ANALYSING THE WORKING PROCESS BETWEEN DESIGNERS AND CARPENTERS IN THE FURNITURE INDUSTRY AT BATU PAHAT, JOHOR, MALAYSIA

By

NURUL FADILAH AZWANIE BINTI AFENDI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

June 2022

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DEDICATION

Special dedication to:

*This research work is dedicated to my beloved late father **Afendi Bin Adam** and my beloved mother **Alija Binti Jailani** also to all my siblings for their excellence encouragement, compassion, guidance and constant prayers during the course of my study.*

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

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June 2022

Chairman : Associate Professor Ts Mohd Shahrizal bin Dolah, PhD
Faculty : Design And Architecture

The collaboration between designers and carpenters in furniture industries at Batu Pahat, Johor need to be improve in order to have a good quality of work during manufacturing process. From the researcher working experience as designer in furniture company at Batu Pahat, Johor, there is a need to study the working process understanding between designers and carpenter to improve design collaboration technique during manufacturing process. Each of designer and carpenter need to know their own task to maintain their quality of work during manufacturing process. The purpose of this study is to analyse the working process between designer and carpenter in the furniture industries. This analysis is to improving the design collaboration between designer and carpenter. This study adopted a mixed- method approach. The first Delphi approach is applied in this study because it only used a few designer and carpenter from the two furniture company at Batu Pahat, Johor. The qualitative approach that applying observation and case study method is to analyse the design process that use during manufacturing process. This study revealed the differentiation of design process between designer and carpenter. This study developed a list of design process that adopted from furniture design process for a guidance to designer and carpenter during manufacturing process. A product data form(PDF) was develop by adopting Bill Of Material (BOM). The furniture company will used this PDF for saving their product data in order. This PDF also used as a guidance to designer in order understand carpenter language easily. It can be summarized that the list of design process is needed in furniture company. This design process will used as a guidance to have a better understanding of working task for each designer and carpenter. The PDF contributes to the furniture company as a standard guidance for the designer to understand carpenter language in the future.

Abstak tesis yang dikemukakan kepada Senat University Putra Malaysia sebagai memenuhi keperluan Ijazah Sarjana Sains

ANALISIS PROSES KERJA ANTARA PEREKA DAN TUKANG KAYU DALAM INDUSTRI PERABOT DI BATU PAHAT, JOHOR, MALAYSIA

Oleh

NURUL FADILAH AZWANIE BINTI AFENDI

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Pengerusi : Profesor Madya Ts Mohd Shahrizal bin Dolah, PhD
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Kerjasama antara pereka dan tukang kayu di dalam industri perabot di Batu Pahat, Johor perlu dipertingkatkan untuk mendapatkan kualiti kerja yang lebih baik semasa proses pembuatan. Melalui pengalaman bekerja pengkaji sebagai seorang pereka di kilang perabot di Batu Pahat, Johor, terdapat keperluan untuk mengkaji pemahaman terhadap proses kerja di antara pereka dan tukang kayu bagi menambah baik kerjasama antara mereka semasa proses pembuatan. Pereka dan tukang kayu perlu mengetahui setiap tugas mereka untuk mengekalkan kualiti kerja mereka semasa proses pembuatan. Kajian ini bertujuan untuk mengenalpasti proses kerja di antara pereka dan tukang kayu di dalam industri perkilangan perabot. Senarai proses kerja ini adalah untuk menambah baik kerjasama antara pereka dan tukang kayu. Kajian ini menggunakan pendekatan kaedah campuran. Kaedah Delphi digunakan di dalam kajian ini kerana kajian ini hanya melibatkan beberapa pereka serta tukang kayu daripada dua syarikat perabot di Batu Pahat, Johor. Pendekatan kualitatif mengaplikasikan kaedah pemerhatian dan kajian kes digunakan untuk mengenalpasti serta menganalisis proses rekabentuk yang digunakan semasa proses pembuatan di kilang perabot yang dipilih. Kajian ini mengenalpasti perbezaan proses reka bentuk yang digunakan oleh pereka dan tukang kayu. Satu senarai proses rekabentuk yang mengadaptasi proses rekabentuk perabot dibangunkan sebagai panduan kepada pereka dan tukang kayu untuk memahami proses kerja semasa proses pembuatan perabot. Borang data produk(PDF) yang mengadaptasi senarai bahan (BOM) direka untuk kegunaan syarikat perabot bagi menyimpan data produk mereka secara lebih teratur. Borang data produk(PDF) akan digunakan oleh syarikat perabot sebagai panduan kepada pereka bentuk di syarikat perabot untuk memahami bahasa tukang kayu pada masa akan datang.

