IMPROVING INTERBRANCH INFORMATION SYSTEM FOR A CHAIN OF GOLD RETAIL SHOPS BY COMPUTERISED INVENTORY MANAGEMENT SYSTEM

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การปรับปรุงระบบสารสนเทศสำหรับผู้ค้าปลีกทองคำระหว่างสาขา ด้วยการจัดการสต็อกสินค้าคงคลังโดยใช้ระบบคอมพิวเตอร์

น.ส.ปุณญวดี ศรีมงคล

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรมหาบัณฑิต
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By	Miss Punyavadee Srimongkol
Field of Study	Engineering Management
Thesis Advisor	Professor PARAMES CHUTIMA, Ph.D.

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ปุณญวดี ศรีมงคล : การปรับปรุงระบบสารสนเทศสำหรับผู้ค้าปลีกทองคำระหว่างสาขาด้วยการจัดการสต็อกสินค้าคงคลังโดยใช้ระบบคอมพิวเตอร์. (IMPROVING INTERBRANCH INFORMATION SYSTEM FOR A CHAIN OF GOLD RETAIL SHOPS BY COMPUTERISED INVENTORY MANAGEMENT SYSTEM)
อ.ที่ปรึกษาหลัก : ศ. ดร.ปารเมศ ชุติมา

งานวิจัยนี้เป็นการการปรับปรุงระบบโลจิสติกส์สำหรับผู้ค้าปลีกทองคำระหว่างสาขาด้วยการจัดการสต็อกสินค้าคงคลังโดยใช้ระบบคอมพิวเตอร์ เพื่อลดระยะเวลาในการย้ายโอนสินค้า ซึ่งหนึ่งในปัญหาหลักที่ห้างหุ้นส่วนจำกัดในกรณีศึกษา ซึ่งประกอบกิจการร้านขายปลีกทองพบเจอในปัจจุบันคือจำนวนของการซื้อขายที่เป็นการสั่งจองล่วงหน้านั้นถูกยกเลิกเนื่องมาจากขั้นตอนการดำเนินการ และการขนส่งสินค้าระหว่างสาขานั้นใช้เวลานาน งานวิจัยนี้จึงได้ติดตั้งซอฟต์แวร์สำหรับการจัดการสินค้าคงคลังทั้งภายใน และระหว่างสาขา

ข้อมูลที่ใช้ในการตั้งค่าซอฟต์แวร์ระบบคอมพิวเตอร์ใหม่ประกอบด้วยรหัสสินค้า (SKU) และสต็อกสินค้าคงคลังของผลิตภัณฑ์ที่ขายดีที่สุดในสาขาทั้ง 3 สาขา ซอฟต์แวร์จะช่วยให้ฝ่ายขายและพนักงานสามารถตรวจสอบสต็อกสินค้าคงคลังได้ทันทีเพื่อให้บริการลูกค้าได้รวดเร็วขึ้น ข้อมูลถูกรวบรวมเพื่อดูว่าสามารถลดจำนวนของธุรกรรมการสั่งซื้อล่วงหน้าที่ไม่สำเร็จได้หรือไม่ ผลลัพธ์ที่ได้แสดงให้เห็นถึงการลดลงในจำนวนของการยกเลิกการซื้อขายที่เป็นการสั่งจองล่วงหน้า และสามารถเพิ่มความพึงพอใจในการบริการให้แก่ลูกค้าได้ ระบบการจัดการสินค้าจะนำไปใช้กับสินค้าทุกประเภทในร้านค้า และผลการตอบรับจะถูกนำไปพัฒนาซอฟต์แวร์ให้ตรงกับการใช้งานของร้านค้าปลีกในธุรกิจการค้าทองรูปพรรณต่อไป

สาขาวิชา	การจัดการทางวิศวกรรม	ลายมือชื่อนิสิต .....
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Punyavadee Srimongkol : IMPROVING INTERBRANCH INFORMATION SYSTEM FOR A CHAIN OF GOLD RETAIL SHOPS BY COMPUTERISED INVENTORY MANAGEMENT SYSTEM. Advisor: Prof. PARAMES CHUTIMA, Ph.D.

This research aimed to develop an inventory and logistics management system to improve the efficiency of the inventory and logistic process of the case study gold retail store chain by implementing computerised inventory management software for interbranch retail jewelry shops. One of the current problems experienced by the case study company which is gold retail shops is that the percentages of unsuccessful preorder transactions are relatively high due to the slow product shipping process. In this project, computerised inventory management was implemented to improve and solve the problem.

The data used to set up the new computerised software includes SKUs and its inventory stock of the best-selling product in all the 3 branches. The software allows the sales and employees to check the inventory stock instantly to provide quicker service to the customers. The data was collected and analyzed. As a result, the percentage of unsuccessful preorder transactions was reduced and satisfactory level of the customers was increased. The computerised software will be used to cover all services in the company.

Field of Study:	Engineering Management	Student's Signature .....
Academic Year:	2023	Advisor's Signature .....

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Punyavadee Srimongkol

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CHAPTER 1
INTRODUCTION

1.1 Background Information and Social Values of Gold in Thailand

Gold has been introduced to human society for nearly six thousand years. The origin of the word ‘gold’ came from the English term ‘Geolo’ which signifies yellow colour. The scientific symbol for the gold element is ‘Au’ which was derived from the Latin word ‘aurum’. The meaning of aurum is gold.

In the past, decorations items in religious ceremonies were gold as it symbolises authority and prosperity. The firstyk45z3ut discovery of gold was discovered in Western Asia, especially in Egypt. Later, gold was discovered in Macedonia, Italy, France, Spain, the United States, and Australia. Gold mining expanded after the discovery of gold in the Americas. For many centuries, gold has been the most valuable form of money for many centuries and is the only metal that is universally recognised.

Thailand used to be known as "Suvarnabhumi", meaning the golden land. The name was given due to its abundant nature. It has evidence from the Department of Mineral Resources. Thailand at that time probably had a large amount of gold.

The relationship between gold metal and the Thai people has a long history, possibly back to the Chiang Saen Empire because there is evidence of a gold-cast Buddha image in Chiang Saen art style. When Thailand received the Khmer Devaraj system as the country's supreme administrative institution, gold was used to make regalia and all the utensils.

Gold Bullion has long been seen as an investment to grow and profit safely while safeguarding the economy. From late 2013, there was an increase in demand for gold ornaments due to the decreasing gold prices. As a result, the gold ornaments demand in Thailand’s market changed. The demand to produce gold ornaments surged when the effects of the global economic crisis on the price of gold diminished. Figure 1 depicts the decrease in gold purchases in the domestic Thai market. (Reuters, survey 2014).

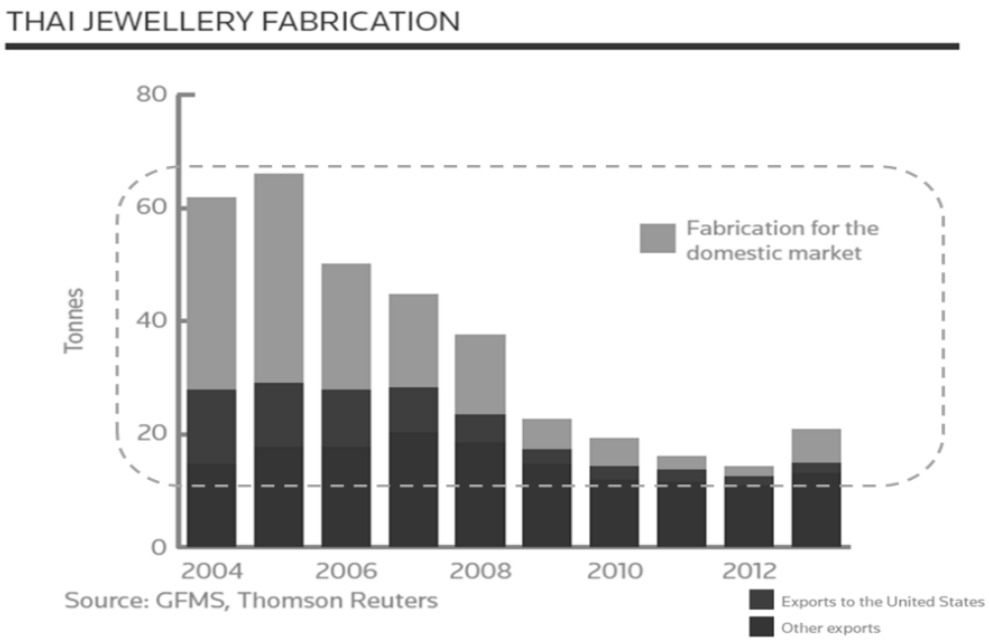


Figure 1: Thai Jewelry Fabrication by Reuters (2014)

There are greater than 6,000 gold ornament retail outlets in the local Thai market Gold Trader (2013). It would be advantageous for these retail establishments to comprehend market dynamics, consumer behavior, and gold ornament buying intentions. Given the expensive nature of gold jewelry, buying "luxury" goods require a significant amount of human interaction. The ability to recognise the value and limited supply are essential factors in the purchase of luxury goods as stated by Cornell (2002).

In Thailand, the usual gold ornaments in the domestic market are 23.16 carats which is equivalent to 96.5% purity of gold Gold Trader (2013). On the other hand, the standard gold ornaments in the American and European markets are from 9 to 18 carats World Gold Council (2014). As a result of the high purity of gold in Thailand's market, they are considered 'luxury products'. Gold ornaments include necklaces, bracelets, rings, earrings, lockets, and frames. as shown in Figure 2. They are various designs and sizes for everyone including men, women, and children, and they can be used for many purposes.

Figure 2: Products in Ordinary Gold Ornament Retail Outlets in Thailand

Several factors could cause fluctuation in gold prices in Thailand. It moves according to the global gold prices, demand, supply, economic conditions, central banks, and the behaviors of the investors. According to a Bangkok Post report on 24 February 2022, the gold prices in Thailand changed 17 times in a day and the price rose by 850 Thai baht due to the invasion of Ukraine by Russia. Such a situation seldom occurs, but not impossible. As a result of the fluctuation, there were long queues outside many gold ornament retail outlets, especially in Chinatown in Bangkok where many outlets are located. As mentioned, gold is a luxury product. Its supply is limited and the process to do gold mining in each country can be very complicated. Gold has proved to be a safe haven for investors or people who want to make a profit in a long run. Its unique characteristics are its lustre, durability, rarity, and reusable. Furthermore, gold can be converted into any currency at any point of time, and it can avoid inflation due to economics.

Figure 3 : Long Queues Formed Outside Gold Shops in Chinatown
News and Reporters (2002)

1.2 General Statement of the Problem

In today's context, the evolution of information technology has developed, and it started to play a role in everyday life. This era is also known as the era of information technology. It becomes more convenient and faster for business owners and customers to interact with each other to find out their needs.

