



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**QUALITY IMPROVEMENT THROUGH LEAN SIX SIGMA
APPROACH AT WOODEN PICTURE FRAME MOULDING
COMPANY**

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

by

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ABSTRAK

Setiap organisasi perkilangan mencari jalan penyelesaian untuk meningkatkan produktiviti dalam organisasi mereka. Salah satu faktor yang menyumbang kepada produktiviti yang rendah adalah peralihan pekerja yang tinggi. Proses yang dijalankan di kilang ini adalah bergantung kepada permintaan. Ini menyebabkan kurangnya pekerja yang mahir untuk mengendalikan proses. Ia seterusnya membawa kepada kecacatan kepada produk dan kerja semula yang mengakibatkan keperluan kerja lebih masa yang mengakibatkan kerugian kepada syarikat. Oleh itu, kajian ini adalah bertujuan untuk mencadangkan kaedah penyelesaian bagi masalah produktiviti di bahagian Compo proses. Kajian ini disokong oleh tiga objektif iaitu: i) untuk mengenal pasti masalah kritikal yang menyebabkan tingginya kadar kecacatan produk di bahagian Compo; ii) untuk menganalisis punca sebenar masalah kritikal di bahagian Compo, dan iii) mencadangkan penyelesaian yang bersesuaian dengan menggunakan alatan dan teknik kejut. Hasil kajian menunjukkan kesan “finger join” yang terhasil pada permukaan produk compo adalah masalah kritikal yang menyumbang kepada produktiviti yang rendah di bahagian compo. Gambar rajah Ishikawa, borang kaji selidik dan konsep majoriti-minoriti telah digunakan untuk menganalisis punca sebenar terhasilnya kesan finger join. Terdapat lapan punca sebenar iaitu; (i) suhu yang tidak konsisten, (ii) kelembapan untuk tidak konsisten di tempat penyimpanan, (iii) tiada penyelarasan kerja, (iv) perbezaan dalam struktur kayu, (v) bahan kompo yang tidak berkualiti, (vi) kecuaiian ketika melakukan proses, (vii) pekerja baru yang kurang menumpukan perhatian, dan (viii) getaran yang terhasil pada mesin. Kajian ini mencadangkan (i) bilik penyimpanan (ii) prosedur penyelarasan kerja (iii) sistem lampu Andon (iv) kotak pengasingan (v) penapis gam, dan (vi) latihan. Kesimpulannya produktiviti di proses compo boleh ditingkatkan dengan kaedah lampu andon, poka yoke, teknik kecacatan sifar dan latihan. Penyelesaian yang dicadangkan adalah berdasarkan punca-punca masalah yang telah dikenal pasti.

ABSTRACT

Every manufacturing organization seeks for a solution to increase productivity in their company. One of the factor that contributes to low productivity in manufacturing process is high of workers turnover. For processes in the factory that manufacture customized products, it is difficult to maintain a high productivity level. The experts are needed to cope with the fluctuated demands. This study done at a furniture Company that produces customized products. The company faces low productivity due to high of workers turnover. Ultimately, quality defects and rework continually increase. Moreover, overtimes has also increased to meet the production target. Thus this study aims to propose solution for productivity improvement at Compo department process. The aim is supported by three objectives: *i) to identify the critical problems that cause high rate of defect at Compo process, ii) To analyses the root causes of the critical problem at the Compo process, and iii) to propose appropriate lean tools and techniques for the solution of the critical problem at Compo process.* The critical problem has been identified as finger join effect on the compo layer surface. Ishikawa diagram, quick survey method and majority minor-concept have been used to analyse the root causes of the finger join effect. There are eight main root causes identified: (i) Inconsistent temperature at compo storage; (ii) inconsistent humidity at compo storage; (iii) missing of standard operating procedure; (iv) variation of wood structure before joining process; (v) poor compo material quality content; (vi) careless while performing the process; (vii) less attention from new workers, and (viii) vibration producing by the machines. This study proposed (i) storage room, (ii) standard operating procedure, (iii) Andon light system (iv) separation box (v) glue filter and (vi) training. In conclusion, productivity in Compo department can be improved by using Andon, Poka Yoke, Zero defects techniques and training. The proposed solutions were based on the identified causes.

