

**NORTH-SOUTH COLLABORATION FOR A MANUFACTURING
EXTENSION DEVELOPMENT PROGRAM: CASE OF SECONDARY
WOOD MANUFACTURING INDUSTRIES IN INDIANA AND
CAMEROON**

by

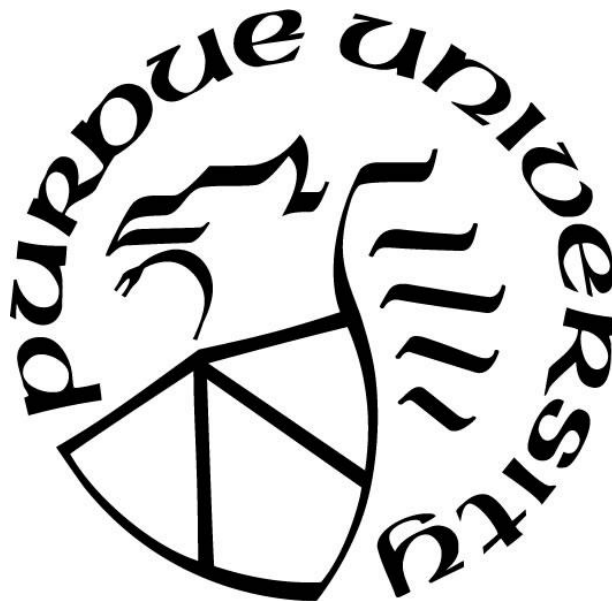
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To my wife, Victoire, and my sons, Emmanuel and Gabriel

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ABSTRACT

This research was performed to foster collaboration between northern countries (Indiana in the USA) and southern countries (Cameroon in Sub-Saharan Africa) through a manufacturing extension program. The United Nations organization instituted north-south cooperation to transfer knowledge from developed countries to underdeveloped nations. This cooperation has taken many forms, from university cooperation to technical assistance programs. One of the major forms it has embraced today is international extension programs. The extension is not new in the agriculture sector in most Sub-Saharan African countries. The most prominent type of extension practice in this region is the train and visit program. With this program, field agents are charged to move to farm cooperatives and provide them with relevant skills in farming. On the other hand, this form of assistance has not been practiced in the manufacturing sectors. The secondary wood manufacturing industry needs such a program to provide its specialists with innovative furniture and cabinet manufacturing practices to compete within their country and worldwide. Consequently, an analysis of the furniture and cabinet design process was done through a survey, accompanied by an assessment of the manufacturing practices of this sector in Cameroon. The analysis results showed that furniture manufacturers in this sector need to upgrade their knowledge in product design and the usage of computer-aided design software to facilitate this process. Also, the study asserts that production techniques related to drying lumber, processing, assembly, and finishing need a considerable upgrade to reach international standards. Finally, the study proposed a manufacturing extension program through the Cooperation of Purdue University and Indiana Hardwood Lumbermen's Association in the United States of America. Through this cooperation, secondary wood products manufacturers will gain state-of-the-art manufacturing practices to enhance their enterprises' performance.

CHAPTER 1. INTRODUCTION

1.1 General overview

The process of empowering secondary wood products manufacturing professionals in Sub-Saharan Africa is an efficient way to overcome barriers to limited use of resources (human, financial, material). One way to accomplish this task is through a north-south collaboration. This form of collaboration has been on the global governance agenda since the mid-20th century (Gonzalez, 2020). The partnership provides better cooperation between northern countries and developing countries guided by principles developed by (Gaillard,1994), now often quoted as the chartered for north-south partners (Binka, 2005). These partnerships include priorities determined by developing countries themselves as stipulated by (UNCSTD 1999), such as:

- Provide as far as possible for developing countries participation in research even when conducted in developed countries institutions;
- Provide for joint participation and control when research is conducted in developing countries.
- Include a training component of the program.

The following mechanisms ensuring the effectiveness of the joint efforts for collaborating were: technical assistance, overseas training, institution building, institutional twinning arrangement, and collaborative research partnership (Gaillard,1994). For both priorities and mechanisms established, technical assistance and training programs were vital to ensuring the program's continuity over time. Today, such actions have a considerable impact on the livelihood of most Africans living south of the Sahara. Several collaborations between African countries and some northern countries have been instituted for research and capacity building in this region. The United Nations Commission for Science and Technology Development (UNCSTD) seeks to ensure the sustainable development of new technologies and international collaboration. The United States Agency for International Development (USAID) aims to transform families, communities, and countries to thrive and prosper (<https://www.usaid.gov/what-we-do>, 11/04/2021). The focus of these partnerships and training programs is mainly on health, agriculture, and life science. The extension is one of the principal

means these organizations use to train, teach, and collaborate between countries in the north and those from the south.

Today, agricultural extension is widespread all over Sub-Saharan Africa, with significant results thanks to different models such as training and visits (T&V), the participatory approach, the farmers' fields schools (FFS), and the ICT-based online advisory services for farmers (Waddinton et al., 2010). For decades now, farmers have enjoyed the booming effect of their farm yield and related revenue obtained from selling various produce. On the other hand, sectors such as secondary wood manufacturing have rarely witnessed extension efforts to boost their production technology, techniques, skills, or capacity and provide them with skills for quality work improvement and customer satisfaction. This case is prevalent in most sub-Saharan Africa countries, including Cameroon.

1.2 Statement of the problem

Modern industries contribute significantly to accumulating physical and human capital and provide relatively well-paid jobs while increasing household income and domestic demand (Signé, 2018). There is little or no empirical information on Cameroon secondary wood manufacturing enterprises. This lack of information is because most are roadside cabinet makers and joiners, and very few grow into industrial-scale manufacturing. This trend causes the industry to be less effective and less competitive internally and globally. Lescuyer et al. (2017) discuss that the poor quality of the furniture manufactured in Cameroon is due to inadequate equipment, training, and a lack of innovative manufacturing techniques. A similar study in Ghana asserts that the lack of modern equipment limits smaller firms' ability to meet the international market standard (Nutassey et al., 2014). The study later emphasizes that smaller firms' inability to innovate in product development proves their non-readiness to compromise with customer demands.

Today's evolving manufacturing industries require a critical review of manufacturing systems in Sub-Sahara Africa and dysfunctioned areas. The secondary wood industry in Africa and Cameroon, in particular, is faced with a major challenge of satisfying customers' demands in terms of quality and delivery time. This inability to meet customer demand leads to massive importation of furniture into the country (Lescuyer et al., 2017). Some of the factors that influence customers to purchase imported furniture and cabinets are the stability, comfort, and

durability (Lescuyer et al., 2017). These factors are generally related to limited knowledge in manufacturing, the absence of quality supplies of glues and iron mongering, and inadequate finishing techniques. Figure 1 below illustrates the furniture production environment in Cameroon and the method employed in the production.



Figure 1. Theurniture manufacturing environment in Cameroon. Source: Yembe Benjamin.

The figure above depicts the environment where those cabinets are finished and displayed for sales. Such an environment does not satisfy all the requirements for finishing as airborne substances, and sawdust particles will settle on the wood surface and affect the quality of the finish. Environmental factors such as high heat from the sun and rain will not facilitate applications of top coat finishing materials. Finally, as the sunlight hits the surface of the finish,

cracks, tears, discoloration, and other surface defects will likely appear and destroy the quality of the wood surface. Other factors that hinder the proper finishing of wood are the unavailability of quality equipment and the influence of customers.



Figure 2. The internal structure of an open woodworking shop. Source: Yembe Benjamin

Figure 2 illustrates the environment where wood is processed and sometimes assembled. One significant difficulty that woodworkers face is the waste management. Byproducts are sometimes used for energy production (substituted for firewood); however, the presence of sawdust and wood scrap hampers the smooth functioning of the workshop and becomes a danger to the operators. Waste in shops occupies spaces allocated for work-in-process and hinders the safe flow of workers and materials. The nature of the floor may cause cutters and knives to wear faster since lumber that is placed on the bare ground can get contaminated with abrasive, sand, and dirt. Such an environment may function operationally, but this sub-optimal organization will have an economic impact on the shop operations. One of the impacts may be a high cost of maintenance and replacement of parts. Capital investment is another important aspect since most furniture manufacturers lack adequate capital to start a business venture.

1.3 Aims and objectives

This study focuses on the state of manufacturing conditions in the production of furniture and cabinets in Cameroon. The primary objective is to assess factors affecting the proper design and manufacturing of furniture and cabinets in Cameroon and propose a manufacturing extension program through a north-south collaboration between Purdue University in Indiana, USA and Cameroon in Sub-Sahara Africa. The following objectives provide direction to the study.

- Determine the ability of Cameroon furniture manufacturers to use computer-aided design software for the design of their items.
- Assess the performance of the furniture manufacturing industries of Cameroon in terms of drying, machining, assembling, and finishing.
- Establish a manufacturing extension program through a north-south collaboration between secondary wood manufacturing industries in Indiana, USA, and Cameroon.

1.4 Limitations

When designing and administering the survey instrument, the researcher had the following limitations:

- Covid-19 related regulations prevented traveling outside the United States of America to collect research data.

- Inadequate internet connectivity in Cameroon for live communication with field agents selected to perform the survey.
- Field agents in Cameroon were sometimes faced with wrath from some respondents refusing to participate in the survey.

CHAPTER 2. OVERVIEW OF THE METHODOLOGY

2.1 Introduction

The survey instrument was developed in three parts. The first part talked about the purchase of raw materials and the advertisement of finished products. The second part is related to the method of product design process that furniture manufacturers employ in Cameroon. The last part questioned the capacity of furniture manufacturers in Cameroon to manufacture products efficiently. The survey instrument was tested once through an in-person interview by the surveyors. It was conducted in Douala and Yaounde, where two industries were interviewed from each city. It was later readjusted then administered to one hundred small and medium-sized furniture enterprises in Douala and Yaounde; that is, fifty in each town. Finally, the data were stored in a Microsoft Excel spreadsheet, and R-STUDIO was used to perform the analysis.

2.2 Raw material purchase, product advertisement, and method of production

As elaborated in part one of the questionnaire, this part of the survey focuses on the different types of products furniture manufacturers produce, the types of raw materials they use, the various means of advertisement they use to get customers, and the type of production processes they use. The questions were both open-ended and close-ended (see appendix A, part one). The questions were formulated after a prior discussion with some enterprises. The sample size surveyed corresponds to twenty percent of the population of furniture manufacturers established by (Lescuyer et al., 2017). This data was used to present facts about the relationship between materials and market demand and how they influence the production type. A respondent was interviewed to respond thoroughly to the questionnaire in each enterprise. The respondents' characteristics varied from technicians, assistant managers, managers, and owners or CEOs of the enterprises. This was done in February 2021. The results provide a glimpse of the nature of furniture and cabinet production in Cameroon and methods of furniture design.

The purpose of this part is to assess the existing level and potential for furniture manufacturers in Cameroon to practice the use of computer-aided design (CAD) software to design their products. The section had four questions. The first relates to what influences customers to desire a given product. Here, the goal is to understand how manufacturers

communicate and interact with customers during the initial stages of product design. The second question assesses the ability of manufacturers to actually design products using different modes of design. Through this question, the ability of the respondent to design a product is revealed, providing good feedback on the level of basic technical drawing skills before proceeding to the use of CAD software. The third question in this section evaluates customers' feedback to producers when they are presented with a drawing done using computer-aided design software. Finally, the last question determines the reasons that cause those who do not use CAD to not to do so.

2.3 Manufacturing capacity of secondary wood products producers in Cameroon

This section of the questionnaire determines the technical aspects related to the production of furniture and cabinets and examines ways, interests, and possibilities in which manufacturers can form associations (see Appendix A, Part two and three). The first aspect is the way in which raw materials, such as lumber, are acquired for the production of furniture. The reason is to verify the possibilities of secondary wood manufacturing industries in Cameroon to operate vertically, horizontally, or both. Vertically here describes the degree to which an organization owns the network processes that give goods their value; whereas horizontally describes the ability of an organization to expand the boundaries of its supply chain network to other entities (Rudberg et al., 2003). When this assessment is done, the next stage is the evaluation of secondary wood manufacturers and the know-how in lumber drying. Questions asked in this section revealed how essential moisture movement in the wood is, the end moisture content for a given type of job, the method of drying, and the measurement of moisture content in wood. The questions here were: open-ended, to provide more room for respondents to give their views on specific questions; close-ended, respondents choose specific response options to different questions; and Likert-scale, which helped rate some items in a response scale (Colosi, 2006). Through these questions, facts were established, indicating major points for inefficient wood drying by furniture manufacturers in Cameroon. Next to these questions are the questions related to the lumber processing and the conditions associated with it. These questions highlighted the state of secondary wood manufacturing structures and how the arrangement and movement of materials are performed. As in the previous question, this set of questions were both open-ended and close-ended.

In this same section, the assembling and finishing know-how of woodworkers were assessed to illustrate factors that may influence them to choose a given mode of assembly over others and a given mode of finishing. From these questions, secondary wood manufacturing industries were split into segments, providing room for specialization in the sector. Finally, inquiries related to the ability of secondary wood manufacturers to form associations through which they can acquire innovative practices in furniture and cabinet production were included as well.

CHAPTER 3. ASSESSMENT OF CAMEROON SECONDARY WOOD PRODUCTS MANUFACTURING INDUSTRIES PERFORMANCE METRICS

This chapter was submitted to *Journal Bois et Forêt des Tropiques* on November 22, 2021, and is currently under review. It has an impact factor of 0.692, publishes about 28 articles per year, and has been in existence since 1947. This journal was chosen because it discusses tropical forestry exploitation, management, and value-added of timber wood from these forest zones.

Abstract

The Cameroon furniture industry is still, with small and medium-sized enterprises, providing much of the domestically produced wood products. The government of this country aims to see this sector grow, compete internationally, and promote the “made in Cameroon.” The fragmented production system in Cameroon affects the quality of products that are being manufactured. The quality of products is affected because manufacturing practices are frequently not known or followed, and the production processes and facilities are not standardized. We surveyed and interviewed 100 furniture manufacturers to assess factors influencing their manufacturing practices. Two surveyors canvassed the cities of Yaoundé and Douala, respectively, the political and economic capital cities of Cameroon, administering the questionnaire to small and medium-sized enterprises. The results show that most furniture manufacturers have limited skills in lumber processing, safe finishing techniques, and proper drying and assembly techniques. In the same vein, we propose developing a manufacturing extension program to build modern manufacturing skills and facilitate access to resources required to achieve this goal.

3.1 Introduction

Cameroon is a country situated in sub-Saharan Africa, specifically in central Africa. Central Africa is the host of the largest portion of the Congo Basin. The Congo-Basin, the second-largest tropical rain forest zone after the Amazon Basin, covers about 198 million hectares (Bikie et al., 2000). This massive natural resource zone serves as a habitat for wildlife

and indigenous people and provides the required materials for industrial development. According to Cameroon's national development strategy 2030 (NDS30), the government aims to empower its forestry sector with sustainable forest management practices and better wood supply to local wood processing and furniture manufacturing industries. This same document stipulates a growth of 4.5% of this sector per year from 2021 to 2030. Also, the Cameroon government plans to enforce the modernization of its production system, scale-up enterprises' competitiveness, and promote the "made in Cameroon." Achieving this goal requires Cameroon's manufacturing industries, especially the secondary wood sector, to be attentive to global changes.

Currently, manufacturing industries in underdeveloped nations are faced with a new challenge of rapid evolution in production systems. This exponential growth of manufacturing industries significantly affects the relationship between material, processes, human resources, and output. In the case of Africa, and Cameroon in particular, there is a dire need to improve the quality of manufactured products, which is achievable through quality process improvement and quality human capital (Signe, 2018). Cameroon's secondary wood manufacturing industry is not indifferent to this general perspective; over 58% of enterprises need machine tools, trained labor, and dried wood (Mahaillet, 2019). It becomes clear that a production system consisting of tools and equipment with limited efficiency would likely not satisfy lean manufacturing principles. A complex sector, such as the secondary wood manufacturing industry, requires a study of its component sectors, that is, its supply and distribution of raw materials, its techniques of production, assembly, finishing, packaging, and shipping of products. Therefore, an in-depth assessment of secondary wood manufacturing industries in Cameroon is required to establish its state of operations and facilities.

Over the years, traditional manufacturing has gained more ground in the secondary wood sector in Cameroon. Many small and medium-sized enterprises have increased the production of furniture and cabinets, especially in the country's major cities (Lescuyer et al., 2017). The primary concern is the state at which they operate, which impacts the quality of products and thus is not competitive against the imported products. Devising strategies to improve the quality of furniture manufactured in Cameroon is essential in limiting the outflow of domestic capital to competing imported products. Hence, to remain competitive, industries must design manufacturing systems that produce high-quality products at low cost and rapidly respond to market changes and consumer needs (Koren and Shpitaln, 2010).

The modern structure of furniture production systems requires it to be responsive to the evolving changes and innovations taking place in the industry. Today, Cameroon's middle-class society desires improved standard products to suit their needs and taste. Additionally, the furniture manufacturing industry's production capacity and its adaptable functionality need to be responsive to variable demand (Koren and Shpitaln, 2010). The traditional nature of the Cameroon furniture industry is a reflection of the country's economic status. Incorporating flexibility in the furniture manufacturing system of the nation will improve its responsiveness to market disruptions by installing modest modern manufacturing systems and material flow design to add production capacity as the market grows. This type of adjustment requires quick scalability of the production system (Spicer et al., 2005).

Since furniture industries must follow a technological path from acquiring raw materials, drying lumber, processing, assembling, and finishing the final product, and how does the Cameroon furniture industry fit into this path? The traditional job-shop nature of most furniture manufacturing industries in the nation makes it difficult to develop and practice a long step-by-step production system. This limitation prevents many enterprises from mastery of the entire furniture production process and resulting quality control. Developing cluster groups in different regions of the nation will set the pace for the rapid acquisition of skills and techniques for growth and industrialization (Long et al., 2011). Cluster is a concentration of manufacturers that mutually cooperate, each developing a narrow specialty in which they excel. All participants in such an ecosystem of manufacturers tend to benefit. These cluster groups will set the pace for the creative industry that serves as the driving force for economic growth, a new conceptual ground dominated by technological breakthroughs because of combined capacities and energies (Fleischmann et al., 2017).

Moreover, Lescuyer et al. (2017) state that the limitation in innovative practices and new-tech acquisition are principal factors precluding this sector to springboard. Hence, clustering becomes imperative for the growth of Cameroon's furniture manufacturing industries through a collaborative effort to improve their production systems and better understand furniture and cabinet manufacturing stages.

This study assesses Cameroon's furniture manufacturing systems' performance metrics through a stage-by-stage analysis of furniture production and the production unit itself. Finally, we propose a manufacturing extension program through which producers will acquire the

package skillset in furniture operations management and practice to improve their effectiveness and competitiveness.

3.2 Nature of furniture manufacturing systems and its hurdles

Effective furniture production is possible if all the stages are respected. To manufacture good products, furniture manufacturers should employ innovative wood processing techniques that maximize the quality of lumber to be processed (Anuntaruttana and Roopsing, 2020), the furniture assembly techniques, and the appropriate layout of the manufacturing space (Zhao and Li, 2014). It is vital to understand the nature of a production line, how machines and equipment are set, organized, and utilized assembly structure, and finishing of furniture and case goods with proper utilization of necessary resources (Pinto and Shayan, 2007). Additionally, the production system has to have built-in workplace safety (Durocher et al., 2019).

Appropriate furniture production requires the lumber to be dried correctly for dimensional stability, products strength, wood preservation, easy machinability, and appropriate surface preparation for finishing (Bell et al., 2014). Hence to perform adequate drying, furniture producers must understand the appropriate methods of drying, notions of moisture variation in wood, and end moisture content in timber (Simpson, 1983). Acquiring this set of skills improves the capabilities of these professionals and provides them with life skills in wood drying. Nowadays, there are varied ways of drying wood, amongst which a solar kiln may be best suited for geographical regions with a high amount of sunshine per year and high alternative energy costs. There are two types of solar kilns, the greenhouse type and the external collector type. The former can be constructed entirely of glass or wall panels made of other materials, also known as semi greenhouse solar kilns (Sattar, 1993). The latter consists of an enclosed insulated chamber in separate structures connected by insulated ducts (Sattar, 1993). The greenhouse type is preferable to the other because of its inexpensive nature. One advantage of solar kilns is their opportunity to reduce the cost of wooden products since the energy source is free (Tagne and Bennanoum, 2018).

Alongside lumber drying, furniture producers have to devise better strategies for processing their lumber appropriately with minimal waste in cost and time. Moreover, dried lumber has outstanding benefits during wood processing, especially in machining, gluing, and finishing (Denig, 2000). A critical stage in furniture production is machining. The operators must

be knowledgeable, and the machines should be sound enough to provide the desired result. In the case of Cameroon, the limited access to adequate machine tools, technological innovations, and the small size of furniture and cabinet producers' workshops prevented them from storing and processing lumber that requires heavy equipment (Lescuyer et al., 2017). However, the adequate processing of lumber does not require immediate high-tech machinery; instead, it does require an appropriate standard and structured design manufacturing process (Nyemba and Mbohwa, 2017; Quesada and Gazo, 2003;). In this light, the Cameroon secondary wood industry is still in its growing state, with only 22% of furniture enterprises owning machine tools and 78% paying to process their lumber to those who own machine tools (Lescuyer et al., 2017). This percentage of machine tools in shops considerably affects the production systems' output (cost, rate, and quality), mainly depending on the quality of the machines selected and implemented (Ayag and Ozdemir, 2006). In addition, the following six criteria influence the selection of equipment and machine tools: price, weight, power, spindle, diameter, and stroke, with price and power highly ranked (Dadgeviren, 2008).

Achieving proper processing requires machine tools that are up to the task and a workshop set up, structured, and organized to enhance material flow while limiting downtime. The furniture industry is in two categories, single-unit production, and multi-unit production. Cameroon furniture producers are typically multi-tasking engaged professionals, thus making it necessary to design their manufacturing systems to be flexible, capable of accommodating the production of different types of articles at a time. Flexibility in the manufacturing system (FMS) is vital for the ever-changing market, labor cost reduction, and increased productivity to benefit the industry (Pirc and Vlosky, 2010). In practicing FMS, industries inherently accommodate mass customization to deal with diverse parts for different projects at a time (Koren, 2010). Customization capability is impacted by the interaction between designs and manufacturing (modularity, customer interface options, and manufacturability) (Kodzi et al., 2013). The flow of materials within this kind of system depends on the status of the industry. In growing economies, manufacturing processes are not fully automated. This type of system indicates that material handling is not automated, and parts are moved by hand or with the help of trolleys from one workstation to another. Adopting a suitable layout consists of considering the following conditions: minimizing the cost of investment in equipment and material handling, satisfying the requirement for product design and manufacturing; providing quality work life for employee

convenience, safety, and comfort; minimizing overall production time (Prasad et al., 2014). Figure 3 below represents a layout plan that considers work-in-process, the distance between machines, the type of products to be manufactured, flexibility in the manufacturing system with reconfiguration, and ergonomic principles—design to produce school tables and chairs in a developing country.

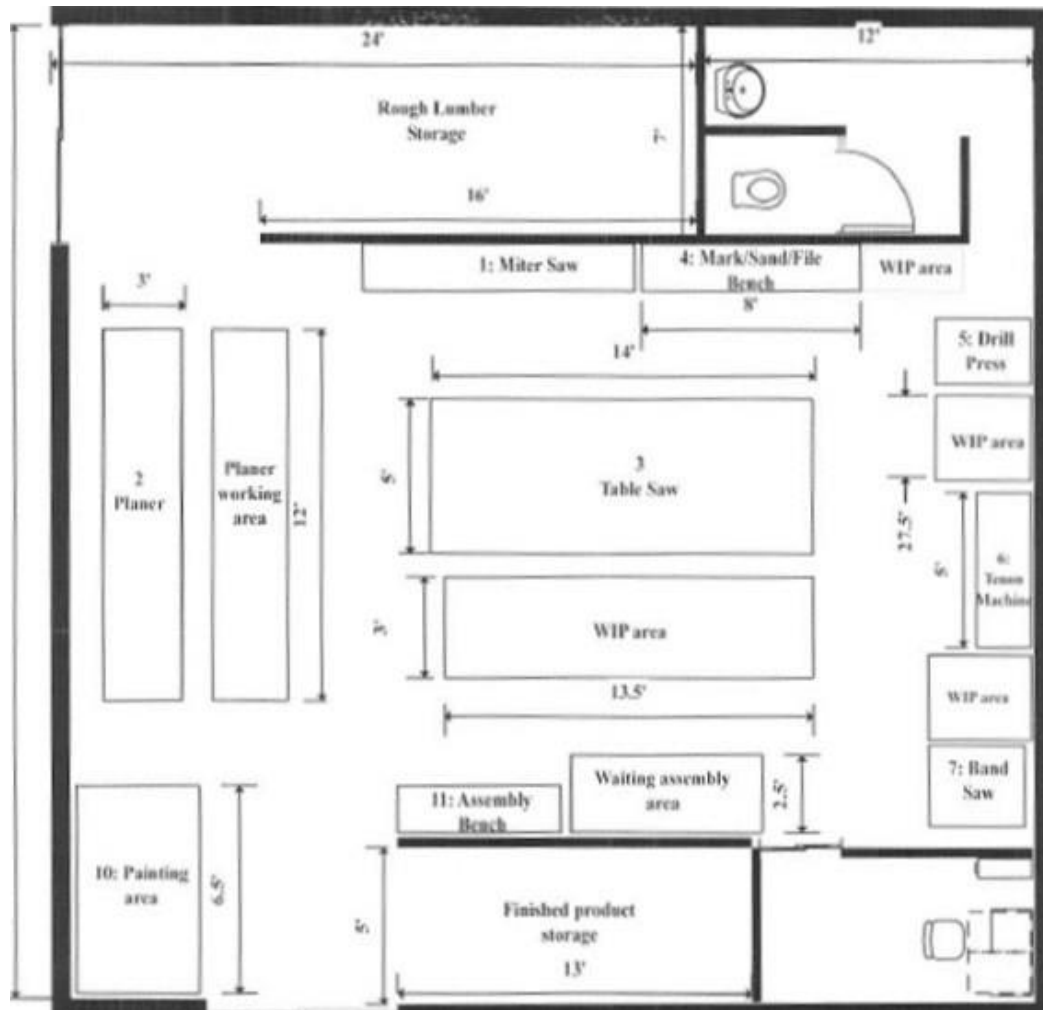


Figure 3. Shop layout (Quesada and Gazo, 2003).