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Special thanks to my friends and the post graduate administration and the staff from Industrial Design Department at Faculty Design and Architecture, Universiti Putra Malaysia. My research work could not have been accomplished without their support and help.

Thank you ,
Nurul Fadilah Azwanie Binti Afendi

This thesis was submitted to Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of Supervisory Committee were as follow:

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Date: 11 January 2024

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LIST OF ABBREVIATIONS

UPM	Universiti Putra Malaysia
FRSB	Faculty Of Design And Architecture
RO 1	Research Objective 1
RO 2	Research Objective 2
RQ 1	Research Question 1
RQ2	Research Question 2
SI	International System Of Unit
MM	Millimetre
CAD	Computer Aided Design
BOM	Bill Of Material
ISO	International For Standardization
PDF	Product Data Form
AI	Assembly Instruction
MCO	Movement Control Order

CHAPTER 1

INTRODUCTION

1.1 Background Of The Study

A good collaboration between employees in the workplace is very important especially in the manufacturing sector. To date, there are no study regarding work collaboration between designer and carpenter in furniture industry. Most researcher focussing into other topic such as design method, ergonomic, emotion etc. In order to have a good collaboration, working process plays a very important role. Nowadays, there's so many workers cannot create a good collaboration between other co-worker in their workplace especially in furniture factory. In furniture factory they need to apply design process in their working process. Design process playing important roles in furniture manufacturing.

In a furniture company, they have a team that worked together to make sure the production run smoothly. In this team, they have designer and carpenter that need to collaborate during working process. The designer was the person who in charged in designing the product for the company and the carpenter was the person who fabricated the design into the actual product. Most of the furniture company hiring a designer that have a higher educational background such as diploma or degree in design while the carpenters are the person who work in the company based on self-taught from their long working experience. Most carpenters were non-design background. From this two differences background, they always have an argument between designer and carpenter during working and prototyping process.

The differences of opinion in the design process between carpenters and designers have always become a problem in their work that can affected the manufacturing process.

In Furniture company, they need to have a collaboration between designer and carpenter during manufacturing process. The differences in the level of education between designer and carpenter is one of the reasons for conflict during manufacturing process. The differences of working process between designers and carpenters were always slowing down the manufacturing process. This problem happened because of the gap and differences level of knowledge between designer and carpenter.

Applying good knowledge in working field is very important for a furniture company in order for a company to achieve company production demand. The company must identify their workers knowledge in order to classify them into each department to make sure the production will run smoothly according to the worker abilities. The limitation of knowledge among carpenters was the problem in design process. Most of the carpenter in a furniture factory have their own style during working process and they demanded to do their task using their own working style.

Knowledge is something that we gained through study in school. From the school, they get to know the actual design process during working. Most of the carpenter in furniture companies were the person that work using experience they get from a long working period. Most of the carpenter in the furniture manufacturing field don't have basic design process knowledge. Most of the carpenter in furniture industries was a person who worked based on the tacit knowledge. According to Gourlay(2002) tacit knowledge is a non-linguistic non-numerical form of knowledge that is highly personal and contact specific and deeply rooted in individual experiences, ideas, values and emotions. Therefore, tacit knowledge can be concluded as a knowledge that be gained by a person through the long experience. Most of the carpenter that work in furniture industry are the worker that work based on the experience they gained over the year. Most of them have to worked without pursuing to higher education. In contrast with designer, who work after graduated, they work based on the knowledge that they gained from their school of taught.

The problem occurred while designer and carpenter need to be collaborated during working in the production line. They need to work together in order to produce a product for the company. During the design process, there were always be disagreements and argument between designer and carpenter due to differences of understanding among them. Figure 1.1 show one of the data that save by the carpenter on a piece of wood that cannot be understood by others person other than the carpenter itself.

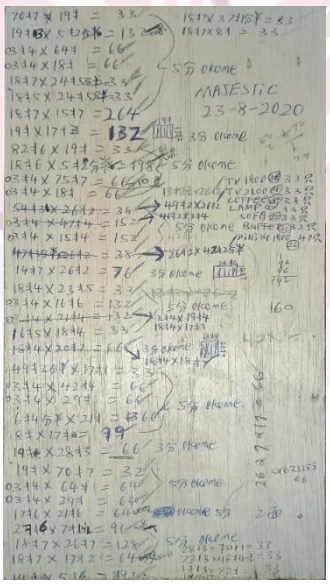

Figure 1.1 : A documentation of measurement data of product from carpenter
(Source : Author, 2020)

In this study, the researcher has identified the problems that occur during collaboration between designer and carpenter through design process based on their educational background and their knowledge.