The enhancement of the usage of information technology can be adapted and applied to businesses of any scale, from small to large. At the same time, the economy of Thailand which is also known as the digital economy is being driven by the introduction of information technology and digital literacy leading to an increase in productivity and production according to the government policy. The policy is expected to completely drive Thailand towards the digital economy of Society (2022), to reduce working hours and better services, especially in the current era where computers and the internet are more commonly used for communication. This is considered to create social opportunities and equality in accessing available information and services through digital media. It is also an improvement in the quality of life for everyone. (Electronic Transactions Development Agency, 2017)

In addition, there are various options for investment. For instance, investment in the money market is available. This includes having savings through financial institutions and investing in various funds or capital markets, such as government bonds, stocks, bonds, etc. However, uncertainties may arise like the current public debt problem in Thailand. The situation causes the return on the investment in the capital market to become lower, fluctuate from time to time, and have higher risk levels. As a result, investors look for an alternative investment option that yields the opposite by diversifying investment portfolios to reduce the risk in their investments. The most popular option is to invest in the gold market. (Sathien Borivechanon, 2010) Gold has been playing an important role in the world economic and financial systems since the pre-World War l. The global economy has transformed its monetary system into the gold standard system. The unit of the currency are set against the weight of the gold and any currency can always be exchanged with gold. The authorities are unable to limit the amount of gold being imported and exported worldwide. Gold is a commodity product because of its identical characteristics regardless of its origin. The standard is set in terms of traded weight as well as purity grades. Gold is a precious metal, and it can be used as a raw material for manufacturing in the industry. It can be used as another type of asset for investment diversification as the price of gold is inversely proportional to the economic indicators. This shows that the value of gold can be maintained, and it is not dependent on market stress. When there is political instability, fluctuation of the financial situation arises, or high inflation, gold is the safest investment in the diversification of investment risks. Gold tends to be less volatile compared to other asset classes. Low-volatility assets can reduce the overall risk of the investment portfolio and increase the investment return for the investors. In conclusion, gold is valuable, and its value will continue to increase. In addition, its high liquidity allows the conversion from gold to cash and vice versa whenever needed. However, over the years, the demand for gold in Thailand has increased steadily as gold is a highly secure asset and able to maintain wealth in a long term. (Suphawadee Siriwat, 2012)

Srimongkol-Chain Gold Retail Shops is a jewelry shop that has been operating since 2004. The 3 branches of Srimongkol-Chain Gold Retail Shops are in Samut Sakhon Province. Figure 5 depicts the organizational chart of Srimongkol-Chain Gold Retail Shops.

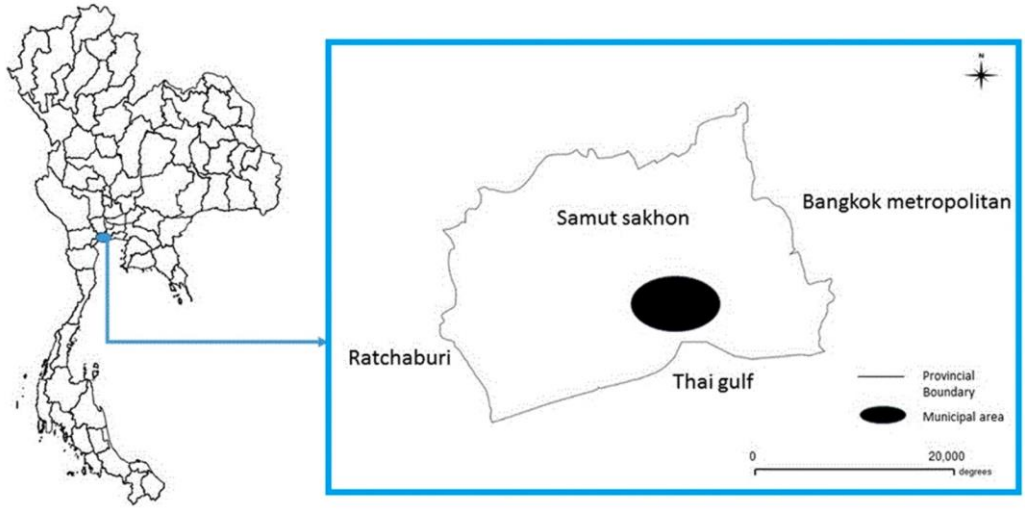


Figure 4: Location of Samut Sakhon Province

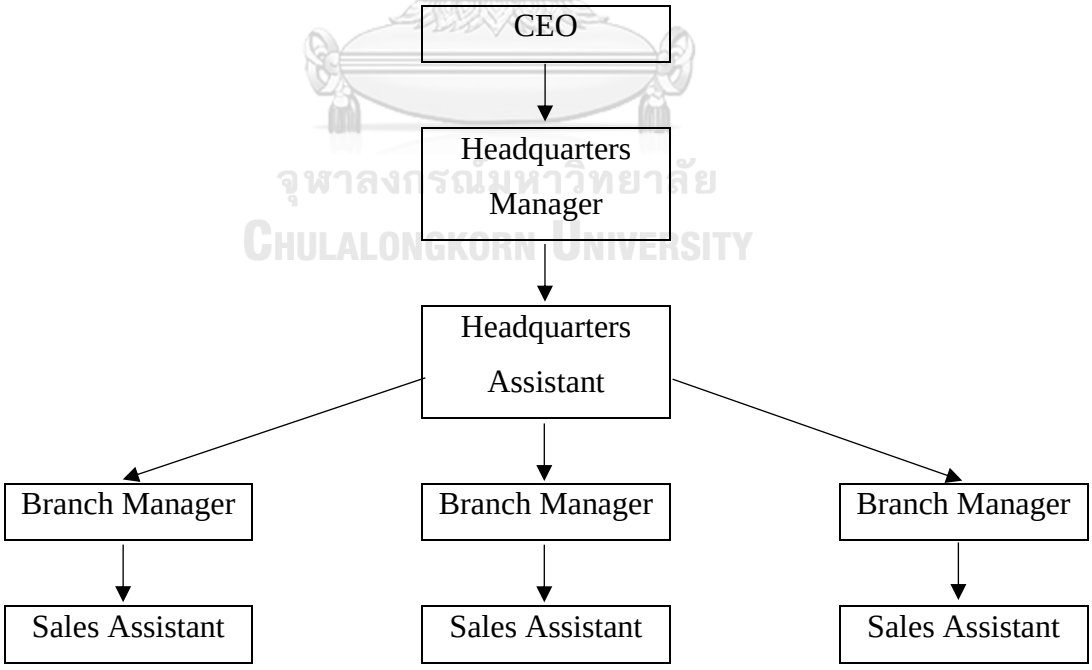


Figure 5: Organizational Chart of Srimongkol-Chain Gold Retail Shops

All three branches have an identical business model and provide services as follows: selling, buying, and pawning of necklaces, bracelets, rings, etc. The average annual income of the first branch of the Srimongkol-Chain Gold Retail Shops met the key performance indicator set by the owner and it was able to stay competitive among the other jewelry shops in the same area. At the same time, a loyal customer base was created, and the size continuously grew as the brand receives good feedback. As a result, Srimongkol-Chain Gold Retail Shops expanded its business to accommodate more customers. However, the epidemic situation of the Coronavirus disease 2019 (COVID-19) coupled with the high volatility of gold prices due to uncontrollable factors such as war caused problems in the delay of logistics and supply chain management. The shop could not satisfy the customers. For instance, it takes one day to verify ring sizes that are available at each store and another three days to transfer the product to the customer's pickup location. Furthermore, during the volatility of gold prices, it takes half a day to draw conclusions and the amount of gold to be replenished, etc.

The inventory stocks of three branches of Srimongkol-Chain Gold Retail Shops are done manually and that leads to the existing complicated working process shown in Figure 6. Apart from having to wait for at least four days for the products to be ready for pick up, there is a high chance that the mistakes by the branch managers and sales assistants could lead to a loss of income for Srimongkol-Chain Gold Retail Shops. The mistakes happen whenever the salesperson searches through the available stocks visually, it is likely that they could miss out on the products they are looking for. It does not just take away the working time, but it could lead to loss of income and not satisfying the customers who are willing to buy the products.

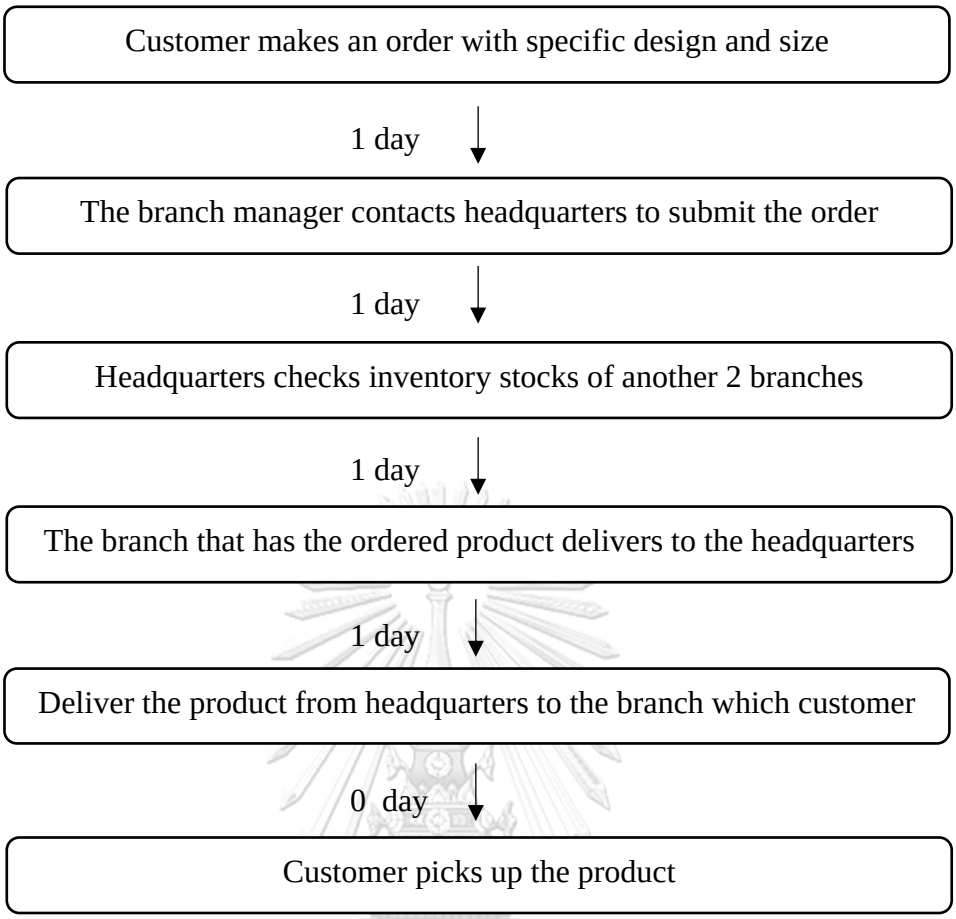


Figure 6: Working Process for Making an Order

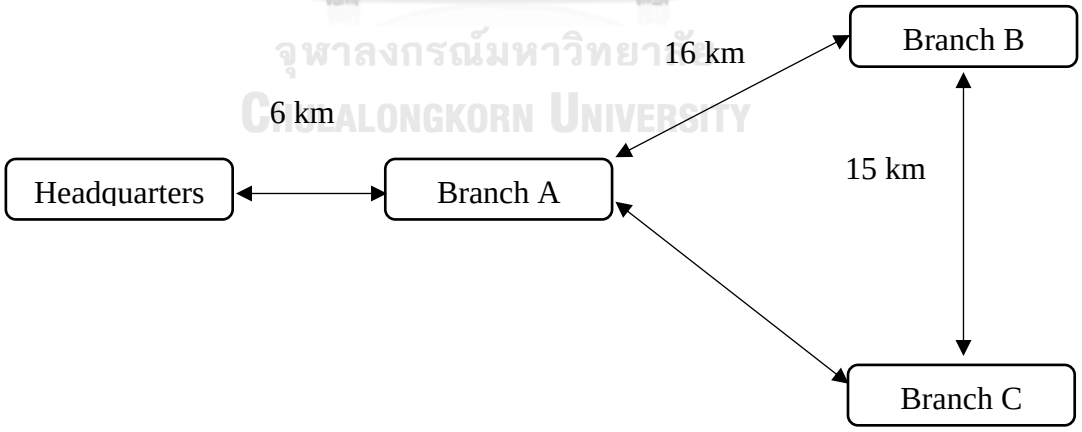


Figure 7: Approximate Distance Between Branches and the Headquarters

Whenever the product is available at other branches, the current working process takes at least 4 working days to deliver the products to the customers. The executive committees have been getting feedback regarding the waiting time which leads to a lower satisfaction level among the customers.