Once the manufacturing system is established with the required machines for lumber processing, another essential aspect of a furniture and cabinet production unit has to be addressed, the assembly and finishing stages. Before proper assembly begins, a structural tree

and a functional domain are developed to describe the hierarchy of the product family and structure of the possible module alongside a description of the composition of the products and the relationship between them (Yue and Sun, 2015). Figure 4 below is a representation of an assembly line of a drawer chest. The said assembly line provides a systematic flow and sequence of operation for the drawer chest. Next to the assembly process is the finishing process. This stage consists of preparing the surface of the wood and its derivative for the final application of top coating materials. Top coating materials generally include paints, varnish, lacquer, wax, and stain. Conventionally, applying a finish on a product is done with a brush, pad, spraying gun or dipping in a well-ventilated environment and dust-free room. However, well-established structures may use a variety of spraying booths with conveyors associated with high throughput (Melton et al., 2002).

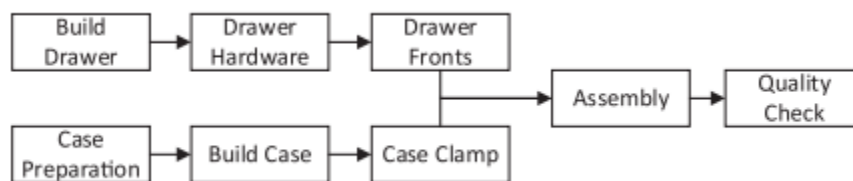


Figure 4. Production flow for drawer chest in an assembly line (Zhao and Li, 2014).

3.3 Methods

The method used in this research was a survey. Surveys are used to collect information from samples of individuals through their responses to questions written in a questionnaire (Check and Schutt, 2012). Two cities of Cameroon were involved in the research, Yaoundé, and Douala. We choose to randomly interview proprietors of 50 small and medium-sized enterprises from various districts in each of the two cities. Lescuyer et al. (2017) ascertained that about 517 woodwork shops and small and medium-sized enterprises exist between Douala and Yaoundé. Three researchers from cooperating Fouban School of Art and Craft were trained to canvas these two cities and administer the questionnaire during in-person interviews. An in-person interview format was used to be able to clarify responses and improve accuracy and response rate. The data collection process was performed during a period of two weeks. RStudio, a statistical data analysis software, was used to analyze the data using the Binomial Logistic

Regression method alongside pie and bar charts to establish the state of furniture and cabinet production in Cameroon.



Figure 5. Questionnaire administration. Source: Donfack Giresse

3.4 Survey Design and Administration

The principal aim of this survey was to assess the product and process performance of furniture and cabinet producers in terms of quality drying, sound processing and assembly, and proper finishing of products. To this effect, we established a thorough qualitative data questionnaire to depict factors that can influence their ability to dry wood appropriately and produce quality products (see Appendix A). The first set of questions evaluate the knowledge of furniture producers to dry lumber appropriately. The second determines their ability to process lumber adequately, effectively, and safely. The third determines typical joints employed during the assembly of products. The fourth set of questions assesses their ability to finish wood adequately using different techniques and finishes and tools.

The surveyors conducted a pre-trial survey with four respondents to test the instrument's validity and determine if questions were straightforward, easily understood, and answered. At the end of the pre-trial, we concluded that the survey document was valid and ready for application in the field with minor changes. The survey was conversational and colloquial. Through this method, the surveyors established a rapport with respondents. This method prompted the latter to provide valuable insight into their daily activities and answer all the questionnaire questions. Considering societal and cultural traditions, this approach was the most appropriate method of administering the questionnaire and collecting data. At the end of the process, the surveyors interviewed one hundred small and medium-sized wood furniture enterprises, meeting our target.

3.5 Characteristics of Furniture Organizations in Cameroon

The organizational nature of manufacturing structures describes their propensity to strive to grow into a larger business scale. The business model provides a framework that takes technological characteristics and potentials and converts them to outputs (Chesbrough and Rosenbloom, 2002). Table 1 below depicts the function occupied by each respondent of the different interviewed structures. Through this table, we can notice that sixty-six respondents are owners of their shops. In the case of Cameroon, this means the proprietor is the sole person who receives orders, executes them, and sometimes recruits part-time workers according to the job at hand to aid in the execution (Lescuyer et al., 2017). Only two instances where a business has a

chief executive officer (CEO) illustrate the scarcity of extensive and specialized furniture manufacturers in Cameroon.

Table 1: Position of the respondent and corresponding number.

Position of Respondent	Number of Response
Owner	66
Woodworker	5
Assistant Manager	2
CEO	2
Sales Officer	3
Apprentice	1
Technician	19

Table 2: Number of companies with their corresponding employee size.

Numbers of Employees per Enterprise	Number of Enterprises
0	1
1	15
2	16
3	5
4	4
5	2
6	2
7	2
10	1
11	1
36	1
46	1
52	1

Table 2 demonstrates the number of employees and the corresponding number of firms. Again, we can observe that enterprises with larger employee sizes ranging from 10 to 52 are just one per employee size. In contrast, the most significant number of respondents have employees ranging from zero to seven. This table proves that organizations with limited employees have limited possibilities to specialize labor and, therefore, influence their ability to adopt new technologies.

3.6 Survey Results and Discussion

A total sample size of one hundred (100) randomly selected small and medium-sized furniture enterprises responded to the survey, corresponding to about 10% of the population of 517 as pre-established by (Lescuyer et al., 2017). Below is the summary of the result analysis of each question of the survey.

3.6.1 Lumber Drying and Acquisition

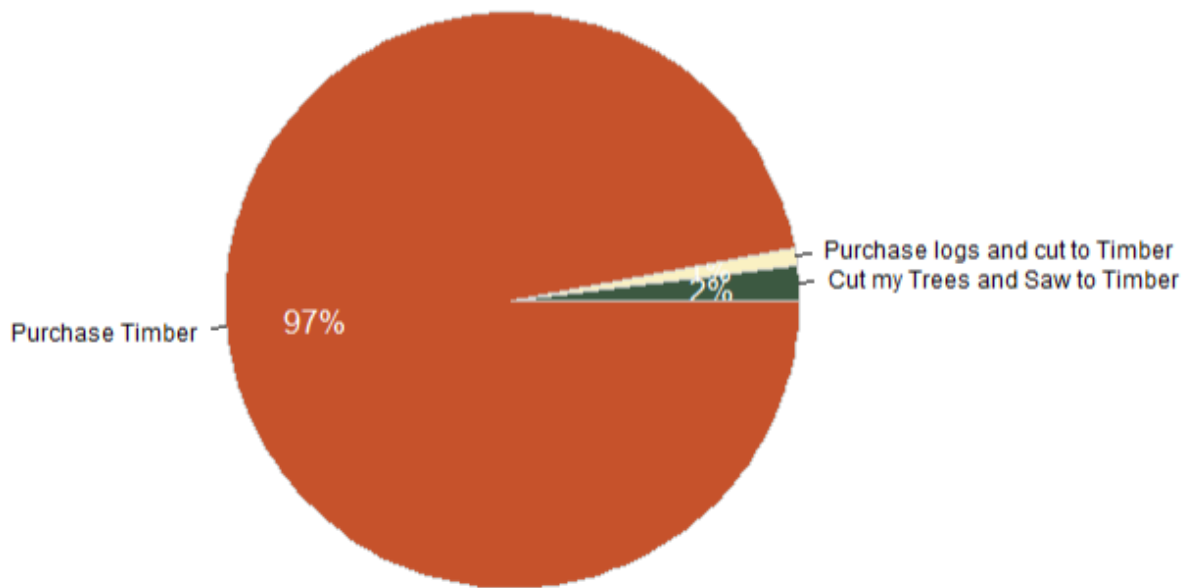


Figure 6. Lumber acquisition method

Figure 6 above illustrates the different ways in which wood manufacturers purchase lumber in Cameroon for their processing. We can observe 97% of furniture producers acquire ready-to-use lumber while only 2% and 1% purchase logs and transform them to timber or cut their trees for timber production, respectively. This information confirms the observation by Lescuyer et al. (2017) that most furniture producers in Cameroon acquire their lumber in various marketplaces for this purpose and have less knowledge about the logging industry, the origin of their timber, and the legal source of the wood. These parameters are clear indications that if furniture manufacturers need to scale globally, they need to source high-quality lumber and be organized to facilitate this process.

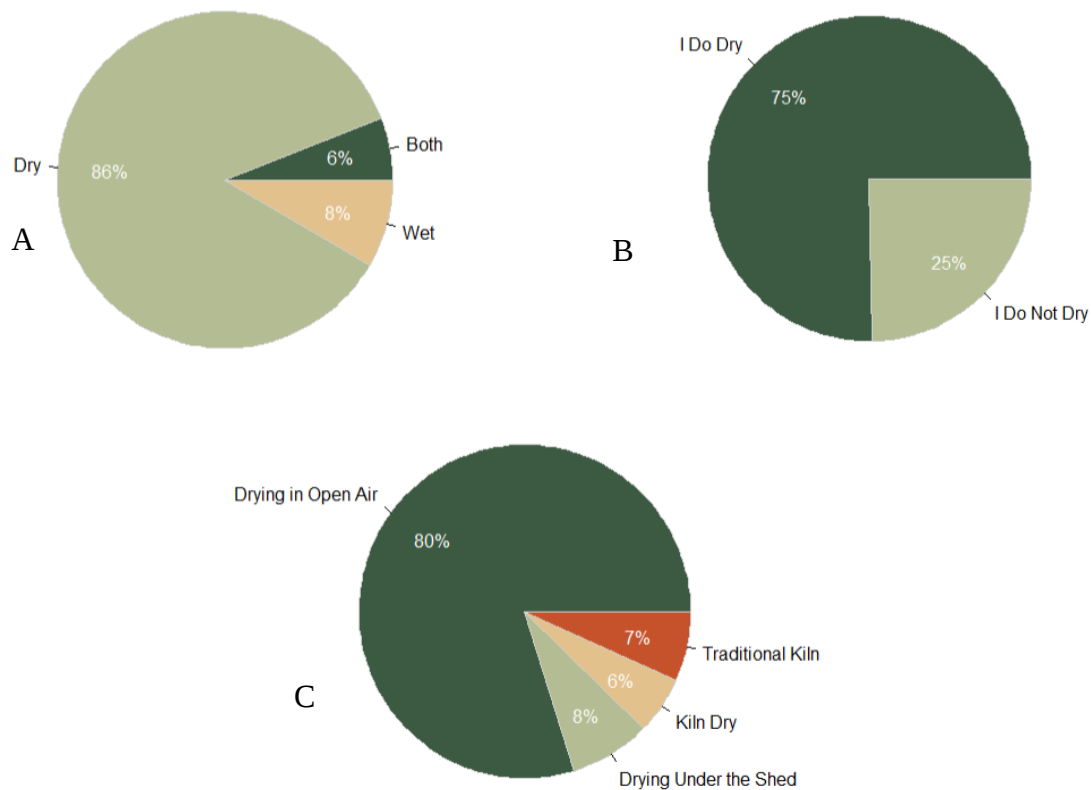


Figure 7. (A) How do furniture manufacturers use wood; (B) who dries furniture manufacturers wood; (C) method of drying wood

Figure 7 illustrates the nature of wood drying in Cameroon. Figure 7A describes in percentage the nature of utilization in Cameroon. 86% of furniture manufacturers said they use wood dry, 8% use wood wet, and 6% use wood dry and wet to manufacture their products. In Figure 7B, 75% of furniture manufacturers affirm that they dry their lumber themselves, while 25% do not dry lumber themselves. On the other hand, 80% of furniture manufacturers say they dry wood in the open air without any shed and probably without stickers. Knowing that wood dried in the open air is subject to many defects and that the 80% who dry lumber in open-air corresponds to the 86% who use lumber dry, we thus say that lumber drying is inadequately performed. This study closely ties with that of (Abissi and Tagne, 2015), who found that 65% of woodworkers in Cameroon air-dry lumber in the open air. The above figure indicates that **Drying in Open-air** has a positive impact of reducing MC in wood; but results in damage to the timber due to direct sunlight that may cause cracks, splits, and checks on the surface and possible deformation and discoloration of the surface over time.



Figure 8. Moisture content measuring methods

Figure 8 above show that about 55% of furniture producers in Cameroon make use of their eyes to measure moisture content (MC) in wood; about 35% use their hands to weigh wood for MC in it; less than 5% use a MC meter; and, 0% make use of a balance to measure MC in wood using the oven-dry method. These are indications of inappropriate drying lumber by furniture manufacturers. It ties with an earlier study (Tagne and Bennamoun, 2018), which stated that only 4% of woodworkers in Cameroon have good notions of wood moisture content required for constructing quality products, and 2.5% know the cost of drying wood. Consequently, the lack of sound knowledge of wood drying and related end MC tremendously affects the quality of wood products developed and manufactured in Cameroon. As MC reduction significantly impacts the quality, strength, and durability of wood, by induction, we can say that the quality of most furniture products in Cameroon is limited.

3.6.2 Method of Transportation of Lumber and Finished Products

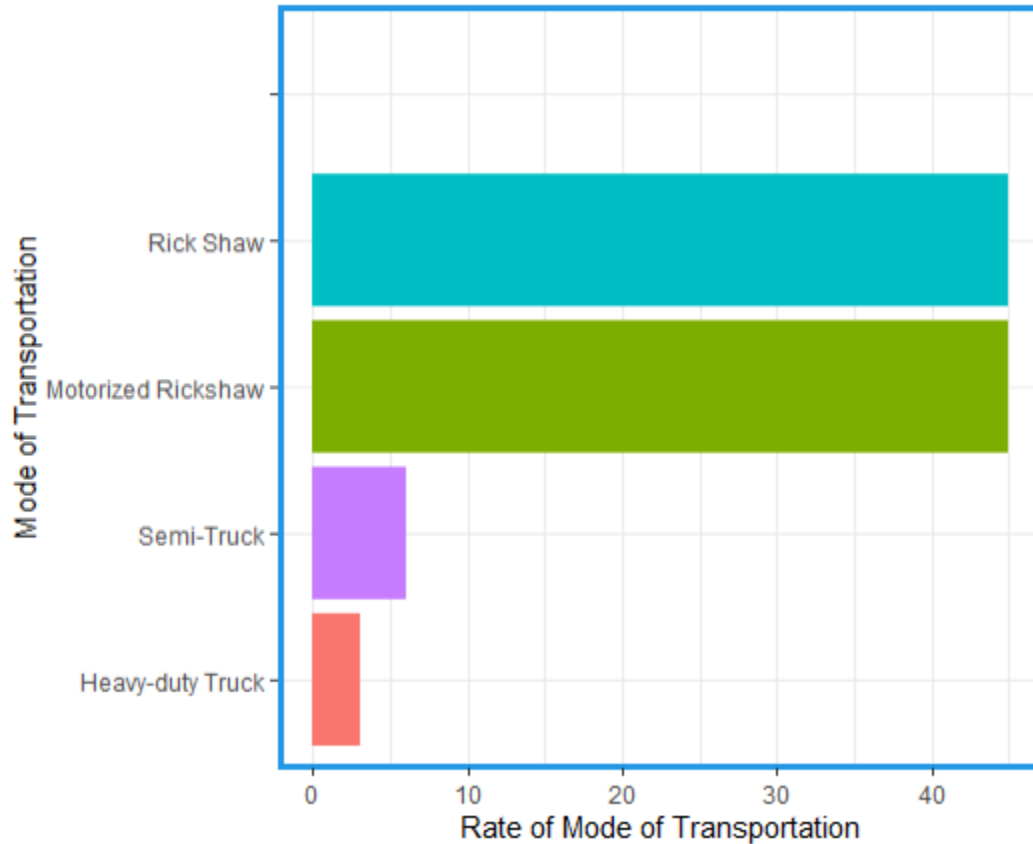


Figure 9. Method of raw and finished wood product transportation

Illustrating different ways of transportation of wood and wooden products is essential for the supply chain and for understanding production capacity and the clientele of furniture manufacturers in the country. From the above Figure 9, product transportation is principally done with a rickshaw or a motorized rickshaw at about 45% rate, while semi-truck is at about 6%, and heavy-duty truck is about 3%. We can assert that furniture transportation is done on a small scale even though there is a growing number of small and medium-size furniture production enterprises in the country. It also indicates that the mode of transportation would likely affect the quality of finished products during delivery, leading to customer dissatisfaction.

3.6.3 The Millwork in the Furniture Industry

This question demands understanding the different types of machines used to process lumber before the assembly stage and the safety involved for a better machining process. In this case, we shall illustrate different types of machines used and identify what hinders a proper machining process that may result in inappropriate products.

3.6.4 Type of production

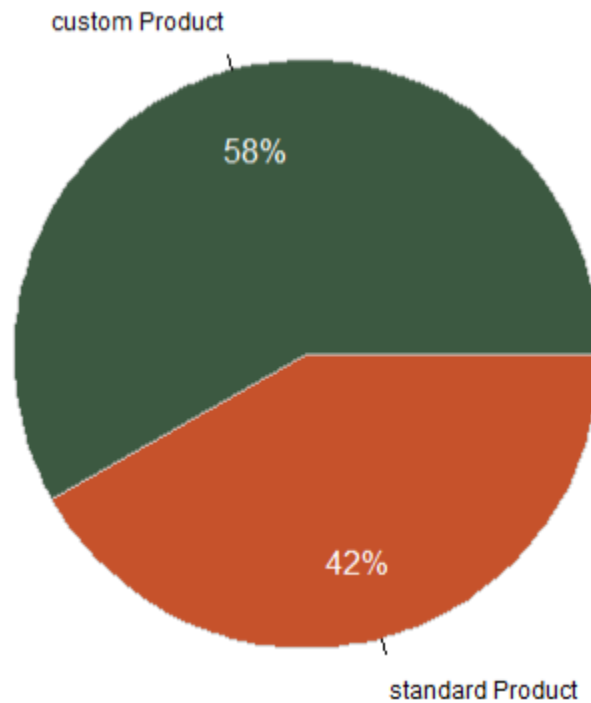


Figure 10. Type of production

From Figure 10, we can notice that there are two principal methods of production of furniture in Cameroon, custom-made products (make to order) at 58% of the production and standard products (make to stock) at 42% of the production output. These results are clear indications that the furniture production techniques in Cameroon are slowly progressing from traditional manufacturing to modern manufacturing. Customers' desires, needs, and wants, and the growing demands for product variation can be easily achieved. This result aligns with Xia and Rajagopalan (2009), affirming that satisfying customers' needs through customization tend to

relax price pressure on different firms as they satisfy customers' needs better. Hence, furniture users tend to have products made to their taste, desire, and preference.

3.6.5 Types of machines

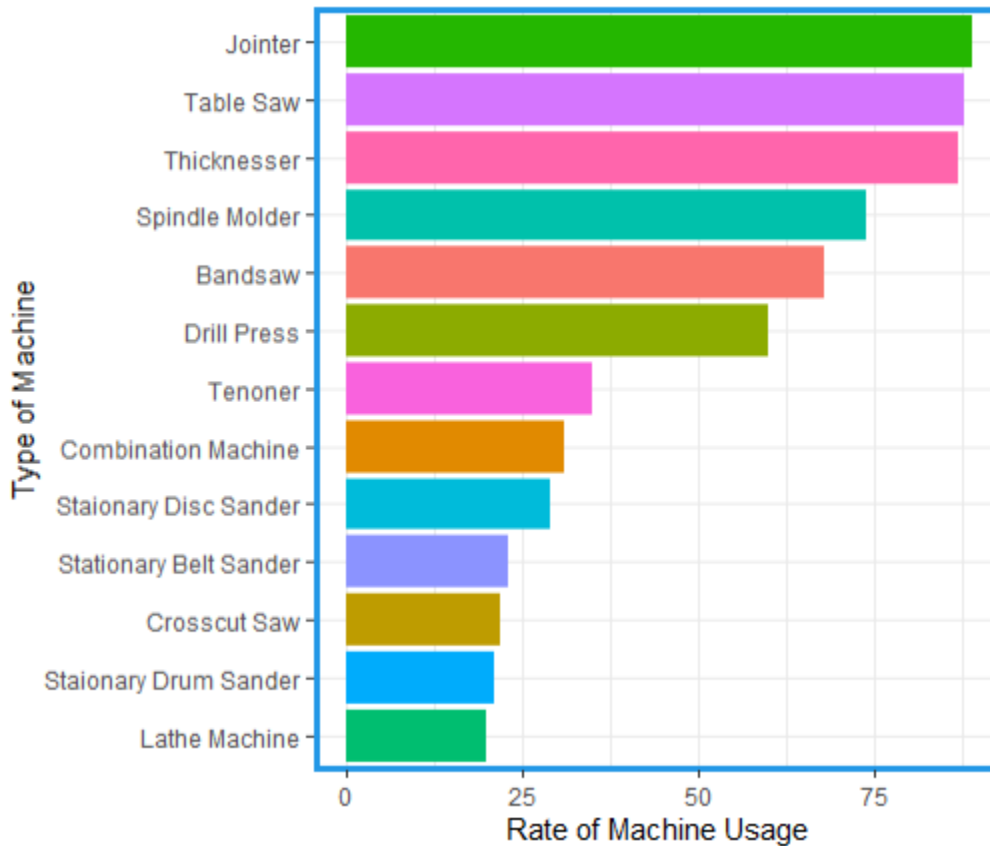


Figure 11. Rate of machine usage per machine

Machine usage and machine selection are critical in the wood industry since, through it, the operator shapes a piece of wood for a specific job. Figure 11 illustrates the rate of machine utilization in different interviewed enterprises. We observe that machines such as the thicknesser, jointer, table saw, band saw, drill press, spindle molder are the most used machines during the milling process of furniture and cabinets. This result ties with (Kodzi et al., 2007), who identified table saw, band saw, planer, router, drill press, and belt sander as the most used machines for different segments of the secondary wood industries ranging from furniture, cabinets, doors, and windows. They also implied that identifying commonalities in machine usage in another industry

segment helps leverage market advantage and design a good training program for a wide range of wood products manufacturers based on shared machines. In the same vein, machines such as crosscut saws, stationary belt sander, stationary drum sander, stationary disc sander, tenoner, and lathe machines have great importance in these industries since they help obtain different wood shapes and a final surface state. However, their less frequent use indicates that furniture producers in Cameroon cannot acquire all machines for their production and therefore rely on different shops where they outsource partial part processing of their products.