DEDICATION

To the soul of my beloved parents, Mohd Yusri Gimam and Mashithah Che Ahmad, my sisters, Najihah, Hidayah and Nur Jannah also lovely friends. Thank you for the continuous support and encouragement.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

HR	-	Human Resource
LM	-	Lean Manufacturing
MR	-	Machine Room
VSM	-	Value Stream Mapping
SOP	-	Standard Operating Procedure

CHAPTER 1

INTRODUCTION

This chapter consists of background of the study, problem statement, aim and objectives, scope of the study, process flows of Company X, benefits and expected outcome of the study. Description of chapters in the thesis is presented at the end of this chapter.

1.1 Background of the Study

Furniture industry is one of the wood based sector that falls under the manufacturing sector which largely contributes to the national economy. Malaysian furniture industry stands as the 10th largest furniture exporters in the world, the 2nd in Asia and the 1st in ASEAN (MFPC, 2007). However, Bauman (2009) stated several factors that effecting wood furniture manufacturing industries such as management, manufacturing, asset quality, marketing and sales, distribution and delivery and this will gives impacts to the productivity.

Term productivity is generally used as a material productivity, worker's productivity, lead time productivity, machine productivity, and others. Productivity is the ratio of output over input for a specific production situation (Rogers, 1998). The efficiency of a production system were measured by productivity. Productivity measures relating of a quality or quantity aspects of output over inputs required to produce it. It is calculated as the ratio of the amount of output produced to some measure of the amount of input used.

Higher productivity means producing more from a given amount of input or producing a given amount with minimum level of inputs. In Malaysia, the furniture manufacturing industries as a whole utilize of aged technology and is still characterized by a heavy reliance on low or semi-skilled (Anand, 2011). Thus, contributed to low industrial and labour productivity. This study focuses on productivity improvement at Compo department at Company X which is one of the manufacturers in furniture industry.

1.2 Problem statement

All manufacturing companies have the most important goal which is to improve their productivity to increase the production efficiency. Company X is the wooden frame manufacturing company which located in Temerloh, Pahang. This factory seeks to increase their production productivity. Currently, there are defect and many rework products produced resulted from the output demand on customized products.

Figure 1.1 shows the number of workers turnover data in Company X from January 2014 until August 2014. The details data are shown at Table A1 in Appendix A. Compo department shows the highest workers turnover compared to the others department. Over that period, 21 new workers joined and 10 workers left. The second highest turnover is at MR department, 10 workers came in and eight workers left. This followed by spray department, six workers came in and three workers left. The other departments showed no higher rate of workers turnover like this three departments. No workers turnover at Foil department.

Figure 1.2 shows the number of defects and reworked products at the Compo department from January 2014 until August 2014. The details data are shown at Table A2 in Appendix A. The rate of defects at the Compo department was 3%. The number of reworked products were 64.1% and this percentage consistent with the number of output produced. This shows very high rate of reworked processes and the number of defects happen at the Compo department.

Figure 1.3 show the overall rates of overtime at the compo department from January 2014 until August 2014. The details data are shown at Table A3 in Appendix A. Based on the data, it shows fluctuated reading over the months. The overtime rate directly proportional to the number of output produced at the Compo department process. The more output produced the highest of overtime rate. Since the company experiences the large number of product reworks, unnecessary overtime has been created and it gives hidden loss to the company.

1.3 Aim and Objectives

The aim of this study is to improve the productivity in Compo department process by using Lean Six Sigma approach. These three objectives are set to achieve this aim:

- i. To identify the critical problems that cause high rate of defect at Compo process.
- ii. To analyse the root causes of the critical problem at the Compo process.
- iii. To propose appropriate lean tools and techniques for the solution of the critical problem at Compo process.

