

MGMT 660 REPORT

HOUSEWARES 2000

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EXECUTIVE SUMMARY

This operational analysis report examines Housewares 2000's operations - a houseware company based in Thailand. The report provides valuable insights into the company's production process flow, inventory management, price breakdown, key challenges before, during, and after the COVID-19 pandemic, and recommendations to improve its performance.

The report's analysis reveals the drastic decrease in the company's demand rate, production flow rate, and process utilization because of COVID-19. EOQ model was employed to determine the optimal order quantity pre- and post-COVID due to the lack of inventory ordering data. Additionally, the price breakdown shows the increase in profit margin due to reduced operational and labor costs to recover lost profits during COVID. The key challenges facing the company before, during, and after the COVID-19 pandemic are also discussed in the report.

Based on the analysis, the report recommends implementing a quality sorting system, automated machinery, and improving employee development facilities to increase process and labor efficiency. These recommendations will help the company increase its revenue and profitability while improving its operational efficiency.

Overall, this report provides an in-depth look into Housewares 2000's operations, challenges, and opportunities for improvement. The raw material order data and annual cumulative inventory in the appendix offer valuable information to support the analysis and recommendations

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INTRODUCTION

Housewares 2000 (HW2000), established in 1988, is one of Thailand's leading distributors and designers of wooden houseware items under the promotion of the Board of Investment of Thailand (BOI). Triple W Industry, a subsidiary of HW2000, is responsible for manufacturing wooden products. HW2000 is located in Nonthaburi, while Triple W is based in Singburi, which is about a 2-2.5-hour drive, making it accessible and fast to transport the products for distribution.

HW2000 is a central hub for all orders and sales where customers place orders with them. The company is responsible for customizing their designs and creating product blueprints passed on to Triple W, which handles manufacturing. After the products are finished, they are sent back to HW2000, where they will be distributed domestically and internationally.

With a focus on wooden houseware items and incorporating melamine and glassware into its products, HW2000 is known for its innovative and unique products, which have gained a reputation within this industry. They have customers from over 25 countries, supplying major retailers, department stores, hotels, catering, and restaurants. However, the COVID-19 pandemic has had a profound impact on their business, as the majority of their exports have been severely affected, and the procurement of raw materials from overseas has been a challenge that has led to a domino effect that caused supply chain disruptions and labor issues.

OPERATIONS

The following list summarizes the key operations that Housewares 2000 practices:

1. Lean Manufacturing: HW 2000 eliminates waste and has a streamlined production process with simple tasks to create products that meet customer demand with minimal excess inventory. They practice Just-in-Time which means that they do not overproduce or does mass production for their products. They only store the raw materials using material resource planning and order forecasting to minimize their inventory levels and only produce what is ordered.

2. Kanban: The company practices a modified Kanban approach to manage production flow.

3. Pull Manufacturing: They produce products only when customers demand (made-to-order), minimizing inventory levels and reducing the risk of waste.

4. Production Line: The facility separates their production line into 2 processes, the first one is for products that uses one piece of wood for example, cutting board while the other process are for products that

needs assembling between different wood pieces such as cake stands. This made the flow of product smoother and reduce the time to changeover and relocate materials.

5. Labor Multi-skill: The facility promotes employees to work cross functionally in different production line to make sure that they earn skills and can understand the production line above what they are responsible for. This can also help with when an employee is unable to work and therefore, there is a gap in the production process so other employees can be a temporary substitution for them.

6. Continuous Improvement: While the company has identified areas for improvement post-covid, such as energy usage, there is room to refine processes as explained in the recommendation section.

