# Importance of Inventory Management Knowledge for New Entrepreneur: A Demonstration through Student Performance in Business Game

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**Abstract**

Today people can sell and buy products on online platforms, thus becoming an entrepreneur is possible for everyone. In the beginning, new entrepreneurs may be able to manage their businesses, but they will struggle with difficulties when their businesses are growing bigger. Therefore, the new entrepreneurs need to learn business knowledge to operate the businesses. The inventory management knowledge such as economic order quantity (EOQ), inventory policy, ABC analysis is one of the essential knowledge in operating a business. The stock costs or warehouse rental costs will be increased without inventory management. This paper aims to demonstrate the importance of inventory management knowledge for operating a business. The demonstration is presented through the performance of undergraduate students in a business game called "MonsoonSim." The students played the game before learning the concept of inventory management, then played again after learning the concept. The results showed that the average profit of retail business games improved from - 25,142.7 Baht to 2,523,461.8 Baht and the average profit of wholesale business games improved from 1,691,505.1 Baht to 2,981,308.5 Baht. The space utilization improved from -108.3 to 19.2 for the retail business games, but the space utilization decreased from 37.5 to 32.4 for the wholesale business games. Besides, days sales on inventory also improved from 54.3 to 15.3 in the retail business games while days sales on inventory improved from 75.5 to 34.5. The students were asked about their attitude towards inventory management and the game by using an online questionnaire. Most students thought that inventory management is vital for operating a business, and they can apply inventory management in their future work. Based on the result, inventory management is one of the knowledge that new entrepreneurs need to know to be able to manage and operate businesses effectively.

*Keywords: Inventory management, Business management, Gamification based learning, New entrepreneur*

## 1. Introduction

At present, it is easy to start a business by selling a product through online platforms. Everyone can sell anything by using only their smartphone. In the beginning, new entrepreneurs can easily handle their businesses, but when businesses are growing, they will face many more challenges and need business knowledge to solve those problems. One of the business knowledge is inventory management.

Inventory management is one of the essential elements in a business, especially in the supply chain and logistics management unit. According to Thailand's Logistics report 2019 of the National Economic and Social Development Council (NESDC), the inventory holding cost is accounted for 46.5% of the total logistics cost, the transportation cost is accounted for 46.1% of the total logistic cost, and the rest is the logistics administration cost (Office of the National Economic and Social Development Council, 2021).

Every business should have a good inventory management system to help lower its total logistics cost. However, it does not simply mean reducing inventory expense can be done by reducing a company's goods or products holding. A company may not have enough goods to meet customers' demands if so. These goods or supply shortage issues can put a company at risk of losing its customers to its competitors. Effective inventory management should have a well-functioning system to balance the inventory holding cost and the risk of products shortage (Waters, 2007).

Based on the study of Suvittawat (2020), inventory management is important for small and large businesses. For small businesses, inventory management concerns space utilization, while for larger businesses, it concerns the information system that helps manage the inventory of several products. Plenty of previous research papers had applied the inventory management theory to improve the inventory in many businesses, such as shoe retail stores (Ngarmpornprasert, 2020), an agricultural business (Erden, 2015),

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hardware and POS application (Hindam & Suthikarnnarunai, 2020), a frozen food business (Rodprayoon & Chanasit, 2020), and a Plastic Lamp Manufacturer (Jiumsanga et al., 2020). The well-known inventory management techniques and theories that were applied in those research are Economic Order Quantity (EOQ), Inventory policy, and ABC analysis.

ABC analysis is the technique that divides the inventory into three groups; the highest value inventory, the medium value inventory, and the lowest value inventory, assigned into groups A, B, and C, respectively. This method helps the business to plan appropriate actions for each group of inventory. For example, most products in group A are high value and slow-moving, so the business needs to avoid the stock-out situation and input high investment on them.