1.4 Scope of the Study

It is based on a case study at Company X that manufacture customized wooden frame products. The study focuses on the productivity improvement at the Compo process. Lean Six Sigma tools and techniques are used to solve the critical problems.

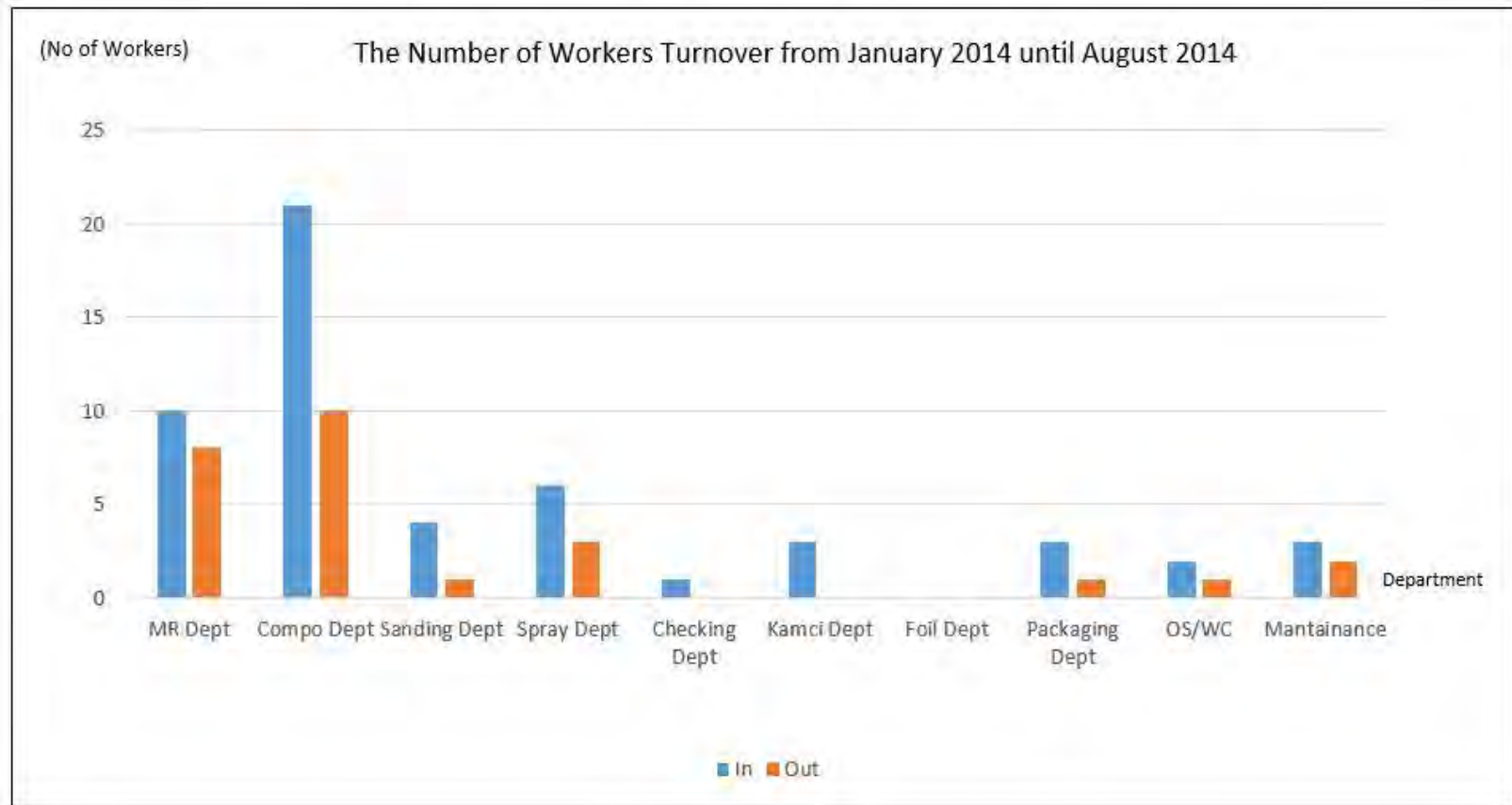


Figure 1.1: The Number of Workers Turnover data in Company X from January 2014 until August 2014