The researcher has identified and classified the design process that use during furniture manufacturing process. This study identified the suitable design process that could be used in furniture manufacturing process in order to overcome the problem during design collaboration between designer and carpenter.

1.1.1 My past and present experience in working area

I graduate from University Putra Malaysia with a Bachelor in industrial design in 2016. Before that, I have been graduated from Polytechnic Ibrahim Sultan with a diploma in industrial design in 2011. Before continuing my study to bachelor, I worked as drafter in a company that base in interior design field. My job description is to do production drawing for furniture that customer request. This task needs me to deal with carpenter that fabricated the furniture. The designer provided me design and dimensions for each part of the furniture and I drawn the technical drawing and sent it to the production to do it. The problem was, all the dimension done using SI Unit (international system of unit) which is using (mm) as a unit. But the carpenter, they always argue and want it in others unit which is inch and hun[1]. So, to make them understand my technical drawing, the researcher need to change the dimension into inch and hun.

After graduated from her degree, The researcher started her career as a designer in Mixbox Furniture Sdn. Bhd. This company is company who based on furniture making. The researcher job scope in this company was to preparing Computer Aided Design(CAD) 3D drawing, technical drawing for production, assembly instruction drawing for customer, bill of material (BOM) drawing and graphic design such as catalogue, poster, billboard and templet.

In this company, they not applying the basic of design process during designing a product. They follow customer needs and jump directly by producing product sample/prototype. So I need to follow up with the carpenter in order to get the design measurement and rough sketch to convert the drawing into 3 dimensional drawing. All the task needs me to deal with carpenter that will do the sample product. Thus, from my experience working in these two furniture companies, they have similarities in their working process. Besides that, they also facing the same problem. The problem that they're facing was the difficulty of forming collaborations between designers and carpenters. This problem was identified because there was a poor communication between the designer and the carpenter.

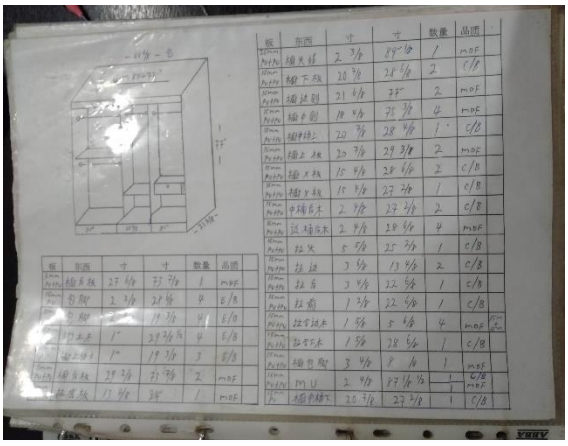

Figure 1.2 : A documentation of measurement data for product from carpenter
(Source : Author, 2020)

Figure 1.2 show the way this carpenter in the company kept their product data measurement. From the figure, only the carpenter could understood the data. Thus, when the data were given to the designer, the designer need to translate the data into the form that everyone can read and understand. In order to translate the data, designer need to do a lot of work with language, the measurement unit, the drawing and the comparison table. From all the problem that identified, I construct my research interest to study on how to improve a collaboration between designer and carpenter. From the construct, it will be analysed the knowledge gap that have between designer and carpenter during working process and find out how to bridging the gap.

1.2 Problem Statement

There has been explored by many workers that work as a designer in furniture manufacturing factory that there has a problem to communicate with others worker (craft man or carpenter) during the design process until manufacturing process of a furniture. This problem occurs because of differences in opinion during the design process. There is a lot of problem occurs between designer and carpenter. One of the requirements to be hired as designer in a company is someone who has been graduated from university which is they need to have at least diploma or degree. While most of the carpenter that work in furniture factory is someone who work based on their experience. Most of the carpenter, they start to work from base basic process before become someone trusted in the company.

