# APPLICATION OF THE ANALYTIC HIERACHY PROCESS (AHP) IN SELECTING SUPPLIERS OF WOODEN FURNITURE INDUSTRY: A CASE STUDY OF XYZ COMPANY

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## ABSTRACT

This study has the objective of selection to suppliers in wooden furniture industry: A case study of XYP company. And to study selection to suppliers in wooden furniture industry: A case study of XYP company with application of the analytic hierarchy process (AHP). To use expert choice software program to calculate the factors to select suppliers of suppliers in wooden furniture industry. This research is qualitative research which includes exploratory research with In-depth interview using semi-structured interview form with key informants which includes business owner, company manager and specialist in procurement and sales. Content validity is used to measure precision and cover according to the content by collecting data to compare and determine the weight of each factor by assessing the consistency of decisions in the order of alternative factors, as well as analyzing the sensitivity to changes of key factors using the expert choice package and synthesizing the results of the decision making of suppliers in wooden furniture industry according to the guidelines of the Analytic hierarchy Process (AHP).

The result found that the manufacturing company's non-conformity ratio compared to all 6 factors is 0.080. And when each factor is taken to find the nonconformity ratio of the 3 supplier companies, it was found that the quality factor the nonconformance ratio value is 0.000. The price factor is non-conformance ratio values 0.001. The delivery factor is non-conformance ratio values 0.000. The service factor is non-conformance ratio value 0.050.

In conclusion, the calculation results using Analytic Hierarchy Process (AHP) and Expert Choice software package from both methods are summarized. The weight of all 6 factors and the weight values of all 3 companies differ slightly, so the most suitable wooden furniture industry for XYZ is Company C, followed by Company B, and finally Company A.

**Keywords:** Analytic Hierarchy Process (AHP), Selecting Suppliers in Wooden Furniture Industry, Wooden Furniture

## INTRODUCTION

The wood furniture industry is mainly production for export, accounting for about 70 percent of the total export value of furniture, and most of it is produced with rubber wood, about 60 percent of the total exported wooden furniture. The production of wood furniture can be divided into two types: Hardwood furniture is about 15% of all wood furniture, most of which is produced domestically. Most of the soft wood furniture is made of rubber wood, accounting for more than 80% of all soft wood furniture, and the total number of wooden furniture operators is about 2,898. There are only some that have export potential, which are usually medium and large enterprises. As for the distribution channels, there are manufacturers

selling directly from the factory to the buyer or selling directly through agents at general furniture stores. Distribution through medium and large department stores and furniture show events. The wood furniture industry is mainly production for export, accounting for about 70% of the total export value of furniture, and most of it is made of rubber wood, about 60% of the total exported wooden furniture. The production of wood furniture can be divided into two types: Solid wood furniture accounts for about 15% of all wooden furniture. Most of them are mainly focused on domestic distribution. Softwood furniture is mainly made of rubber wood, accounting for more than 80% of all softwood furniture. Due to its commercial cultivation and continuous regeneration, there are also various types of wood, veneers, and bamboo. Softwood furniture will focus on the international market because the production characteristics are easier than hardwood and can be designed in a variety of ways, especially knock down furniture, which is in demand in the international market and can save space and transportation costs. Furnishings can be categorized according to their attachment into 3 main groups: 1) Built-in furniture has a unique style, luxury, and very high strength, but it cannot be moved or reused and is expensive. 2) Movable furniture is cheaper than fixed furniture, and 3) Knock down furniture combines the advantages of the first two systems of furniture. Currently, the materials used in the manufacture of wooden furniture consist of: Solid wood, plywood or veneer, and medium density fiber board or particle board, with real wood furniture having the highest durability and price and decrease, respectively (Land and Houses Bank Business Research, 2023).

The situation is further exacerbated by stringent regulations aimed at curbing deforestation, which limit the volume of wood that can be harvested annually. These supply constraints are predicted to influence market dynamics significantly, potentially leading to price hikes or shifts in trade patterns. Moreover, the domestic demand for wood is also on an upward trajectory, fueled by the expanding construction sector and increasing popularity of wooden furniture and home decor. This additional demand places further strain on the already limited wood resources. Meanwhile, the industry is exploring potential solutions to these challenges such as investing in sustainable forestry practices and increasing imports of wood from other countries. The effectiveness of these strategies will be a determining factor in the evolution of the Thai wood market in the coming years. Wood in Thailand Market Overview 2023-2027.