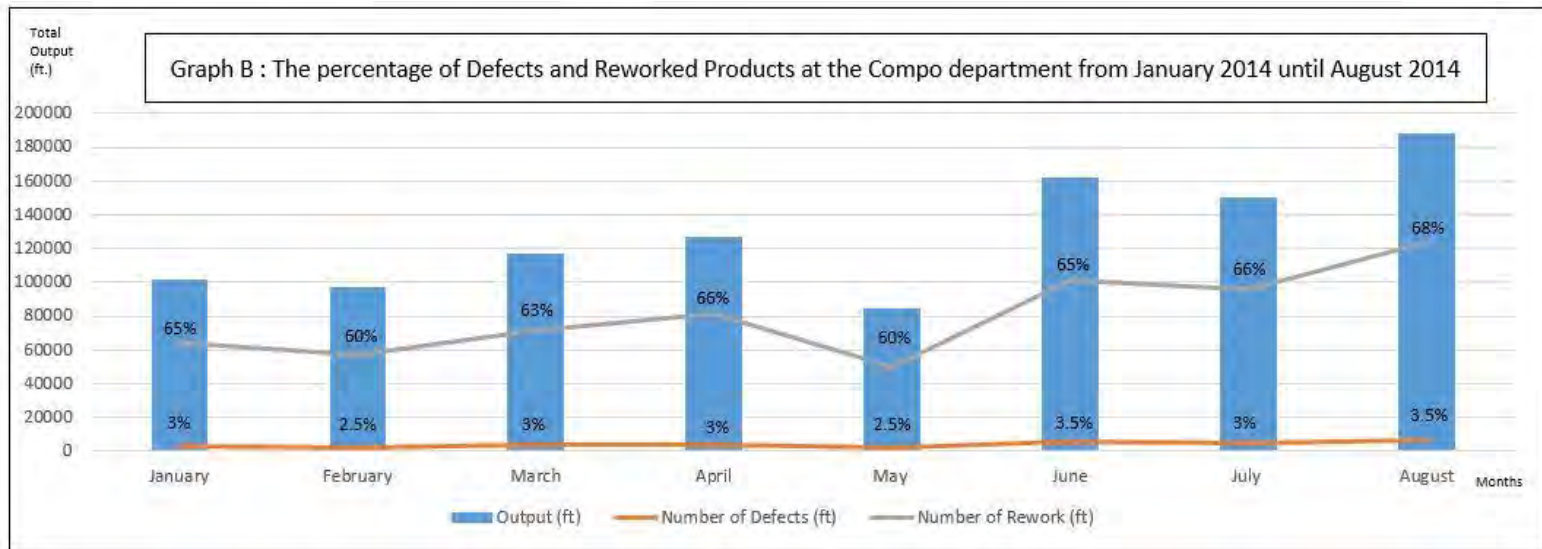


Figure 1.2: The Number of Defects and Reworked Products at the Compo Department

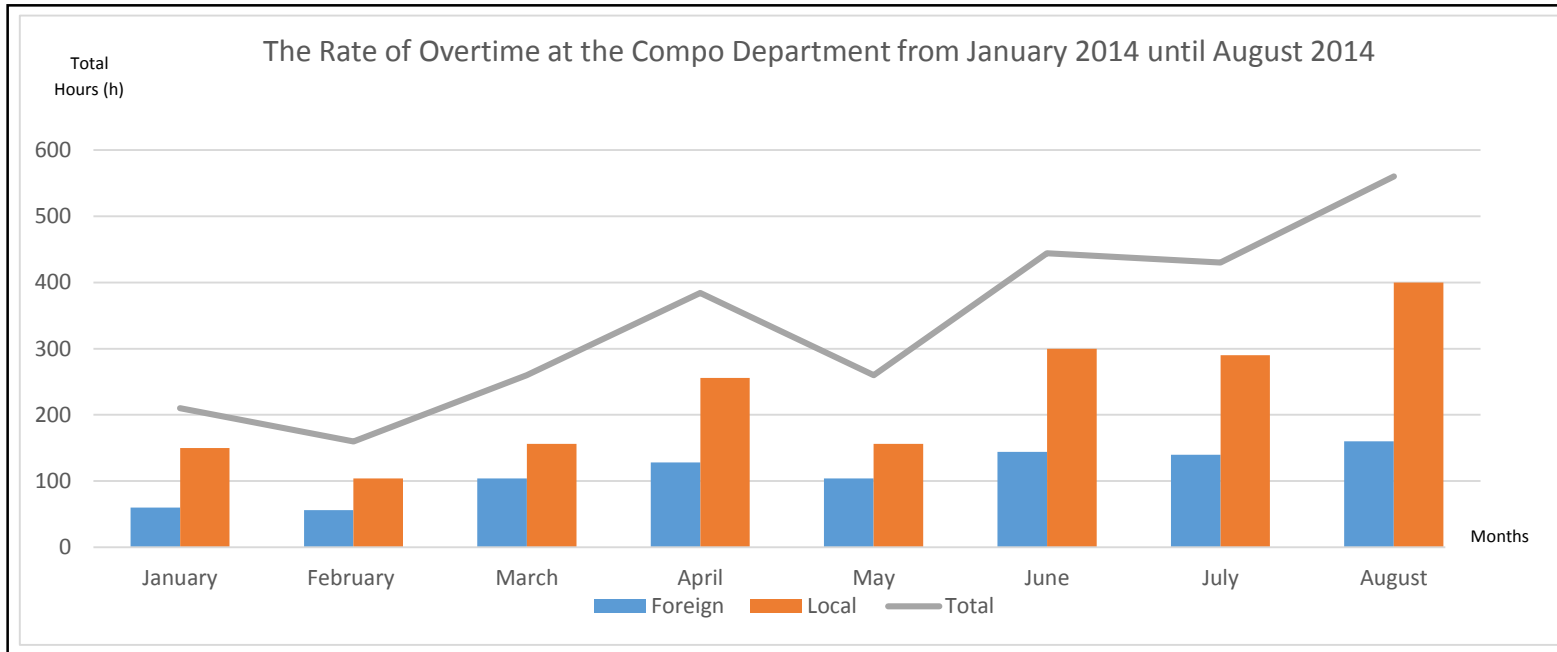


Figure 1.3: The Rate of Overtime at the Compo Department from January 2014 until August 2014

1.5 Background of Company X

1.5.1 History of Company X

Company X was set up in 1982, in Pahang. The company produces customized picture frame which is only for export. Currently, Company X has secured market to the United States, Canada, Europe, Australia, Asia Pacific countries, and Middle East countries. Company X equipped with full range of profiles, sizes ranging from small 10mm fillets to 160mm ornate moulding, in an extensive range of finishing, from wood tone to hand leaf and ornate series. Company X is set to provide a full range of moulding in variety finishing to their customer, to facilitate buying everything from one source save customer cost. Their main focus is to meet customer satisfactions with their products.

1.5.2 Core Business

The core business of Company X is to manufacture customized picture frame by using various type of woods such as Meranti, Pulai and Jelutong. All the products must undergo basic processes such as rip and saw, finger join, milling, compo and spray. Company X has suppliers and customers all in foreign countries.

1.5.3 Process Flow

Process flow in Company X is just similar like other manufacturing organization which start from suppliers to the customers. Figure 1.4 shows the basic process flows of wooden frame products. Basically, there are two types of wooden frame products; Compo and Normal. The Compo type is coated with certain compo material layer to the wood surface to close the natural structure and cutting effects produced from MR department while normal type does not required any coating process.