Other than that, some company hiring and trained the foreign worker to become carpenter in their company. The carpenter was usually the person that come from non-design base background. So, from these two differences of educational background, there are differences of opinion and ways of working between them. During the working process, the designer implemented their knowledge from what they study in university and applied it during work while most of the carpenter use their experience who has been work for ages and do their task based on their experiences. There always have a problem in term of communication and giving opinion while they collaborate during design

process. This problem has slowing down the work and effected the manufacturing process. The main problem that can be seen from these differences is their knowledge during process of design. The designer has their own design process while the carpenter used their own design process during working process. This factor revealed that, problem that occur because of the knowledge gap.

So, there is a need to study of working process understanding between designer and carpenter carpenters during design process in order to improve the manufacturing process in furniture factory. There are a need to form a collaboration and to find the triangulation in the design process between designer and carpenter.

The problem statement has been state from the working experience of the researcher in point 1.1.1. Researcher has experience working as a designer in two furniture company at Batu Pahat, Johor. This two company facing a similar problem which is :

1. Communication problems between designer and carpenter that occur cause by misunderstandings during the work process.

2. There is no specific design collaboration guide that can be followed during design process.

This similar problem occurs in this two furniture factories that researcher have work before and it slow down the process of manufacturing. The limitation of communication between employees is barrier in collaboration between designer and carpenter. The lack of communication become a problem to each employee's understanding to their duties in manufacturing process.

1.3 Research Question

Main research question:
How to improve working process understanding between designer and carpenter during manufacturing process?

Sub-RQ 1 :
What is the standard design process that use during furniture manufacturing process?

Sub-RQ 2 :
How to improve design collaboration between carpenter and designer during furniture manufacturing process?

1.4 Research Objective

RO 1: To identify standard design process between carpenter and designer in order to improve design collaboration during manufacturing process.

RO 2: To provide design understanding in order to come out with guidance for designer to understand carpenter

1.5 The Study Area

Furniture factory

The research area of this study is in furniture factory in Batu Pahat , Johor. This study was conducted at Mixbox Furniture Sdn. Bhd and Distinctive Fine Furniture Sdn Bhd. These furniture factories were located in Batu Pahat, Johor. This study's research scope is to study working process of designer and carpenter in furniture industries at Batu pahat. Due to researcher working experience as a designer in furniture factories at Batu Pahat, researcher find that this area are suitable to get the a research since there were many furniture factories around Batu Pahat .This area has been selected due to their company management and factory operation are suitable with my study.

1.6 Scope And Limitation Of Study

Area of Study

The research scope for this study is design process among designer and carpenter in the furniture factory that has been selected by the researcher. This study was grounded theory focuses for the design process in the furniture manufacturing process of a furniture factory. Most of the furniture factories has no list of design process in their company. Most of their worker are working through ages experience. Many research has been done for design process, but there is no specific research that listed the furniture working process. These create a limit for researcher to gain the basic design process for furniture factories.

Worker involve

This study are focuses between designer and carpenter that involve during design process in the furniture factory. This study are focuses on designer and carpenter understanding towards their working process during manufacturing process. The covid 19 pandemic that hit the world in 2020 has made it difficult for researchers to meet the worker because the malaysian government has declared mco for about a year and 7 months.

Knowledge

The knowledge and experiences of the designer and carpenter gain and applied during work.

Research Topic

The literature review about this topic is so limited because there were not many people has been research about this topic. To date, there are no study regarding working process or design process of designer and carpenter in furniture industry especially in Malaysia. Most researcher focussing into other topic such as design method, ergonomic, emotion etc. There is not many journals and article that has been published. The experience that researcher have during working as designer is use for literature review.

1.7 Knowledge Contribution

The main objective of this research was to evaluate the working process between workers (designer and carpenter) in order to improve design collaboration among them and to come out with a guidance for designer to understand the carpenter. So there have three knowledge contribution from this study which is