The high waiting time for the product transfer from one branch to another is due to the absence of the visibility of the real-time inventory which leads to difficulty and confusion when searching for the products. The effectiveness of inventory stock visibility can be considerably improved by implementing Stock Keeping Unit (SKU) coding. Each distinct product variant or item in your inventory is given a unique alphanumeric code called an SKU. It contributes to efficiency in inventory stock by providing more accurate tracking, faster search and retrieval, streamlined reordering, more effective demand forecasting, inter-branch stock transfers, improved collaboration, and physical inventory counts.

From the problems stated, the researcher realized the importance of issues regarding inventory management and logistics systems. The system still causes delays and complicates the working process leading to taking a longer amount Srimongkol-Chain Gold Retail Shops of time for gold delivery. As a result, it becomes more difficult to manage the stock in the warehouse. The researcher recognised the importance of the problem of delivering products through existing processes and strategies. Therefore, a suitable process for delivery should be fast, efficient, and easy to operate. The mentioned process helps to get rid of the confusion and careless mistakes by the employees. Also, the work done must be correct and has high quality to impress and satisfy the customers. Therefore, the work process should have a clear standard to drive all the employees in the same direction. It will avoid misunderstanding and miscommunication within the organization.

From the problem stated, the present research for the thesis is, therefore, to develop an online platform as an inter-branch inventory information system to improve and maximise customer satisfaction. The system is also expected to help with the delivery of the products sold and minimize the mistakes in managing stocks by employees. An expected outcome of the research is to improve the logistics management system and supply chain for maximum efficiency in the work process.

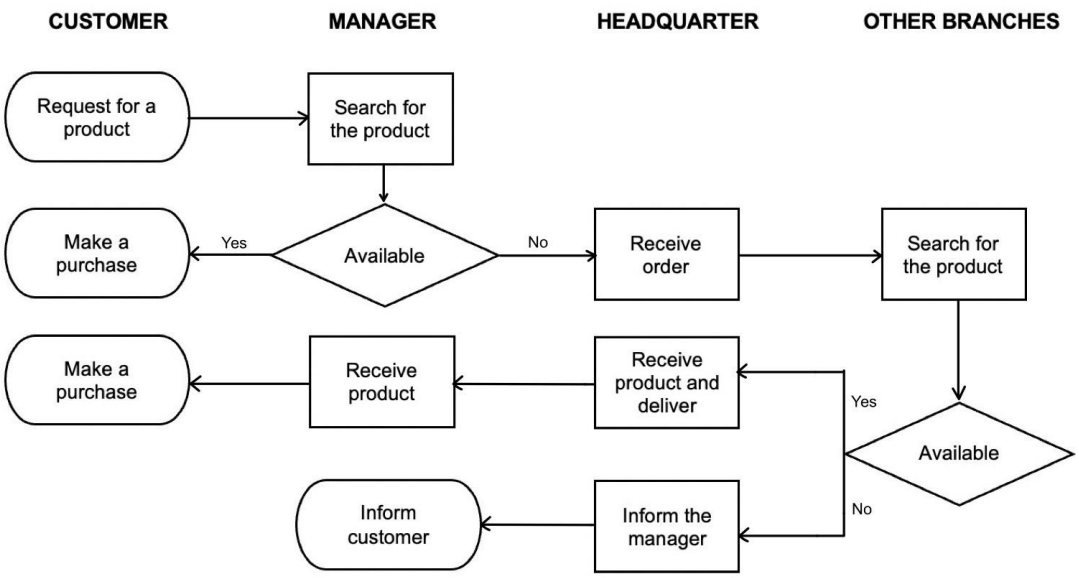


Figure 8: Existing Workflow Diagram

The number of successful transactions made for products sold in September and October 2022 was recorded based on the types of the products. From Table 1 and Table 2, rings are more popular among all the categories available.

Table 1: Number of successful transactions in September 2022

Branch / Product	A	B	C
Necklace	2	4	6
Bracelet	8	1	4
Ring	13	11	5
Earrings	0	1	0
Locket	0	1	0
Frame	1	0	0

Table 2: Number of successful transactions in October 2022

Branch / Product	A	B	C
Necklace	6	2	5
Bracelet	5	3	3
Ring	9	9	8
Earrings	0	0	0
Locket	0	1	0
Frame	0	1	0

In addition to the data recorded in Table 1 and Table 2, the frequency of preorders and unsuccessful preorder transactions were recorded during the same period. From the obtained information, the percentages of the unsuccessful transactions were calculated for each branch as shown in Table 3 and Table 4.

Table 3: Percentages of Unsuccessful Transactions in September 2022

Statistics / Branch	No. of Preorders Transactions	No. of Unsucessful Transactions	% of Unsucessful Transactions
A	7	1	14.3
B	5	1	20
C	2	0	0

Table 4: Percentages of Unsuccessful Transactions in October 2022

Statistics / Branch	No. of Preorders Transactions	No. of Unsucessful Transactions	% of Unsucessful Transactions
A	4	1	25
B	6	2	33
C	2	1	50

1.3 Research Objective

The objective of this research is to develop an inventory management system that includes classification and coding by generating Stock Keeping Units (SKUs) of the products to improve the efficiency of the inventory and product delivery and transfer process of the case study gold retail store chain.

1.4 Scope of the Content

This research focuses on the study and analysis of the implementation of the software to improve the delivery time of the products. It is to be applied to the retail stores. This research will focus on gold ornament retail outlets.

- Application: Three gold retail outlets under the same organization
- Product: Gold ornaments (96.5% purity)

This study is quantitative research. It is done by using the in-depth interview and focus group discussion method to support the software which will be implemented. The sample group is the branch managers and sales assistants of Srimongkol-Chain Gold Retail Shops in Samut Sakhon Province.

- Information system development covers surveying user's requirements for the implementation of the software.
- The initial phase that will be done in this research covers inventory management for only one type of product namely the most popular category.

1.5 Expected Benefits

The results of this research will lead to the implementation of the inventory stock software between branches of Srimongkol-Chain Gold Retail Shops in Samut Sakhon Province.

- Increase the satisfaction level of the customers
- Reduce the shipping time between branches
- Reduce human errors caused by employees in managing inventory stock
- Suggestions on how to improve the logistics and supply chain management system for maximum efficiency of the work.

The results of this research will help the gold shop business owners and those looking forward to entering the industry to plan marketing strategies to match the demand of the customers and raise the service standard. It also helps in expanding the platform and increasing the distribution channels for the business owners to reach out to the customers.

1.6 Definitions

Information System refers to a system consisting of different parts such as a computer system including hardware, software, networking, database, developers, users, related employees, and experts in the field. All components work together to define, collect, store, and process the data to create the information to deliver to the users which supports the performance, decision-making, planning, managing, controlling, analyzing, and monitoring of business performance.

Retail Store refers to a marketing institute that acts as a distribution unit of gold from manufacturers or operators delivered directly to customers.

Gold refers to the gold bar and gold ornament.

CHAPTER 2
REVIEW OF LITERATURE

The objectives of the study about analyzing the information system for retail use in the jewelry and gold industries are 1. To analyze the online system of the inventory stock among different branches of Srimongkol-Chain Gold Retail Shops located in Samut Sakhon Province 2. To study the users' requirements and expectations for the computerized system for every branch of Srimongkol-Chain Gold Retail Shops in Samut Sakhon Province. 3. To survey the issues experienced and needed improvements for the computerized system for every branch of Srimongkol-Chain Gold Retail Shops in Samut Sakhon Province. To ensure that the objectives set are achieved, the researcher has reviewed the concepts, theories, and existing related research as follows:

2.1 Sales and Marketing Information System for Rasmee Gold Shop

2.2 Development of Information Systems for Inventory System for 99Karat Gold Shop

2.3 A Product Classification and Production Traceability System for Women Silver Jewelry Products

2.4 Adoption and Implementation of Group Technology Classification and Coding Systems: Insights from Seven Case Studies

2.5 Analysis of Entity-Relationship Diagrams

2.1 Sales and Marketing Information System for Rasmee Gold Shop

The retail gold shop usually has gold ornaments as the main products. There are several items in the store that can be categorised into the following six basic groups: Bracelet, Necklace, Ring, Earring, Locket, and Frame.

Two young businessmen opened a retail gold shop with the intention of modernizing it. Additionally, they seek to avoid potential difficulties in the future as well as solve current issues. They choose to develop a system that can increase the organization's effectiveness and efficiency.

The shop was managing everything manually, but if the number of clients rises, it would be good for the shop to think about switching to another method of

operation. When handled manually, file management becomes more challenging as the number of consumers rises. To increase the efficacy and efficiency of the company, the suggested alternative is to develop a computerized system for the gold shop. Sales and marketing as well as finance and accounting are Rasmee Gold Shop's two primary sections.

Most of the work done in the sales and marketing division of Rasmee Gold Shop is done manually, while some data is also prepared on personal computers that do not currently use database applications. When consumers enquire about the gold that is available in stock, the sales personnel will just visually inspect the gold. Therefore, there is a risk that the sales personnel could make mistakes leading to a loss in income. Additionally, the salesperson needs time to search for the product ordered.

The manual system used by Rasmee Gold Shop must be replaced with a new computerized system that can enhance performance, information, economy, control, efficiency, and service across all processes. All the current forms, including user methods for determining what they truly need or desire from the new computerized system, were reviewed to obtain a complete set of user requirements. The methods used to gather this data were facilitated meetings, questionnaires, and interviews. As a result, a new computerized system is created.

The suggested system solution for this project is to hire a software developer to create a new program. Therefore, the new software is deployed on the network server once the network has been constructed. The software vendor must take part in the installation and testing processes.

As a result of the implementation of the software system for the gold retail shop, it is advised to create and execute an e-commerce solution to further enhance the suggested system. Customers will be able to access the system more quickly and simply too. (Atinuch Sonchaisakul, 2003)

2.2 Development of Information Systems for Inventory System for 99Karat Gold Shop

The 99Karat gold shop is in Chonburi, Thailand. It has been operating for more than ten years. It deals with the selling and purchasing of gold and jewelry with consumers. The store is run by three people—one is the manager and owner, and the other two are either clerks or sellers. Typically, the store purchases the ornament from Bangkok wholesalers and then sells it to its consumers at retail pricing.

The clerk compiles all transactions; she handles them and manually enters them into the book. To verify that the inventory matches the transaction, the clerk must additionally count the items on the shelves. The store owner double-checks the money collected and spent in the evening using the transactions listed in the ledger. The retail gold shop usually has gold ornaments as the main products. They are rings, necklaces, bracelets, and so on.

The shop's information system is currently run by hand. All daily transactions are gathered by a clerk. The data is all on paper and is kept in filing cabinets. The shop's inventory system regulates how many items are bought and sold. The quantity sold is manually subtracted by the clerks from the inventory sheet when products are sold. When the inventory level is low, the clerk notifies the store owner, who then places an order with the wholesaler over the phone or goes there personally. Then, the inventory purchased is added to the inventory stock manually.

Due to the manual system, there are several problems which are experienced by the clerks regularly. They are:

2.2.1 Control of Inventory Management is ineffective

The nature of manually dealing with inventory management makes it a time-consuming operation. The issue of the actual inventory and transaction not matching the record has been experienced by the shop. Human error in stock checking or transaction recording is the root of this issue.

The inefficient use of financial resources is caused by the lack of an effective tracking system for the quantity sold, quantity in stock, and price per item.

