia has its own identities in illustrating Malaysian cultures for a long time. However, nowadays these pattern no longer represent traditional designs and signatures since experiencing transformation (Kari et al., 2018). In short, modern batik pattern has no unique identity in Malaysia. Therefore, this research has come up with a solution in

implementing Kansei Engineering to determine batik pattern that represents the affective aspects of Malaysia citizens towards batik pattern.

The traditional batik production technique is time consuming and cannot accommodate large production capacity because it is produced manually by batik artisan (Hanif et al., 2017). This problem causing traditional batik production to have an issue to meet demands of batik products that increasing rapidly these days with the decreasing amount of batik artisan. Therefore, this study is conducted to develop a modern batik canting production technique using CNC system to improve batik canting production capacity and to reduce batik canting production time.

### 1.3 Objectives

The main objective of the research is to propose modern batik canting production technique. To realize the main objective of the research, there are some objectives of this research:

- 
- a) To investigate the design of batik that influence human affective using Kansei Engineering.
  - b) To transform the batik pattern in a CAD software.
  - c) To propose modern batik canting production technique using CAD software for generating G-code.

### 1.4 Research Scope

This study is conducted to improve the batik canting production industry in Malaysia. The research is limited to batik industry in Malaysia. The application of CNC system is applied to the modern batik canting production technique to discover alternative to the traditional batik

canting production techniques. The concept of the modern batik production technique is adapted from the traditional batik canting technique.

Kansei Engineering (KE) method is used to determine the pattern of batik based on the users' emotional and psychological aspects. This research uses 20 Kansei words in the Kansei data collection process. The data collected is limited to the Malaysia citizens. Data is collected by the distribution of a set of questions to respondents. The data is analyzed using statistical analysis software to determine the design of batik that influence human affective.

The batik pattern obtained from Kansei data analysis is sketched into digital platform using CAD software. The pattern of the batik is limited to the data from KE method. CAD software is used in the process to propose the modernized batik canting production technique. The modern batik canting production technique is limited to the application of CNC system only.

This study is limited to the generation of CNC system in the batik canting production to be used in CNC batik machine. The development of batik machine design is not discussed in this study. The regulations of temperature, feed rate and materials are also the limitation of this study.

### **1.5 Summary**

This chapter presents the background and objectives that is based on the research problems. The study focused on the use of Kansei Engineering to identify Malaysian affection/emotion towards batik pattern. This will be the basis for the present study to develop a G-code in enhancing the batik canting production.

## CHAPTER 2

### LITERATURE REVIEW



#### 2.1 Introduction

This chapter will briefly discuss the literature review of the research. Literature review is a review on previous research for references that are obtained from articles, journals, books and thesis project that are related to the project research.

The topics that will be covered in this chapter are the batik production and pattern that available in Malaysia. The differences of various kinds of batik pattern in Malaysia will be determined. Apart from that, better understanding of Kansei Engineering and its application will be achieved in this chapter. Kansei Engineering method will be used to get user's emotion towards batik pattern. Moreover, the application of CNC in batik industry from previous research also will be discussed in this literature review.

## 2.2 Batik Production

Batik is a technique of producing art pattern by applying wax on whole cloth. The pattern that known as motif has various design depending on the creativity of the artisan and the local culture. In the early period, batik was traditionally produced using three types of technique which is batik block, batik canting and batik screen. Meanwhile, in modern days, a new type of batik production is introduced to improve the batik process which is batik printing.

### 2.2.1 Traditional Technique

In Malaysia, the first batik technique that has been introduced to local artisan was batik cap. Batik cap also known as batik block is one of the famous traditional handicraft arts in Malaysia. The early process of batik cap is using wood block carving by applying black dyes and this initial method is known as ‘terap hitam’ as shown in Figure 2.1. Batik producers on the East Coast first introduced the use of wax in the application process. After some time, the wood block is then replaced with harder copper or steel-based block to improve the process. The pattern made from this copper and steel-based block are neater and more delicate. However, batik cap requires high craftsmanship skills of creating the copper or steel-based block (Lias et al., 2020).