3.6.6 Types of products manufactured by Furniture Producers in Cameroon

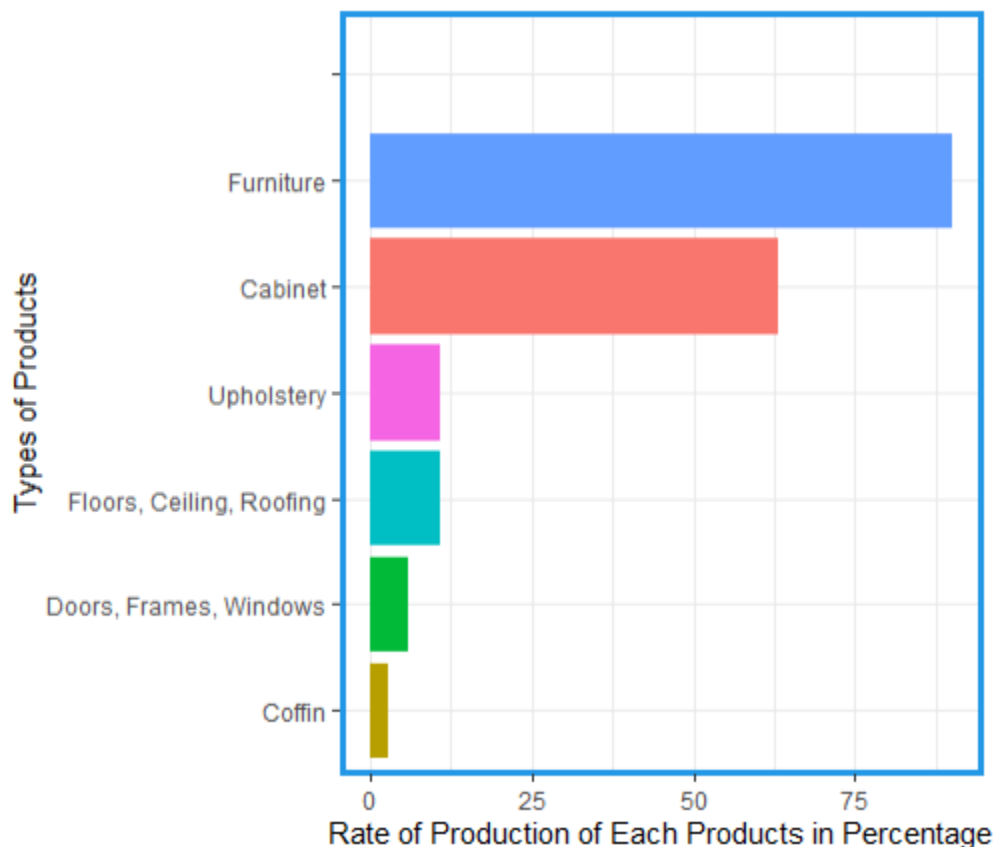


Figure 12. Different types of wooden products manufactured in Cameroon.

The bar graph from Figure 12 above illustrates the rate at which each product family is produced. We can observe a high rate of production of furniture followed by cabinets, then upholstery, and doors, frames, and windows. Gazo and Vlosky (2000) established that if more than ten companies produce a product, it is considered a separate value-added wood industry segment. In this case,

furniture manufactured by about 88% of the respondents; cabinets at about 63%; upholstery at 11%; floors, ceilings, and roofing at 11% are representations of different wood products industry segments in Cameroon. However, much is still to be done to attain a higher level of specialization—we can have a separate industry for doors and windows and an independent industry for different types of cabinets, be it kitchen cabinets and bathroom cabinets.



Figure 13. Types of products manufactured in Cameroon

3.6.7 Factors affecting machine fatigue

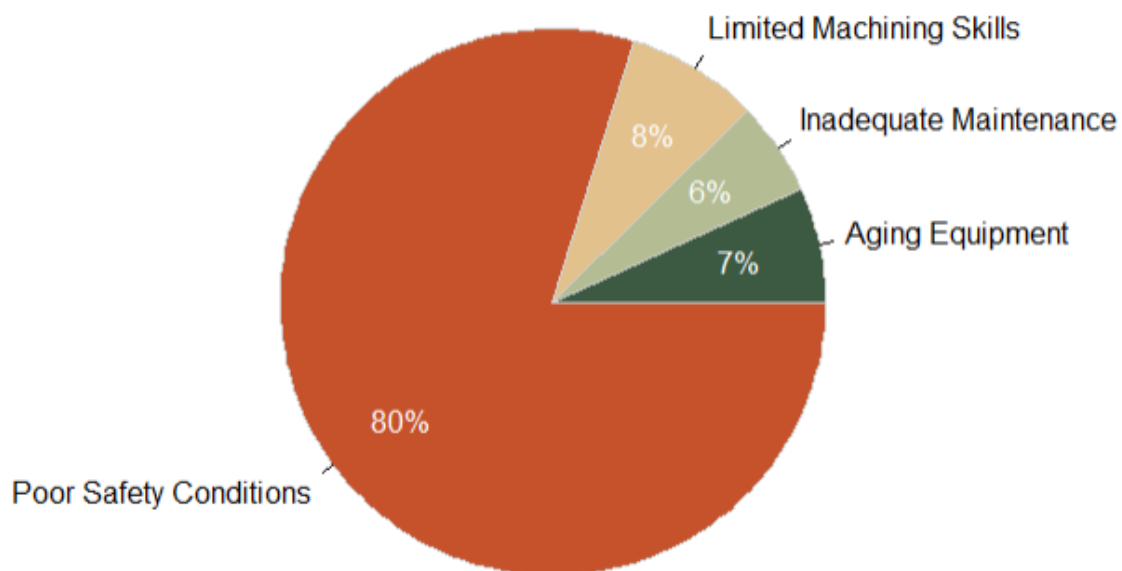


Figure 14. Factors affecting machine fatigue in percentage.

Figure 14 above illustrates in percentage factors that cause machines to fatigue quickly. we observe that poor safety conditions carry the majority with about 80%, followed by limited skills at 8%, and aging equipment at 7%. These values indicate that the surrounding environment where lumber is processed does not provide safe conditions for machining, operator mobility, material handling, and equipment safety. segmentation of the likelihood to different classes of machine usage. This result indicates that one major factor for the rapid wearing of equipment and machine tools in Cameroon's wood products industries is the lack of a well-constructed processing facility associated with a lack of skills to operate the equipment appropriately.

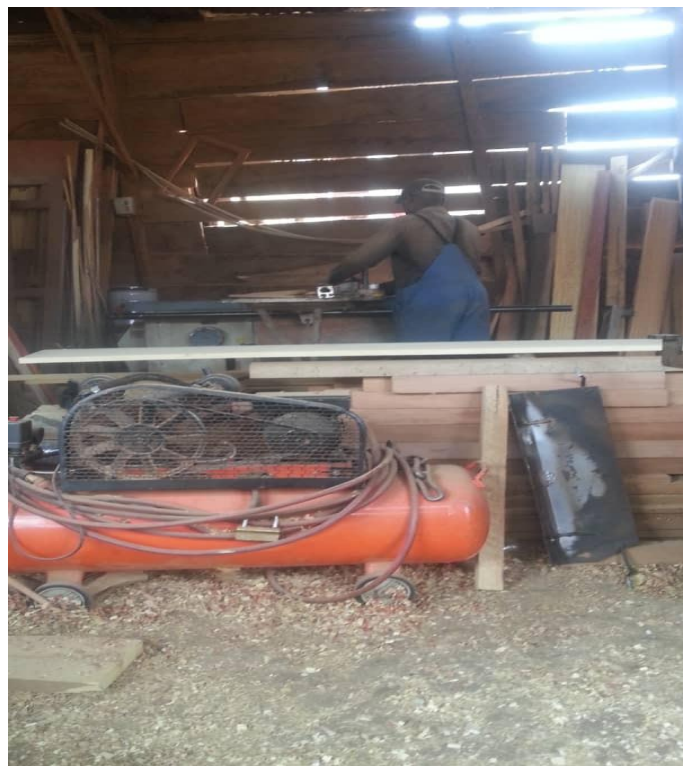


Figure 15. A machining shop equipped with a compressor for finishing

Figure 15 provides a pictorial view of the results observed in figure 14. The nature of the shop shows an inappropriate disposition of equipment and materials that consequently impact the safety and flow of materials and equipment. The nature of the construction and flooring does not provide free air circulation in the shop and could affect the safety of operators.

3.6.8 Method of assembly

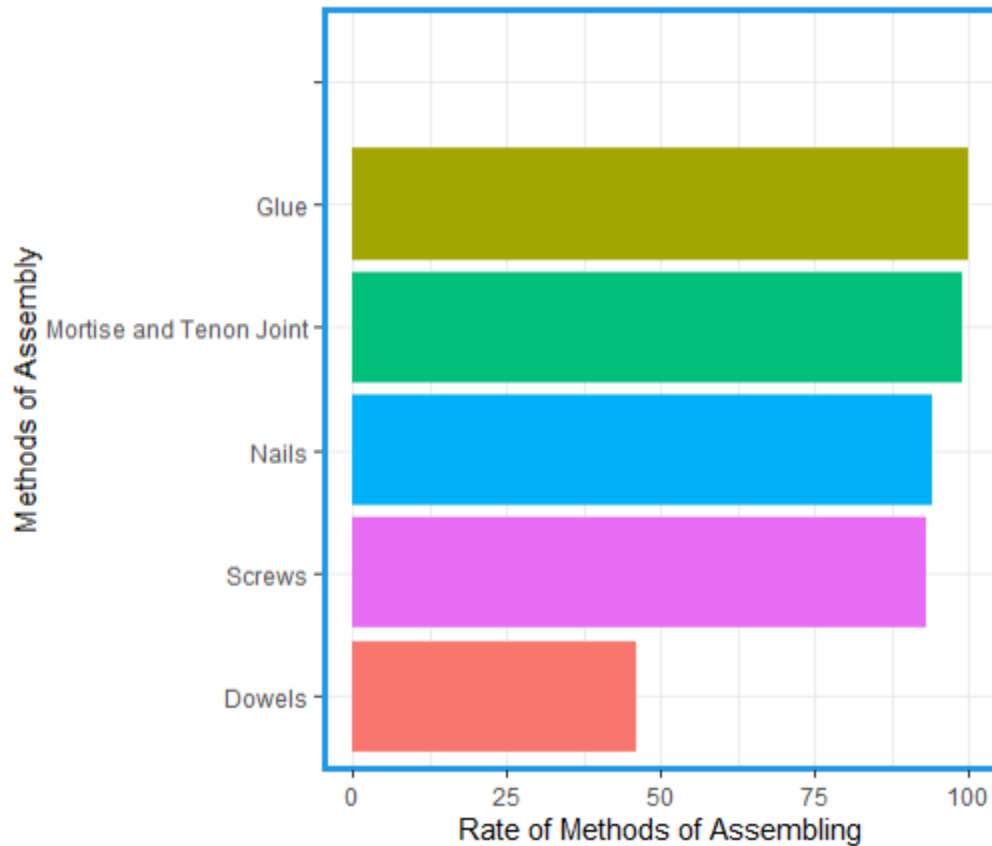


Figure 16. Different methods of assembly

Joining is of prime importance in woodwork because it provides different possibilities for bringing pieces of lumber together. Moreover, Figure 10 above indicates that most woodworkers employ mortise and tenon joints when assembling their various types of furniture and cabinet parts, in addition to glue, nails, and screws. Dowels are used as well, but not too frequently. Less frequent use of dowels at 46% and the overwhelming use of nails at 94% indicate that assembly methods are still traditional. The use of modern joints that provide greater strength and less material removal is least frequent.

Consequently, if a proper assembly needs to be done, a structural tree and a functional domain are required to describe the hierarchy of the product family and structure of the possible module or members alongside a description of the composition of the products and the relationship between them (Yue and Sun, 2015). This composition and relationship between

them refer to the jointing techniques employed to bring each member together. Jointing techniques have the merits to strengthen the durability of external structures without nails (Choi, 2009). Hence, nowadays, the use of nails in furniture and cabinet manufacturing tends to be almost zero in developed countries because of the quality of joining techniques employed and quality glue with limited curing time.



Figure 17. Assembly stage of table and chairs. Source: Donfack Giresse

3.7 State of Furniture and Cabinet Finishing in Cameroon

We evaluated the ability of furniture producers to apply six types of finishes, specifically: paints, varnish, lacquer, shellac, stain, and a mixture of varnish and stain (dependent variables) using different methods of applications such as brushing, spraying, wiping, and dipping. Related factors that may influence the quality of application of finish, such as inadequate finishing facility, lack of adequate tools, limited access to a quality finish, limited skills in finishing, were also assessed.

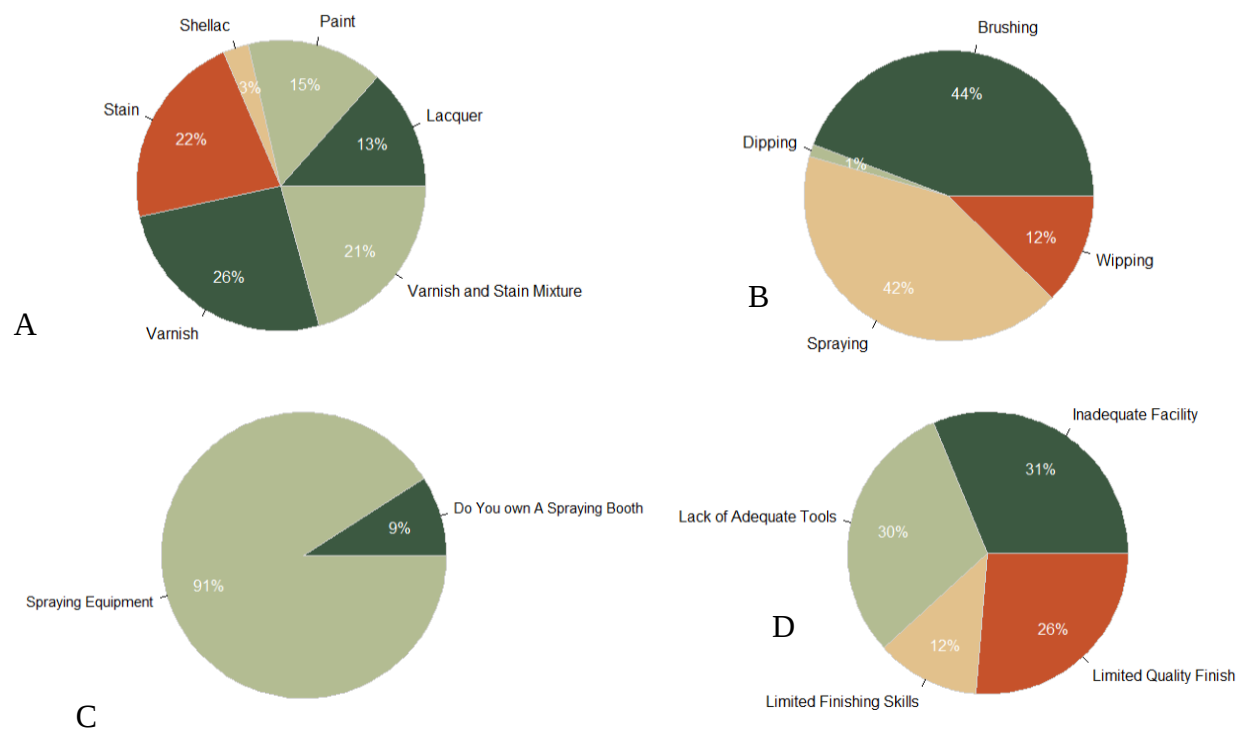


Figure 18. (A) Types of finishing applied by furniture manufacturers; (B) different methods of applying finishes; (C) spraying equipment owned by furniture manufacturers; (D) factors affecting the quality application of finishes.

Figure 18A describes different types of finishes that furniture manufacturers apply on wood surfaces. Varnish carries the highest at 26%, followed by stain at 22%, and the mixture of varnish and stain at 21%. The sum of the percentages of these three finishes is about 69%, whereas lacquer is 13%, shellac 1%, and paint 15%. These values are clear indications that furniture manufacturers have limited access to a wide variety of finishes and probably limit their ability to apply finishes properly. Figure 18B illustrates the different methods that furniture

manufacturers in Cameroon utilize to apply finishes on wood surfaces. Brushing is at 44%, spraying at 42%, wiping at 12%, and dipping at 1%. These percentages indicate that applying top-coating materials on wood surfaces requires some improvement. Figure 18C shed more light on this fact as 91% of enterprises indicated that they own spraying equipment; however, only 9% indicated they use spraying booth during top-coating. Figure 18C then concludes this fact by providing relevant information such as 31% of respondents attest that inadequate facilities hamper the quality of finishing application. It further illustrates that 30% of the manufacturers lack adequate tools, and 20% do not have access to quality finishes. On the other hand, 12% indicated finishing skills preclude them from correctly applying top-coating materials. Consequently, Cameroon's finishing systems are still traditional because of inadequate facilities, limited skills, and lack of adequate supply of good finishing products converse to what (Melton et al., 2002) stated that well-established structures might use a variety of spraying booths.



Figure 19. Preparing the surface for enamel coating

3.8 Proposed Solution

Below is an extension logic model represented in table 3 that takes into consideration local furniture manufacturers' economic and social conditions. To begin with, we established a flow chart to illustrate the organization of our extension model and, finally, based on the logit model developed by the United States National Institute of Science and Technology (US-NIST) through which we seek to resolve the problems found above.

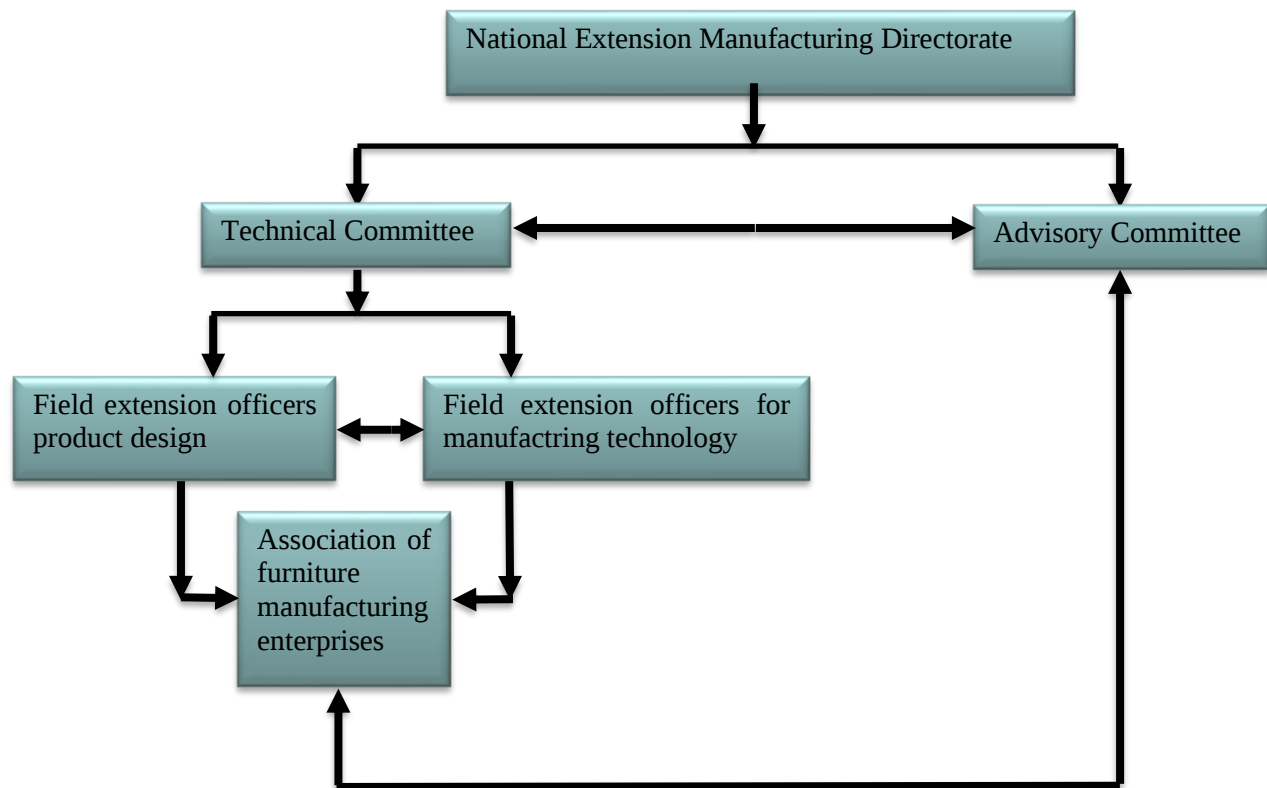


Figure 20. Organogram of manufacturing extension program

The above organogram illustrates the organization flow chart of the manufacturing extension program. The program directorate manages the program's daily administrative and financial aspects, controlling the action of field extension officers, and communicating with government representatives the program's outcome and the state's expectations. The advisory committee comprises representatives from the Ministry of Forestry and Fauna, Ministry of Small and Medium-size Enterprises, Chamber of Commerce, and the Ministry of Higher Education. Field Extension Officers are specialists with extensive experience in furniture development and

manufacturing charged with helping furniture producers improve and offer suggestions with steps they may adopt to improve capability. University professors are required to bring forward innovative technological practices developed from their research to advance processes. Finally, the association of furniture producers comprises registered furniture producers within a given region. Through these clustered associations, field agents can easily connect with furniture producers to solve their problems, be it in the design of products and manufactur

Table 3 Developing a Logic Model to Enhance Furniture Manufacturing by SME in Cameroon

Situation: market competition and customer satisfaction are demanding for every production system. therefore, for owners of small and medium-size wood manufacturing enterprises in Cameroon (SME) to withstand the global trend, they need to improve the quality of their products through innovative manufacturing practices, quality finishing.

Inputs		Outputs			OUTCOMES -- IMPACT		
		What they do	Who they reach		Short	Medium	Long
- Set up a workshop with the help of an enterprise with professionals. - Developed handouts containing safe, innovative furniture processing, and assembly techniques. - Provide a handout with safe finishing techniques.		- Field officers will Illustrate how to safely use and maintain machines and equipment for a good production yield. - Illustrate better safe practices during finishing application that are safer to the operator and will not hamper the quality of the finish.	Cameroons' Small and medium-size Wood Manufacturing Enterprises.		The workshop participant will demonstrate the skills to: - Innovative machining practices that are lean, safer, and - Organize their workshop appropriately to facilitate better flexibility during different operations - Assemble and finish their product with no defects on the surface	The participant will: - Practice lean and flexible manufacturing practices - Use adequate assembly techniques visualization before proceeding to assemble. - Organize their finishing environment appropriately for better finishing and to avoid hazardous events	The participant will be: Abe competitive worldwide with quality products
Assumptions: Owners of medium-size enterprises will want to: develop products that satisfy customers' requirements. Improve the quality of their products. Limit on the waste of materials.					External Factors: to acquire quality equipment and finishing products. International standards related to wood products and their manufacturing.		

3.9 Conclusion

Based on the survey responses analyzed in this paper, Cameroon's furniture industry requires improving its manufacturing ability to satisfy the growing consumer needs, specifically as the demand for customized products increases with time. The survey indicated that Cameroon furniture manufacturers have limited knowledge in wood drying, measurement of moisture content in wood, the control of drying parameters, and the end moisture content. In the same vein, we found that limited machining skills are the most significant factors that hamper furniture producers from performing adequate wood processing and better organization of their workshops and enterprises, leading to rapid aging of their equipment and machine tools. As machining operations are faced with difficulties, so are the assembly and the finishing stages or steps of the manufacturing process. In this light, furniture manufacturers still frequently use nails and mortise and tenon joints, indicating that the jointing techniques are still very traditional and consequently affect the quality and appearance of the final product. The finishing methods analysis also showed that most furniture manufacturers have few skills in the usage of a variety of finishing products, and this is because of lack of adequate facilities, limited skills in wood finishing, and limited access to quality finishing products. We proposed a manufacturing extension program through which furniture producers' skills will be enhanced in Cameroon. We hope the result of this survey serves as a springboard for more in-depth research toward the application of the proposed solution and the reassessment of the outcome after implementation. More especially as the Cameroon government, through its National Development Strategy (NDS30), aims to establish a favorable economic growth condition and wealth accumulation. Through its structural transformation, it seeks to strengthen the wood processing industries with a kind view to the manufacture of furniture.

3.10 References

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CHAPTER 4. DIGITALIZATION OF FURNITURE AND CABINET DESIGN AND DEVELOPMENT IN CAMEROON.

This chapter was submitted to Journal Bois et Foret des Tropiques on November 22, 2021, and is currently under review. It has an impact factor of 0.692, publishes about 28 articles per year, and has been in existence since 1947. This journal was chosen because it discusses tropical forestry exploitation, management, and value-added of timber from these forest zones.

Abstract

Cameroon furniture industry is characterized by low usage of computers to improve its manufacturing quality during its design stage. To this effect, we developed and administered a questionnaire to assess factors influencing furniture producers' adoption of a computer-aided design approach to product development. Two surveyors canvassed the cities of Yaounde and Douala, respectively, the political and economic capital cities of Cameroon, administering the questionnaire to small and medium-sized enterprises. The results show that most furniture manufacturers do not utilize computer-aided design because they lack the required skills to perform the designs, and the software is expensive. In the same vein, the study asserts that developing a manufacturing extension program will go a long way to build these skills and facilitate access to resources required to achieve this goal.