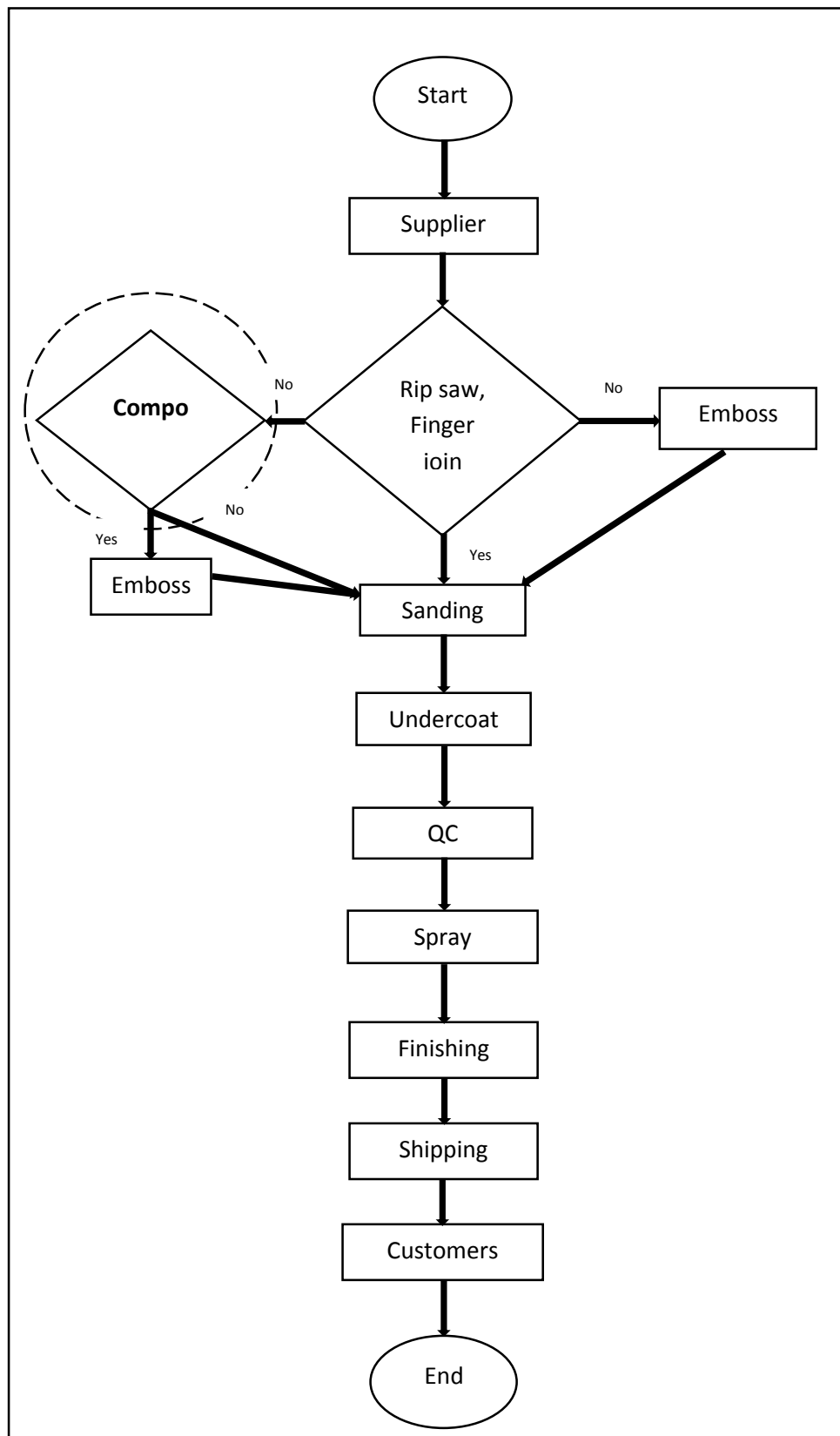


Figure 1.4: The Process Flow of Wooden Frame Products