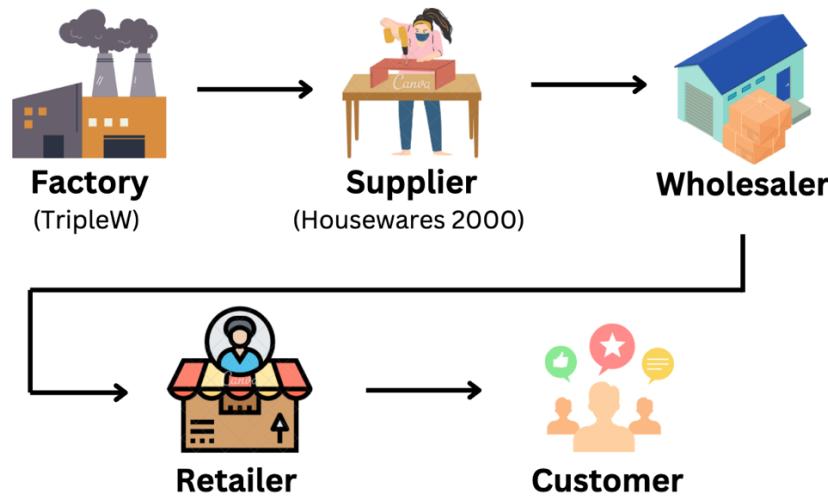


Figure 1. Operational Supply Chain

Figure 1 illustrates the supply chain of wooden houseware. Housewares 2000 orders raw material from Triple W to fulfill wholesale orders. Wholesalers purchase houseware in large quantities and store them in warehouses. Next, the wholesalers sell the wooden houseware items to retailers, who stock in stores or online platforms. The retailers then market the products to customers and sell them to the end users.

PROCESS FLOW

Wood is a natural and sustainable resource that is environmentally friendly and non-toxic, making it a healthier option for kitchenware. The organic properties of wood also provide excellent insulation, keeping food warm for more extended periods, and its durability makes it a long-lasting investment. Moreover, wooden kitchenware is aesthetically pleasing, adding a warm and rustic feel to the kitchen. The production of wooden kitchenware has also created job opportunities in the industry, supporting local economies and contributing to the sector's growth. Furthermore, wooden products are versatile,

customizable, and can be designed to cater to specific customer requirements, making them a popular choice in the market.

Manufacturing wooden kitchenware involves a meticulous and intricate process consisting of twelve crucial stages. The initial step commences with the ordering of raw materials from the factory. Acacia wood is in high demand; thus, its ordering time is comparatively shorter than that of other woods, such as teak, which is ordered based on specific client requirements. Typically, orders are received in bulk quantities exceeding 5000 units.

A real-time order for wooden lid jars was analyzed to understand the production process thoroughly. The first stage entails wood cutting, followed by shaping it roughly according to the desired design. Next, the wood undergoes a slicing process using two-sided and four-sided planar machines. The first rough sanding process follows, requiring approximately 5 seconds per unit. Subsequently, the wood is cut and shaped per the precise requirements utilizing CNC machines, which can handle complex designs and minor modifications.

Once the base design is achieved, the product undergoes a sponging process, taking about 22 seconds per unit. The exterior alterations are then carried out by drilling the base of the lid to perfection. The mechanical process is followed by refined sanding, ensuring dimensional accuracy and smoothness. The company logo is stamped onto the product using the hot stamp process. Finally, the products undergo a thorough quality check, including sealing, polishing, and glazing. A light finishing touch is given to the products, after which they are packaged and shipped.



Figure 2. Process Flow Diagram

This example closely follows the Toyota production and control line, where all the processes in the process flow are done without any assembly line, and quality control checks are thorough. Products are usually distributed internationally; the delivery process takes around ten days. If the order includes rare wood, or something more customized, the lead time increases accordingly.

The wooden lid jars manufacturing process is a highly intricate and specialized undertaking that demands skill and expertise. Each step must be meticulously executed to ensure the final product meets the required specifications and quality standards. The design and production of these wooden jars require sophisticated machinery and cutting-edge technology, which highly trained professionals skillfully operate - a challenge later discussed. The result is a stunning and functional product that meets the diverse needs of customers. Figure 3 illustrates the complexities of the manufacturing process.



Figure 3. Manufacturing Process

ANALYSIS

This section compares the pre- and post-COVID operations of Housewares 2000. The pandemic significantly impacted the company's sales and revenue. The analysis revealed that the company experienced a sharp decline in sales during the initial phase of the pandemic, with revenue dropping by 50% compared to pre-COVID levels. However, the company adapted quickly by shifting its focus to online sales channels and reducing operational costs. As a result, the company partially recovered sales by the end of 2021, and revenue increasing in 2022, close to pre-COVID levels. To compare pre- and post-COVID operations, process analysis and inventory management tools were employed.