4.1 Introduction

Furniture production has gained prominence over time from the earliest furniture and cabinet producers in the days of Louis XIV to the contemporary period. As time passes by, each generation brings forward its means of facilitating the production and design of these precious items. Today, industries with limited access to innovative design ideas and designs means lag behind the development of the times (Dongjiu and Keke, 2017). This forces people to seek new working methods to solve product design problems, such as the application of computer-aided design (CAD) in the furniture industry (Shi, 2021). Hagstrom et al. (2006) established that CAD software fulfilled the needs of furniture manufacturers in Sweden and improved their product

development capabilities. For furniture manufacturing industries in Cameroon to design standardized products, they need to adopt such practices.

Manufacturing processes and product development is performed today in an advanced setting in most parts of the world. Product design starts with the specification to collect essential data about the product and the conceptual design to portray the realizable physical object (Hsu and Woon, 1996). In this light, it becomes intuitive to understand how this tool has gained momentum over time in revolutionizing small-scale businesses to compete with larger ones. Meredith (1987) described how small firms employ new technologies in novel ways to gain a significant advantage over their competitors through lead-time reduction, flexibility, and quality. The study demonstrated how the adoption of broader objectives by smaller firms aids in implementing new technologies.

In this respect, we observed how industries in emerging economies have grown. For this case, we witness the expansion of China in technological shift thanks to its appropriation and dissemination of university-developed technologies and research by its industries. Long et al. (2011) assert that clustering or spatial agglomeration facilitated China's industrialization and growth. Through clustering, China has been able to merge the production of the same products in distinct localities, which has helped leverage barriers between large and small companies in terms of technological adoption. Fleischmann et al. (2017) called it the creative industry; it is a driving force for economic growth, a new conceptual ground dominated by technological breakthroughs because of combined capacities and energies. This combination of details, lead-time reduction, quality, and flexibility are all factors that encourage a business to grow through customer satisfaction.

It has become ubiquitous that computer-aided design in the furniture industry serves as a springboard to raise the standard of product development. As furniture modeling is enhanced, its manufacturing takes a great leap, and homes become furnished with great products. It is hard to imagine a modern house without well-constructed furniture provided by a furniture industry that is competitive in a national or international market (Nihat et al., 2010). This idea bores down to the fact that design remains the most critical in any manufacturing industry; it determines the stages of production of the said product and its marketing. Lescuyer et al. (2017) illustrate how the furniture manufacturing industry in Cameroon is lagging in terms of technology acquisition and innovative practices. They found that the market share of imported furniture in Cameroon

between 2004 and 2008 was 40 percent and that it doubled since 2007. They indicated that the mechanical stability and comfort of furniture articles are the most significant variables affecting the decision of Cameroonians to purchase imported furniture.

This paper evaluates the computer-aided design know-how of Cameroon's furniture producers and their understanding of design basics and computational tools to enhance the quality of products they develop. Finally, we propose a manufacturing extension program through which furniture producers can acquire CAD skillset. The 21st century came with a lot of innovation in this field. Furniture manufacturing industries in Cameroon must align with this trend and international standards to compete worldwide.

4.2 Importance of Computer-Aided Design to the Secondary Wood Industry

Design shapes society in all its strata. Industries have used it to develop products and structure their manufacturing processes into either design for manufacturing or design for assembly. In the same vein, each time we design a product, we make a statement about the direction the world will move. In this case, design is no more an issue for architects, artisans, and manufacturers alone; it is also that of politicians, businesses, and organizations. As designs evolve into shaping today's society, they also shape today's manufacturing process through requirements such as customers' desires, facilities of the operator, functionality, cost ratio, quality of products, the capability of the process, material requirements, and work method. The factors mentioned above are critical to customer satisfaction and a smooth manufacturing process.

For furniture manufacturing firms in Cameroon to stand out, they must innovate. They must aim to satisfy customers' needs, make profits, develop attractive products with appealing look and feel, modern materials, and technological features (Gautam and Singh, 2008). These enterprises can achieve this with the appropriate use of computer-aided design tools. CAD tools allow designers a fast and inexpensive way to visualize and examine new ideas, increasing efficiency and allowing more time to be spent on creativity (Kelly, 2001; and Shrage, 2000). A piece of furniture that is well designed must satisfy the following factors: functionality, form, solidity, and aesthetics. These lead to human factors since most of the furniture is for individuals. Robertson and Radcliffe (2009) illustrated how CAD could positively influence circumscribed thinking while leading the users to express their creative ability beyond the limitation of the

work at hand. Therefore, creativity plays a unifying factor on which the enhancement of design is based to suit the need of customers.

Substituting traditional design methods that embodied hand tools, drafting paper, and drafting boards with computer-developed applications for designing is a stepping stone in acquiring agility in the Cameroon furniture industries. Agility in manufacturing refers to producing products and providing services of different kinds and varieties within a short period (Vinodh et al., 2010). The authors pursued their ideation by stating how CAD skills could improve agility in practice by 80 percent when designing a switch's knob and positively affect market competitiveness. It illustrates the improvement of productivity when adopting innovative technologies, and by doing so, traditional manufacturing companies enhance their competitive abilities nationally and internationally (Vinodh et al., 2010). Hence, acquiring CAD skills for preparing models that respond quickly to customers' requirements is an aspect of agility, as it corresponds to one of its essential features: knowledge base.

Furniture manufacturing can only be done appropriately with good drawings illustrating process stages, details, and specifications. Conventional CAD usage is limited to product design and ordinary geometric modeling (Shah and Mantyla, 1995). Design for manufacturability (DFM) includes tolerancing, process routing, surface finishing states, and desired processing geometries. There are over 500 furniture manufacturers in the cities of Douala and Yaounde in Cameroon. With a growing middle-class population with expectations regarding furniture mechanical soundness, aesthetics, and forms (Lescuyer et al. 2017), DFM embedded into CAD skills becomes necessary to reduce cost and delivery time and increase competitiveness locally and globally.

The key to achieving an advanced furniture manufacturing industry in Cameroon is to embark on the innovative track. Digitalization has brought much improvement in processing industries in terms of economic costs and productivity. The capital share of manufacturing industries in the US increased by a factor of five, from 3% to 15% through digitization (Morrison, 1997). Morrison concluded that sectors like the furniture industry experienced multiple growths from 1% to 24% from 1976 to 1991 through adopting information technology systems in their enterprises. Likewise, it is possible to fully initiate the product life cycle through digital intelligent design systems with a rich database with simulation technology that improves the development cycle by 40% and rework by 50% (Zhou, 2013). Improvement in product

development and rework comes along with significant improvement in work precision as computer-aided manufacturing systems and computer numerical control systems come to play. The implementation of material resource planning II (MRP II) brought supplemental benefits to the manufacturing industry by coordinating plant floor activities, reducing cycle time, and increasing capacity (Meredith, 1987). She described how MRP II positively affected planning, scheduling, plant monitoring and control, forecasting, and order entry through the interconnection of software packages. She concluded that the adoption of CAD has a significant positive impact on flexibility, quality, lead-time, productivity, and quality of drawings of a product development.

Achieving optimal production of furniture on time requires synergy forces among producers and external parties. Manufacturing extension, therefore, can play this unifying role between producers, governmental, non-governmental organizations, and universities institutions. (Shapira et al., 1995) assert that manufacturing extension partnership aimed to upgrade the performance and competitiveness of small and medium-sized manufacturers (SME) in the United States. For example, the industrial-technological extension service (ITES) of the state of New York facilitated the awareness of new technologies and management practices of SMEs (Oldsman 1996). Some firms relayed that they would have ceased operating or transferred to other states if they had not received assistance from ITES (Oldsman, 1996).

In early 1980, Cameroon began implementing extension plans in its agricultural sector. This program was specifically aimed at alleviating the livelihood of farmers in the Western region of the country. The program was named T&V (Training and Visit Extension System) (Tchouamo et al., 1999). On the other hand, small and medium-sized enterprises, especially shop manufacturers, have not had a successful and accomplished extension program. This is why most industries, especially in the wood manufacturing sector, end up closing after a few years of operating. Most of them belong to the informal nature of the different enterprises (Lescuyer et al., 2017). Thus, adopting a manufacturing extension program for furniture manufacturing industries in Cameroon is an opportunity to consolidate CAD skills to enhance product design and development quality. Especially as extension officers charged with this task will have to employ a participatory approach differently from the top-down method (Prokopy et al., 2017). Extension as a community engagement program can be effective if a logic model (LM) helps guide the outcome's accomplishment with well-defined activities, precise input, and output

needed. The LM serves as a means of critical thinking in the simulation, planning, and monitoring program evaluation (Cooksy et al., 2001; Dwyer and Markin, 1996; Julian et al., 1995). Therefore, through the LM, the dissemination of CAD skills to furniture producers in Cameroon will have a well-defined road map towards acquiring this know-how since the connection of activities and their resources will ultimately change the performance in this vital manufacturing area.

4.3 Methods

The method used in this research is a survey. It aims to collect information from samples of individuals through their responses to questions written in a questionnaire (Check and Schutt, 2012). Two cities of Cameroon were involved in the research, Yaoundé, and Douala. We choose to randomly interview proprietors of 50 small and medium-sized enterprises from various districts in each of the two cities. Lescuyer et al. (2017) ascertain that about 517 woodwork shops and small and medium-sized enterprises exist between Douala and Yaoundé. Three researchers from the cooperating Fouban School of Art and Craft canvassed these two cities and administered the questionnaire. An in-person interview format was used to be able to clarify responses and improve accuracy and response rate. The data collection process was performed over a period of two weeks. RStudio, a statistical data analysis software, was used to analyze the data using the Binomial Logistic Regression method to establish the ability of furniture Producers in Cameroon to use CAD and their experience in design. Pie charts and bar charts are used to illustrate factors that influence the desire of furniture consumers to choose given products.

4.4 Survey Design and Administration

Delineating the ability of furniture producers to design products using CAD is the principal aim of this survey. To this effect, we established a thorough qualitative data questionnaire to depict factors that can influence the design of a product and how they do to produce these drawings. The first question was related to the type of production they practice—here, we collected information about whether they manufacture customized or standardized products. The next question was what influences their customers' choice of a given product—

this was aimed at assessing if most of the producers designed their products themselves. The third question in the survey asked what method of design do they utilize. The questions were all close-ended questions. With this question, we evaluated their know-how in drawing in stages from a quick freehand pencil or pen drawing, preliminary draft using a tablet, previous experience, a drafting board with drawing instruments, and CAD software. The fourth and fifth questions consisted of knowing the advantage of using CAD software for those who use it and the reasons that cause others not to use the software.

The surveyors conducted a pre-trial survey with four respondents to test the instrument's validity and determine if questions were straightforward, easily understood, and answered. At the end of the pre-trial, we concluded that the survey document was valid and ready for application in the field with minor changes. The survey was conversational and colloquial. Through this method, the surveyors established a rapport with respondents. This method prompted the latter to provide valuable insight into their daily activities and answer all the questionnaire questions. This approach was the appropriate method of administering the questionnaire in an environment where internet connectivity is suitable for online surveys, and not all enterprises possess a mailbox. At the end of the process, the surveyors interviewed one hundred small and medium-sized wood furniture enterprises, meeting our target.

4.5 Characteristics of Cameroon furniture producers

The organizational nature of manufacturing structures elucidates their ability to strive to a larger business scale or not. The business model provides a framework that takes technological characteristics and potentials and converts them to outputs (Chesbrough and Rosenbloom, 2002). Table 4 below depicts the function occupied by each respondent of the different interviewed structures. Through this table, we can notice that sixty-six respondents are owners of their shops. In the case of Cameroon, this means the proprietor is the sole person who receives orders, executes them, and sometimes recruits part-time workers according to the job at hand to aid in the execution (Lescuyer et al., 2017). Just two chief executive officer (CEO) titles illustrate the scarcity of extensive and specialized furniture manufacturers in Cameroon.

Table 4. Position of respondents and corresponding number.

Position of Respondent	Number of Responses
Owner	66
Woodworker	5
Assistant Manager	2
CEO	2
Sales Officer	3
Apprentice	1
Technician	19

Table 5. A number of companies with their corresponding number of employees.

Numbers of Employees per Enterprise	Number of Enterprises
0	1
1	15
2	16
3	5
4	4
5	2
6	2
7	2
10	1
11	1
36	1
46	1
52	1

Table 5 shows the number of employees and the corresponding number of firms. Again, we can observe that enterprises with larger employee sizes ranging from 10 to 52 are just one (1) per employee size. In contrast, the most significant number of respondents have employees ranging from zero (0) to seven (7). Organizations with limited employees have limited possibilities to specialize labor and, therefore, influence their ability to adopt new technologies.

4.6 Survey Results and Discussions

A total sample size of one hundred (100) randomly selected small and medium-sized furniture enterprises responded to the survey, corresponding to about 10% of the population of 517 as pre-established by Lescuyer et al. (2017). Below is the summary of the result analysis of each question of the survey.

4.6.1 Furniture Production methods in Cameroon

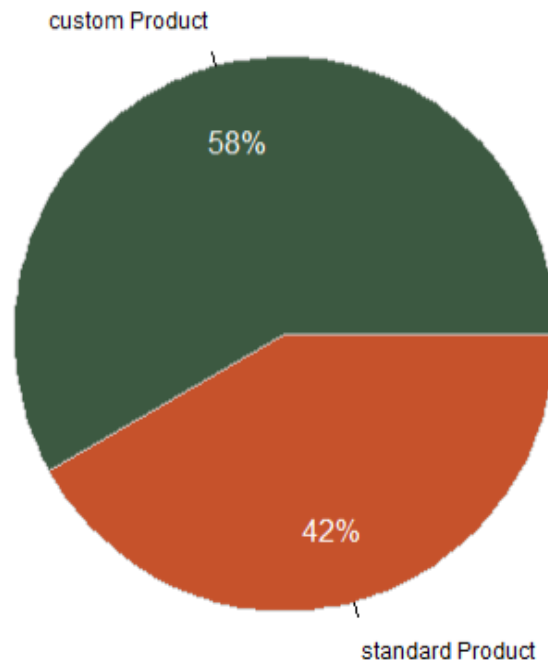


Figure 21. Method of production of furniture in Cameroon

We observed that the demand for custom products is 58%, higher than that for standard products (42%). This result aligns with that of Xia and Rajagopalan (2009), affirming that satisfying customers' needs through customization tend to relax price pressure from each firm as it satisfies customers' needs better. Hence, furniture users tend to have products made to their taste, desire, and preference. It then becomes imperative to utilize CAD and new information technology tools in the design process.

4.6.2 What influences your customers' desires for a given design?

The summary table below illustrates the response rate in percentage to each question's answer followed by its pie chart

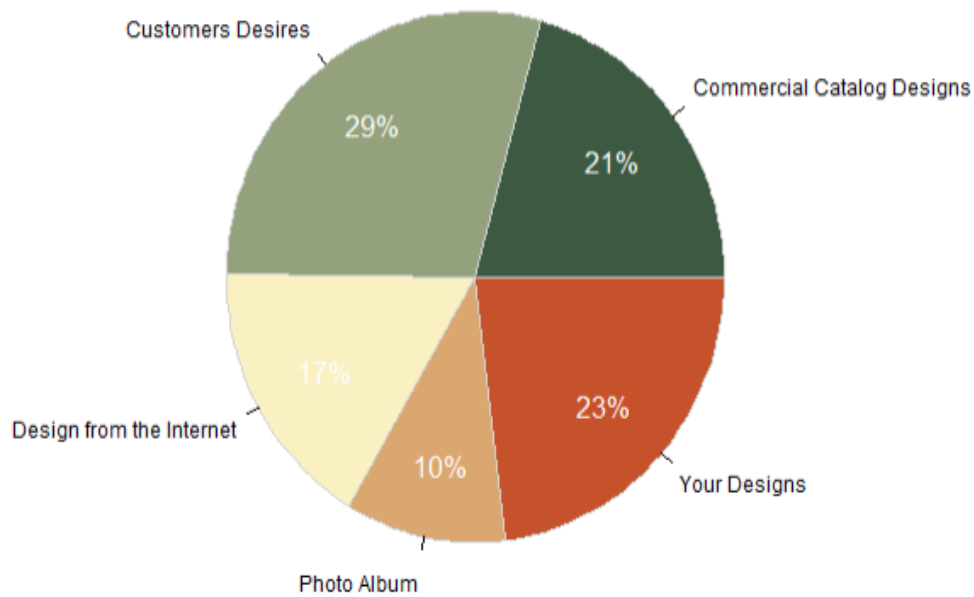


Figure 22. Customer design preference.

From Figure 4 above, *customers' desires* carry the most significant response percentage of 29%, followed by the design of the furniture producers of 23%, commercial catalog at 21%, then design from the internet at 17%, and the photo album at 10%. With these results, Manufacturers have to be flexible, open, and responsive to customers' desires to compete in a global market (Zengin and Ada, 2010). This is achieved through product customization with the help of appropriate drawings.

4.6.3 Method of designs

The below analysis is related to establishing the relationship between the different methods of design furniture producers in Cameroon practice and how it helps them produce more CAD drawings. Logistic regression is used to determine the influence of variables and the type of influence they had on the ability to design using CAD. It is preferred here because it does not assume homoscedasticity of variables, their linearity, and normality. CAD here is a dichotomous variable expressing the ability to use the software or not. The same analysis is performed with considering association as an added variable—a three modality variable with one(1) as “Good Idea,” two(2) as “Bad Idea,” and three(3) as “Neutral.”

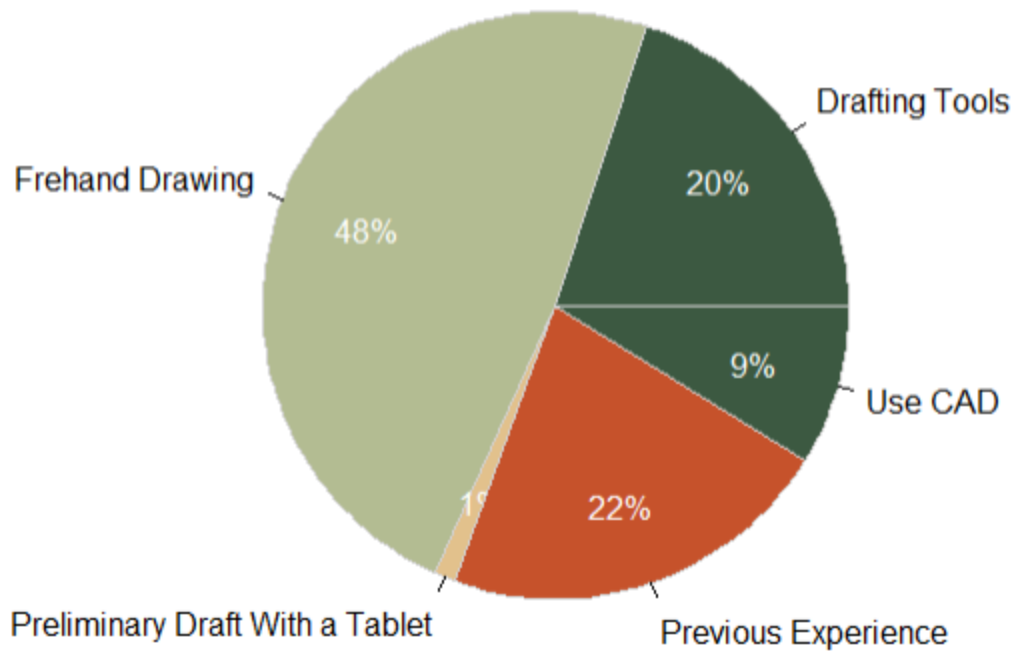


Figure 23. Method of design

Figure 23 above depicts how furniture manufacturers in Cameroon design their products. 48% of the manufacturers use freehand to design their customers' products, 22% design products from previous experience, 20% use drafting tools, and 9% use computer-aided design software. CAD being at 9% indicates the nature of the enterprises in terms of size and proves how knowledge of product development and design is still not well perceived by furniture manufacturers in Cameroon. This limited perception is backed by the 48% who use freehand as a design method since it is not sure on what basis they develop their products.

4.6.4 Consider association

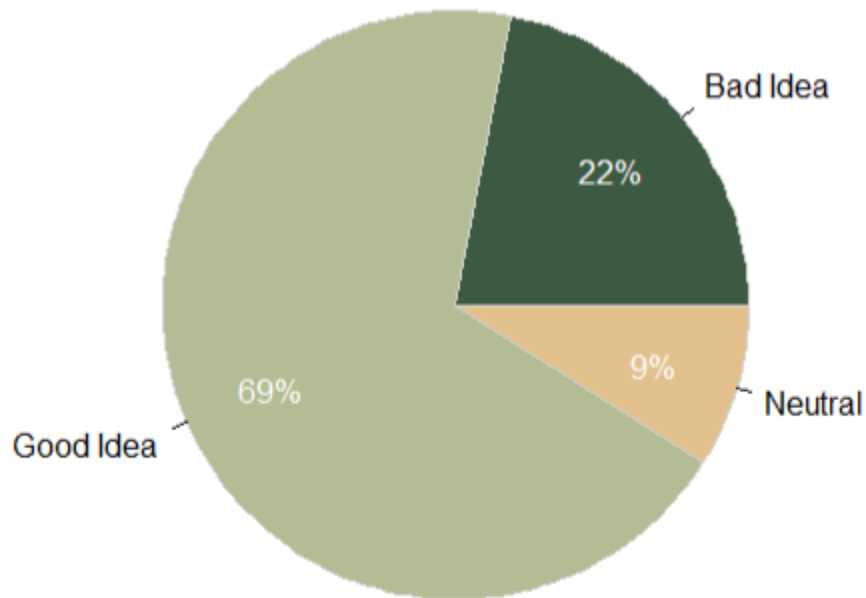


Figure 24. The capacity of furniture manufacturers to form associations

This part of the result assesses the ability of furniture manufacturers to form associations. 69% of the manufacturers affirm that belonging to an association will do well for them in creating room for partnership between them, providing a platform where they can better improve the processes and educate themselves. Though 22% said it was a bad idea, this could be due to their past experience with their local associations. Most of the time, their previous form of association did not target capacity building; instead, it focused on helping one another when faced with either an illness or a deceased family member.

4.6.5 The reasons why some manufacturers do not use CAD

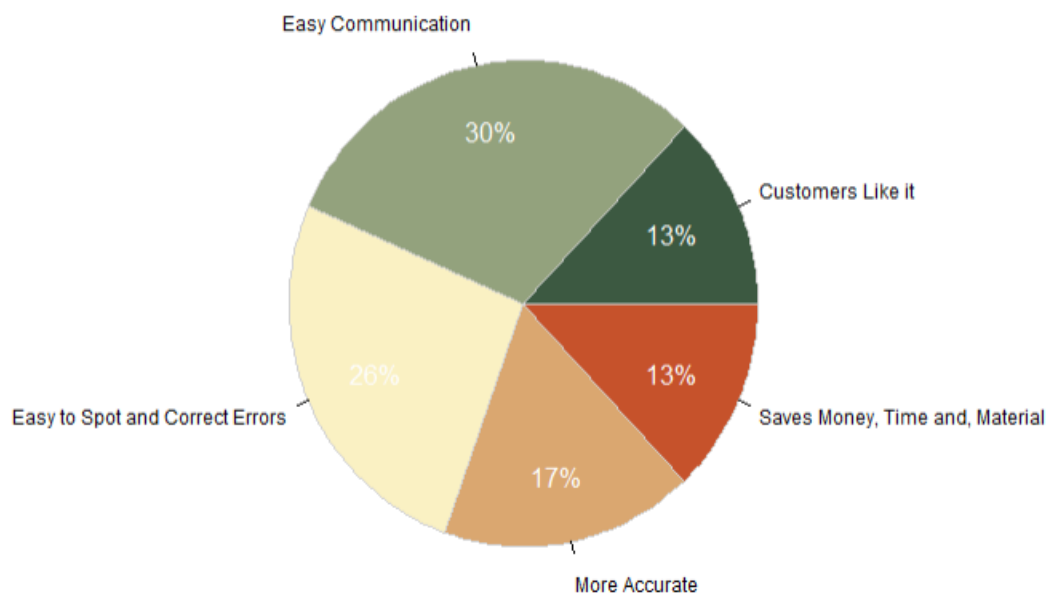
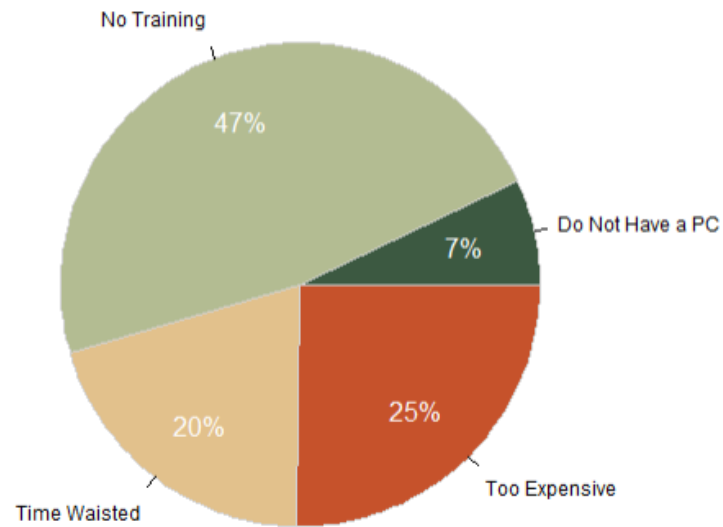


Figure 25. Advantages of using CAD software

The above graphs illustrate why some furniture producers in Cameroon do not use CAD software and the advantages of those who use them. In Figure 5, we can observe that 47% of furniture producers don't use CAD software because they lack the skills, 25% claim it is too expensive, 20% assert that it is time wasted, and 7% of the furniture producers say they don't own a computer. On the other hand, about 30% of those who use CAD attest it makes it easier for them to communicate with customers, 26% say it makes it easier for them to spot errors, and 17.% affirm its accuracy when using CAD software for design purposes.