Figure 2.1: Batik copper block (Lias et al., 2020)

Then, in early 1900s, batik screen was introduced. Batik screen technique can produce batik in a shorter time and mostly found in Terengganu and Kelantan. Batik screen uses cotton

yarn fabric and is used to make batik sarung. Batik screen is made using block screen that are designed based on the desired pattern. Each block screen can only print one colour and the number of blocks prepared depends on the number of colours as shown in Figure 2.2. The process of preparing the block screen manually starts with photographing the design. Next, the film is washed. To colour is isolated by cutting and pasting the film on plastic. It is then exposed to light on a filtered silk cloth that is stretched over the frame and photo emulsion is smeared on it. The block screen is then cleaned to produce the design. The block screen that has been prepared is used to print the fabric with the desired dye on the screen table. The printed fabric is dried and the colour can stabilize before being washed and dried again. The fabric printing can be repeated several times depending on the desired number of colours (Samin et al., 2018).



Figure 2.2: Batik screen technique (retrieved from <https://www.noorarfa.com/types-of-batik/>)

Batik canting was established in 1960s and started in Kelantan and Terengganu. This technique uses the canting tools that has spouts of various width. The canting is a copper vessel that look like a bowl of pipe that has thin wall, small and spouted. It is usually joined with a short bamboo or reed handle and typically length about eleven centimetres. Artisan draws the batik pattern on a piece of white cloth using the wax that flows down from the canting that has the small and descending curve spouts (see Figure 2.3). To achieve different outcome with perfection, different number of spouts, widths and endings in the canting is used. Batik canting technique requires highly skilled artisan to produce a nice and neat batik pattern. Artisan generally spent



a long period of time to master this technique and became experienced. The pattern of the batik using batik canting is versatile and only limited by the creativity of the artisan. However, producing batik using batik canting technique is a high time-consuming process. The process of batik canting takes a long time, even for weeks, even months if the design of the pattern is difficult and the selling price is relatively expensive (Nurainun & Rasyimah, 2008). Normally, batik canting only made based on customers' orders.



Figure 2.3: Batik canting technique (Retrieved from <http://demasterbatik.blogspot.com/2014/12/proses-proses-penghasilan-batik.html>)

### 2.2.2 Modern Technique

In the modern era where technology is advancing at an unprecedented rate, new type of batik production emerged which is batik printing. This batik is produced using high technological machines compared to hand drawn traditional technique. If the hand drawn batik technique of production takes a long time to complete one batik cloth, the batik printing technique can produce tens or even hundreds of batik in a day. Batik printing also can be made of various design and colour. The design and pattern also can be duplicated and suitable to manufacture in large scale. Moreover, the selling price of batik printing is cheaper compared to

traditional batik due to the simpler process of batik printing. However, the production of batik printing has been questioned by batik artisan. It is because batik printing seems to demolish the original art of traditional batik production. The process of making batik using batik printing does not contain the original characteristics of traditional batik which is batik printing process does not use wax and the batik printing products only have one side of design on the cloth. The absent of historical value of batik printing products make the batik cheaper and does not have aesthetic value. The quality of batik printing product is not as good as traditional batik as the colour of the batik is easily fade. Some artisan call batik printing as a cloth with batik pattern because batik printing is not the same as the traditional batik.

### **2.3 Challenges of batik production in Malaysia**

The popularity of batik in Malaysia has grown both locally and abroad. Tourist from other nations come to Malaysia and amazed by the beauty of art that exist in the batik itself. However, the popularity of batik also attracts the attentiveness from producers in other countries such as Vietnam and China that they started to simulate the pattern of batik that are made by our local artisan (Nordin et al., 2012). The imitation from other producers negatively impacted our local producers as the price of batik from other producers are generally lower than local producers. Despite having a more quality batik produced by local producers, the mimic batik produced by foreign producers has given a stiff competition to local producers thus affecting their sales and income.

Foreign batik producers use the batik printing technique to produce batik that imitates the design from local producers. The use of printing process has intimidated the production of local batik as the printing does not maintain the historical aspects of the original batik. Malaysian batik producers now facing major issues of protecting traditional design and production technique. If the traditional technique is not conserved properly, batik maybe will be facing extinction and will be a big loss to our country.

Majority of batik production in Malaysia nowadays use batik canting to produce their batik products. However, due to increasing demand, local batik producers facing difficulties to accommodate massive quantities of orders particularly uniform of government and corporate