Economic Order Quantity (EOQ) is the lowest cost order quantity. The calculation of EOQ is based on the fixed demand, the ordering costs, and the inventory holding costs (Vollman et al., 2007). As illustrated in Figure 1, if the order quantity is less than the EOQ points, the ordering costs are higher. On the other hand, the holding costs will increase if the order quantity is higher than EOQ.
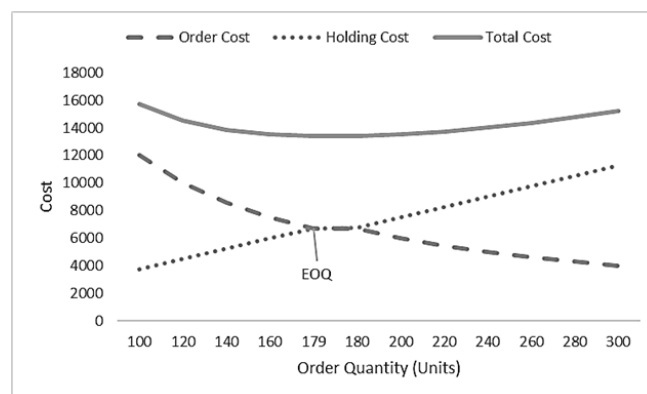


**Figure 1** EOQ costs

For the inventory policy, there are two main inventory policies namely continuous review policy (Q, R) and Periodic review policy (Simchi-Levi et al., 2008). As shown in Figure 2, the concept of continuous review policy is ordering Q units when the inventory level equals the reorder points (R). In the periodic review policy, the company has a certain period of ordering such as every 14 days or every month. At the ordering time, the company investigates the inventory level and fills the inventory to the base stock level. The company needs to set the base stock level that covers the period of ordering. The example of the inventory level of the company that implements the periodic review policy is shown in Figure 3.

An effective inventory policy is needed and must be defined properly by an entrepreneur. To do so, the entrepreneur should be knowledgeable about an inventory management system and all kinds of inventory policy, including economic order quantity and reorder point. To illustrate, an entrepreneur in the food industry must know when and how much to buy each raw material to serve customers' demands. Hence, this research aims to shows the impact of inventory management on business performance. New entrepreneurs or small businesses can realize that inventory management is essential for their business from the result of this research.

## 2. Objectives

The purpose of this research is to show that inventory management knowledge is essential in running a business for new entrepreneurs. To do so, the authors study the performance of student samples in the ERP-based Game called 'MonsoonSim.' The game imitates fundamental business concepts and creates Enterprise Resource Planning (ERP) structure (MonsoonSim, 2021) so that the students can experience different business situations through simulation and gamification.

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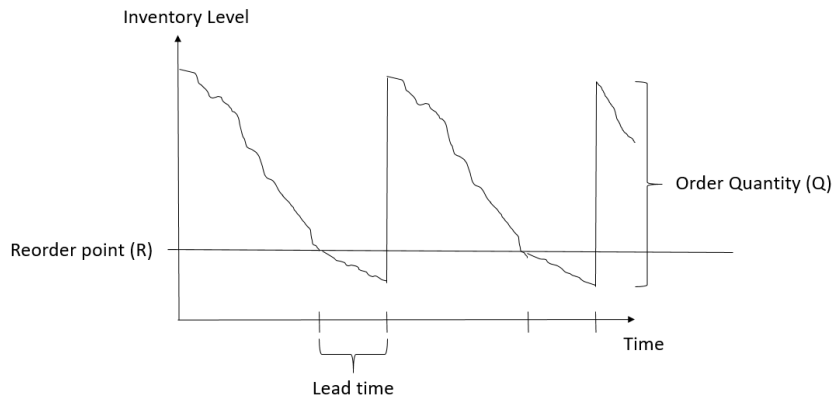
**Figure 2** Continuous Review Policy Process
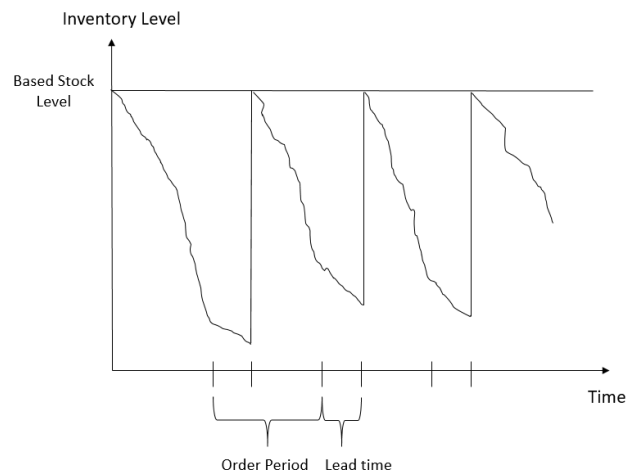