The analysis results indicate that furniture manufacturers in Cameroon almost do not use CAD software to design their products, affecting their capacity to produce accurately and efficiently. Moreover, there is proof that most of their products are manufactured under custom-made products, which requires continuous agility in the design of products and understanding the concept of design for manufacturing and assembly. We propose a manufacturing extension logit model elaborated in the section below to palliate this deficiency.

4.7 Proposed Solution

Below is an extension logic model represented in table 6 that considers local furniture manufacturers' economic and social conditions. To begin with, we established a flow chart to illustrate the organization of our extension model and, finally, based on the logit model developed by the United States National Institute of Science and Technology (US-NIST) through which we seek to resolve the problems found above.

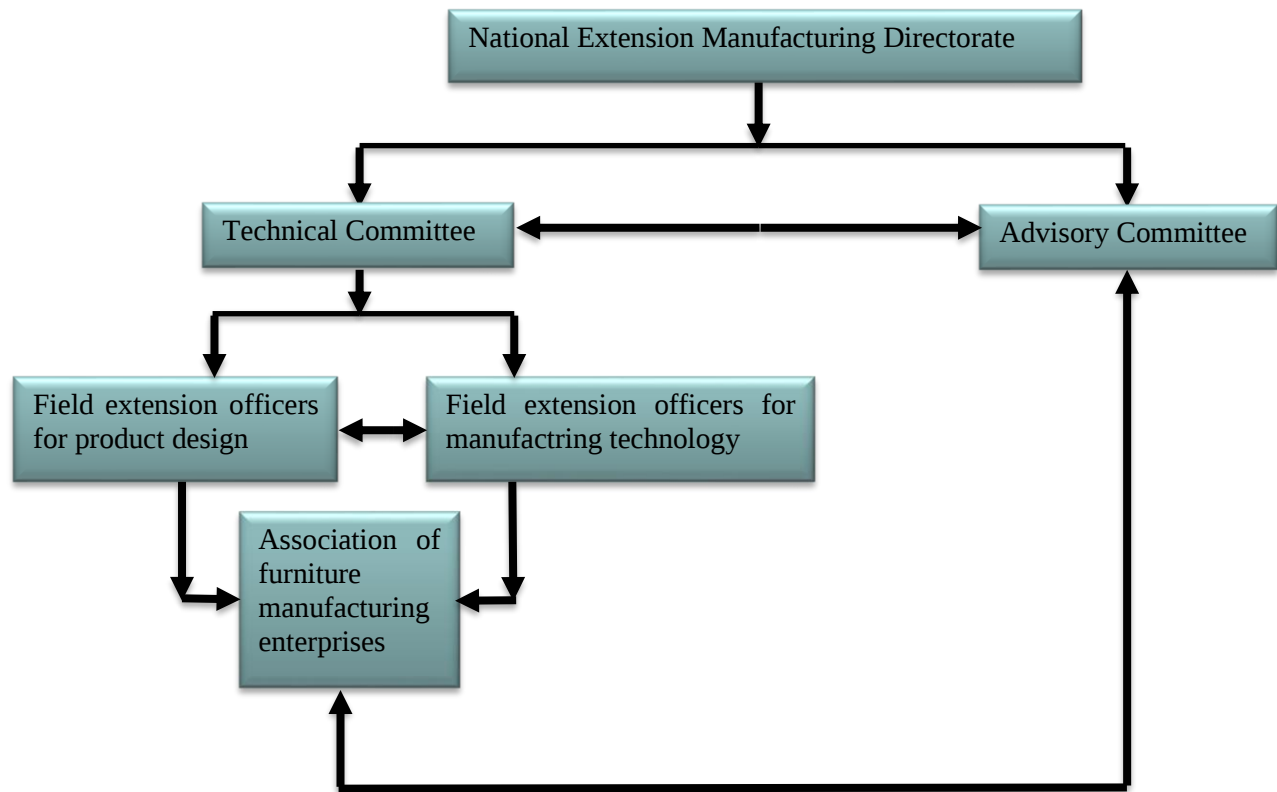


Figure 26. Organogram of Manufacturing extension program

The above organogram illustrates the organization flow chart of the manufacturing extension program. The program directorate manages the program's daily administrative and financial aspects, controlling the action of field extension officers, and communicating with government representatives the program's outcome and the state's expectations. The advisory committee comprises representatives from the Ministry of Forestry and Fauna, Ministry of Small and Medium-size Enterprises, Chamber of Commerce, and the Ministry of Higher Education. Field Extension Officers are specialists with extensive experience in furniture development and manufacturing charged with helping furniture producers improve and offer suggestions with steps they may adopt to improve capability. University professors are required to bring forward innovative technological practices developed from their research to advance processes. Finally, the association of furniture producers comprises registered furniture producers within a given region. Through these clustered associations, field agents can easily connect with furniture producers to solve their problems, be it in the design of products and manufacturing.

Table 6 Developing a Logic Model to Enhance the digitalization of furniture design by SME in Cameroon.

Situation: market competition and customer satisfaction are demanding for every production system. therefore, for owners of small and medium-size wood manufacturing enterprises in cameroon (sme) to withstand the global trend, they need to master the basic furniture design principles through cad, cad interface and tools, 2d and 3d modeling. through these, they will reduce the risk of developing products that do not satisfy ergonomic principles and generate more revenue from their quality products.

Inputs		Outputs			Outcomes -- Impact		
		<i>What you do</i>	<i>Who you reach</i>		<i>Short</i>	<i>Medium</i>	<i>Long</i>
- Setting up of a computer laboratory with installed CAD software that could contain a maximum of 30 persons. - Developed handout with different illustrations of usage of essential 2D and 3D modeling tools - Provide a handout with standard dimensions and ergonomic principles.		- Field officers will illustrate how to use the required 2D and 3D modeling tools for designing a simple table chair. - We shall proceed with the usage of dimensioning and principles for printing.	Cameroons' Small and medium-size Wood Manufacturing Enterprises.		The workshop participant will demonstrate the skills to: - Login into a computer and access a CAD software interface - Use basic 2D and 3D modeling tools for designing and dimensioning products. - Print out designed products.	The participant will: - Develop products in 2D and 3D. - Carry out an appropriate rendering and printing of products. - Communicate efficiently with customers products specifications	The participant will be: Able to develop agility in their design and manufacturing principles.
Assumptions: Owners of medium-size enterprises will want to: develop products that satisfy customers' requirements. Improve the quality of their products. Limit on the waste of materials.					External Factors: Inability to have access to a computer for designing their products. International standards related to wood products and their manufacturing.		

4.8 Conclusion

Based on the analysis of the survey responses performed in this paper, Cameroon's furniture industry still requires improving its product design knowledge to satisfy the growing consumer need, specifically as the demand for personalized products increases with time. The survey result indicated that only fifteen small and medium-sized enterprises in Cameroon use CAD software to perform their furniture designs. The study found inherent factors that influence these manufacturers not to use CAD, such as lack of training and the expensive nature of CAD software. We hope the result of this survey serves as a springboard for more in-depth research toward the application of the proposed solution and the reassessment of the outcome after implementation. Specifically, these results should aid the Cameroon government to establish favorable economic growth conditions and wealth accumulation through its National Development Strategy (NDS30). Through its structural transformation, it seeks to strengthen the wood processing industries with a kind view to the manufacture of furniture.

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CHAPTER 5. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary

The north-south collaboration for developing a manufacturing extension program reveals itself essential towards reinforcing partnerships and cooperation among countries even though one of the main problems is the asymmetry of the alliance where countries in the north tend to dominate those of the south (Gaillard, 1994). Manufacturing extension comes as an excellent opportunity to reinforce collaboration through community engagement. Observing the development trend in the north and transferring it through a community engagement program in the south breaks the barriers of asymmetry partnerships and promotes mutually inclusive relations. Such an engagement program is an opportunity to leverage manufacturing barriers in Sub-Saharan Africa, especially in Cameroon's secondary wood manufacturing industry. This sector of manufacturing is faced with a lot of challenges. The challenges range from limited knowledge of product design and development, using computer-aided design software to improper manufacturing practices due to limited skills, lack of innovative technologies, and access to quality input materials. This deficiency in quality production systems of this sector has caused a loss of confidence by customers to internally manufactured products, and they have turned their desires to imported products. Domestic manufacturers have a growing need to improve their processes. Hence, instituting a manufacturing extension program through a north-south collaboration will leverage the manufacturing standard of the south (Cameroon) and expose the north (Indiana-USA) and Cameroon to their respective cultures while reinforcing ties for a better partnership.

5.2 Conclusion

Improving manufacturing practices in Cameroon is vital in satisfying one of the recommendations of the national development strategy 2030 document (NDS30). This research shows that Cameroon's secondary wood manufacturing industry is still lagging in many areas. It proved that wood product development requires particular attention to improve the industry's standard. The study indicates that only about 15% of furniture manufacturers use computer-aided

design software to develop their products, and 85% either develop their products from commercial catalogs or from designs they see through the internet.

As wooden products manufacturing depends on its design quality, it also depends on how well the lumber to be used is dried. The drying ability analysis of furniture manufacturers revealed that 55% of furniture manufacturers use their eyes to measure moisture content in wood. In comparison, 35% use their hands to measure, and only 5% use a moisture meter to measure wood MC. These results tie with Tagne and Bennamoun (2018), indicating that only about 4% of furniture manufacturers in Cameroon have notions of end moisture content for various wood products. Hence most wood products manufactured in Cameroon present some limitations and might wear out rapidly due to the increasing variation in its moisture content. When wood is purchased and dried, the next stage is processing. The secondary wood industry in Cameroon's rough mill end is faced with many challenges, including the lack of access to equipment and machine tools, limited skills in lumber processing, and inadequate maintenance and workshop organization. These factors hamper the smooth functioning of lumber processing and therefore affect the assembly and finishing stages. The assembly process of furniture in Cameroon still operates with traditional methods of jointing wood such as mortise and tenon joints, nails, and sometimes the use of screws and wood glue. The overwhelming use of nails reduces the joints' ability to stay strong and last for long, thereby rapidly depreciating an appealing product. Finishing operations and wood finishers face the same challenges as the processing sector. These challenges include limited knowledge in applying quality finishing, lack of equipment availability, and an inappropriate finishing environment. As a solution to the above-mentioned problems, a manufacturing extension program is developed in the recommendation section in partnership with Purdue University in Indiana to resolve the challenges.

5.3 Recommendations

Manufacturing extension is a tool used to provide technical assistance to enterprises. It has a positive effect on both the survival and growth of an enterprise, but these effects depend on the firm's size and the characteristics of the counseling experience (Solomon et al., 2013). Using manufacturing extension with expertise knowledge from Indiana's finest secondary wood manufacturers is an asset for the counterpart in Cameroon. One case of Indiana manufacturing

extension is its current Hardwood University program run by Indiana Hardwood Lumbermen Association (IHLA) and Purdue University through its Forestry and Natural Resource Department and faculty associated with The Wood Research Laboratory. The program brings together newly recruited employees in the hardwood industry and experienced ones seeking advancement in their respective organizations. During each program session, topics discussed include current challenges that enterprises face, and strategies to overcome those challenges are well clarified. Evaluation forms are distributed at the end of each session to collect information related to the satisfaction with the program and how it can be improved.

Implementing such a program in Cameroon with expertise from Indiana Hardwood Lumbermen Association will foster collaboration between the two counterparts. Also, it will provide a platform through which most of Cameroon's secondary wood manufacturing challenges identified earlier will find concrete solutions. To achieve this goal, Cameroon secondary wood manufacturers need to be organized into associations. Being organized this way will facilitate the immersion of the program, promote communication among manufacturers to discuss their specific needs, and help them generate funds for the smooth running of the association. Appendixes B and C show how Harwood University is planned with a related evaluation form.

APPENDIX A: SURVEY QUESTIONNAIRE

Introduction

Hi everyone, I am ...

This questionnaire aims to collect standardized information necessary to evaluate the status of furniture and cabinets production of small and medium-sized enterprises in Cameroon and equally roadside furniture producers. Through this questionnaire, an analysis will be performed and put to light possibilities of enhancing capacities of furniture producers through a manufacturing extension program that will be elaborated and prepared for application. The manufacturing extension program brings people, businesses, enterprises, academia, and government within a network to advance manufacturing and promote robust and sustainable national programs that will change the face of timber processing and furniture manufacturing in the country. This research was done by Purdue University in the USA in partnership with the Higher Institute of Art and Craft in Foumban in Cameroon.

Part one: Raw Material Purchase

1. List of typical products you make.
 - ☐ Furniture
 - ☐ Cabinets
 - Others, please specify:
2. Types of materials you frequently use to produce your products.
 - ☐ Wood List the species
 - ☐ Composites materials
 - ☐ Metal
 - ☐ Plastic
 - Others, please specify.
3. How do you get orders?
 - a. Customers find me.
 - ☐ Roadside display
 - ☐ Words of mouth
 - ☐ Signpost

b. I find customers.

- ☐ Salespeople or sales department.
- ☐ TV advert
- ☐ Radio advert
- ☐ Internet
- ☐ Showroom
- ☐ Roadside display
- ☐ Others Please specify:

4. What type of production do you practice?

- ☐ Make to Order (custom products)
- ☐ Make to Stock (Standard product)

Part Two: Design

This will focus on the design and design principles of wooden cabinets. It is aimed at understanding the knowledge base of the furniture development capacity of Cameroonian woodworkers and their ability to utilize computerized tools in designing these products.

1. What influences your customers' desires for a given product?

- ☐ Commercial catalog designs.
- ☐ Your designs.
- ☐ Designs from the internet.
- ☐ Customers' desires.
- ☐ Others please specified.

2. How do you design your products? Select all that applies.

- ☐ A freehand pencil or pen quick sketch.
- ☐ Preliminary draft using a tablet.
- ☐ Previous experience
- ☐ Using hand drawing with tools
- ☐ Using computer-aided design software

3. If you use computer design software. How does it benefit you?

- ☐ Easy communication.
- ☐ Customers like it.
- ☐ Easy to spot and correct errors.
- ☐

- Saves money, time, and material.
 - ☐ More accurate.
 - Other please specify:
4. If you do not use computer aided design software, why?
- ☐ Too expensive.
 - ☐ No training.
 - ☐ Do not have a Personal Computer.
 - ☐ Time wasted.
 - Other please specify:

Part three: Manufacturing capacity of secondary wood products producers in Cameroon (Wood Purchasing).

1. How do you get wood?
 - ☐ Cut my tree and saw it to timber.
 - ☐ Purchase log and saw it to timber.
 - ☐ Purchase timber
2. Do you use timber ☐ wet or ☐ dry? ☐
3. If dry, who dries it?

☐ I do dry it
 ☐ I do not dry it.
4. How do you dry it if you do dry?
 - ☐ Air drying under a shed.
 - ☐ Air drying in the open air.
 - ☐ Industrial kiln.
 - ☐ Traditional kiln (kiln made by you)
 - Other please specify:
5. What is end Moisture Content of wood? Please explain below.
 -
6. How do you measure Moisture in wood?
 - ☐ By simple eye observation
 - ☐ By hand weighting.
 - ☐ By weighting with a balance.
 - ☐ By weighting with moisture content meter.

- Other please specify:

7. What most used means of transportation of timber do you employ?

- ☐ Rickshaw
- ☐ Motorized Rickshaw
- ☐ Semi-truck
- ☐ Heavy-duty truck
- Others please specify:

8. How do you process wood? Please fill in your answers.

-
-
-
-
-

9. What machines do you have in your machining shop? Select all that apply.

- ☐ Crosscut saw (Radial arm saw)
- ☐ Surfacer (Planer)
- ☐ Thicknesser.
- ☐ Table saw.
- ☐ Tenoner
- ☐ Spindle molder
- ☐ Band saw
- ☐ Stationary belt sander
- ☐ Stationary disc sander
- ☐ Stationary drum sander
- ☐ Drill press
- ☐ Wood lathe machine
- ☐ Computer numerical control machine (router)
- ☐ Combination machine

- Others please add:

10. What kind of difficulties do you face while machining?

- ☐ Limited machining skills
- ☐ Poor safety conditions
- ☐ Inadequate maintenance
- ☐ Aging equipment.
- Others:

11. What typical jointing methods do you use in assembling wooden items?

- ☐ Mortise and tenon joints
- ☐ Dowel
- ☐ Nail
- ☐ Screw
- ☐ Glue
- Other please specify:

12. What type of finish do you apply to wooden products?

- ☐ Paint
- ☐ Varnish
- ☐ Lacquer
- ☐ Shellac
- ☐ Stain
- ☐ A mixture of varnish and stain
- Other please specify:

13. How do you apply finish on your products?

- ☐ Brushing
- ☐ Spraying
- ☐ Wiping
- ☐ Dipping
- Other please specify:

14. Do you own a spraying boot in your shop or enterprise?

☐ YES ☐ NO

15. Do you own a set of spraying equipment?

☐ YES ☐ NO

16. What are your difficulties when applying finishes on items? Select all that applies.

- ☐ Inadequate finishing facility.
- ☐ Lack of adequate tools.
- ☐ Limited access to quality finishes.
- ☐ Limited skills in finishing.
- Others please specify:

17. Do you belong to any form of association of woodworkers in your locality?

☐ YES ☐ NO

18. If yes, which one?

Name of association:

19. What are the benefits?

- a. ☐ To improve your capital.
- b. ☐ To share expertise.
- c. ☐ To increase your market.
- d. ☐ To create a partner organization.
- e. Others please specify:

20. What can the association or cooperative group do better? Please fill in your answers.

- a.
- b.
- c.
- d.
- e.

21. If not involved with any professional association, why?

- ☐ No existing or available association.
- ☐ Not interested in associations.
- ☐ Expensive to be a member of an association.
- ☐ Not easily accessible.
- Other please specify:

22. What are potential reasons to create or join an association for you?

☐

- For education
- ☐ For lobbying and represent us before the government
- ☐ To combine purchasing power
- ☐ To find partners
- Other, please specify:

23. Do you consider an association with local woodworkers?

- ☐ Very bad idea
- ☐ bad idea
- ☐ Neutral
- ☐ A good idea
- ☐ Very good idea

24. How committed are you to such an initiative?

- ☐ Not committed.
- ☐ Neutral
- ☐ Interested

25. Enterprise address. This will be solely used to assist you in the creation of a wood manufacturer association in Cameroon.

Name of company:
Company address (location):
Webpage:
Phone (fixed/mobile):
Name of Owner/President/Director/CEO:
The number of employees:
Name of the person answering the questionnaire:
Position of person:

Dear respondent,

Thank you for taking the time to answer this questionnaire. The purpose of this questionnaire is to develop means through which we can enhance our capacities as wood practitioners in education, training, safety measures, innovative practices, and current technological equipment in the future.

APPENDIX B: INDIANA’S HARDWOOD UNIVERSITY

Hardwood University

Goal

Provide hardwood industry professionals with information and training on sustainability of material supply, best management practices, procurement and marketing, tree, log and lumber quality and measurement, step-by-step processing techniques, equipment and decision-making.

Audience

- Employees new to the hardwood industry
- Employees that are preparing for advancement, cross-training, etc.

Organized by

- Purdue University Department of Forestry and Natural Resources
- Indiana Hardwood Lumbermen’s Association

Instructors

- Prof. Rado Gazo
- Prof. Eva Haviarova
- Subject matter guest speakers as needed

When and where

This is an annual, once per month program consisting of nine events. Exact date and location for each event will be announced one month prior, but will generally be held in the middle of the workweek. Locations will be selected to take advantage of IHLA cooperating member company facilities within Indiana. Participants will receive an attendance certificate and those that complete all nine events in a chosen track within a 2-year period will receive an IHLA/Purdue recognition of program completion.

Program – there are three tracks

- Primary Industry - focused on log buyers, sawmill, stave mill, veneer mill, lumber drying operators
- Secondary Industry - focused on furniture, cabinet, millwork and other manufacturers of wood products
- Training a-la-carte - designed for companies and individuals that would like to organize in-house training on a selected topic

Primary Industry Curriculum

August 25, 2021	1 day – SEPAC	Tree and log quality, scaling and measurement
Observe standing trees and discuss tree grades. Practice tree grading on selected trees. Fell a tree and discuss bucking decisions to maximize value of each log. Discuss and practice log grading (Gazo, guest speaker).		
Indiana Society of American Foresters qualifies for 5 Category 1 SAF CFFs Indiana Association of Consulting Foresters qualifies for 5 Category 1 CFE Credits		
September 22, 2021	1 day - Edinburgh, IN	Marketing hardwood veneer, stave, saw logs
Discuss tree quality and log merchandising. The highest-value use of our hardwood resource is for fine face veneers. Excellent markets have always existed for “perfect” trees and logs. Marketing of “somewhat less than perfect” trees and logs can present a challenge. The practicing forester may not be exactly sure what a particular veneer buyer can accept and why log or tree value can vary widely and change weekly. Furthermore, the markets for the veneer itself change. A tour of Danzer facility and showroom as well as a field trip to a logging site is included (Hartog, Gazo).		
Indiana Society of American Foresters qualifies for 5.5 Category 1 SAF CFFs Indiana Association of Consulting Foresters qualifies for 5.5 Category 1 CFE Credits		
October 14, 2021	1 day – Akron, IN	Grade-sawing hardwood logs
Theory and practice of sawing hardwood logs into lumber. Observe external characteristics affecting lumber quality and measurement of selected logs. Discuss decisions made at head saw, resaw, edger and trimmer that affect the lumber grade. Cut logs on a portable sawmill to observe the process in practice and evaluate the impact of right/wrong decisions (Gazo).		
Indiana Society of American Foresters qualifies for 5.0 Category 1 SAF CFFs Indiana Association of Consulting Foresters qualifies for 5.0 Category 1 CFE Credits		
November 10, 2021	1 day – Southern IN	Saw filing and maintenance
Discuss proper care and maintenance of sawmill processing equipment. Circular and band mills will be included. Saw filing (Sharpening, swaging and shaping, tensioning and leveling, etc.) and Knife Grinding (preparing, grinding, coolant, etc. will be discussed (guest speaker).		
January 27, 2022	1 day - Purdue	Sawmill efficiency and quality control
Discuss current and state-of-the-art sawmilling technology, including tree and log scanning, automated lumber grading, lumber overrun and recovery, statistical quality control, lean manufacturing principles and other modern management techniques (Gazo, guest speaker).		
February 23, 2022	1 day – Logansport, IN	Air drying hardwood lumber

Discuss moisture content of wood, why drying is necessary, various ways in which to dry lumber. Review principles of setting up a quality air-drying yard, proper lumber stacking and basics of wood preservation (Gazo).		
March 30, 2022	1 day – Edinburg, IN	Kiln drying hardwood lumber
Discuss various methods and types of dry kilns, their pros and cons. Learn to develop a kiln-drying schedule and a way to select and check kiln samples. Discuss lumber drying defects and how to prevent them (Gazo).		
April 26-28, 2022	3 days - Indiana	Hardwood 101 industry tour
Visit a tree farm, logging job, sawmill, veneer mill, drying yard, and furniture or cabinet manufacturer. Discuss industry processes, challenges and opportunities with principal owners or managers. Gain understanding of industry vocabulary, supply chain and connection to upstream and downstream processes (Gazo).		
May 18, 2021	1 day - Purdue	Introduction to hardwood lumber quality/grading
Basic overview of reasons for grading lumber, measurement of boards and NHLA lumber grading rules. Limited practice of grading sample boards. Discuss how log quality affects lumber grade and how head sawyer, resaw, edger and trimmer operators can maximize value potential (Gazo).		

Secondary Industry Curriculum

April 27-29, 2021	3 days - Indiana	Hardwood 101 industry tour
Visit a tree farm, logging job, sawmill, veneer mill, drying yard, and furniture or cabinet manufacturer. Discuss industry processes, challenges and opportunities with principal owners or managers. Gain understanding of industry vocabulary, supply chain and connection to upstream and downstream processes (Gazo).		
May 12, 2021	1 day - Purdue	Wood science 101
Basic overview of wood as a manufacturing material. Discuss properties of wood related to manufacturing, and learn basics of wood identification. Includes an overview of wood-based engineered materials used in furniture and other wood products (Gazo, Haviarova).		
August 27, 2021	1 day –Indy (Expo)	Shrinking and swelling of wood
Discuss moisture content of wood, its measurement and effect on wood products. Review furniture and cabinet design principles to minimize the effect of wood movement on product quality (Gazo, Haviarova).		
September 15, 2021	1 day – Jasper, IN	Rough mill operation
Discuss manufacturing of dimension parts. Crosscut –first and rip-first rough mill processes, equipment, automation and optimization. Effect of lumber grades and cutting orders on yield (Gazo).		