PROCESS ANALYSIS

Table 1 depicts the derived stage capacity for each process part of manufacturing.

Table 1. Bottleneck Analysis

Process	Activity Time (sec/unit)	Stage Capacity (units/hr)
1. Wood Cutting	13.67	263.4
2. Wood Slicing	6.33	568.7
3. Rough Sanding	5.0	720
4. Shaping	24.67	145.9
5. CNC	6.0	600
6. Sponge	22.0	163.6
7. Drill	30.0	120
8. Refined Sanding	45.0	80
9. Hot Stamp	9.0	400
10. Sealing and Polishing	31.0	116.1
11. Finishing	25.0	144
12. Packing	2.0	1800

Refined Sanding was determined to be the process bottleneck with a daily capacity of 640 units/day, assuming an 8-hour workday. As Housewares 2000 employs made-to-order (JIT) operations, all the raw material ordered from the supplier is consumed. Appendix A showcases the annual raw material order data provided by the company. Using this information and conservatively assuming the raw material usage per unit produced ($0.1 \text{ ft}^3/\text{unit}$), the demand rate was calculated. Table 2 presents a comparison of key process parameters pre- and post- COVID-19.

Table 2. Pre- and Post-COVID Process Comparison

Key Parameters	Pre-COVID (2018-2019)	Post-COVID (2021-2022)
Average Demand Rate	453 units/day	291 units/day
Process Capacity	640 units/day	640 units/day
Flow Rate	453 units/day	291 units/day
Process Utilization	70.7%	45.4%

The first parameter analyzed is the average demand rate, which shows the daily units demanded. Before the pandemic (2018-2019), the average demand rate was determined to be 453 units/day, but it

decreased significantly to 291 units/day post-COVID (2021-2022). The second parameter analyzed is process capacity, representing the maximum number of units the process can produce in a day. This parameter remained constant at 640 units/day for both periods as the bottleneck capacity remained constant. The third parameter, flow rate, represents the number of units produced per day, dictated by the average demand rate, in this case, decreased by the same amount. The last parameter analyzed, process utilization, depicts the percentage of the processing capacity being used, which decreased significantly from 70.7% pre-COVID to 45.4% post-COVID, indicating the significant inefficiency of the process caused by the effects of the pandemic. The COVID-19 pandemic has been a significant driver of the bullwhip effect, disrupting supply chains globally, causing demand volatility, and making it difficult for suppliers to anticipate and meet demand. Small fluctuations in consumer demand caused significant variations in supply chain demand upstream. In this context, the table likely reflects the impact of the bullwhip effect on the supply chain process, where the decrease in average demand rate post-COVID (2021-2022) may have been amplified as it traveled upstream in the supply chain, resulting in a reduction in flow rate and process utilization. As Housewares 2000 is upstream in the supply chain, it experienced magnified bullwhip effects.

INVENTORY MANAGEMENT

Housewares 2000 does not utilize a strict inventory ordering/management policy. Alongside the annual raw material order, they provided a raw material reorder point, also presented in Appendix A. Due to the random nature of demand and enhanced bullwhip effects, they place raw material orders once inventory reaches the reorder point. With no lead time and a safety stock present in the facility, this method has been fruitful for the company. However, due to the lack of ordering data, our team has taken the liberty to implement the EOQ model for the company's operations to determine the most optimal order quantity to meet the average annual demand pre- and post-COVID.

Table 3 presents the findings of the EOQ Inventory Model.

Table 3. EOQ Model

Key Parameters		Pre-COVID (2018-2019)	Post-COVID (2021-2022)
Average Demand Rate		453 units/day	291 units/day
Average Annual Demand		165,000 units/year	106,000 units/year
Price		\$1.20/unit	\$1.20/unit
Fixed Ordering Cost		\$5/order	\$5/order
Holding Cost (15%)		\$0.18/unit	\$0.18/unit

EOQ	958 units/order	768 units/order
Number of Orders	173	138

Using these key parameters, the EOQ model was applied to calculate the optimal order quantity and the number of orders needed for pre- and post-COVID periods. The EOQ for the pre-COVID period was calculated to be 958 units/order, whereas the EOQ for the post-COVID period was 768 units/order. Naturally, with the decrease in demand, the optimal order quantity also decreased. Consequentially, the number of orders also decreased from 173 orders pre-COVID to 138 orders post-COVID.