2.2.2 Having Trouble with Information Retrieving

This problem is based on the difficulties in searching for information, data, and papers. Given the volume of documents and information loss, searching for documents takes a long time.

The Direct Cutover approach will be used to implement the new computerized system. The first reason that the new system may be used right away is that the old system of the store requires manual operation. Second, since the old system's functioning is straightforward and it is not a sizable system, there will not be any impact from implementing the new system on the old system. The store has never used a computer to carry out its operations; instead, everything is recorded on paperwork and in an accounting book. It is so clear that the new system has nothing to do with the old one, and its failure will have no effect on the manual system.

After installing the new system and removing the old one. The number of errors has significantly dropped. The new system greatly reduces the workload of the accountant and clerk to record everything down onto pieces of paper and collect them all. Missing papers occasionally caused serious problems, but those issues have been resolved since the computerized system was implemented. We can infer that all errors have been removed with this computerized system. It offers efficient control of inventory management and stock, and available inventory is automatically updated for easy tracing. (Wuttikorn Arintamapong, 2002)

2.3 A Product Classification and Production Traceability System for Women Silver Products

Many small to medium-sized businesses use outsourcing for production. Tracing and classifying systems were introduced to help with controlling the quality of the products. The product coding system was developed depending on the theory of coding and the classification of technology. The coding defines the major characteristics of manufacturing and design. The traceability of manufacturing of silver jewelry for women benefits in cost reduction and minimizing processes while also improving the quality of the products.

The structure of the codes for the products consists of a letter followed by numbers which are six to fifteen digits long. Every coding structure is implemented

using mixed code which is a hybrid structure. The established coding structures are made up of alphanumeric characters with up to fifteen digits; the first digit denotes the family of the product, and the second and subsequent digits' meanings depend on each family. Figure 9 displays the general coding scheme that has been established.

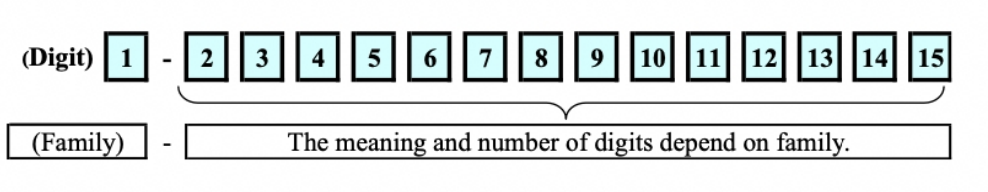


Figure 9: Structure of General Coding

The results were in terms of satisfaction level. It was obtained from the questionnaires distributed to the executives within the company. The responses for most of the codes from the survey concluded that the executives were satisfied with the coding system in terms of ease of understanding and ability to access the information quickly. However, it was concluded that the executives neither agree nor disagree with the contribution to minimizing costs. The prototype of the designed system for manufacturing traceability and product classification underwent field testing, and the company executive was pleased with some of the favourable feedback that had positive implications for future development. (Chuvej and Achara, 2008)

Classification of Jewelry Product

The system and techniques for assessing and identifying jewelry and other expensive products like antiques, gemstones, fine porcelain, and other collections were developed by Hendry (2004). A database was used to store the data sets for different types of valuable products. Examples of elements in the classification of jewelry include the type, size, weight, color, cut, and clarity of a gemstone as well as the material, styling, and style of the setting or mounting the gemstone on such jewelry. The classes in the classification of jewelry include rings, bracelets, necklaces, lockets, and other jewelry items. The classification was developed for different study goals. As a result, it should only be used as a general guide, and various modifications may be required.

In the Group Technology (GT) coding system, symbols are assigned depending on one of three possible code structures: Anlağan, O. (1996) (Min & Shin, 1994;)

- Monocode or Hierarchical Structure

The monocode structure resembles a tree, with each digit (or digits) amplifying the data or information of the previous digit (or digits). Each digit's significance is determined by the preceding digit (or digits) that came before it in the code. The benefits of monocode include the ability to store a lot of information and data with just a few digits, and the ability to store and retrieve design-related data such as shape, material, size, etc. The drawbacks of monocode include the difficulty in defining the meaning of each number and the possibility of blank codes in some positions in sub-groups with varying levels of sub-sub-grouping.

- Polycode or Attribute Structure or Chain Code:

The coding symbols exist independently of one another. It is code in a fixed place. Each digit at a particular place in the code defines special characteristics of the features. Polycode's benefits are simple to state and comprehend, and helpful in production settings where the manufacturing process needs to be described. Polycodes have the drawbacks that their length can grow excessively long and that comparing codes to verify for resemblance needs extra effort.

- Mixed Code or Hybrid Structure

The mixed code is also known as a hybrid structure. It is a mixture of monocode and polycode structures by utilizing monocode when possible and polycode for the remaining digits. Mixed code is the most widely used coding and categorisation structure because it preserves the benefits of both systems. While maintaining the ease to quickly identify the products with special characteristics, a mixed code structure would be significantly more compact than polycode structure.

In many industries, mixed coding is often applied as a fundamental framework for comprehending classification and processes for coding. Opitz coding system is one example. It includes both information regarding manufacturing and design into consideration. The three groupings of digits are the fundamentals that make up the structure of the Opitz coding system. They are form code, supplemental code, and secondary code.

Fatheldin & Kirkpatrick (1968) (as cited in Lee, 1984, p.5) criticises and concluded the Opitz's Code that the fundamental of universal codes are widely used and useful as a starting point to implement the coding system. However, the coding system still needs to be adapted and modified to ensure that it can meet and accommodate the specific organizations' requirements.

Anlağan, O. (1 9 9 6) mentioned that in order to choose or create a coding system that suited a company's goals, it is crucial to comprehend the characteristics of classification and coding systems. The essential classification and coding system attributes that should be considered are flexibility which depends on its applications, accuracy to provide correct products information, ease to use, and retrieve

Hyer & Wemmerlöv (1989) (as referenced in Tatikonda & Wemmerlöv, 1992, page 2089) mentioned that the coding and classification process could be carried out entirely manually or with computer assistance from an interactive expert system.

2.4 Adoption and Implementation of Group Technology Classification and Coding Systems: Insights from Seven Case Studies

The study is about the seven case studies of firms that implemented the Classification and Coding (CC) systems. One of them is the former user while the rest are the current ones. From the analysis and discussion, a conclusion can be drawn, and it shows that the current users find the systems generally satisfying although it is not easy to implement and use. CC systems should be user-friendly, and the instant systems should be available for purchase if the products that need to be coded are of a standard sort. Furthermore, significant senior management backing is necessary and must endure throughout the system; maintenance of the system is crucial. The initial step should be to code the high payback, justification, and selection part groups. The decision to establish a CC system cannot be made lightly, which is a key lesson. To provide value to the company after the acquisition, it must be maintained and kept up to date. Additionally, switching to a different system or significantly altering the current system might be highly expensive.

Due to these factors, categorisation structures must satisfy application objectives and be flexible to handle future product invention, new product and process technologies, and integration of the database. Codes should also be as simple as

possible because lengthy, complicated codes demand significant data collection efforts and significantly degrade usability. The recent systems that do not employ coding have the ability to record precise information about the products in relational databases. It substantially improves flexibility and usability, but it does not lessen the significance of choosing what data should be stored and preserved.

Several questions came up after studying the six case studies of the CC users as only half of them implemented CC systems to help with the design of manufacturing cells, even though Group Technologies (GT) or CC has long been considered essential for this application. It is important to investigate this lower-than-anticipated rate of application. Other cell production procedures might be more widely used as an explanation or CC users might require more training and instruction regarding this application.

Given the emphasis on quick new product development today's context, GT/CC has long been highlighted as a tool for aiding efficient and successful product design. According to Tatikonda and Wemmerlov (1992), a lot of the tools and techniques used to speed up and improve the development process—such as deploying quality functions and design-for-assembly—are information-intensive. How such tools and procedures could be supported by CC systems, codified and classification of information on parts, process equipment, and other elements, is a major research subject.

A succession of data-gathering operations and newer CC applications are clearly specified by knowing which portion groups have a higher return on investment than others. The research on this issue would entail creating a way for evaluating system usage and efficiency over time. The researcher is interested in the aspects that foster the learning of the organization, particularly the role that computing technology plays. Additionally, being able to evaluate the dynamic behavior of the CC systems would provide better user feedback mechanisms, relevant performance measurements, more accurate cost/benefit statistics, and appropriate network structures for system utilization. A more suitable initial system implementation structure would be provided to ensure flexibility.

The feedback from the survey done within the sample group was analyzed. It shows that about sixty percent of the respondents were not using CC systems while

about one-third are using the CC system with less restrictive applicability. The possible reasons behind the low usage of CC systems may be due to:

1. Insufficient knowledge regarding the redundant cost, time wasted on doing searches, and avoidable mistakes.

2. Inadequate comprehension of GT/CC.

3. The intangible nature of information systems advantages.

4. Low perceived up-front advantages.

5. The risk of failing to uphold system discipline over time.

6. The cost of data capture, which is thought to be too high in comparison to system benefits

7. Adequate or already in place information systems.

8. The inability of the firm to implement the CC system.

The CC/GT database is believed to play a significant role in a computer-integrated design and production system. Choosing, implementing, and using CC system presents managerial and technological hurdles. Therefore, additional study is required in both fields. Previous CC system usage-oriented research mostly relied on the self-reported data of the firms which are through surveys and interviews. To considerably improve the understanding of the operational challenges, costs, and benefits of CC systems, future research should combine longitudinal studies with real-time assessment of CC usage.

2.5 Comparative Analysis of Entity Relationship Diagram (ERD)

The article analyzed and differentiated different ERD notations that are commonly found in textbooks and software for creating relational database models known as Computer-Aided Software Engineering (CASE). From the study, the researcher found that the differences in each ERD depend on the n-ary relationships, acceptance of relationship attributes, location and constraints of cardinality representation, participation representation, the ways subclass entity of overlapping and disjointed are represented, and the ERD level modeling of the foreign keys. The findings of the comparisons in this study were summarized. The explanation and illustration of each diagram were done by a typical problem domain.

The creation of additional modeling heuristics, the detection and elimination of excess relationships, ERDs optimization, the best use of specialized hierarchy, and objective evaluations of ERD quality are some of the areas in which more research and study are needed in ER modeling. The various cardinality, participation restrictions, and associated integrity restrictions must be explored in relation to this problem.

The inadequacies of earlier approaches were addressed semantically by new entity-relationship methodologies from the middle of the 1970s through the 1980s. The research community is saturated with ER modeling strategies, therefore new approaches are not so enthusiastically welcomed until the modeling designer can demonstrate how his new approach provides greater semantic power. New symbols to depict object-oriented ideas are continuously being added to the ERD. To represent complex objects, certain of them are permitted to contain non-atomic characteristics [4, 5]. To model object-oriented notions like methods, operations, and messages, some of them are expanded to add new semantics [30]. This just serves to highlight the adaptability and expressive strength of this modeling approach.

CHAPTER 3
METHODOLOGY

This research studied the user's requirements and factors that affect consumer behavior with an expectation to increase the efficiency of the inventory management and logistics system between 3 branches of the gold retail shops. During the selling process, customers may request or order the design that is available in the other branches and the transfer of the products is the cause of delay. Studying user's requirements and consumer behavior will determine the efficient and effective features of the computerized systems. There will be two interviews and they will be done by the users which are the owners, branch managers, and sales assistants of Srimongkol-Chain Gold Retail Shops located in Samut Sakhon. The results from the first interview were analyzed before installing the software while the second interview will be done one month after the implementation.