October 20, 2021	1 day – Logansport, IN	Wood gluing
Discuss types of wood glues, presses and clamps. Review principles for achieving a strong and reliable glue joints. Discuss panel glue-up, finger jointing and panel veneer laminating. (Gazo).		
November 17, 2021	1 day – Dale, IN	CNC manufacturing
Discuss principle of operation, selection and operation of CNC equipment. Focus on part hold down, tooling and tool path programming. Overview of Computer Aided Design, Computer Aided Manufacturing and Computer Integrated Manufacturing (Gazo).		
January 25, 2022	1 day - Purdue	Common wood processing equipment
Discuss basic wood processing equipment and sequence of operations from rough kiln dried lumber to furniture blanks and final machined parts. Will include facers, jointers, planers, crosscut and rip saws, moulders, tenoners, band saws, routers, shapers, boring machines and lathes (Gazo).		
February 23, 2022	1 day - Purdue	Furniture strength design and performance testing
Discuss basic concepts of furniture strength design. Get familiar with furniture and cabinet performance standards, codes, types of tests, theory and practices. Use actual testing machine to perform an accelerated test (Haviarova).		
March 30, 2022	1 day – Jasper, IN	Sustainable wood products development
Discuss many positive attributes of wood as a natural construction material. Overview of Life Cycle Analysis and cradle to grave carbon accounting and end-of-life recycling of wood products (Haviarova).		

APPENDIX C: HARDWOOD UNIVERSITY EVALUATION FORM

EVALUATION FORM

Hardwood University - Tree and log quality, scaling, and measurement

August 25, 2021

1. **Overall workshop.** For each of the following areas, please indicate your reaction:

Aspect	Excellent	Good	Needs Improvement	Not Applicable
Covered useful material				
Practical to my needs and interests				
Well organized				
Presented at the right level				
OVERALL				

2. Please rate your **knowledge levels** on the following topics before today and now.

TOPICS	Knowledge Before Today					Knowledge Now				
Tree measurement	None 1	2	3	4	Lot 5	None 1	2	3	4	Lot 5
Log Measurement	None 1	2	3	4	Lot 5	None 1	2	3	4	Lot 5

3. How useful was this program in providing new knowledge to help you make future decisions and take action?

	Not Useful	Somewhat Useful	Useful
Make decisions	☐	☐	☐
Take action	☐	☐	☐

4. Based on the information presented at this program, please list practices that you plan on adopting within the next 12 months:

5. Based on the information presented in the program, what is the likelihood that you would **recommend Purdue Forestry and Natural Resources** to your family, friends and colleagues?

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10
Not likely **Likely**

6. Please help us to do better next time. Any comments or suggestions? Please **identify topics of your interest** for future programs (use reverse side if more space needed).

APPENDIX D: RESPONDENTS' RESPONSES TO THE SURVEY

1. List of typical products you make	2. Types of materials you frequently used to produce your products	3. How do you get orders? [Customers find me.]	3. How do you get orders? [I find customers]	4. What type of Production do you Practice?	5. What influence your customers' desires for a given product?	6. How do you design your products? Select all that applies.	7. If you use computer design software. How does it benefit you?	8. If you do not use computer aided design software, why?
Furniture;ceiling, doors and windows	Wood	Word of mouth		Make to Order (custom products)	Your designs.	A freehand pencil or pen quick sketch.		No training.
Furniture;Cabinet;Menuiserie Generale	Wood;Metal;Bilinga, Iroko, Padouk, Doussie, Mousse,, Tissue, Vitre.	Road side display	Road side display;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		No training.
Furniture;Cabinet;cupboard, doors and frames, counters.	Wood;Metal;Plastic;Mobabi, Doussie, Bosserouge.	Road side display;Word of mouth		Make to Order (custom products)	Your designs.;Customers' desires.	Using computer-aided design software	Easy to spot and correct errors.	
Furniture;Cabinet	Wood;Type: Bidou, Doussie, Padouk, Bilinga, Zingana	Road side display	Road side display;Internet;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		Do not have a Personal Computer
Furniture;Cabinet	Wood;Specie: Padouk, Ayous, Wenge, Bosserouge, Bibolo, Movingui, Bilinga, Iroko, Bibinga.	Road side display;Word of mouth;Sign post	Road side display;Showroom	Make to Order (custom products); Make to	Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Using		Time wasted.

				Stock (Standard product)		hand drawing with tools		
Furniture;Cabinet	Wood;Specie: Padouk, Iroko, Bibolo, Makore, Ayous.	Road side display	Internet;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.		Too expensive.
Furniture;Cabinet	Wood;Specie: Bilinga, Iroko	Road side display;Sign post	Road side display	Make to Stock (Standard product)	Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		No training.
Furniture;Cabinet	Wood;Specie: Iroko, Bibolo, Makore, Bilinga.	Road side display	Road side display;Internet	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	Previous experience		No training.
Furniture;Cabinet	Wood;Specie: Makore, Sapele, Bosse rouge, Bibolo, Padouk, Movingui, Bete, Mbiana.	Road side display	Road side display;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.		No training.
Furniture;Cabinet;General woodworking	Wood;Composite Materials;Metal;Plastic; Specie: Bibolo, Bilinga, Doussie, Movingui, Makore, Ayous.	Road side display;Internet	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.	Previous experience;Using hand drawing with tools		No training.

Furniture;Cabinet;General Woodwork	Wood;Plastic;Specie: Sapele, Iroko, Movingui, Bidou, Tali.	Road side display	Road side display;Internet;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	Previous experience;Using hand drawing with tools		Too expensive.
Furniture	Wood;Massif wood, MDF, and plywood	Road side display;Sign post	TV advert;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Customers' desires.	Using computer-aided design software	Easy communication.	
Furniture	Wood;Specie: Sapeli, Bilinga, Doussie, Iroko, Pachi.	Road side display	Road side display;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.	A freehand pencil or pen quick sketch.;Previous experience		Too expensive.
Furniture	Wood;Specie: Sapeli, Pachi, Bilinga, Iroko, Padouk, Tali.	Road side display	Road side display;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.		Too expensive.
Furniture	Wood;Specie: Sapelli, Pachi, Bilinga, Bidou, Tali, Padouk,	Road side display	Road side display;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.		Too expensive.
Furniture;upholstery	Wood;Specie: Padouk, Sapeli.	Road side display	Road side display;Showroom	Make to Order	Commercial catalog	Previous experience		No training.

				(custom products); Make to Stock (Standard product)	designs.;Your designs.			
Furniture;Cabinet	Wood;Specie: Padouk, Bilinga, Bibinga, Makore	Road side display	Road side display	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		Lack of time.
Furniture;Cabinet	Wood;Specie: Doussie, Bibolo, Ayous, Iroko	Road side display	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		Lack of means.
Furniture;Cabinet	Wood;Specie, Bilinga, Padouk, Sapele, Makore.	Road side display	Internet;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		No training.
Cabinet	Wood;Bilinga, Padouk, Movingui, Bibolo, Zingana, Doussie,Ayous, Iroko.	Road side display	Road side display;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		Time wasted.
Furniture	Wood;Specie: Zingana, Iroko, Sapele	Road side display	Showroom	Make to Order (custom products);	Commercial catalog designs.;Your	A freehand pencil or pen quick		Time wasted.

				Make to Stock (Standard product)	designs.;Customers' desires.	sketch.;Previous experience		
Furniture;Cabinet	Wood;Specie: Bilinga, Pachi, Sapeli, Iroko, Ayous, Moabi, Padouk, Bibolo.	Road side display	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.			No training.
Furniture;Cabinet	Wood;Metal;Plastic;Specie: Makore, Bilinga, Padouk, Sapeli, Iroko, Movingui, Doussie, Pachi.	Road side display;Word of mouth	Road display;Internet side	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience;Using hand drawing with tools;Using computer-aided design software	Easy to spot and correct errors.	
Furniture;Cabinet	Wood;Composite Materials;Specie: Iroko, Padouk, Sapeli.	Road side display	Internet;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience;Using computer-aided design software	For more Precision, Facilitate Communication.	
Furniture;Cabinet;Upholstery, Carpentry	Wood	Road side display	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience;Using computer-aided design software	Easy to spot and correct errors.	

Furniture;Cabinet;Site works	Wood;Composite Materials;Specie: Bubinga, Doussie, Padouk, Pachi.	Road side display;Word of mouth	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.		Do not have a Personal Computer
Furniture;Cabinet	Wood;Composite Materials;Padouk, Bibolo, Bilinga,	Road side display;Word of mouth;Sign post	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience;Using hand drawing with tools		Do not have a Personal Computer
Furniture;Cabinet;Roof , Ceiling, Decoration	Wood;Composite Materials;Metal;Plastic; Specie: Padouk Bilinga, Iroko, Sapeli	Road side display;Word of mouth	Internet;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Preliminary draft using a tablet.;Previous experience;Using hand drawing with tools	Ease communication, Customers like it, easy to spot and correct errors, More precision.	
Furniture;Cabinet	Wood;Composite Materials;Specie: Iroko, Bilinga, Sapeli, Bibinga, Makore,.	Road side display;Word of mouth	Showroom	Make to Order (custom products)	Your designs.;Designs from the internet.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		No training.
Furniture;Cabinet	Wood;Padouk Iroko, Bilinga	Road side display;Word of mouth	Internet	Make to Order (custom products)	Commercial catalog designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.		Too expensive, I do not have a computer, and I

								don't have time.
Furniture;Cabinet	Wood;Composite Materials;Metal;Specie: Sapeli, Iroko, Movingui, Padouk, Doussie, Bibolo.	Road side display	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience;Using hand drawing with tools		
Furniture;Cabinet;Upholstery	Wood	Road side display	Road side display	Make to Order (custom products)	Your designs.;Customers' desires.	Previous experience		Is too expensive and I don't have a computer
Furniture;Cabinet	Wood;Movingui, Padouk, Bilinga	Road side display	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience;Using hand drawing with tools		No training.
Furniture;Cabinet	Wood;specie: Padouk, Iroko, Pachi, Sapeli, Makore, Dousie, Bilinga,	Road side display	Road side display;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		
Furniture	Wood;Specie: Sapeli, Bibolo, Bilinga, Iroko	Road side display;Word of mouth		Make to Order (custom products); Make to Stock	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		

				(Standard product)				
Furniture	Wood;Specie: Sapeli, Bibolo, Bilinga, Iroko	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		
Furniture;Cabinet	Wood;Plastic	Road side display;Sign post	Road side display;Showroom	Make to Order (custom products)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Preliminary draft using a tablet.;Previous experience;Using hand drawing with tools;Using computer-aided design software	easy to spot error, saves money, time and material.	
Furniture;Cabinet;roof	Wood;Composite Materials;Specie: Iroko, Movingui, Padouk	Word of mouth;Sign post	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Designs from the internet.;Customers' desires.;Conception in function of customer's space	A freehand pencil or pen quick sketch.;Using computer-aided design software	ease communication, easy to spot and correct errors, more precision.	
Furniture	Wood;Specie: padouck, bilinga	Road side display	Road side display	Make to Stock (Standard product)	Commercial catalog designs.;The finishing	A freehand pencil or pen quick sketch.		Do not have a Personal Computer
Cabinet	Wood;Pachy, Doussie, Iroko	Word of mouth	Internet	Make to Order (custom products)	Designs from the internet.;Customers' desires.;by my advice.	Previous experience;Using hand		Too expensive.

						drawing with tools		
Furniture;Cabinet	Wood;Composite Materials;Metal;Plastic; Specie: Doussie, Movingui, Bete	Word of mouth;Sign post	Sales people or sales department;Internet;Showroom	Make to Order (custom products)	Customers' desires.	A freehand pencil or pen quick sketch.;Using computer-aided design software	easy communication; Customers like it; easy to spot errors; saves money, time, and material	
Furniture;Cabinet	Wood;Specie: Iroko, Movingui,	Road side display;Word of mouth	Road side display;Internet;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.		Do not have a Personal Computer
Furniture;Cabinet;Flooring, and ceiling	Wood;Metal;Specie: Padouk	Road side display	Road side display;Sales people or sales department;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		No training.
Furniture;Cabinet	Wood;Specie: Ayous, Bibolo	Road side display	Internet;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		
Furniture;Cabinet	Wood;Specie: Sapeli, Iroko, Bilinga, padouk.	Road side display;Word of mouth	Road side display;Showroom	Make to Order (custom products); Make to Stock	Commercial catalog designs.;Your designs.	A freehand pencil or pen quick sketch.;Previous experience		Do not have a Personal Computer

				(Standard product)				
Furniture;Cabinet;General Woodworking	Wood;Specie: Biliga, Iroko, Sapeli, Makore, Moabi, Ayous.	Road side display	Internet;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		It's not necessary.
Furniture;Cabinet	Wood;Specie: Bilinga, Zingana, Pachi, Padouk,	Road side display	Road side display;Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		Time wasted.
Furniture;Cabinet	Wood;Specie: Bilinga, Tali, Bibinga	Road side display	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		Too expensive.
Furniture;Cabinet	Wood;Specie: Padouk, Makore, Bibolo, Tali.	Road side display	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience;Using computer-aided design software	easy communication; customers like it; easy to spot and correct errors, saves money, time, and material.	
Furniture;Cabinet;upholstery	Wood;Iroko, Bilinga, Bibolo, Pachi, Padouk, Tali, Movingui, Ayous, Ecop	Road side display	Road side display	Make to Order (custom products); Make to	Commercial catalog designs.;Your designs.;Designs from the	A freehand pencil or pen quick sketch.;Previous experience		No training.

				Stock (Standard product)	internet.;Customers' desires.			
Furniture;Cabinet	Wood;Specie: Movingui, Iroko, Bibolo, Sapelli	Road side display	Road side display	Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Previous experience		No training.
Furniture	Wood;Specie: Iroko, Ayous, Sapeli.	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Designs from the internet.;photos catalogue.	A freehand pencil or pen quick sketch.;Using computer-aided design software		too expensive, no training, i don't have a PC.
Furniture	Wood;Specie: Iroko, Sapeli, Ayous, Bilinga, Bibinga, Movingui, Padouk, Bosse, Moabi.	Word of mouth		Make to Order (custom products)	Commercial catalog designs.;Designs from the internet.;from the phone.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		I am experienced, so I can do it without drawing.
Furniture	Wood;Iroko	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Designs from the internet.;Customers' desires.;also from the phone.	Previous experience		too expensive, no training.
Furniture	Wood;Specie: Padouk, Moabi, Iroko, Ayous, Sapeli, Frake, Mbete, Movingui, Zingana, Atui, Pachi, Bosse, Zingana	Road side display;Word of mouth		Make to Order (custom products)	Customers' desires.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		Too expensive.
Furniture	Wood;Specie: Bilinga, Sapeli, Iroko.	Road side display;Word of mouth		Make to Order	Your designs.;Designs from the	A freehand pencil or pen quick	Easy communication	

				(custom products)	internet.;Customers' desires.;from the phone	sketch.;Using hand drawing with tools;Using computer-aided design software	ion, more precision.	
Furniture	Wood;Specie: Sapeli, Iroko, Padouk.	Road side display;Word of mouth		Make to Order (custom products)	Commercial catalog designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		Too expensive.
Furniture;Ceiling	Wood;Specie: Sapeli, Ngolon, Mbete, Bibolo, Iroko.	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Customers' desires.;especially the desires of the customers.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		Too expensive.
Furniture;Cabinet;upholstery	Wood;Specie: Sapeli, Ngolon Moabi, Pachi, Iroko.	Road side display		Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Designs from the internet.;Customers' desires.;catalogue in the phone.	A freehand pencil or pen quick sketch.		No training, Do not have a personal computer.
Furniture	Wood;Composite Materials;Metal;Plastic	Road side display;Word of mouth			Customers' desires.;Image from the phone.	A freehand pencil or pen quick sketch.;Using computer-aided design software	Customers like it.	
Furniture	Wood;Iroko,, Sapel.	Road side display;Word of mouth		Make to Order (custom products)	Customers' desires.;Also images from the phone.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		No training, I don't have a PC.

Furniture	Wood	Road side display		Make to Order (custom products)	Photos album.	A freehand pencil or pen quick sketch.		Too expensive.
Furniture;coffin	Wood;Metal;Plastic;Species: sapeli, Ayous, Zingana, Bubinga.	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Designs from the internet.;Customers' desires.;catalogue in the phone.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		No training.
Furniture;Cabinet;Coffin	Wood;Plastic;Species: Zingana, Bibolo, Wengue, Bubinga.	Road side display		Make to Order (custom products); Make to Stock (Standard product)	pictures from album.	Previous experience		No training.
Furniture;Cabinet	Wood;Species: Iroko, Ngolon, Sapeli.	Road side display		Make to Order (custom products); Make to Stock (Standard product)	From catalogue in the phone.	A freehand pencil or pen quick sketch.		No training.
Furniture;Cabinet	Wood	Road side display		Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		No training.
Furniture	Wood;Species: Iroko, Pachi	Road side display;Word of mouth		Make to Order (custom products)	Customers' desires.	A freehand pencil or pen quick sketch.		Too expensive.

Furniture	Wood;Specie: Sapeli, Iroko, Ngolon, Sipo, Bosse, Tali.	Road side display;Word of mouth		Make to Order (custom products)	Designs from the internet.;Customers' desires.;photos catalogue.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		No training.
upholstery	Wood;Specie: Sapeli; others: foam, sewing materials.	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		Too expensive.
upholstery	Wood;Specie: Sapeli; others: foam, sewing materials.	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		Too expensive.
Cabinet	Wood;Specie: Sapeli, Iroko, Ngolon, padouk. Others: foam and sewing materials	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Designs from the internet.;Customers' desires.;catalogue from the phone.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		No training.
Cabinet;roofing, Ceiling	Wood	Road side display;Word of mouth		Make to Order (custom products)	Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		No training.
Furniture;Cabinet	Wood;Composite Materials;Specie: Bibing, sapeli, Bibolo, Iroko.	Road side display;Word of mouth		Make to Order (custom products); Make to Stock	Photo Album	A freehand pencil or pen quick sketch.;Using hand drawing with	Easy communication.	

				(Standard product)		tools;Using computer-aided design software		
Furniture;Cabinet;Ceilings and doors.	Wood;Specie: Iroko, Movongui.	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Designs from the internet.;photo album.	A freehand pencil or pen quick sketch.		No training.
Furniture;Cabinet	Wood;Specie: Pachi, Sapeli, Iroko.	Road side display		Make to Order (custom products)	Designs from the internet.	A freehand pencil or pen quick sketch.		Too expensive.
Roof and Ceiling works	Wood;Specie: Iroko, Padouk, latui.	Word of mouth		Make to Order (custom products)	Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.		
Furniture;Cabinet;site works as well(roofing and ceiling works)	Wood;specie: Iroko, Bilinga, Bibolo, Bubinga, Movingui, Ayous.	Road side display;Word of mouth		Make to Order (custom products)	Your designs.;Customers' desires.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		Time wasted.
Furniture	Wood;Specie: Iroko, Sapeli, Padouk, Movingui, Mbete,...	Road side display;Word of mouth		Make to Order (custom products)	Commercial catalog designs.;Customers' desires.	Using hand drawing with tools		Too expensive.
Furniture;Cabinet	Wood;Bibolo, Iroko, Movingui, sapeli, Mbete.	Road side display;Word of mouth		Make to Order (custom products)	Customers' desires.			No training.
Furniture;Cabinet	Wood;Iroko, Ngolon, Sapeli.	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Designs from the internet.;Customers' desires.;I also use my phone.			No training.

Furniture;Roofing.	Wood;Specie: Iroko, Padouk, Sapeli, Pachi.	Road side display;Word of mouth		Make to Order (custom products)	Commercial catalog designs.;Designs from the internet.;Customers' desires.	Using hand drawing with tools		No training.
Furniture;Cabinet	Wood;Iroko, Sapeli, Ngolon	Road side display;Word of mouth		Make to Order (custom products)	Catalogue in the phone.	Previous experience		No training.
Furniture	Wood;Specie: Iroko, Sapeli, Movingui, Bilinga, Padouk, Mbete.	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Pictures of past works.	A freehand pencil or pen quick sketch.		No training.
Furniture;Cabinet;Site works	Wood;specie: Iroko, Movingui, Sapeli, Bilinga	Road side display;Word of mouth		Make to Order (custom products)	Designs from the internet.;catalogue in the phone.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		No training.
Furniture;Sitework	Wood	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Designs from the internet.;catalogue in the phone.			Too expensive.
Upholstery	Wood;specie: all that satisfy the customer.	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;Designs from the internet.;Customers' desires.;I also use my phone.	A freehand pencil or pen quick sketch.		Too expensive.

upholstery	Wood;Sapeli Iroko, Others: Foams and Materials.	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Your designs.;pictures of products.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		No training.
Furniture;Cabinet;Upholstery	Wood;Sapeli, Bibolo, Bilinga, Iroko, Padouk, Zingana	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.;Using hand drawing with tools;Using computer-aided design software		
Furniture;Cabinet	Wood	Road side display	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Designs from the internet.	A freehand pencil or pen quick sketch.		Too expensive.
Furniture	Wood;Specie: Bibolo, Sapeli.	Road side display		Make to Stock (Standard product)	Commercial catalog designs.;Customers' desires.;sometimes proposed design from customers.	A freehand pencil or pen quick sketch.		No training.
Furniture	Wood;Specie: Iroko, Sapeli, Pachi, Padouk.	Road side display		Make to Stock (Standard product)	the customer buys what is made already.	A freehand pencil or pen quick sketch.		No training.
Coffin	Wood	Road side display;Word of mouth		Make to Order (custom products);	Commercial catalog designs.;Designs from the			Time wasted.

				Make to Stock (Standard product)	internet.;reproduction of catalogue.			
Furniture;Cabinet	Wood;Specie: Libeh, Iroko	Road side display	Showroom		Customers' desires.	A freehand pencil or pen quick sketch.		No training.
Furniture;Cabinet	Wood;Specie: Iroko, Pachi, padouk.	Road side display;Word of mouth	Showroom	Make to Order (custom products); Make to Stock (Standard product)	Your designs.;My catalogue and production	A freehand pencil or pen quick sketch.		No training.
Furniture;Cabinet	Wood;Specie: Iroko, Sapeli, Eben	Road side display;Word of mouth		Make to Order (custom products); Make to Stock (Standard product)	Commercial catalog designs.;Catalogue in the phone	A freehand pencil or pen quick sketch.		No training.
Furniture;Cabinet	Wood;Specie: Iroko, Bibolo, Mbete, Pachi, Movingui, Sapeli, Padouk	Road side display		Make to Order (custom products)	Commercial catalog designs.	A freehand pencil or pen quick sketch.		No training.
Furniture;Cabinet;Upholstery	Wood;Specie: Sapeli, Bibolo, Iroko. Others: Foam Mateial,	Road side display		Make to Order (custom products); Make to Stock (Standard product)	Your designs.;Customers' desires.;photo album.	A freehand pencil or pen quick sketch.;Using hand drawing with tools		No training.
Furniture	Wood;Specie: depends on the customer	Road side display;Word of mouth		Make to Order (custom products)	Designs from the internet.	A freehand pencil or pen quick sketch.;Using hand drawing with tools;Using		No training.

						computer-aided design software		
Furniture;Cabinet	Wood;Specie: Eben, Sapeli, Iroko, Biliga, Pachi, Bubinga.	Road side display;Word of mouth	Showroom	Make to Order (custom products)	Commercial catalog designs.	A freehand pencil or pen quick sketch.;Using hand drawing with tools;Using computer-aided design software	Easy to spot and correct errors.	
Furniture	Wood;Specie: Iroko, Moabi, Padouk, Ayous.	Road side display;Word of mouth		Make to Order (custom products)	Commercial catalog designs.;Designs from the internet.;Customers' desires.	A freehand pencil or pen quick sketch.		No training.