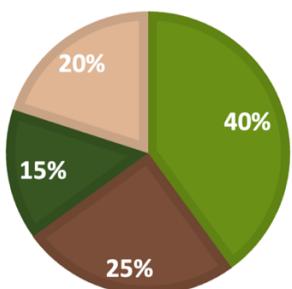
In summary, the EOQ model can be a valuable tool for companies to optimize inventory costs. The table demonstrates how the model's output changed before and after the COVID-19 pandemic. The decrease in average demand rate post-COVID has led to a reduction in the optimal order quantity and the number of orders needed to meet demand, emphasizing the importance of adjusting inventory management strategies in response to changes in demand patterns, potentially saving Housewares 2000 high costs had it been implemented.

PRICE BREAKDOWN

A crucial aspect of post-COVID profit recovery has been due to lower costs. As the process was not 100% utilized pre-COVID, the company implemented cost-cutting measures such as energy-efficient machinery use, etc., in addition to labor shortage to lower operational and labor costs. The following figures illustrate the financial breakdown of each unit sold pre- and post-COVID.

PRE COVID UNIT PRICE BREAKDOWN

- Raw Material Cost ■ Labor Cost
- Operations Cost ■ Profit



POST COVID UNIT PRICE BREAKDOWN

- Raw Material Cost ■ Labor Cost
- Operations Cost ■ Profit

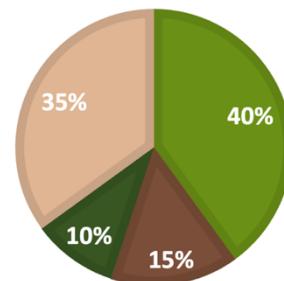


Figure 4. Unit Price Breakdown Pre- and Post-COVID

KEY CHALLENGES

This section presents the challenges faced by the company pre-, post-, and during COVID.

PRE COVID-19

Before the COVID-19 pandemic, the company faced several challenges that impacted the efficiency and productivity of production lines.

One of the major challenges was the variety of designs and production lines, resulting in a lack of standardization and increased waiting times, leading to low economies of scale. Additionally, the shortage of skilled labor and workmanship and insufficient training hindered production and caused delays. Another challenge was the need to train employees to multitask, which disrupted the production flow as they had to move around from one place to another. Furthermore, bottlenecks in the earlier stages of production due to the lack of standardization and insufficient workforce resulted in employees needing more work in later stages, further hampering productivity.

The company hesitated to invest in additional capital, such as automated machines, because of uncertainties regarding the industry's competitiveness and limited labor skills. Thailand's manufacturing and production processes were not at their peak during that time. Since it is a wood industry, it requires labor to segregate wood grades, making investing in machines that could replace the human touch challenging.

Overall, the pre-COVID challenges faced by the company impacted its efficiency, productivity, and competitiveness. Despite these challenges, however, they continued to innovate and evolve, with some manufacturers investing in automation and technology to improve their production processes.

DURING COVID-19

During the COVID-19 pandemic, the company faced significant challenges that affected its operations, supply chain, and workforce. One of the most significant effects was the closure of production lines due to workers contracting the virus, forcing factories to shut down.

The procurement of raw materials was hindered due to transportation challenges and supply shortages. The closure of several wood suppliers due to numerous retailers, restaurants, and hotels closing necessitated the search for new supplier options and the establishment of new relationships with them. Additionally, a reduction in the number of oak and ash wood suppliers and sawmills in the USA, coupled with the surge in home renovations, led to a higher demand for wood despite the drastic drop in supply. Consequently, raw material circulation decreased, resulting in longer lead times and higher freight costs

for shipments to Thailand. The import of raw materials was also impacted, as the company encountered challenges obtaining their supplies from Thai-based suppliers, given the government's regulatory restrictions prohibiting inter-provincial travel. Consequently, the company had to maintain a significant raw material stock, leading to high inventory costs.

In contrast, despite successfully acquiring raw materials and finalizing orders for shipment to customers, the company encountered challenges in exporting its products. Specifically, they experienced difficulties securing shipping containers at the largest distribution hub in China. This shortage of available containers was due to the high volume of shipments passing through the shipping network that runs through the hub. Unfortunately, COVID-19 has extensively impacted China, exacerbating these container shortages and leading to further delays in product exportation. As a result, the company has faced significant logistical and financial hurdles in fulfilling orders and successfully meeting demands.