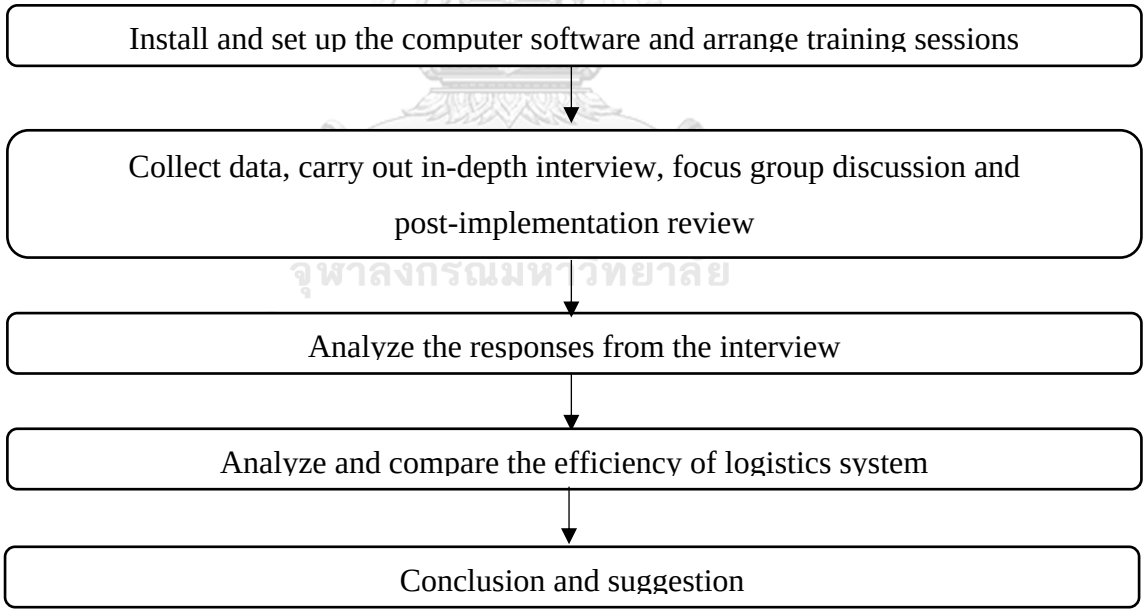


Figure 10: Research Methodology

The development of SKUs and implementation of the software for inventory management for retail use in the jewelry and gold industries as shown in Figure 10 will cover the 3 following points;

1. To analyze the online system of the inventory stock among different branches of Srimongkol-Chain Gold Retail Shops located in Samut Sakhon Province

2. To study the users' requirements and expectations for the computerized system for every branch of Srimongkol-Chain Gold Retail Shops in Samut Sakhon Province.

3. To survey the issues experienced and needed improvements for the computerized system for every branch of Srimongkol-Chain Gold Retail Shops in Samut Sakhon Province.

The survey and interview are used in this study to find out the rooms for improvements and what to include in the computer software which will be implemented. The software is expected to help in improving the system and work processes to maximise the satisfaction level of the consumers. This study is qualitative research which has the following details:

3.1 Target Population and the Sample Size

3.1.1 Target population

The population used in this study is the branch managers and sales assistants of Srimongkol-Chain Gold Retail Shops in Samut Sakhon Province.

3.1.2 Sample size

The sample size in this study is the branch managers and sales assistants who work at Srimongkol-Chain Gold Retail Shops located in Samut Sakhon and other members who need to be involved in using the new computerized system.

3.2 Research Tools

The tool used in this research is an interview regarding the users' requirements and a post-implementation review which will be answered by the actual users. The results of the first interview will be applied to the development of the software which will be installed and implemented in the case study retail stores in the gold trading industry. It is to find out the essential functions and features.

The in-depth interview and focus group discussion has topics regarding both internal and external factors. The internal factors include questions about the revenue, transactions, services, SKU coding, training, and the differences between the existing

and new systems. On the other hand, external factors that will be discussed include studying the rivals and causes of unsuccessful preorder transactions. There are eleven topics altogether.

Apart from the in-depth interview and focus group discussion, there will be another review with the actual users which are the employees. This review will be done after the system is installed and used for a month. All the employees are required to complete the review and it will be used for further study on how to further develop the software to maximise its effectiveness and efficiency.

3.3 Data Collection

In this research, the researcher will proceed with organizing the in-depth interview and focus group discussion and post-implementation review according to the following procedures and details:

3.3.1 The researcher gathers the necessary information

3.3.2 The researcher contacts and coordinates with the gold shop branch managers and sales assistants to have a meeting for an in-depth interview and focus group discussion regarding the software implementation.

3.3.3 The researcher gathers responses from the interviews and discussions to find out the users' requirements.

3.3.4 One month after the implementation, the researcher will contact and coordinate with the gold shop branch managers and sales assistants to have a post-implementation review.

3.3.5 The researcher gathers responses from the reviews to conclude and suggest for further studies.

3.4 Data Analysis

The data from in-depth interviews and focus group discussions are a qualitative study. To analyze the data, which is obtained from the qualitative study, it is important to rearrange and organize the responses, show, conclude, and define the overall results. In this study, two main methods will be used for gathering the data are as followed;

- In-depth interview and focus group discussion

A focus group refers to inviting interviewees to talk and discuss a certain topic and it usually lasts one to two hours approximately. The interviewer or the researcher is the person who leads the meeting and asks questions to find out more from the interviewees.

On the other hand, the in-depth interview is one on one interview to obtain even more specific information. The in-depth interview ensures that the responses are not guided by the thoughts or opinions of other interviewees in the group.

The objective of the in-depth interview and focus group discussion is to find facts from the interviewees. It can be done by questioning the interviewees about what they are personally thinking or feeling rather than making assumptions through observation. The phrases used in the questions are;

a. Why...?

b. How...?

c. What do you think about...?

d. What do you feel about...?

e. What is your opinion on...?

f. How would you deal with...?

After questions are asked, the probing may be followed. It is to seek clarification, completion, continuity, hypothetical, and reactions.

As it is a qualitative study, the results from the interview will be in terms of the problems and their root causes, and the micro-level solutions to the problems. The hypothesis will only be made after the responses from the interviews are analyzed. The sample size can be smaller compared to a quantitative study and a conceptual framework is not mandatory prior to the interviews.

By doing both in-depth interviews and focus group discussions, it can be ensured that the information gathered is both in terms of the overall image and in specific details. Questions that are more personal or sensitive can be asked during the in-depth interview as it is done more personally, and the responses will not be influenced by their colleagues.

3.5 Implementation of the Software

The software which stores the data for in-stock inventories will be implemented and applied to all three branches of the Srimongkol-Chain Gold Retail Shops. In this study, the available information on the first product to be set up in the software will be based on the analyzed responses from the questionnaires. It is to allow checking of in-stock inventories online so that the orders do not have to be passed through the headquarters. This is to shorten the working process and make it more efficient to satisfy the customers. From the new workflow in Figure 11, customers will be notified much quicker if the product is not available. Furthermore, the working process gets simpler if the product is available in other branches.

As the existing and the new system do not overlap or relate, the new system can be implemented without any effect. The existing system requires branch managers and sales assistants to work manually and record everything as a hard copy while the new system stores all the important information on the computer. During the testing period, both systems can be done simultaneously. The failure of the new system will not affect the existing system at all.

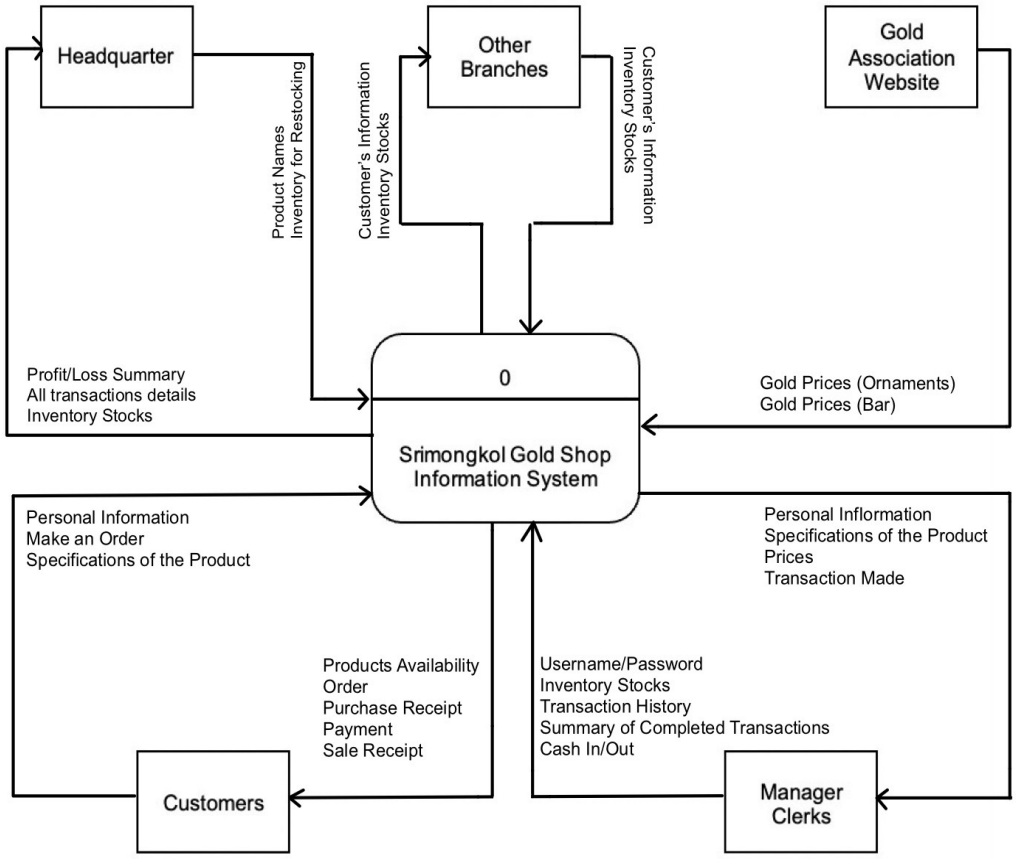


Figure 11: Context Diagram of the Implemented Software

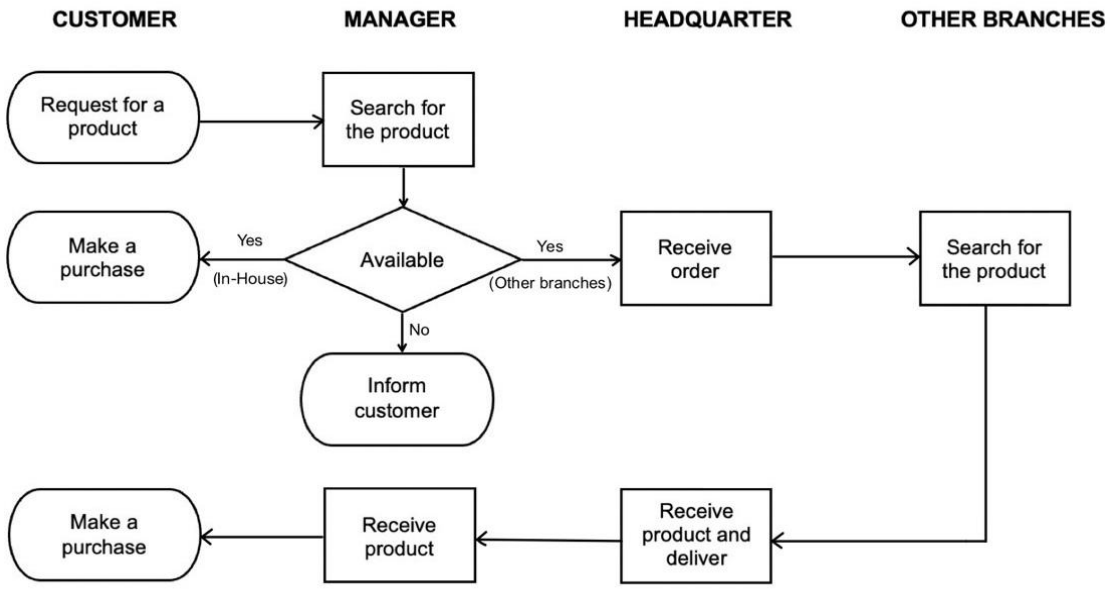


Figure 12: New Workflow After Implementation of the Software

From Figure 11 and Figure 12, there are several pieces of information that need to be inputted into the software before it can run and allow the working process of Srimongkol-Chain Gold Retail Shops to work as expected. The required information is as followed:

i. Company's Profile

- Company's name
- Company's address
- Taxpayer number
- Existing inventory
- Interest rates
- Allowed duration for pawning
- Conditions for calculation of dates and interests for pawning

ii. Customers' Information

- Customer's name
- Customer's Address
- Customer's identification number
- History of transactions