9. How do you get wood?	10. Do you use timber	11. If dry, who dries it?	12. How do you dry it if you do dry?	13. What is end Moisture Content of wood? Please explain below.	14. How do you measure Moisture in wood?	15. What most used means of transportation of timber do you employ?	16. How do you process wood? Please fill in your answers.	17. What machines do you have in your machining shop? Select all that applies.
Purchase timber	Dry	I do not dry it	Air drying in the open air.	when it contains water and sap	By hand weighing.	truck	in a sawmill. payment is required and the task is done by myself	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Combination machine

Purchase timber	Or Both	I do dry it	Air drying in the open air.;on le seche rarement.	quand il contient de l'eau	By simple eye observation	Motorized Rickshaw	a partir des machines a bois, degauchis sage, Rabotage, sciage, et toupie.	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary disc sander;Stationary drum sander;Combination machine
Purchase timber	Dry	I do dry it	Industrial kiln.	It is the capacity of wood to contain moisture.	By weighting with moisture content meter.	Semi-truck	Sawing, Surfacing, Planning, profiling, and finishing.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary belt sander;Stationary disc sander;Drill press;apparatus dowels.
Purchase timber	Dry	I do not dry it		It is when wood is not dry.	By simple eye observation	Motorized Rickshaw	With wood machines	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Stationary belt sander;Stationary disc sander;Stationary drum sander;Drill press;Wood lathe machine;Combination machine
Purchase timber	Dry	I do dry it	Air drying in the open air.;Traditional kiln (kiln made by you)	It is sap in wood.	By simple eye observation	Motorized Rickshaw	I do pay in a machining shop for processing.	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Wood lathe machine
Purchase timber	Or Both	I do not dry it		It is when wood contain moisture.	By simple eye observation	Motorized Rickshaw	Processing in paid machining shops in function of work to be done.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary drum sander;Drill press

Purchase timber	Dry	I do not dry it		it is when wood contain moisture.	By simple eye observation	Motorized Rickshaw	In paid Machine shop	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Stationary belt sander;Stationary disc sander;Stationary drum sander;Drill press
Purchase timber	Dry	I do dry it	Air drying in the open air.	It is when it contain water and sap.	By simple eye observation	Motorized Rickshaw	With Specialized Equipment	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Stationary belt sander;Stationary disc sander;Stationary drum sander;Drill press;Combination machine
Purchase timber	Dry	I do dry it	Air drying in the open air.	when it contain water.	By simple eye observation	Motorized Rickshaw	By Crosscutting, Dressing, surfacing, Planing, sawing, and profiling.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Combination machine;portable power tools.
Purchase timber	Wet	I do dry it	Air drying in the open air.	It is when wood is not dry.	By hand weightin g.	Motorized Rickshaw	I process my wood in a machining shop.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary disc sander;Stationary drum sander;Drill press;Combination machine
Purchase timber	Or Both	I do dry it	Air drying in the open air.	When wood contain water.	By simple eye observation	Rickshaw	With machines and depending on specific jobs.	Surfacer (Planar);Thicknesser.;Table saw.;Stationary belt sander;Stationary disc sander;Drill press;Sewing machine and others.
Purchase timber	Dry	I do dry it	Industrial kiln.		By weightin	Heavy-duty truck		

					g with a balance.			
Purchase timber	Or Both	I do not dry it	We use wood without drying.	When wood contain moisture.	By hand weightin g.	Rickshaw	We use machine to process wood.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary disc sander;Stationary drum sander;Combination machine
Purchase timber	Or Both	I do not dry it	Air drying in the open air.;sometime I uses without drying.	When wood contains water.	By simple eye observation	Rickshaw	I pay to Process my wood	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary disc sander;Stationary drum sander;Wood lathe machine
Purchase timber	Or Both	I do not dry it	Air drying in the open air.;I commonly use without drying.	When wood contain moisture.	By simple eye observation	Motorized Rickshaw	I pay money for processing my wood in a machining shop.	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary disc sander;Stationary drum sander;Wood lathe machine
Purchase timber	Dry	I do not dry it		when wood contain moisture content.	By simple eye observation	Motorized Rickshaw	I process my wood in a machine shop	Table saw.;Sewing Machine
Purchase timber	Or Both	I do dry it	Air drying in the open air.	when wood contains moisture.	By simple eye observation	Rickshaw	With specialized machines and by sawing, surfacing, and finishing.	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Drill press;Wood lathe machine

Purchase timber	Dry	I do not dry it		It is water contain in wood.	By simple eye observation	Rickshaw	I process my in a machining shop and I pay for it.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Drill press;Wood lathe machine
Purchase timber	Or Both	I do dry it	Air drying in the open air.;it is water contain in wood.		By simple eye observation	Motorized Rickshaw	We process wood according to orders in paid machine shops.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Drill press;Wood lathe machine;Portable machines
Purchase timber	Or Both	I do dry it	Air drying in the open air.	It is moisture contain in wood.	By simple eye observation	Motorized Rickshaw	I process wood according to the cabinet to produce.	Surfacer (Planar);Thicknesser.;Tenoner;Spindle molder;Bandsaw
Purchase timber	Or Both	I do dry it	Air drying in the open air.	It is moisture contain in wood.	By hand weightin g.	Motorized Rickshaw	the processing is done according to the design and specificati on of customers .	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Drill press;Impact drill, Hand Disc sanders.
Purchase timber	Dry	I do dry it	Air drying in the open air.	It is water contain in wood.	By simple eye observation	Rickshaw	The processing of wood depends on the cabinet and as well s the model.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary belt sander;Stationary disc sander;Drill press;Combination machine
Purchase timber	Or Both	I do dry it	Air drying in the open air.	I waster that	By simple eye	Motorized Rickshaw	We start with the radial arm	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table

				wood contain .	observa tion		saw to crosscut before surfacing, then planing, ripping and profiling.	e saw.;Tenoner;Spindle molder;Bandsaw;Drill press;Wood lathe machine
Purchase timber	Dry	I do dry it	Industrial kiln.;Traditional kiln (kiln made by you)		By weightin g with moistur e content meter.	Motorized Rickshaw	we surface first face and first edge, then plane to thickness, saw to width dependin g on the specificati on, and finally do profiling.	Crosscut saw (Radial arm saw);Surfacer (Planar);Table saw.;Spindle molder;Bandsaw;Stationa ry belt sander;Drill press
Purchase timber	Dry	I do dry it	Industrial kiln.		By weightin g with moistur e content meter.	Heavy-duty truck		Surfacer (Planar);Thicknesser.;Tabl e saw.;Tenoner;Spindle molder;Bandsaw;Stationa ry belt sander;Stationary disc sander;Drill press
Purchase timber	Or Both	I do dry it	Air drying in the open air.	It is becaus e wood is not dry in this case we say that it contain water.	By simple eye observa tion	Average size cargo.	surfacing, dressing, planing, sawing, drying.	Surfacer (Planar);Thicknesser.;Tabl e saw.;Spindle molder;Bandsaw;Stationa ry belt sander;Stationary drum sander;Drill press;Compressor

Purchase timber	Dry	I do dry it	Air drying under a shed.					Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary belt sander;Stationary disc sander;Stationary drum sander;Combination machine
Purchase timber	Or Both	I do not dry it		It is the quantity of water in wood when it is not dry	By hand weightin g.	Rickshaw, Motorized Rickshaw.	Crosscutting, Surfacing, Planing, sawing, Profiling	Crosscut saw (Radial arm saw);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Stationary disc sander;Drill press;Bit Mortiser.
Purchase timber	Or Both	I do dry it	Air drying under a shed.;Air drying in the open air.;It also depends on the quality of wood.		By simple eye observation	Motorized Rickshaw, semi-truck	Removal of bark, then saw to desired dimensions, plane, cut to length, then mold.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Drill press;Combination machine;portable power tools
Cut my own tree and saw it to timber.;Purchase timber	Or Both	I do not dry it				Motorized Rickshaw	Surfacing, Planing, Sawing, profiling	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw
Purchase timber	Dry	I do dry it	Air drying in the open air.	It is the quantity of water in wood.	By hand weightin g.	Semi-truck	We start from the cutting list, then we go to the circular saw, followed	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary belt sander;Drill press;Combination machine

							by the planar, Thicknesser, then lastly the profiling.	
Purchase timber	Or Both	I do dry it	Air drying under a shed.	It is wood that still contains water.	By simple eye observation	Motorized Rickshaw	With required machines.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary disc sander;Drill press;Wood lathe machine;Combination machine
Purchase timber	Or Both	I do not dry it		It wet wood that still contains moisture.	By simple eye observation	Rickshaw	We plane, surface, saw, profiling, hand and mechanical sandpapering.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Stationary disc sander;Stationary drum sander;Drill press
Purchase timber	Or Both		Air drying in the open air.	Is water contained in wood.	By simple eye observation	Motorized Rickshaw		Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary disc sander;Drill press
Purchase timber	Or Both	I do dry it	Air drying under a shed.;Air drying in the open air.	It is wood that is dry.		Rickshaw	I use machines such as the combination plane.	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary disc sander;Drill press;Combination machine
Purchase timber	Or Both	I do dry it	Air drying under a shed.;Air drying in the open air.	It is wood that is dry.		Rickshaw	I use machines such as the combination plane.	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary disc sander;Drill

								press;Combination machine
Cut my own tree and saw it to timber.;Purchase log and saw it to timber.;Purchase timber	Dry	I do dry it	Air drying under a shed.;Industrial kiln.;Traditional kiln (kiln made by you)		by simple eye observation, by hand weighting, by weighting with a moisture content meter.	semi-truck, heavy-duty truck.	fell the tree from the forest, saw to board, dry for about two month, then process with required machines, assemble and do finishing.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary belt sander;Stationary disc sander;Stationary drum sander;Drill press;Wood lathe machine;Combination machine
Purchase timber	Dry	I do dry it	Air drying in the open air.;Traditional kiln (kiln made by you)	the rate of moisture that wood contain	By simple eye observation, manual weighting.	Rickshaw, semi-rickshaw, semi-truck		Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary belt sander;Drill press;Wood lathe machine;Combination machine;grinder
Purchase timber	Dry	I do dry it	Air drying in the open air.		By simple eye observation	Motorized Rickshaw	Dressing, planing, sawing, bandsawing.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Stationary disc sander;Drill press
Purchase timber	Or Both		Air drying in the open air.		By simple eye observation	Motorized Rickshaw		Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Bandsaw;Stationary disc sander;Stationary drum sander;Drill press
Purchase timber	Dry	I do dry it	Air drying under a shed.;Industrial kiln.	It is the quantity of	By weighting with	Semi-truck	thanks to machine tools such	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table

				water contain ed in wood	moistur e content meter.		as: planer, surfacers, table saw, and others	e saw.;Tenoner;Spindle molder;Bandsaw;Stationa ry belt sander;Drill press;Wood lathe machine;Combination machine
Purchase timber	Or Both	I do dry it	Air drying under a shed.;Air drying in the open air.;Traditional kiln (kiln made by you)			Rickshaw		Surfacer (Planar);Thicknesser.;Tabl e saw.;Tenoner;Spindle molder;Bandsaw;Stationa ry drum sander;Drill press;Wood lathe machine;Combination machine;chain mortiser.
Purchase timber	Dry	I do dry it	Air drying in the open air.	It is wood that is not yet dry.	By simple eye observa tion	Rickshaw	surfacing, dressing, sawing, planing, sanding.	Surfacer (Planar);Thicknesser.;Tabl e saw.;Tenoner;Spindle molder;Bandsaw;Stationa ry belt sander;Stationary disc sander;Stationary drum sander;Drill press;Wood lathe machine
Purchase timber	Dry	I do dry it	Air drying in the open air.	it is water contain in wood.	By simple eye observa tion	Motorized Rickshaw	I pay to process my wood in a machine shop.	portable power tools
Purchase timber	Or Both	I do not dry it		It is the quantit y of water in wood.	By simple eye observa tion	Motorized Rickshaw	with our machines	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Tabl e saw.;Tenoner;Spindle molder;Bandsaw;Stationa ry belt sander;Stationary disc sander;Stationary drum sander
Purchase timber	Dry	I do dry it	Air drying in the open air.	it is water contain in wood.	By simple eye observa tion	Motorized Rickshaw	We process it in a machine shop	Surfacer (Planar);Thicknesser.;Tabl e saw.;Tenoner;Spindle molder;Bandsaw;Stationa ry belt sander;Drill press

Purchase timber	Or Both	I do dry it	Air drying in the open air.	it is water contain in wood.	By simple eye observation	Motorized Rickshaw	I process it using machine and also in function of the design. a machine choosen.	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary belt sander;Drill press;Wood lathe machine
Purchase timber	Or Both	I do dry it	Air drying in the open air.	It is water contain wood	By simple eye observation	Motorized Rickshaw	We process it in a mill.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary belt sander;Stationary drum sander;Drill press;portable power tools
Purchase timber	Dry	I do dry it	Air drying in the open air.	water contain in wood.	By simple eye observation	Motorized Rickshaw	in a machine shop	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Bandsaw;Stationary belt sander;Stationary disc sander;Stationary drum sander;Drill press
Purchase timber	Dry	I do dry it	Air drying in the open air.	It is water in wood.	By simple eye observation	rickshaw, Motorized Rickshaw.	in machine shop and in function of the model.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary belt sander;Stationary disc sander;Drill press
Purchase timber	Dry	I do not dry it		it is water contain in wood.		Motorized Rickshaw	in machine shops.	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Stationary disc sander;Stationary drum sander;Drill press;jig saw.
Purchase timber	Wet	I do dry it	Air drying in the open air.	it is the portion	by simple	Rickshaw	We process	Crosscut saw (Radial arm saw);Surfacer

				of water in wood.	eye observation, by hand weighting.		wood in wood machinery shops.	(Planar);Thicknesser.;Table saw.;Bandsaw;Wood lathe machine;Combination machine
Purchase timber	Wet	I do dry it	Air drying in the open air.		by eye observation, by hand weighting, and from the sound.	rickshaw, motorized rickshaw, car.	most part of the processing is done in workshop and I pay for it.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Stationary disc sander;Drill press;Wood lathe machine;Combination machine
Purchase timber	Wet	I do dry it	Air drying in the open air.	it is much water contain in wood.	By hand weighting.	Rickshaw	I process my wood in a machine shop.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Stationary disc sander;Drill press;Wood lathe machine
Purchase timber	Wet	I do dry it	Air drying in the open air.;We use less time to dry.	It water contain in wood.	By hand weighting.	Rickshaw	I machine with my machines	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Stationary belt sander;Drill press
Purchase timber	Wet	I do dry it	Air drying in the open air.;sometimes we use it wet.		By hand weighting.	Rickshaw	we process it with our machines	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Drill press;Wood lathe machine
Purchase timber	Wet	I do dry it	Air drying in the open air.	it is when there is much water in wood.	By hand weighting.	Rickshaw	I process it in a payed machine shop.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Drill press
Purchase timber	Wet	I do dry it	Air drying in the open air.;We sometimes use it wet.	It is the sap in wood.	By simple eye observa	Rickshaw	I pay in a machine shop to	Surfacer (Planar);Thicknesser.;Table saw.;Spindle

					tion, by hand weightin g.		process my wood.	molder;Bandsaw;Drill press
Purchase timber	Wet	I do dry it	Air drying in the open air.		by eye observa tion and by hand weightin g.	Rickshaw, Motorized rickshaw, it also depends on the quantity.	We pay in machine shops to do machining .	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Portable power tools for sanding.
Purchase timber	Dry	I do not dry it				Motorized Rickshaw	I process using machine tools.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Wood lathe machine;Combination machine;portable disc sander.
Purchase timber	Dry	I do dry it	Air drying in the open air.	It is when wood is wet.	By hand weightin g.	Motorized Rickshaw	I pay in a machine shop to process my wood.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Portable power tools.
Purchase timber	Wet	I do dry it	Air drying in the open air.	It is water in wood.	By hand weightin g.	Motorized Rickshaw	I have the basic machines which I used to process wood.	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Wood lathe machine;portable disc sander.
Purchase timber	Dry	I do dry it	Air drying in the open air.	It is when there much water in wood.	By simple eye observa tion	Rickshaw	I process my wood in a machine shop and I pay.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Wood lathe machine;portable disc sander.
Purchase timber	Dry	I do not dry it	Some times we use wood as it is.		By simple eye observa tion	Motorized Rickshaw	We pay to process our wood.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;portable disc sander.

Purchase timber	Wet	I do dry it	Air drying in the open air.	Wood cannot be without water.	By hand weightin g.	Motorized Rickshaw	I pay in machine shops to process my wood.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Combination machine
Purchase timber	Dry	I do dry it	Air drying in the open air.	is water in wood.	By simple eye observation	Rickshaw	I pay in machine shop to process it.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Drill press;Wood lathe machine
Purchase timber	Wet	I do not dry it	We buy wood that is almostdry.	It is water in wood.	By hand weightin g.	Rickshaw	We process wood in machining shops.	Surfacer (Planar);Thicknesser.;Combination machine;portable disc sander.
Purchase timber	Wet	I do not dry it	we sometimes use it as it is.	It is water in wood.	By simple eye observation	Rickshaw	I process it in a machine shop and I pay.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Drill press
Purchase timber	Wet	I do dry it	Air drying in the open air.	when wood still contain water.	By simple eye observation	Rickshaw	I carry basic operations in a machine shop where I pay, and the rest is done in my shop.	Surfacer (Planar);Thicknesser.;Table saw.;Drill press;Wood lathe machine;Combination machine;sewing machine.
Purchase timber	Wet	I do dry it	Air drying in the open air.	when wood still contain water.	By simple eye observation	Rickshaw	I carry basic operations in a machine shop where I pay, and the rest is	Surfacer (Planar);Thicknesser.;Table saw.;Drill press;Wood lathe machine;Combination machine;sewing machine.

							done in my shop.	
Purchase timber	Wet	I do dry it	Air drying in the open air.	it is water still present in wood.	By simple eye observation	Rickshaw	we process wood in machine shop and we pay.	Surfacer (Planar);Thicknesser.;Table saw.;Bandsaw;Drill press;Combination machine
Purchase timber	Wet	I do dry it	Air drying in the open air.		By simple eye observation	Rickshaw	In a machining shop and I pay.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Drill press
Purchase timber	Dry	I do not dry it	sometime we purchase already dried wood.	It is water in wood.	By simple eye observation	Rickshaw	I process wood in a machining shop.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Stationary drum sander
Purchase timber	Dry	I do dry it	Air drying in the open air.	It is sap in wood	By simple eye observation	Rickshaw	I process wood in a machine shop where I pay.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Combination machine
Purchase timber	Or Both	I do dry it	Air drying in the open air.	It is wood that still contain moisture.	By simple eye observation	Motorized Rickshaw	We process in a machine shop.	Surfacer (Planar);Thicknesser.;Table saw.;Bandsaw;Combination machine
Purchase timber	Wet	I do dry it	Air drying in the open air.	It water in wood.	By hand weightin g.	Semi-truck	I process it in a machining shop and I pay.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder
Purchase timber	Wet	I do dry it	Air drying in the open air.	it is the quantity of moisture contain	By hand weightin g.	Semi-truck	we process wood in a machine shop.	Surfacer (Planar);Thicknesser.;Table saw.;Tenoner;Spindle molder;Bandsaw;Drill press;Combination machine;Portable disc sander.

				in wood.				
Purchase timber	Wet	I do dry it	Air drying in the open air.	It water in a portion of wood.	By hand weightin g.	Rickshaw	We process in a machining shop.	Surfacer (Planar);Thicknesser.;Table saw.;Bandsaw;Stationary belt sander;Drill press
Purchase timber	Wet	I do not dry it	sometimes the wood is dry during purchase, sometimes I use it as it is.	It is water present in wood.	By simple eye observation	Rickshaw	In a machining shop.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Drill press;Portable disc sander.
Purchase timber	Wet	I do dry it	Air drying in the open air.		By simple eye observation	Motorized Rickshaw	I process wood in a machine shop.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Wood lathe machine;Combination machine;Portable disc sander.
Purchase timber	Wet	I do dry it	Air drying in the open air.		By eye observation and hand weightin g.	Rickshaw	I process wood in a machine shop and I pay.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Drill press
Purchase timber	Wet	I do not dry it	Sometimes it come dry and sometimes we use it as it is.	It is moisture in wood.	By hand weightin g.	Rickshaw	we machine in shops meant for machining .	Surfacer (Planar);Thicknesser.;Combination machine
Purchase timber	Wet	I do not dry it	Air drying in the open air.	It is water in wood.	By hand weightin g.	Motorized Rickshaw	we process in a machining shop that belong to me.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Drill press

Purchase timber	Wet	I do dry it	Air drying in the open air.	It is water in wood.	By hand weightin g.	Rickshaw	I pay to process my wood.	Surfacer (Planar);Thicknesser.;Table saw.;Bandsaw;Drill press;Wood lathe machine;Combination machine
Purchase timber	Or Both	I do dry it	Air drying in the open air.	It is water in wood.	By hand weightin g.	Rickshaw	We process wood and pay in function of what and the design.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Stationary drum sander;Drill press;Wood lathe machine
Purchase timber	Wet	I do dry it	Air drying in the open air.	It is the quantity in wood.	By hand weightin g.	Rickshaw	I process in machine shop and I pay.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Drill press;Wood lathe machine;Combination machine
Purchase timber	Wet	I do not dry it				Rickshaw	I process my wood in a machining shop by providing the shape and it is being sawn on the bandsaw.	Surfacer (Planar);Thicknesser.;Table saw.;Bandsaw;Jig saw.
Purchase timber	Or Both	I do dry it	Air drying in the open air.		By hand weightin g.	Motorized Rickshaw	I process In a machine shop and I pay.	Surfacer (Planar);Thicknesser.;Table saw.;Bandsaw;Drill press;portable power tools.
Purchase timber	Dry	I do dry it	Air drying in the open air.	the stae where wood	By hand weightin g.	Motorized Rickshaw	We use the combinati on	Combination machine

				is still fresh.			machine tool to process and pay our wood.	
Purchase timber	Dry	I do not dry it		It is water in wood	By simple eye observation	Rickshaw	We process wood in a machining shop.	Surfacer (Planar);Table saw.;Combination machine
Purchase timber	Dry	I do not dry it		Quantity of water in wood.	By hand weightin g.	Rickshaw	I process in machine shop and I pay.	
Purchase timber	Dry	I do dry it	Air drying in the open air.	Elaborated sap in wood.	By hand weightin g.	Motorized Rickshaw	We have our machines.	Crosscut saw (Radial arm saw);Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Stationary belt sander;Drill press;Combination machine
Purchase timber	Or Both	I do dry it	Air drying in the open air.	Wood that is just coming from the forest.	By simple eye observation	Rickshaw	We use a combination machine to process wood.	Combination machine
Purchase timber	Or Both	I do dry it	Air drying in the open air.		By hand weightin g.	Motorized Rickshaw		
Purchase timber	Or Both	I do dry it	Air drying in the open air.	Non mature wood.	By hand weightin g.	Motorized Rickshaw	We pay to process our wood in a machining shop.	Combination machine
Purchase timber		I do dry it	Air drying in the open air.		By hand weightin g.	Motorized Rickshaw	We use our own combinati	Combination machine

							on machine tool.	
Purchase timber	Or Both	I do dry it	Air drying in the open air.	wood that still contain water.	By hand weightin g.	Rickshaw	we process in a machining shop where we pay.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Drill press;Combination machine;sewing machine.
Purchase timber	Or Both	I do dry it	Air drying in the open air.	when wood is just coming from the forest.	By simple eye observa tion	Motorized Rickshaw	I process in a Machining shop and I pay.	
Purchase timber	Wet	I do dry it	Air drying in the open air.	Quantity of water in wood.	By hand weightin g.	Rickshaw	WE process in a machining shop and pay.	Combination machine
Purchase timber	Wet	I do dry it	Air drying in the open air.	when the color is different from the dry ones.	By hand weightin g.	Rickshaw	I machine in other machining shops and pay.	Surfacer (Planar);Thicknesser.;Table saw.;Spindle molder;Bandsaw;Stationary disc sander;Drill press
18. What kind of difficulties do you face while machining? Select all that applies	19. What typical jointing methods do you use in assembling wooden items?	20. What type of finish do you apply to wooden products?	21. How do you apply finish on your products?	21. Do you own a spraying boot in your shop or enterprise?	22. Do you own a set of spraying equipment?	23. What are your difficulties when applying finishes on items? Select all that applies.	24. Do you belong to any form of association of woodworkers in	25. If yes, what are the benefits?

							your locality?	
Limited machining skills;Poor safety conditions;Inadequate maintenance	Mortise and tenon joints;Nail;Glue;pins	Varnish	Brushing;Wiping	No	No	Lack of adequate tools.;Limited access to quality finishes.;consumes too much time	No	
Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue;rainure et languette.	Paint;Varnish;Lacquer;Shellack;Stain;A mixture of varnish and stain	Spraying;poncage	No	Yes	Lack of adequate tools.;Limited access to quality finishes.	No	
Inadequate maintenance; Regular maintenance.	Mortise and tenon joints;Screw;Glue	Paint;Varnish;Lacquer;Shellack;Stain;A mixture of varnish and stain	Brushing;Spraying;Wiping;Dipping	Yes	Yes	No difficulties	Yes	To improve your capital;To share expertise.;Name: CESAC
Poor safety conditions	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.	No	
Limited machining skills;Poor safety conditions;Inadequate maintenance; Aging equipment.;No respect of delivering orders.	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Paint;Varnish;Lacquer;Shellack;Stain;A mixture of varnish and stain	Brushing;Spraying;Wiping	No	No	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.	No	
Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Stain	Brushing;Spraying;Wiping;Dipping	No	Yes	Lack of adequate tools.;Limited skills in finishing.	No	