Social distancing measures were also implemented, making it challenging to maintain normal operations and reducing productivity. The company offered free vaccinations to its employees, particularly as most were in the higher age bracket. However, some workers declined to receive the vaccine, and per Thailand's governmental regulations, the company could not mandate that they stay home. As a result, an outbreak occurred within the facility, despite workers' adherence to safety measures such as mask-wearing and social distancing. This led the facility to close for five days which caused a production imbalance. As the pandemic worsened, the company resorted to incentivizing some workers to leave their jobs to reduce labor costs and align with the decrease in orders. However, as the economy recovered and orders resumed, the facility faced a labor shortage due to insufficient workers to meet demand. Given the specialized and intricate nature of the woodwork industry, sourcing and recruiting suitable employees proved challenging.

Finally, the closure of retail stores, hotels, restaurants, and catering businesses led to decreased product demand, reducing manufacturer orders. This decline in demand further exacerbated the challenges faced during the pandemic.

POST COVID-19

The COVID-19 pandemic has significantly impacted various aspects of our lives, including the global economy. One area that has been affected is the supply chain and purchasing power.

Due to the Ukrainian war, European customers demonstrated reduced purchasing power and disposable income. This worsened the pandemic's effects on HW 2000 as most customers were European. The war

in Ukraine has also been compounded by the closure of many suppliers, which has reduced the options available for supply choices. This has led to a shortage of goods in the market and has caused prices to rise. Moreover, the pandemic has caused a global economic slowdown, leading to decreased orders. Strong currencies like the US dollar and weak currencies like the Thai baht and Euro have made it challenging for businesses to export goods, leading to a slowdown in order.

The pandemic has also led to workers quitting their jobs due to fears of contracting the virus. This has resulted in a labor shortage, making it challenging for businesses to meet orders when they come in. Additionally, suppliers have had to implement strict buying conditions to minimize production costs and compensate for losses incurred during the pandemic.

After the pandemic, the company had to make many challenging decisions regarding the amount to order and profitability. The effect it had on the entire process is further explained in the sections below.

RECOMMENDATIONS

This section presents the proposed recommendations by our team to improve operations and increase the company's overall profitability.

1. Creating a Training Workspace

Establishing a training workspace within an industry has numerous benefits that can contribute to the growth and success of the business. A training workspace is a designated area where employees can acquire new skills, improve their existing ones, and learn about the latest technology and equipment used in the industry. A training workspace helps in improving the skills and knowledge of employees. This can result in a more productive and efficient workforce, leading to increased profits for the business. Through training, employees can learn about new techniques and technologies that can streamline processes, reduce costs, and improve quality. It can help businesses to adapt to changes in the industry. With new technologies and techniques constantly emerging, it is essential for companies to stay up to date to remain competitive. A training workspace can provide employees with the necessary knowledge and skills to use new equipment and tools effectively. It can also improve safety and reduce accidents in the workplace. Proper training can help employees understand the potential hazards associated with their work and learn how to operate machinery and equipment safely. This can help prevent accidents and injuries, reducing costs associated with worker's compensation claims and lost productivity. Additionally, employees who feel safe and secure in their work environment are more likely to be productive and motivated, contributing to a positive work culture.

2. Implementing Quality Sorting System

One of the most significant benefits of implementing quality sorting system is cost saving and will give financial benefits. Most of the products manufactured in the company are Grade A material which is way finer than the required quality for most of the companies. 80% of the demands are for Grade B products, making a huge financial difference in the qualities and customer demands. We also proposed adding Grade C material for customers with lower budget so that they can be satisfied with the products. Implementing a quality sorting system can lead to several operational benefits. One of the most significant benefits is improved efficiency. By identifying areas in the production process that need improvement, businesses can streamline their processes and reduce production times. Additionally, reducing the number of defective products can improve throughput, allowing businesses to produce more products in less time. Improved efficiency can also result in cost savings, as businesses can reduce the cost of labor, raw materials, and other resources associated with production.