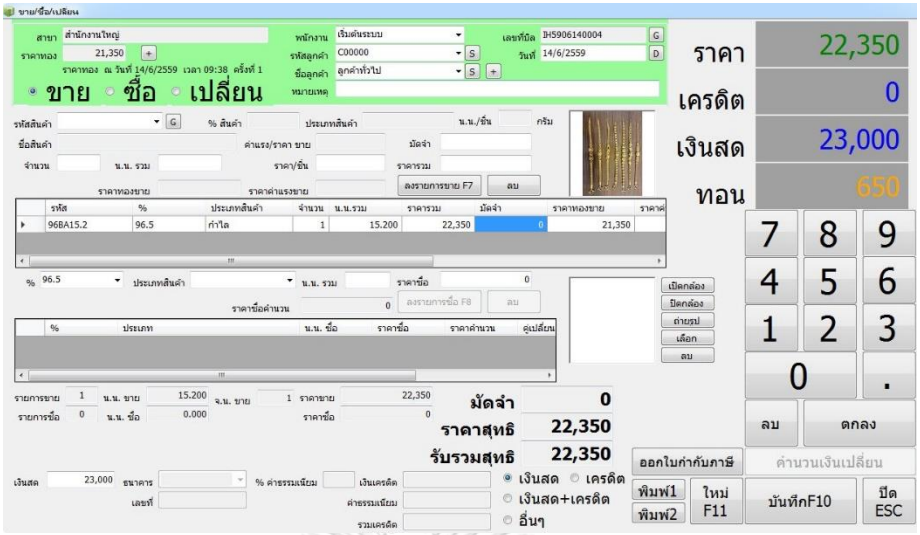


Figure 13: Screen for Selling/Buying/Exchanging Transactions

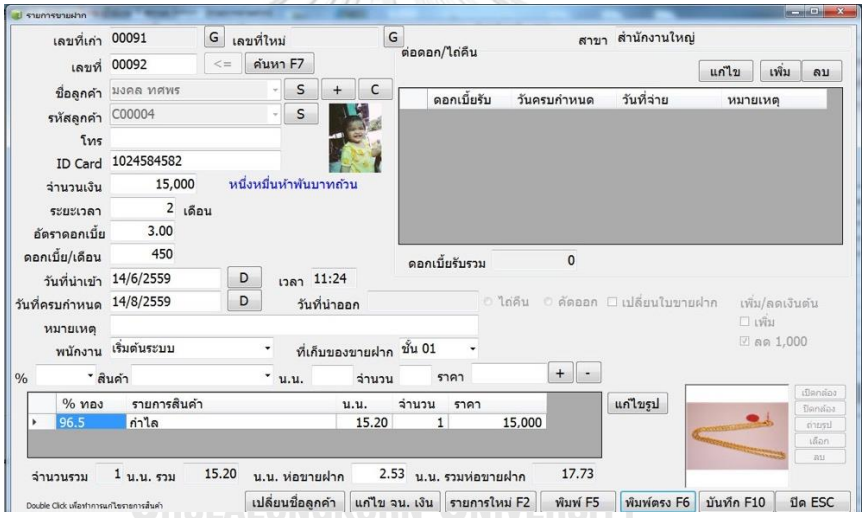
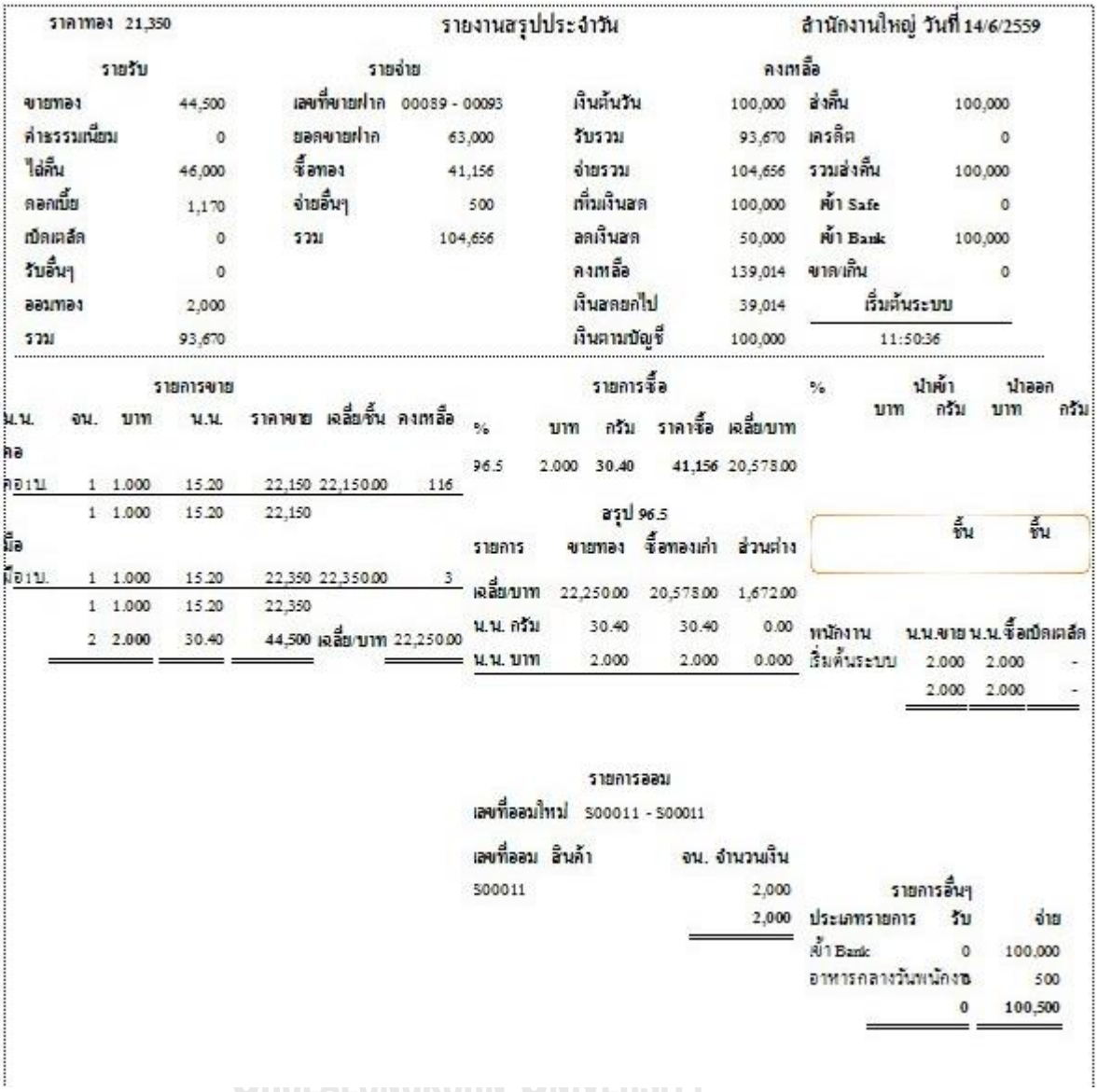


Figure 14: Screen for Pawning Transactions



ราคาทอง 21,350 — รายงานสรุปประจำวัน — สำนักงานใหญ่ วันที่ 14/6/2559

รายรับ		รายจ่าย		คงเหลือ		คงเหลือ	
ขายทอง	44,500	เลขที่ขายฝาก	00089 - 00093	เงินต้นวัน	100,000	ส่งคืน	100,000
ค่าธรรมเนียม	0	ยอดขายฝาก	63,000	รับรวม	93,670	เครดิต	0
ไถ่คืน	46,000	ซื้อทอง	41,156	จ่ายรวม	104,656	รวมส่งคืน	100,000
ดอกเบี้ย	1,170	จ่ายอื่นๆ	500	เพิ่มเงินสด	100,000	เข้า Safe	0
เปิดเคส	0	รวม	104,656	ลดเงินสด	50,000	เข้า Bank	100,000
รับอื่นๆ	0			คงเหลือ	139,014	ขาด/เกิน	0
ออมทอง	2,000			เงินสดยกไป	39,014	เริ่มต้นระบบ	
รวม	93,670			เงินตามบัญชี	100,000	11:50:36	

รายการขาย

น.น.	จน.	บาท	น.น.	ราคาขาย	เฉลี่ยชิ้น	คงเหลือ
คอ						
คอ1บ.	1	1.000	15.20	22,150	22,150.00	116
	1	1.000	15.20	22,150		
มือ						
มือ1บ.	1	1.000	15.20	22,350	22,350.00	3
	1	1.000	15.20	22,350		
	2	2.000	30.40	44,500	เฉลี่ย/บาท	22,250.00

รายการซื้อ

%	บาท	กรัม	ราคาซื้อ	เฉลี่ยบาท
96.5	2.000	30.40	41,156	20,578.00

สรุป 96.5

รายการ	ขายทอง	ซื้อทองเก่า	ส่วนต่าง
เฉลี่ย/บาท	22,250.00	20,578.00	1,672.00
น.น. กรัม	30.40	30.40	0.00
น.น. บาท	2.000	2.000	0.000

%	นำเข้า บาท	นำเข้า กรัม	นำออก บาท	นำออก กรัม

	ชิ้น	ชิ้น

พนักงาน	น.น.ขาย	น.น.ซื้อเปิดเคส	
เริ่มต้นระบบ	2.000	2.000	-
	2.000	2.000	-

รายการออม

เลขที่ออมใหม่ S00011 - S00011

เลขที่ออม	สินค้า	จน.	จำนวนเงิน
S00011			2,000
			2,000

รายการอื่นๆ

ประเภทรายการ	รับ	จ่าย
เข้า Bank	0	100,000
อาหารกลางวันพนักงาน		500
	0	100,500

Figure 15: Summary of Daily Transactions

Figure 13 to Figure 15 show the screens of the software which is in the Thai language. In Figure 13 and Figure 14, shows the screen of the transactions for selling – buying, and pawning, respectively. They are used by the branch managers and sales assistants. The summary page as shown in Figure 15 is the document to be sent to the headquarters for accounting work.

3.6 Stock Keeping Units (SKUs)

Following the classification and coding approach described in A Product Classification and Production Traceability System for Women Silver Products study,

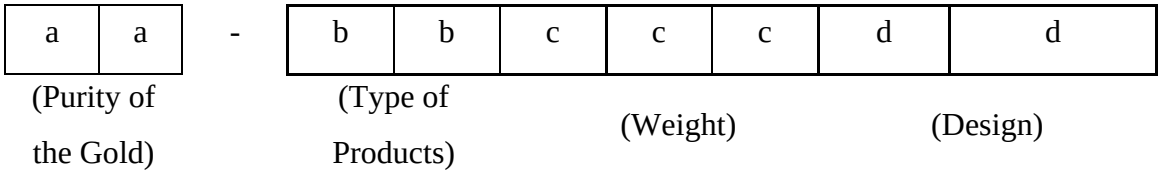


Figure 16: SKU Coding for Rings

The first digit represents the purity of the gold. The common purities found in Thailand are 90.0%, 96.5%, and 99.9%.