Limited machining skills;Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Stain;A mixture of varnish and stain	Brushing;Sandpapering.	No	No	Lack of adequate tools.	No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Dowel;Screw;Glue	Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	No	Inadequate finishing facility.	No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	No	Inadequate finishing facility.;Lack of adequate tools.;appearance of rot when wood is wet.	No	
Limited machining skills;Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	No	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.	No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue; sewing	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	No	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.	Yes	Carpenters Union (No Profit for Me)
	Screw;Glue	Lacquer	Spraying;Wiping	Yes	Yes		No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue; Sewing.	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	No	Inadequate finishing facility.;Lack	No	

						of adequate tools.; Limited access to quality finishes.		
Poor safety conditions; Inadequate maintenance; Aging equipment.; Lack of space.	Mortise and tenon joints; Dowel; Nail; Screw; Glue	Paint; Varnish; Lacquer; Stain; A mixture of varnish and stain	Brushing; Spraying; Wiping; Sanding.	No	No	Inadequate finishing facility.; Lack of adequate tools.; Limited access to quality finishes.; Lack of space.	Yes	To create a partner organization.; Name: FUDA
Poor safety conditions; Inadequate maintenance; Aging equipment.; Lack of space.	Mortise and tenon joints; Dowel; Nail; Screw; Glue	Paint; Varnish; Lacquer; Stain; A mixture of varnish and stain	Brushing; Spraying; Wiping	No	No	Inadequate finishing facility.; Lack of adequate tools.; Limited access to quality finishes.; Lack of space	Yes	To create a partner organization.; Name: FUDA
Poor safety conditions; Aging equipment.	Mortise and tenon joints; Nail; Glue	Paint; Varnish; Stain	Brushing; clothing of upholstery.	No	No	Lack of adequate tools.	No	
Limited machining skills	Mortise and tenon joints; Dowel; Nail; Screw; Glue	Paint; Varnish; Lacquer; Stain; A mixture of varnish and stain	Brushing; Spraying; Wiping	Yes	Yes	Limited access to quality finishes.	Yes	To share expertise.; To increase your market.; To create a partner organization.; Name: The Younghamo
Poor safety conditions; Inadequate maintenance; Aging equipment.	Mortise and tenon joints; Nail; Screw; Glue	Paint; Varnish; Stain; A mixture of varnish and stain	Spraying	No	No	Inadequate finishing facility.; Lack of adequate tools.; Limited access to quality finishes.	No	
Poor safety conditions; Inadequate maintenance; Aging equipment.	Mortise and tenon joints; Dowel; Nail; Screw; Glue	Paint; Varnish; Lacquer; Stain; A mixture of varnish and stain	Brushing; Spraying; Wiping	No	No	Inadequate finishing facility.; Lack of adequate tools.; Limited access to quality finishes.	No	

adequate maintenance		varnish stain; Sealer. and				of adequate tools.; Limited access to quality finishes.		
Poor safety conditions; Aging equipment.; Inadequate machining time.	Mortise and tenon joints; Dowel; Nail; Screw; Glue	Varnish; Lacquer; Stain; Sealer	Brushing; Spraying	No	Yes	Inadequate finishing facility.; Lack of adequate tools.; Limited access to quality finishes.	No	
Limited machining skills; Poor safety conditions; Aging equipment.	Mortise and tenon joints; Nail; Glue	Varnish; Stain; Sealer.	Spraying	No	No	Inadequate finishing facility.; Lack of adequate tools.; Limited access to quality finishes.	No	
Inadequate maintenance	Mortise and tenon joints; Dowel; Nail; Screw; Glue	Paint; Varnish; Lacquer; Stain; A mixture of varnish and stain; Sealer.	Brushing; Spraying; Wiping	Yes	Yes	Lack of adequate tools.; Limited access to quality finishes.; Too many products of poor quality.	No	
Limited machining skills; Poor safety conditions; Inadequate maintenance; Aging equipment.	Mortise and tenon joints; Dowel; Nail; Screw; Glue	Paint; Varnish; Lacquer; Stain	Brushing; Spraying	No	No	Inadequate finishing facility.; Lack of adequate tools.	No	
Poor safety conditions; Inadequate	Mortise and tenon joints; Screw; Glue; Tong	Varnish; Lacquer; Shellac; Stain; A mixture of varnish and stain	Spraying; Wiping; Dipping	Yes	No	Inadequate finishing facility.; Lack	No	

maintenance; Aging equipment.	ue and groove, counter profile.					of adequate tools.;Limite d access to quality finishes.;Limi ted skills in finishing.		
Limited machining skills;Aging equipment.	Mortise and tenon joints;Dowel;Nail;Scre w;Glue	Paint;Varnish;Lacquer;S tain;A mixture of varnish and stain	Brushing;Spraying;Wi ping	Yes	Yes	Limited access to quality finishes.;Limi ted skills in finishing.		
Limited machining skills;Poor safety conditions;Ina dequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	Yes	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limite d access to quality finishes.;Limi ted skills in finishing.	Yes	To increase your market.;Name: SABADE
Limited machining skills;Inadequa te maintenance	Mortise and tenon joints;Dowel;Nail;Scre w;Glue	Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying;Wi ping	No	No	Inadequate finishing facility.;Lack of adequate tools.	No	
Poor safety conditions;Ina dequate maintenance; Aging equipment.;El ectricity outage.	Mortise and tenon joints;Dowel;Nail;Scre w;Glue	Paint;Varnish;Lacquer;S tain;A mixture of varnish and stain;Wax.	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limite d access to quality finishes.	No	
Limited machining skills;Aging equipment.	Mortise and tenon joints;Dowel;Nail;Scre w;Glue	Paint;Varnish;Lacquer;S tain;A mixture of varnish and stain	Brushing;Spraying	No	No	Lack of adequate tools.;in need of a spraying booth.	No	

Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Glue	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	No	Inadequate finishing facility.	No	
Inadequate maintenance	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	Yes	Yes		No	
Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue; Tongue and groove.	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying;Wiping	Yes	Yes	Lack of adequate tools.;lack of appropriate handling equipment.	Yes	To share expertise.;To create a partner organization.
Limited machining skills;Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Shellack	Brushing;Spraying	No	No	Lack of adequate tools.;Limited skills in finishing.;Lack of training.	No	
Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue;Sewing	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	Yes	Yes	Lack of adequate tools.	No	
	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Varnish;Stain;A mixture of varnish and stain	Brushing;Wiping	No	No	Lack of adequate tools.	No	
	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Varnish;Stain;A mixture of varnish and stain	Brushing;Wiping	No	No	Lack of adequate tools.	No	
Limited machining skills;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying;Wiping	Yes	Yes	Limited access to quality finishes.	Yes	To improve your capital;To share expertise.;To increase your market.;To create a partner organization.

Limited machining skills;Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	No	Limited access to quality finishes.;Limited skills in finishing.	No	
Poor safety conditions	Mortise and tenon joints;Nail;Glue	Varnish;Stain	Brushing;Spraying;Wiping	Yes	Yes	Lack of adequate tools.;Limited access to quality finishes.	Yes	To share expertise.;Name: Paris Meuble.
Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Paint;Varnish;Lacquer;Shellack;Stain;A mixture of varnish and stain	Brushing;Spraying	No	No	Lack of adequate tools.	No	
Aging equipment.	Mortise and tenon joints;Dowel;Glue;finger joint, dovetail joint	Paint;Varnish;Lacquer;Shellack;Stain;A mixture of varnish and stain	Brushing;Spraying;Wiping	Yes	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.;Limited skills in finishing.	Yes	To share expertise.;To increase your market.;Name: Club Meuble
Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Paint;Varnish;Lacquer;Shellack;Stain;A mixture of varnish and stain	Brushing;Spraying;Wiping;Dipping	No	No	Lack of adequate tools.	No	
Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	No	Limited access to quality finishes.	No	
Poor safety conditions;Inadequate	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Lacquer;Shellack;Stain	Brushing;Spraying;Wiping	No	No	Inadequate finishing facility.	No	

maintenance; Aging equipment.								
Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Lacquer;S tain;A mixture of varnish and stain	Brushing;Spraying	Yes	No	Lack of adequate tools.	No	
No difficulty.	Mortise and tenon joints;Dowel;Nail;Scre w;Glue	Paint;Varnish;Lacquer;S hellack;Stain;A mixture of varnish and stain	Brushing;Spraying	Yes	Yes	Lack of adequate tools.	No	
Poor safety conditions;Ina dequate maintenance; Aging equipment.	Mortise and tenon joints;Dowel;Nail;Scre w;Glue	Paint;Varnish;Stain;A mixture of varnish and stain;Sealer	Brushing;Spraying	No	Yes	Limited access to quality finishes.	No	
Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Dowel;Nail;Scre w;Glue	Paint;Varnish;Stain;A mixture of varnish and stain	Spraying;Wiping	No	Yes	Limited access to quality finishes.	Yes	To increase your market.;To create a partner organization.
Limited machining skills;Aging equipment.	Mortise and tenon joints;Dowel;Nail;Scre w;Glue	Varnish;Stain	Brushing;Spraying;Wi ping	No	No	Limited access to quality finishes.;Limi ted skills in finishing.	No	
Poor safety conditions;Ina dequate maintenance; Aging equipment.	Mortise and tenon joints;Dowel;Screw;Glu e	Paint;Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.	No	
Poor safety conditions;Ina dequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	No	Lack of adequate tools.;Limite d access to quality finishes.	No	
Limited machining skills;Poor safety conditions;so	Mortise and tenon joints;Nail;Screw;Glue	Varnish;it depends on the customer.	Brushing;Spraying	No	Yes	Inadequate finishing facility.	No	

me machines are not secure and the sawdust is too much.								
Limited machining skills;Poor safety conditions;Aging equipment.;the machines have poor precision.	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.	Yes	To improve your capital;To share expertise.;To increase your market.;To create a partner organization.;Name: Association des menuisier et simpatisant de Nkomkana
Poor safety conditions;so many issue with the spindle molder.	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	Yes	Yes	I do not have any finishing problem.	Yes	To share expertise.;for our security and aid.
Limited machining skills;Poor safety conditions;We are just trying our best.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Stain;A mixture of varnish and stain;According to the order.	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Limited skills in finishing.	No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.	No	
Poor safety conditions;we do with the capacity of machine.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;without booth nothing is appropriate.	No	

Poor safety conditions;needed a lot of carefulness.	Mortise and tenon joints;Dowel;Nail;Screw	Varnish;Stain	Brushing	No	No	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.;Limited skills in finishing.	No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue;tongue and groove.	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.	No	
no issue with this area.	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Paint;Varnish	Brushing;Spraying	No	No		No	
Limited machining skills;Poor safety conditions;Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Paint;Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.	No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue;Tongue and groove.	It all depends on the customer.	Brushing;Spraying	No	Yes	Inadequate finishing facility.	No	
Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limited skills in finishing.	No	
Poor safety conditions;Inadequate maintenance;	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Stain	Brushing;Spraying	No	Yes		No	

Aging equipment.								
Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue; Butt Joint.	Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying;Wiping	No	Yes	Inadequate finishing facility.;Limited skills in finishing.	Yes	To share expertise.;Name: Association des Menuisiers D'Elig-Ejoa
Limited machining skills;Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Paint;Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.	No	
Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Paint;Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.	No	
Limited machining skills;Poor safety conditions;Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	No	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.;Limited skills in finishing.	No	
Poor safety conditions;Aging equipment.;some machines are good others not.	Mortise and tenon joints;Dowel;Nail;Screw;Glue;butt joint.	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limited access to	Yes	To improve your capital;To share expertise.;To increase your market.

						quality finishes.		
Poor safety conditions;Aging equipment.;some machines are good others not.	Mortise and tenon joints;Dowel;Nail;Screw;Glue;butt joint.	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.	Yes	To improve your capital;To share expertise.;To increase your market.
Limited machining skills;Poor safety conditions;Inadequate maintenance;Aging equipment.	Mortise and tenon joints;Nail	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Limited access to quality finishes.	No	
Poor safety conditions;Inadequate maintenance;Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.		
Poor safety conditions;Aging equipment.;too much sawdust	Mortise and tenon joints;Nail;Glue	Varnish	Brushing;Spraying	No	No	Inadequate finishing facility.;Lack of adequate tools.;Limited skills in finishing.	No	
Poor safety conditions	Mortise and tenon joints;Nail;Screw;Glue	Varnish	Brushing;Spraying	No	Yes	Inadequate finishing facility.	No	
Limited machining skills;Poor safety conditions;Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Limited skills in finishing.	No	

Limited machining skills;Poor safety conditions;Aging equipment.	Mortise and tenon joints;Nail;Glue	Paint;Varnish	Brushing;Spraying	No	No	Lack of adequate tools.;Limited skills in finishing.	No	
Limited machining skills;Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue;butt joint.	Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.	No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;too much sawdust.	No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Limited skills in finishing.	No	
Limited machining skills;Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Limited access to quality finishes.;Limited skills in finishing.	No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Dowel;Nail;Glue	Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Lack of adequate tools.;Limited access to quality finishes.;Limited	No	

						ted skills in finishing.		
Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue;Tongue and groove.	Varnish;Stain;A mixture of varnish and stain;it also depends on the customer.	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limited skills in finishing.;Sometimes we rent spraying equipment.	No	
Poor safety conditions;Aging equipment.;we work with what is available.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.;Too much sawdust.	No	
Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying;Wiping	No	Yes	Lack of adequate tools.;Limited access to quality finishes.	No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.	Yes	To share expertise.;Name: Association des Menuisier D'eliffa
Poor safety conditions;Inadequate maintenance; Aging equipment.;No adequate spacing	Mortise and tenon joints;Nail;Glue	Varnish;Stain;A mixture of varnish and stain		No	Yes	Inadequate finishing facility.;Lack of adequate tools.	No	

between machine.								
No great problem.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.;Limited skills in finishing.	No	
Limited machining skills;Poor safety conditions;Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue;stipples	Paint;Varnish;Lacquer;A mixture of varnish and stain;it depends of the customer.	Brushing;Spraying	No	Yes	Lack of adequate tools.;Limited access to quality finishes.	No	
Limited machining skills;Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue; Dovetail Joint	Varnish;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.	No	
Limited machining skills;Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish	Brushing;Spraying	No	No	Limited access to quality finishes.	No	
Poor safety conditions;Aging equipment.;shortages of	Mortise and tenon joints;Dowel;Nail;Screw;Glue	Varnish;A mixture of varnish and stain	Brushing;Spraying	No	No	Inadequate finishing facility.;Lack of adequate tools.;Limited access to		

power most often.						quality finishes.;too much sawdust.		
everything is okay.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Lacquer;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.	No	
Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Lacquer	Brushing;Spraying	No	No	Inadequate finishing facility.;Lack of adequate tools.;Limited skills in finishing.		
	Mortise and tenon joints;Nail;Screw	Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.	No	
Limited machining skills;Poor safety conditions;Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Varnish;Lacquer;Stain;A mixture of varnish and stain	Brushing;Spraying;Wiping	No	Yes	Inadequate finishing facility.;Limited skills in finishing.	No	
Poor safety conditions;Inadequate maintenance; Aging equipment.	Mortise and tenon joints;Nail;Screw;Glue	Paint;Varnish;Shellack;Stain;A mixture of varnish and stain	Brushing;Spraying	No	Yes	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality finishes.;Limited skills in finishing.	No	
Poor safety conditions;Aging equipment.	Mortise and tenon joints;Dowel;Nail;Screw;Glue;tongue and groove.	Paint;Varnish;A mixture of varnish and stain	Brushing;Spraying;Wiping	No	No	Inadequate finishing facility.;Lack of adequate tools.;Limited access to quality	No	

						finishes.; Limited skills in finishing.		
Poor safety conditions; Inadequate maintenance; Aging equipment.	Mortise and tenon joints; Dowel; Nail; Screw; Glue	Paint; Varnish; Stain; A mixture of varnish and stain	Brushing; Spraying	No	Yes	Inadequate finishing facility.; Lack of adequate tools.; Limited access to quality finishes.	No	
Limited machining skills; Poor safety conditions; Aging equipment.	Mortise and tenon joints; Nail; Screw; Glue; butt joint.	Varnish; A mixture of varnish and stain	Brushing; Spraying; Wiping	No	Yes	Inadequate finishing facility.; Lack of adequate tools.	No	
Limited machining skills; Poor safety conditions; Inadequate maintenance; Aging equipment.	Mortise and tenon joints; Dowel; Nail; Screw; Glue	Varnish; Stain; A mixture of varnish and stain	Brushing; Spraying	No	Yes	Inadequate finishing facility.; Lack of adequate tools.; Limited access to quality finishes.	No	

26. What can the association or cooperative group do better? Please fill in your answers	27. If not involved with any professional association, why?	28. What are potential reasons to create or join an association for you?	29. Do you consider an association of with local woodworkers	30. How committed are you to such an initiative?
	not engage and not interested by associations	ratify cos and educate	A good idea	Neutral
	No existing or available association.	For lobbying and represent us before the government	Very good idea	Interested
Promote our Knowhow, put to light our designs(made in Cameroon)		For education	Neutral	Neutral
	No existing or available association.	To combine Purchasing power.	A good idea	Interested
	No existing or available association.	For lobbying and represent us before the government	Very good idea	Interested
	No existing or available association.	To find partners	A good idea	Interested
	No existing or available association.	For education	Very good idea	Interested
	Not interested in associations		bad idea	
	No existing or available association.	To find partners	A good idea	Interested
	Not easily accessible.	To combine purchasing power	A good idea	Interested
To reduce Taxes		For lobbying and represent us before the government	Neutral	Neutral
	Not interested in associations	To find partners	Very good idea	Interested
	No idea about the existence of any.	To find partners	A good idea	Interested
reduce tax.				
Lower taxes				
	Not interested in associations		Very bad idea	Not committed.
Reduce the cost of wood in the market.			A good idea	Interested
	No existing or available association.		bad idea	Not committed.
	No existing or available association.	For education	A good idea	Interested

	No existing or available association.	To combine purchasing power	A good idea	Interested
	No existing or available association.	To find partners	Neutral	Neutral
	No existing or available association.	For education	Very good idea	Interested
	No existing or available association.	For education	Very good idea	Interested
	No existing or available association.	For education	Neutral	Neutral
			Neutral	Neutral
augmentation of the capital, consider more customers, maintain for long customers, increase productivity, limit the consumption of imported furniture.		To combine purchasing power, to look for partner, for lobbying.	A good idea	Interested
	Not interested in associations		Very bad idea	Not committed.
	No existing or available association, Expensive to be a member.	To combine purchasing power	Very good idea	Interested
	Expensive to be a member of an association	To combine purchasing power	Neutral	Neutral
	Not interested in associations		Very bad idea	
	Not interested in associations		Neutral	Neutral
Consolidate links between us technicians,		education, lobbying, and partnership	A good idea	Interested
	No existing or available association.	For education	Neutral	Neutral
			Neutral	Neutral
	No existing association, expensive to be a member, not easily accessible.	For lobbying and represent us before the government	Neutral	Neutral
	No existing association, expensive to be a member, not easily accessible.	For lobbying and represent us before the government	Neutral	Neutral
to unite to generate income because to establish a wood industry we need a huge			Neutral	Neutral

capital, good workers, tools, and confidence.				
	I have no idea about it.	For lobbying, for partnership, a platform.		
Train youth, improve performance,		For education	A good idea	Interested
	Not interested in associations	To combine purchasing power	Neutral	Neutral
To provide more visibility		For education, for lobbying, to combine purchasing power, to find partners.	Very good idea	Interested
	No existing or available association, not easily accessible.		Neutral	Neutral
	No existing or available association.	for education, for lobbying, to combine purchasing power, to find partner.	A good idea	Interested
	Not easily accessible.	To combine purchasing power	bad idea	Not committed.
	Lack of information	For education	Very good idea	Interested
	No existing or available association.	For education	A good idea	Interested
			Very good idea	Interested
Increase partnership, reduce tax.		For education	A good idea	Interested
	No existing or available association.	for education, to combine purchasing power, to find partners.	Very good idea	Interested
	Not interested in associations		Neutral	Neutral
	Not interested in associations		bad idea	Not committed.
	Not interested in associations		Neutral	Neutral
assistance during illnesses, and during death.		for education, for lobbying, to find partners.		
to teach one another, collaborate, and during working accident.		For education		
	No existing or available association.	for education, lobbying, combine purchasing power, find partners.	Very good idea	Interested

	No existing or available association.	for education, for lobbying, to combine purchasing power.	A good idea	Interested
	Not interested in associations	For education, to combine purchasing power, to find partners.	A good idea	Interested
	Not interested in associations	To combine purchasing power, to find partners.	Neutral	Neutral
	Not interested in associations	To find partners	Very good idea	Neutral
	Not interested in associations	For education, for lobbying, to find Partner	A good idea	Neutral
	No existing or available association.	For education, to find partner, to combine purchasing power.	Very good idea	Interested
	No existing or available association.	For education	A good idea	Neutral
	Not interested in associations		Neutral	Neutral
	No existing or available association.	For education	Neutral	Neutral
Weekly contributions, and how to make more gains.				
	No existing or available association.	For education	Very good idea	Interested
	No existing or available association.	For education	Very good idea	Interested
	No existing or available association.	For education	A good idea	Interested
To secure customes and woodworkers, and to aid each other.				
To secure customes and woodworkers, and to aid each other.				
	Not interested in associations	To find partners	A good idea	Neutral
	Not interested in associations	For education	Neutral	Neutral
	No existing or available association.	For education	A good idea	Interested
	No existing or available association.	For education, and develop standardize costs.	A good idea	Interested

	No existing or available association.	For education, and to find partners.	Very good idea	Interested
	No existing or available association.	For education	Very good idea	Interested
	No existing or available association.	For education	Neutral	Neutral
	No existing or available association.	To find partners	A good idea	Interested
	Not interested in associations	For education	Neutral	Neutral
	No existing or available association.	For education	A good idea	Interested
	No existing or available association.	For education, To combine Purchasing power, To find partners.	A good idea	Interested
	Not interested in associations	for education, for lobbying, to combine purchasing power, to find partners.	A good idea	Interested
	No existing or available association.		Neutral	Neutral
	Expensive to be a member of an association.	For education	Very good idea	Interested
Aid each other, sensitize on safe processing of wood.		For education	A good idea	Interested
	No existing or available association.	For education	A good idea	Neutral
	No existing or available association.	For education	A good idea	Interested
	No existing or available association.	For education	A good idea	Interested
	No existing or available association.	To combine purchasing power	Very good idea	Interested
		For education	Very good idea	Interested
	No existing or available association.	To find partners	A good idea	Interested
	Not interested in associations		bad idea	Neutral
	No existing or available association.	For education	Very bad idea	Not committed.
	No existing or available association.	For education	A good idea	Interested
	Not interested in associations		bad idea	Not committed.

	No existing or available association.	To find partners	A good idea	Interested
	Not interested in associations	For education	A good idea	Interested
	No existing or available association.	For education	Very good idea	Interested
	No existing or available association.	To find partners	Very good idea	Interested
	No existing or available association.	For education	A good idea	Neutral

The number of employees:	Position of person answering the questionnaire:
0	owner
4	Proprietaire
43	Woodworker.
6	Assistant Director.
2	CEO
2	CEO
1	Owner
2	Owner.
2	woodworker.
4	Owner.
5	Owner.
52	Commercial
2	Woodworker.
1	Owner.
1	owner.
2	Owner.
1	owner.
1	Owner.
2	Owner.

3	Co-Owner.
2	Apprentice
4	OWNER
3	Owner.
	Technician
	Sales Officer
5	Assistant Manager.
	Woodworker.
	Technician
10	Technician
2	technician
	sales agent
	Owner.
	Owner.
11	
7	
3	Technician
	Owner.
36	Foreman.
6	Foreman.
2	Machinist
1	Owner.
3	Owner.
2	owner.
2	Technicien
2	Technician
1	Owner.

1	Owner.
	Technician.
	Owner.
1	Machinist.
1	foreman.
3	Owner.
	Owner.
	Technicien
	Woodworker.
	Owner.
	Owner.
	Woodworker.
7	employee.
	Owner
	Owner.
	Owner.
	Owner.
4	Foreman.
2	Technician
2	Technician
	Owner.
	Owner.
1	Owner.
	Patrick Diandha
	Owner.
	Owner.
	owner.
	Owner.
	Owner.

	owner.
	Foreman.
	Owner.
	Foreman.
	Owner.
	Owner.
1 Apprentice.	Owner.
1	owner.
	Owner.
Occasional employees	Owner.
	Owner.
2	Owner.
	Owner.
	Owner.
	Owner.
	Owner.
	Co-owner.
1	Owner.
	Owner.
	Owner.
	Owner.