However, the researcher conducted a field trip to Nakhon Pathom province, a province that has continued to develop and develop, with the expansion of residences and the increasing number of industrial factories, forcing XYZ, a wood furniture manufacturer, to produce wooden furniture to meet the needs of customers. From the field visits to conduct the study, it was found that the company faced problems in selecting wood manufacturing companies. There are suppliers who ship the goods.

## RESEARCH OBJECTIVES

To select suppliers for wood furniture manufacturers using the application of the analytic hierarchy process (AHP) in selecting suppliers of wooden furniture industry: A case study of XYZ company, Phutthamonthon District, Nakhon Pathom Province.

## LITERATURE REVIEW

The literature related to this research paper is the concepts and theories related to the analytical hierarchical process. Concepts and theories related to analytical hierarchical processes. The theory of the Analytic Hierarchy Process (AHP) is based on dividing the structure of the problem into individual layers. The first step is to set goals, define criteria, sub-

criteria, and alternatives, respectively, and then analyze the best alternatives by analyzing the trade off, criteria, and pairwise selection to make it easier to decide the comparative importance of each criterion by scoring them according to their importance. When scoring, prioritize criteria. Therefore, the choice is analyzed one pair at a time according to the specified criteria one by one until all criteria are met. If the rating of importance or preference is reasonable (Consistency), alternatives can be ranked to find the best alternative. The most suitable tool for use in Pair Wise Comparison is the use of square meters. In addition to square meters, mixes can be useful to explain comparisons. It can also be used to test the consistency of reasoning and the sensitivity of choice priorities.

**Table 1**: Examples of Pairwise Comparison (Saaty, 1980)

| Decision Criteria | | Factors | | | | |
|---|---|---|---|---|---|---|
| $C_1, C_2, C_3, \ldots\ldots, C_n$ | | $A_1$ | $A_2$ | $A_3$ | $\rightarrow$ | $A_n$ |
| Factor | $A_1$ | 1 | $a_{12}$ | $a_{12}$ | $\rightarrow$ | $a_{1n}$ |
| | $A_2$ | $1/a_{12}$ | 1 | $a_{23}$ | $\rightarrow$ | $a_{2n}$ |
| | $A_3$ | $1/a_{in}$ | $1/a_{2n}$ | 1 | $\rightarrow$ | $1/a_{3n}$ |
| | $\rightarrow$ | $\downarrow$ | $\downarrow$ | $\downarrow$ | $\downarrow$ | $\downarrow$ |
| | $A_5$ | $1/a_{1n}$ | $1/a_{2n}$ | $1/a_{3n}$ | $\rightarrow$ | 1 |

The calculation of rational consistency consists of 4 steps. as follows.

Step 1) Calculating λmax is to take the sum of the diagnostic values of each factor in each vertical row and multiply it by the sum of the averages in each horizontal row and add up the resulting products. The result is equal to the total number of factors being compared. In the case where the diagnostic factors are completely consistent, λmax = n.

Step 2) Calculate the Consistency Index (CI) from the formula CI = (λmax - n) / (n-1).

Step 3) Determine the Random Consistency Index (RI) The RI is derived from the collection of Oak ridge National Laboratory and the working group as a matrix size dependent value ranging from 1x1 to 10x10.

Step 4) Calculate the Consistency Ratio (CR) is to find the comparative ratio between the CI value calculated from the square meter and the RI value obtained from sampling from the CR value table obtained from the formula as follows: CR=CI/RI.

**Table 2:** Random Consistency Index (RI) by matrix size (Saaty, 1980)

| Dimensions of the matrix table | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| RI | 0.00 | 0.00 | 0.58 | 0.90 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 | 1.49 |

How to conduct research. This research is qualitative. The study was conducted in the research area, namely Phutthamonthon District, Nakhon Pathom Province. as follows.