The second digit, a, is represented by any of the six alphabets listed to represent the type of the products.

- B: Bracelet
- E: Earrings
- F: Frame
- L: Locket
- N: Necklace
- R: Ring

The coding is followed by the weight in grams. It is 3 digits long and the decimal point is neglected. In Thailand's gold industry, baht is used as a unit of measurement. One baht is equivalent to 15.2 grams. The gold retail outlets usually have rings ranging from 0.25 baht which is 3.8 grams. In the SKU coding, it will be written as 038. For 0.5-, 1-, and 2-baht gold, they will be written as 076, 152, and 304, respectively.

The following two digits in the fifth and sixth places represent the sizes of the rings. The sizes vary from 46 to 70.

The seventh digit represents the more specific design of the products.

- 1: Plain
- 2: Smooth/Even Pattern

- 3: Male
- 4: Female
- 5: With Gem
- 6: Enamel
- 7: White gold plated

The last digit will be represented using the alphabet H or S. H stands for Hollow gold while S stands for Solid gold. The quality and purity of the gold are the same for both types. The only difference is the design. For the same weight of gold, the hollow ring will be bigger than the solid rings

R-152611S is an example of a complete SKU coding for a ring. It tells the employee that the ring they are looking at is a plain and solid gold ring that is 15.2 grams heavy, and its size is 61.

3.7 Training Sessions for Users

The objectives and the goals for the training and seminar are to improve the weaknesses to empower the employees with knowledge. The branch managers and every sales assistant must be able to understand and use the inventory software implemented efficiently and effectively. Any transactions made must be recorded and added to the computerized system.

The software developer who has more than 10 years of experience will prepare the lesson and provide training sessions to all the existing users. Outsourcing hiring for training is needed as the software is new to everyone in the organization. The duration of the training is three to five days depending on how fast the users can learn. The software developer will ensure that all the users understand and are able to use the software correctly and effectively.

For a long-term plan, the assistant at the headquarters will prepare training for every new employee. The new joiners will go through in-house training to use the software at the headquarters before learning other required skills at the branch they are allocated to. In-house training will ensure that there is no data leakage and saves cost. The expected training period at the headquarters is about a week which is five to six working days.

3.8 Post-Implementation Review

Before concluding how the implemented software helps the Srimongkol-Chain Gold Retail Shops in inventory and logistics management, the post-implementation review will be done. The reviews will focus on how capable the software is. At the same time, the users must review the pros and cons, and if they experience any difficulties using or adapting to the software implemented. The test plan for the implementation is to transfer the inventory stock data by its categories starting from the popular and trending products so that it is easier to compare the improvements. If the data are transferred to the new system all at once, it may create confusion and it will take a longer time to verify in case of any unexpected errors. Therefore, the reviews by the users will be done after the implementation of the software and completion of inventory data setup of the most popular products.

3.9 Results and Conclusion

The results will be in terms of reviews from the users who use the software, the delivery time of the products from the day the customer makes an order, and the percentage of successful orders will be calculated to compare the efficiency and effectiveness of the new system.

The results of the study are to compare the waiting time for the products to be ready for customers to pick up. At the same time, it is expected to increase the satisfaction of the customers to increase the sales and income of the gold shop. The summary, discussion, and suggestions will be added for further study.

CHAPTER 4
RESULTS

The study in Chapter Four focuses on outlining the useful conclusions attained from data collection and interviews within the organization. The main objective of this chapter is to deepen the understanding and perspectives of how computerised software could increase the efficiency of the company's logistics system and helps in increasing percentage of the successful transactions.

For a thorough analysis of this research, the chapter compares the findings from the literature research with the insights from the interviewees. The comparison helps in driving conclusions about the current situation and the perspectives provided by the employees.

The study provides a useful opportunity to analyze how well the interviewees' perceptions correspond with or diverge from the available research by contrasting the literature review findings with the interviewees' responses.

4.1 Research Context

In the previous chapter, the study was about the investigation of the procedure for choosing and evaluating vendors for the implementation of software. The criteria for choosing software suppliers and vendor evaluation systems were considered before software selection.

In this chapter, the data collected are presented. Together with the responses from the actual users of the software, further improvements can be identified and concluded to maximise the efficiency. Other than the study of the increase in efficiency of the logistics for product delivery, the study investigates the elements that affect an organization's users' acceptance and adoption of new software systems. User adoption's effects on system efficacy can be studied, together with user satisfaction, usability, training, support, and user resistance.

This study examines the typical difficulties encountered during the implementation of software and identifies key success criteria. Project scope, budget overruns, schedule slippage, integration concerns, customisation requirements, and the function of project leadership are all possible topics for this study.

The post-implementation assesses the long-term effects of software implementation on organisational performance and results during the post-implementation evaluation. The realisation of post-implementation advantages, system usage, user happiness, process efficiency, and the congruence between software capabilities and organisational goals can all be investigated.

4.2 Data Analysis Results

The data of the transactions were recorded before and after the installation of the software. Apart from the data collection, there were focus group discussions and in-depth interviews which gather more feedback for further studies.

4.2.1 Multi-Criteria Decision Analysis (MCDA)

To evaluate and rank alternative choices based on multiple criteria or factors which affect the outputs of the company. The data analysis process in MCDA involves several steps to derive meaningful results. Here is an overview of the typical steps involved in analyzing MCDA data and interpreting the results. Weightage and scoring are assigned to each criterion identified. Collect data on how each choice performs on each criterion. The data will be collected through expert opinions and the capabilities of the software.

4.2.2 Focus Group Discussions

A list of variables that are important for the improvement of the software is included in these questionnaires. It gathers information about specific feedback or issues from actual users' opinions and views during the beginning phase of the transition. It is beneficial to understand users' perspectives, attitudes, and experiences.

A moderator guides a discussion among the participants by leaving open-ended questions in the group setting. A diverse group representing various viewpoints and experiences on the topic of the research is what is intended by this effort. The topic-related comments, ideas, and experiences of the participants are welcomed and encouraged. Although the conversation is typically guided, it nevertheless allows for open-ended and participatory debates between the participants, who can also give feedback to one another.

4.2.3 In-Depth Interview

The interview will be carried out after the focus group discussion. The questions are prepared for a one-on-one setting. Without outside influences, the researcher is expected to probe deeply into each participant's distinctive point of view. Participants can share sensitive or private information in a private, secure environment.

4.2.4 Post-Implementation Review by Employees

The purpose of a post-implementation review (PIR) by users is to assess the success of a project or system implementation from the perspective of the end-users or stakeholders who directly interact with the newly implemented solution. To analyse and assess the results and efficiency of the implemented system from the end-users' point of view. To ascertain whether the established solution has met its intended goals and to pinpoint any areas for improvement, the post-implementation review entails obtaining feedback, insights, and experiences from the people who work directly with it.

4.3 Group of interviewees

According to Table 5, users from 3 different positions were involved. Each position represents the specific uses and changes that they are in charge. These 3 groups from different positions are all the end-users who were affected by the new software implemented.

In this study, there were 8 participants from 3 different sectors involved. They are from the headquarters, the branch managers of each store, and the working levels. Objectives of the project were clearly explained with a provided training session on how to use the implemented computerised software. The interview attempts to obtain a thorough understanding of the range of perspectives and experiences linked to the new system implemented by involving representatives from all the end users.

Table 5: List of Interviewee

	Participants	**Position**	**Branch**
Group 1	Participant I	Headquarters Manager	Headquarters
	Participant II	Headquarters Assistant	Headquarters
Group 2	Participant III	Branch Manager	Branch A
	Participant IV	Branch Manager	Branch B
	Participant V	Branch Manager	Branch C
Group 3	Participant VI	Sales Assistant	Branch A
	Participant VII	Sales Assistant	Branch B
	Participant VIII	Sales Assistant	Branch C

4.4 Overview of the Implemented Software

4.4.1 Capabilities of the Implemented Software

The computerised system for gold retail shops is often known as a point-of-sale (POS) system. It is like any other shop such as coffee shops and restaurants that uses computerised systems. They are created to aid in the management of several facets of the retail industry, including financial reporting, sales tracking, inventory management, and customer management. The features cover all operations within a gold retail shop shown in Figure 17. It includes buying, selling, exchanging, and pawning. As for the implication of the software to Srimongkol-Chain Gold Retail Shops, the features of the software must be able to aid in the following aspects as a base.

Figure 17: The Capabilities of the Installed Software

4.4.1.1 Inventory Management

It assists in managing and tracking the gold inventory, which includes the many kinds of gold products, their quantities, and their costs in accordance with their SKUs. Making better inventory management decisions may be aided by having customer information linked to inventory records. Making informed judgments about stock levels and purchases might be aided by knowing which products are popular with clients.

4.4.1.2 Sales Processing

The software system enables the store to manage sales transactions, including producing invoices or receipts for clients, taxes calculation, and accepting various payment methods. Sales assistant can rapidly and precisely compute the overall cost of gold items, including taxes and reductions using the software. It is

compatible with a range of payment options, including cash, credit cards, and electronic transfers. Additionally, it can provide itemised receipts for clients.

4.4.1.3 Customer Management

It helps the store to keep track of consumer data, such as contact information, purchase history, and preferences, which can be helpful for developing relationships with customers and putting reward programs in place. As a result, customers can receive individualised service, focused marketing efforts, and simple client data retrieval.

4.4.1.4 Pricing and Pricing Updates

As the pricing of the gold could fluctuate and change several times a day, the system must be able to real-time update the market pricing as well as store the fixed charges which depend on the weight and design. The fixed charge is added to the market price to make the total price of each item, ensuring accurate pricing and transparency.

4.4.1.5 Reporting and Analytics

The system must have the capability to produce reports on sales, inventory levels, and financial information, giving information on the success of the shop, cash availability, and assisting in decision-making if there is any to be done. This allows for seamless data exchange and streamlines processes across different aspects of the business.

4.4.1.6 Security and Authentication

The POS system for gold retail shops should have security components such as user identification, access controls, and employee activity tracking, as a minimum due to the high value of the gold itself. These components are useful in preventing the loss of cash and products from the inventory stock.

4.4.1.7 Integration Capabilities

The capability to integrate with other software or hardware solutions, like accounting software or barcode scanners may be helpful on the system to further optimize processes in the future.

Retail gold stores can use computerised systems that can be tailored to their own business

requirements. These systems can range from straightforward software solutions to more in-depth and feature-rich ones. To discover a system that best suits the needs of a specific gold retail shop, it is advised to investigate and assess the many possibilities on the market.

4.4.2 Selection of the Software

The comparison of software from several developers was done using multiple-criteria decision-making (MCDM) or multiple-criteria decision analysis (MCDA). Each alternative was scored based on different criteria which could help improve the company's system and the weights which represent and reflect the importance of each criterion. In this study, the criteria were categorised into 3 main groups. They are data storage, transactions and inventory management capabilities, and others. The weights add up to 100%. The range of the raw score for each criterion is from 1 to 10.

After the criteria, weight, and score were defined, the weighted-sum model was used. The creation of a "weighted-sum model" is a simple and sensible method for averaging the performance of each alternative across numerous criteria. The sum of the weighted score determines the capability and feasibility of each alternative.