1. Contribution for designer to understanding carpenter

2. Contribution for carpenter to understanding the design process

3. Contribution to furniture factory to have the smoothly running business

1.8 Research Framework

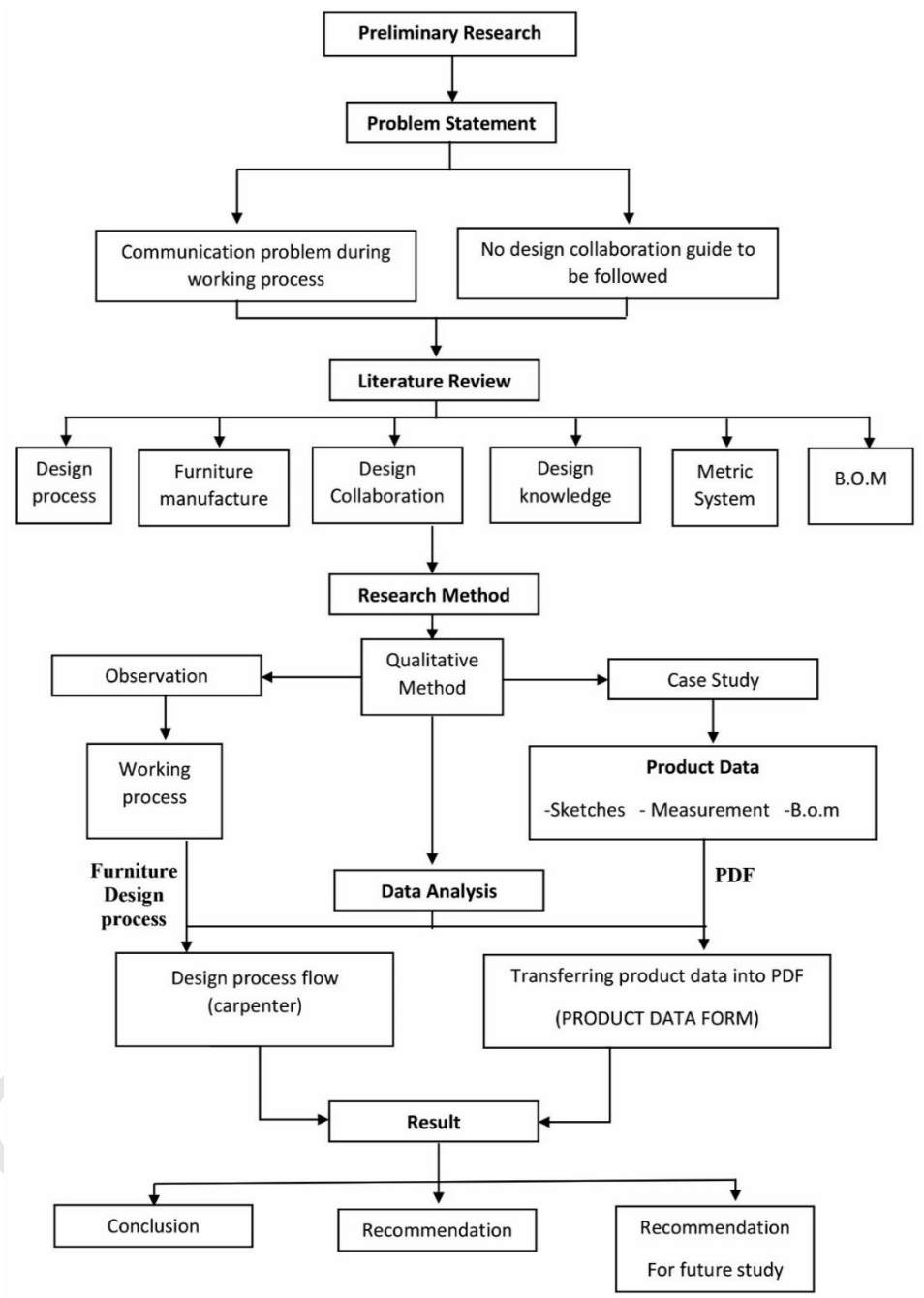

Figure 1.3 : Research framework chart
(Source : Author, 2020)

1.9 Conclusion

Designer and carpenter are the most important person to implement the working process in a furniture company. According to Abu Harith ex proton CEO (2021) during World Industrial Design Day Malaysia (WIDD) 2021 at Kuala Lumpur, designer and carpenter were the 'Profit centre" of the company. These two professions need to have a good cooperation during their collaboration in working process. The problem that occurs in between of working process will slow down the production flow.

This study aims to access workers understanding toward their task given. The problem that occurred between designer and carpenter is because the differences of their educational background. The designer usually followed the design process that was recognised globally. It is basic knowledge for any design school worldwide, the carpenter who are non-design base person was only do their task base on their long working experience. This study will access design process between designer and carpenter in order to find a collaboration bridge to designer and carpenter in manufacturing process.

It is important to a company to have a worker that understand to their work task. This study also conducted to proposed a guidance to understand design language between designer and carpenter. The product data from carpenter will be used to develop product data form (PDF) that adapting bill of material (BOM).

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