Step 1) Study relevant theories and research, including the selection of suppliers for wood furniture manufacturers, the Analytic hierarchy Process (AHP) and the implementation of the Expert Choice program.

Step 2) Study the factors regarding the decision to choose a wooden furniture manufacturer supplier.

Step 3) Design a hierarchical structure to decide on a supplier for wood furniture manufacturers, including designing a questionnaire that is appropriate and comprehensive.

Step 4) Analyze and collect data to compare and determine the weight of each factor.

Step 5) Evaluate the consistency of decisions in the order of alternative factors as well as analyze the sensitivity to changes in key factors using the Expert Choice program.

Step 6) Analyze and summarize the decision to select a wooden furniture supplier according to the Analytic hierarchy Process (AHP) approach.

## RESEARCH RESULT

Findings The results showed that after creating a pair-by-pair comparison table and calculating according to the steps of the Analytic Hierarchy Process (AHP), the data were put into the Expert Choice ready-made program. Number 1 is the quality factor. It has a significant value of 0.523, 2nd place, price factor. It has an important value of 0.311, ranking 3rd in product insurance factors. It has a importance value of 0.100, 4th place, delivery factor. It has a significant value of 0.091, ranking 5th on the reliability factor. It has a significance of 0.054, and number 6 is the service factor. It has a significance of 0.044. When the importance of the selection factors for wood furniture manufacturers was determined and the factors were used to select the three wood furniture supplier companies, namely Company A, Company B, and Company C, using the method of putting data into the Expert Choice program, it was revealed that the 1st most important weighting company was Company C with a significance weight of 0.425 or 42.55%, 2nd place was Company B with a significance weight of 0.291 or 29.18%, and 3rd place was Company A with a importance weight of 0.283 or 28.30%.

In conclusion, the ranking of wood furniture supplier companies Case Study Company XYZ The most suitable company from the overall score is Company C with a significance weight of 0.425 or 42.55%, followed by Company B with a importance weight of 0.291 or 29.18%, and Company A with a importance weight of 0.283 or 28.30%.

New knowledge from research based on the study on the application of analytical hierarchical processes in the selection of wood furniture manufacturer suppliers for the wood furniture industry. Case Study of XYZ Co., Ltd. The research team gained new knowledge from the research. as follows This can be explained by the following steps: Measurement with a hierarchical analysis process can measure abstract properties, and the results of decisions are in the form of priorities. The hierarchical analysis process can be applied to interconnected elements of any form. Process prioritization is a multi-criteria decision analysis issue. Since the comparative importance of processes depends on a variety of competency attributes that may conflict across supply chains, the use of an analytic hierarchy process (AHP) can be used to effectively solve multi-criteria decision-making.

## SUMMARIZE

Based on the study on the application of analytical hierarchical processes in the selection of wood furniture manufacturer suppliers. The case study of XYZ Co., Ltd. can be concluded that, from the hierarchical structure charting of the selection of wood furniture manufacturer suppliers, When the importance of the factors for the selection of wood furniture manufacturers was determined and the factors were used to select the three wood furniture supplier companies, namely Company A, Company B, and Company C, using the pair-by-pair comparison method, it was found that the 1st most important weighting company was Company C with a significance weight of 0.424 or 42.45%, 2nd place was Company B with a significance weight of 0.292 or 29.25%, and 3rd place was Company A with a significance weight of 0.283 or 28.30%.

# RESEARCH SUGGESTION

Based on the findings, the researcher has the following recommendations

1) Recommendations for the utilization of research findings According to this study, the data obtained with criteria and reasons that can be used to make actual packaging purchasing decisions along with consideration of other factors with priority weights in descending order and by analyzing the ratio of data inconsistencies. The results of the assessment are at an acceptable level, showing that the results of the assessment can be used to make decisions by management in the selection of wood furniture suppliers. This will not only help the company not to lose business opportunities, but also build confidence for customers that the company can deliver quality work at a cost-effective time within the specified time.

2) Suggestions in the next research in this study, data were used only for one company. If the results are to be implemented, the factors may need to be adjusted to suit the business. If someone is interested in conducting additional studies, they may choose to add additional qualitative considerations to help them know the reasons for choosing a supplier company in more detail.

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