**Figure 3** Periodic Review Policy Process
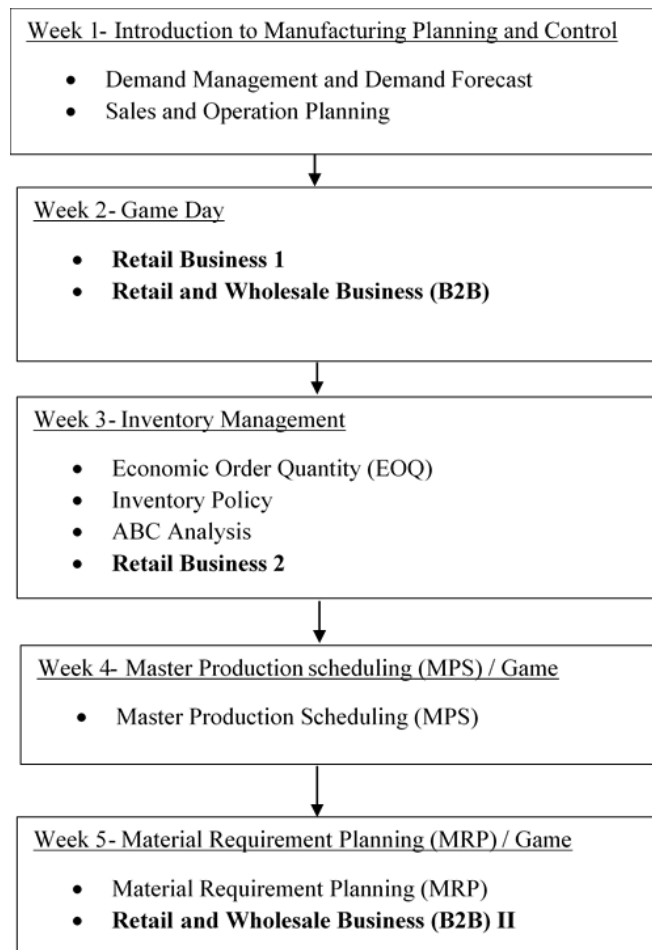
### 3. Materials and Methods

In this research, the importance of inventory management is demonstrated through the performance in playing a business game of 45 undergraduate students in the Demand, Resource, and Inventory Management course. The students were representing people who are just starting a business. The course's duration was five weeks and the structure of the course is shown in Figure 4.

In this course, the students played a business game after learning each topic. For instance, the students studied demand forecasting in Week 1 then played the game in Week 2. The game was played in a group of 4-5 students. The business game used in this course is "MonsoonSim," which is an ERP-based business game. MonsoonSim was launched in 2012 and used by more than 200 academic institutes for teaching business concepts through the game (MonsoonSim, 2021). This method of learning is called experiential learning.

The performance of the student group is KPIs provided by the game. The KPIs are net profit, the average days sales on inventory, and space utilization. The detail defined in the game is as follows.

The days sales on inventory (DSI) represents the average number of days that the business can sell off the inventory. DSI measures the sales of your business and the effectiveness of inventory, in which high DSI indicates that your sales are not good or your inventory is too much. The appropriate DSI depends on the type of business or industry.