3. Introducing Automation Machines

A significant advantage of using autonomous machines in the industry is increased efficiency. Autonomous machines are designed to work continuously and consistently, without the need for breaks or downtime. This means that they can operate around the clock, resulting in increased productivity and efficiency. Additionally, autonomous machines can perform tasks faster and more accurately than humans, resulting in faster turnaround times and reduced error rates. Using autonomous machines in the industry can also lead to increased productivity. Autonomous machines are designed to perform repetitive tasks without getting tired or distracted, which means that they can work at a consistent pace for long periods of time. This can lead to increased output and productivity, as well as improved quality control. We proposed of using Autonomous robots to help in producing the bulk orders for Grade B and Grade C products and partial help for the Grade A material, keeping the experts using handcrafted designs for Grade A material.

4. Create Relationship with The New Suppliers

When a business has multiple suppliers to choose from, suppliers will have to compete with one another to win the business of the business. This can result in better pricing, higher quality products, and improved customer service. Another significant benefit of creating relationships with new suppliers in the industry is the potential for cost savings. When businesses have multiple suppliers to choose from, they can

negotiate better pricing and terms. Suppliers who want to win the business of a new customer may be willing to offer lower prices, reduced delivery fees, or other incentives to gain the business.

5. Brand Marketing for The Lower Budget Kitchenware

As the lower budget kitchenware and Grade C products can attract a lot of potential clients, we advised to promote the idea to the public. Brand marketing for lower budget bulk kitchenware products can bring several benefits to a business, including increased sales, improved customer perception, and differentiation from competitors. By promoting the brand and products effectively, businesses can create awareness among potential customers, build a positive reputation and image, and differentiate themselves from their competitors. These benefits can help businesses increase their revenue, build customer loyalty, and achieve long-term success in the marketplace.

CONCLUSION AND TAKEAWAYS

The primary objective of this project was to provide a comprehensive understanding of the processes involved in a real-world company from the point of order request to the final delivery. As a result, we gained valuable insights into the supply chain management practices of the company.

Throughout this project, we focused on various topics, including inventory management, process analysis, and the company's adaptability in the face of significant changes brought about by COVID and post-COVID circumstances. By analyzing these topics, we deeply understood the company's operations and supply chain management practices. We also better understood the importance of setting quarterly and yearly goals for a company. Through our analysis of the company's processes and supply chain management, we saw firsthand how having clearly defined goals and objectives can drive performance and success. The company achieved greater efficiency and productivity by setting specific targets for inventory management, delivery times, and supply chain optimization, resulting in improved customer satisfaction and profitability.

We also learned that setting goals at regular intervals help companies to stay focused on their priorities and adapt quickly to changing market conditions. By tracking progress against these goals, companies can identify areas for improvement and make necessary adjustments to their strategies and operations.

Our research and analysis provided a detailed picture of how the company manages its inventory, ensures timely delivery, and optimizes its supply chain to meet the demands of its customers. We learned about

the various strategies employed by the company to achieve maximum efficiency and reduce operational costs while maintaining the highest level of quality.

Moreover, we delved into the changes brought about by the pandemic and how the company adapted to the unprecedented situation to continue its operations. The company's ability to adjust its processes and supply chain strategies in response to the pandemic was remarkable, and we learned a great deal from this experience.

In conclusion, this project has provided us with a valuable learning opportunity, allowing us to deeply understand the processes involved in a real-world company's supply chain management. We have developed a greater appreciation for the complexities and challenges of managing inventory, optimizing supply chains, and delivering quality products to customers. This experience will serve us well in our future endeavors, and we are grateful for the opportunity to have undertaken this project.

APPENDIX A: RAW MATERIAL ORDER DATA & ANNUAL CUMULATIVE INVENTORY

* Assuming 0.1 cubic. ft/unit

Year	Order Quantity (cubic ft./year)	Average Order Quantity (cubic ft./year)	Average Order Quantity (units)
2018	17,156.04		
2019	15,927.56	16,541.80	165,418.00
2020	5,555.65	5,555.65	55,556.50
2021	8,150.26		
2022	13,075.19	10,612.73	106,127.25
ROP (cubic ft.)			650
ROP (units)			6500





APPENDIX B: LAYOUT OF THE FACTORY



APPENDIX C: CUSTOMERS WORLDWIDE