Week 1- Introduction to Manufacturing Planning and Control
- Demand Management and Demand Forecast
- Sales and Operation Planning

Week 2- Game Day
- **Retail Business 1**
- **Retail and Wholesale Business (B2B)**

Week 3- Inventory Management
- Economic Order Quantity (EOQ)
- Inventory Policy
- ABC Analysis
- **Retail Business 2**

Week 4- Master Production scheduling (MPS) / Game
- Master Production Scheduling (MPS)

Week 5- Material Requirement Planning (MRP) / Game
- Material Requirement Planning (MRP)
- **Retail and Wholesale Business (B2B) II**

**Figure 4** Course Structure and Business Game

Space utilization is the utilization of the retail space and the utilization of the warehouse space. The KPIs show how the players match the space and the inventory management. To be an example, let's say Team A rents a 200-square-meter location, but only 50 square meters are used. Team A apparently has poor space utilization. However, if Team B rents 50 square meters but uses 200 square meters. This does not simply mean Team B has good space utilization. Instead, they also have poor space utilization and also need to pay the overflow fee.

After finishing the course, the students were interviewed about their attitude towards inventory management and the game. Their opinions about inventory management were collected through the questionnaire in which the answers to each question were based on a five-point scale, ranging from 1 (Strongly disagree) to 5 (Strongly agree).

1. Question#1 - How much do you know about 'inventory management' before playing MonsoonSim?

2. Question#2 – After learning 'inventory management' (e.g. inventory policy, economic order quantity, reorder point), does it help you in playing MonsoonSim?

3. Question#3 – How important the inventory management knowledge (e.g. stock management) is for running a business?

4. Question#4 – Nowadays starting an e-commerce business is easier. Do you think an entrepreneur still needs to know about inventory management?

5. Question#5 - In the future, do you think you will have a chance to apply the knowledge of inventory management in working or operating a business?

## 4. Results and Discussion

The net profit of each team is shown in Table 1. The average net profit for retail game 1, retail game 2, B2B1, and B2B2 are -25,142.7, 2,523,461.8, 1,691,505.1, and 2,981,308.5 Baht, respectively. As shown in Table 2, the average days sales on inventory (DSI) for retail game 1, retail game 2, B2B1, and B2B2 are 54.3, 15.3, 75.5, and 34.2, respectively. The utilization of space of each team is shown in Table 3, in which the average utilization for retail game 1, retail game 2, B2B1, and B2B2 are -108.3, 19.2, 37.5, and 32.4, respectively.

From the analysis of the questionnaire, the demographic of the students shows that 80% of them are female and the majority are 21-30 years old. In Table 4, the average score of question #1, question #2, question #3, question #4, and question #5 are 3.23, 3.70, 4.20, 4.05, and 4.09, respectively.

**Table 1** Result of net profit in the games

| Net Profit | Retail 1 | Retail 2 | B2B1 | B2B2 |
|---|---|---|---|---|
| A | (85,995.00) | 2,686,066.00 | 3,889,943.00 | 4,775,020.00 |
| B | (591,987.00) | 2,919,849.00 | 2,079,121.00 | 7,365,238.00 |
| C | 300,224.00 | 1,655,913.00 | (581,733.00) | (384,635.00) |
| D | 497,603.00 | (987,140.00) | (2,432,081.00) | (1,103,771.00) |
| E | 472,299.00 | 963,275.00 | (525,500.00) | (1,062,673.00) |
| F | (473,224.00) | 910,223.00 | 1,983,917.00 | 7,885,708.00 |
| G | 1,073,305.00 | 4,021,917.00 | 3,489,710.00 | 2,415,159.00 |
| H | (835,693.00) | 2,651,575.00 | 3,103,804.00 | (222,580.00) |
| I | (386,248.00) | 6,686,913.00 | 1,506,496.00 | 7,866,227.00 |
| J | (221,711.00) | 3,726,027.00 | 4,401,374.00 | 2,279,392.00 |
| **Average** | (25,142.7) | 2,523,461.8 | 1,691,505.1 | 2,981,308.5 |

**Table 2** Result of day sales on inventory in the games

| Day Sales on Inventory | R1 | R2 | B2B1 | B2B2 |
|---|---|---|---|---|
| A | 55 | 35 | 64 | 39 |
| B | 166 | 6 | 39 | 37 |
| C | 8 | 49 | 240 | 25 |
| D | 20 | 10 | 33 | 2 |
| E | 107 | 3 | 18 | 28 |
| F | 50 | 5 | 43 | 121 |
| G | 8 | 15 | 45 | 15 |
| H | 36 | 11 | 36 | 21 |
| I | 14 | 5 | 176 | 17 |
| J | 79 | 14 | 61 | 37 |
| **Average** | 54.3 | 15.3 | 75.5 | 34.2 |

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In the retail game, 6 out of 10 teams had a negative net profit in the first retail game. The performance of all teams improved from the first game after they have learned about the inventory management theory and sales and operation planning. Thus, 9 out of 10 teams had a positive net profit in the second retail game. Both utilization of the space and days sales on inventory (DSI) were also improved in each team. It can be seen that the average utilization and average days sales on inventory in the second retail game showed an improvement from the first retail game.

In the wholesale business or B2B games, the average net profit, space utilization, and DSI were improved from the first B2B game after the students have learned about master production scheduling and material requirement planning. Besides, the utilization and DSI were also higher than those of the retail game since the wholesale business tends to keep more stock than the retail business.

The result of the questionnaire showed the students were at an average level of inventory management before learning this course. After learning the concept of inventory management and playing the game, they thought that inventory management knowledge is essential for operating the business in this era. They also thought that they will apply the inventory management concept in their future work.

Based on all results, the inventory management and the production planning and control concept will help the students or new entrepreneurs in better operating their businesses. However, other important business concepts that the entrepreneurs need to learn still exist, namely accounting, business laws, and marketing. Therefore, entrepreneurs have to improve themselves and their businesses to compete in the fast-changing business world.

**Table 3** Utilization of space in the games

| Space Utilization | R1 | R2 | B2B1 | B2B2 |
|---|---|---|---|---|
| A | 36 | 72 | 41 | 43 |
| B | 74 | 27 | 65 | 26 |
| C | -1252 | -243 | 18 | 32 |
| D | 45 | 36 | 16 | 2 |
| E | 51 | 6 | 34 | 40 |
| F | 54 | 67 | 23 | 31 |
| G | 38 | 29 | 25 | 36 |
| H | 14 | 70 | 54 | 38 |
| I | 37 | 63 | 56 | 42 |
| J | -180 | 65 | 43 | 34 |
| **Average** | -108.3 | 19.2 | 37.5 | 32.4 |

**Table 4** Results of the questionnaire

| Question | Average |
|---|---|
| Q1: How much do you know about 'inventory management' before playing MonsoonSim? | 3.23 |
| Q2: After learning 'inventory management' (e.g. inventory policy, economic order quantity, reorder point), does it help you to play MonsoonSim easier? | 3.70 |
| Q3: How important the inventory management knowledge ( e.g. stock management) is for running a business? | 4.20 |
| Q4: Nowadays, starting an e-commerce business is easier. Do you think an entrepreneur still needs to know about inventory management? | 4.05 |
| Q5: In the future, do you think you will have a chance to use the knowledge about inventory management in working or operating a business? | 4.09 |

## 5. Conclusion

This study aims to demonstrate the importance of inventory management knowledge for new entrepreneurs. The demonstration is presented through the performance of the undergraduate students in the MonsoonSim business game. The students played the game once before learning the concept of inventory management and again after learning the concept of the inventory policy. The performance of their business, which was indicated as net profit, space utilization, and days sales on inventory, showed an improvement after learning the concept of the inventory policy. Based on the result, the inventory management knowledge helped the students to better operate their businesses. The students were also interviewed about their attitude towards inventory management and the game. The result showed that inventory management knowledge is vital for operating a business.

In conclusion, this study demonstrates that inventory management knowledge can help the students or new entrepreneurs in better operating their businesses. They can apply the knowledge to operate their stock and the space to reduce inventory costs. However, there are other business concepts such as marketing and accounting that they have to learn for operating their business.

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