Applying the weighted-sum model to this study, the raw score for each criterion is multiplied by the respective weight assigned in percentage. Then, the scores were added up to get the total score. The maximum total score for this MCDA is 10 and the alternative that obtains the highest score will be selected and implemented.

MCDA was scored through the discussion between the end users and the managers in the headquarters. This is to compare the software from various perspectives relevant to their area of expertise.

Table 6: MCDA for the various software to implement

Criteria		Weight		Score					
				Software A		Software B		Software C	
		Total	Individual	Raw	Calculated	Raw	Calculated	Raw	Calculated
Data Storage	Able to store data on cloud	40%	15%	10	1.5	10	1.5	10	1.5
	Able to access information of the interbranch		15%	10	1.5	10	1.5	7	1.05
	Customization of the promotion for each customer		2%	7	0.14	8	0.16	7	0.14
	Storage of customer information		5%	7	0.35	9	0.45	10	0.5
	Able to connect to ID card reader		3%	10	0.3	10	0.3	10	0.3

Table 6: MCDA for the various software to implement (Continue)

Criteria		Weight		Score					
				Software A		Software B		Software C	
		Total	Individual	Raw	Calculated	Raw	Calculated	Raw	Calculated
Transactions and Inventory Management Capabilities	Able to manage inventory based on SKUs	35%	5%	9	0.45	10	0.5	10	0.5
	Able to record transactions according to customer's names		2%	10	0.2	10	0.2	8	0.16
	Auto update the gold prices		3%	10	0.3	10	0.3	10	0.3
	Access restrictions for the sales		3%	9	0.27	9	0.27	8	0.24
	Track the cash flow		5%	10	0.5	10	0.5	9	0.45
	Summary of the cash, inventory stocks and gold sold		5%	10	0.5	10	0.5	10	0.5
	Open savings account for customers		2%	8	0.16	10	0.2	6	0.12
	Calculate the interest and effective rate for pawning		5%	9	0.45	9	0.45	10	0.5

Table 6: MCDA for the various software to implement (Continue)

Criteria		Weight		Score					
				Software A		Software B		Software C	
		Total	Individual	Raw	Calculated	Raw	Calculated	Raw	Calculated
	Report the expired pawned transactions		5%	10	0.5	10	0.5	10	0.5
Others	User-friendly	25%	3%	9	0.27	8	0.24	6	0.18
	Expansion towards online platform		2%	5	0.1	5	0.1	5	0.1
	Warranty card for the products		2%	10	0.2	9	0.18	8	0.16
	Produce receipt and QR code for payment		2%	8	0.16	8	0.16	5	0.1
	IT Support		5%	6	0.3	8	0.4	5	0.25
	Pricing		4%	8	0.32	10	0.4	6	0.24
	Before and after sale service		3%	6	0.18	8	0.24	3	0.09
	Reputation and brand image		4%	7	0.28	9	0.36	5	0.2
Total score		100%			8.93		9.41		8.08

The scoring was based on the MCDA criteria and the weightage was calculated based on 3 dimensions. They are data storage, transactions and inventory management capabilities, and others. From the MCDA shown in Table 5, the selected software that was implemented in the 3 branches of Srimongkol-Chain Gold Retail Shops was Software B as it achieves the highest score compared to the other 2 software available. The information and inventory stock data regarding the rings were transferred to the computerised system based on their SKUs.

Software B was selected as it is the most appropriate and the settings can be customized to match the use of the to-be model of Srimongkol-Chain Gold Retail Shops system. The yearly fee is paid to rent the server bundle. All the transaction records from all the 3 branches of Srimongkol-Chain Gold Retail Shops will be recorded and sent to the database that is within the rented server. All the submitted information will be stored in the database and the users can access the information through the middleware.

4.4.3 Transition and Set-Up of the Software

The direct cutover method will be used to implement the new computerized system. There are several reasons for this choice. Firstly, the current manual operation of the store allows for immediate implementation of the new system. Secondly, since the old system is not complex and the store has never used computers before, there will be no adverse impact on the existing system when the new system is introduced. The new system is entirely independent of the old one, so any failure of the new system will not affect the current operations. The store's entire working system will undergo a complete transformation compared to its previous state. Moreover, unlike the old system, users will not need to verify the output of the new system, making the direct cutover method more convenient for them. Lastly, using the direct cutover method is generally the most cost-effective approach for making the changeover.

The processes of the installation and implementation of the computerised software began with preparing the required hardware. Then, acquiring and installing the selected software. The software developers will appoint sessions for training on how to use and optimize the system before preparing data to be used as a database in the software. To ensure a smooth and successful transition and implementation, the

developers and users must ensure that the software is able to operate without error through system deployment and system testing.

The SKUs were generated automatically through the capability of the software. The input includes the purity of the gold, type of products, weight, and size as shown in Figure 18. To fully transition from the existing manual system to the new computerised system, the inventory stock was set up as shown in Figure 19 and Figure 20.

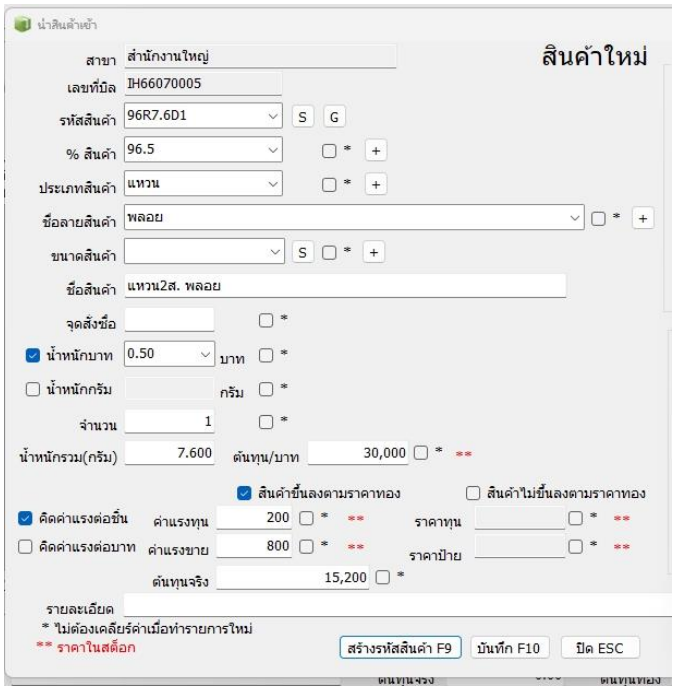


Figure 18: Information Input for SKU Generation

ตัดสต็อก	สาขา	เลขที่	วันที่	วันที่ตัด	จำนวนรวม
☑	สำนักงานใหญ่	IH66070001	1...	1...	967
☑	สำนักงานใหญ่	IH66070002	1...	1...	92
☑	สำนักงานใหญ่	IH66070003	1...	1...	23
☑	สำนักงานใหญ่	IH66070004	1...	1...	2

Figure 19: The Set-Up of Inventory for Each Branch

	รหัส	%	ประเภทสินค้า		ชื่อ	ขนาด
▶	96R1.9SS40	96.5	แหวน	.. .	แหวน1/2ส. 40	40
	96R1.9SS43	96.5	แหวน	.. .	แหวน1/2ส. 43	43
	96R1.9SS44	96.5	แหวน	.. .	แหวน1/2ส. 44	44
	96R1.9SS46	96.5	แหวน	.. .	แหวน1/2ส. 46	46
	96R1.9SS47	96.5	แหวน	.. .	แหวน1/2ส. 47	47
	96R1.9SS48	96.5	แหวน	.. .	แหวน1/2ส. 48	48
	96R1.9SS49	96.5	แหวน	.. .	แหวน1/2ส. 49	49
	96R1.9SS50	96.5	แหวน	.. .	แหวน1/2ส. 50	50
	96R1.9SS51	96.5	แหวน	.. .	แหวน1/2ส. 51	51
	96R1.9SS52	96.5	แหวน	.. .	แหวน1/2ส. 52	52
	96R1.9SS53	96.5	แหวน	.. .	แหวน1/2ส. 53	53
	96R1.9SS54	96.5	แหวน	.. .	แหวน1/2ส. 54	54
	96R1.9SS55	96.5	แหวน	.. .	แหวน1/2ส. 55	55
	96R1.9SS56	96.5	แหวน	.. .	แหวน1/2ส. 56	56
	96R1.9SS57	96.5	แหวน	.. .	แหวน1/2ส. 57	57
	96R1.9SS58	96.5	แหวน	.. .	แหวน1/2ส. 58	58
	96R1.9SS59	96.5	แหวน	.. .	แหวน1/2ส. 59	59
	96R1.9SS60	96.5	แหวน	.. .	แหวน1/2ส. 60	60
	96R1.9SS61	96.5	แหวน	.. .	แหวน1/2ส. 61	61
	96R1.9SS62	96.5	แหวน	.. .	แหวน1/2ส. 62	62
	96R1.9SS63	96.5	แหวน	.. .	แหวน1/2ส. 63	63
	96R1.9SS64	96.5	แหวน	.. .	แหวน1/2ส. 64	64
	96R1.9SS65	96.5	แหวน	.. .	แหวน1/2ส. 65	65
	96R1.9SS66	96.5	แหวน	.. .	แหวน1/2ส. 66	66
	96R1.9SS67	96.5	แหวน	.. .	แหวน1/2ส. 67	67

Figure 20: Generated SKUs for Rings

4.4.4 Test Plan

The new software is deployed on the network server and once the network has been constructed, the software vendor must take part in the installation and testing processes.

For project implementation, group training was prepared. All users of the system, whether they are secondary users or major users, will undergo training. The trainees are divided into two groups: management and operation. Each group's training goals must be specified in detail so that trainees understand exactly what is expected of them.

For the operation during training, the branch managers and sales assistant worked on both existing and new systems simultaneously to ensure that there is no issue regarding the accounting which includes cash and inventory levels.

The training included looking up the inventory for the demanded items by the customers using the software. The software shows real-time inventory stocks which

allows users to check for the availability of the products as soon as customers visit the branch.

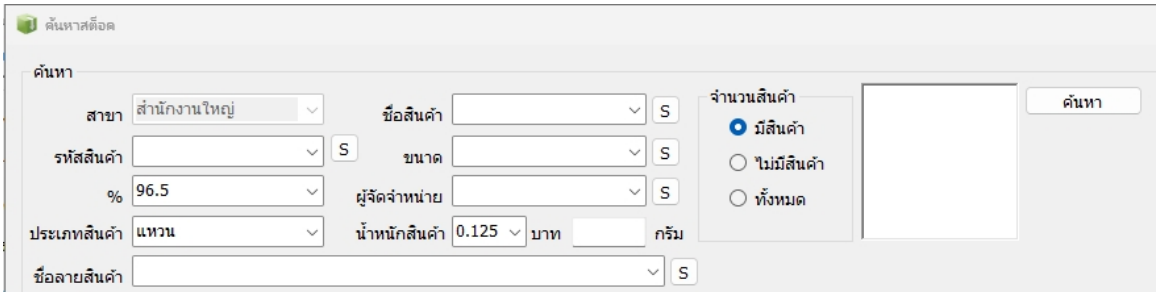


Figure 21: Input to Search through Available Products of a Specific Sizing

4.5 Data from the Actual Transactions

4.5.1 Data Before the Implementation of the Computerised Software

Table 7: Statistics for rings in September 2022

Branch / Product	A	B	C
Total Successful Transactions (a)	13	11	5
Successful Preorders (b)	6	4	2
Unsuccessful Preorders (c)	1	1	0
% Total Preorders to Total Transactions (d) = [(b)+(c)]/[(a)+(c)]	50.0%	41.7%	40.0%
% Unsuccessful Preorders to Total Preorders (e) = (c)/[(b)+(c)]	14.3%	20.0%	0.0%

Table 8: Statistics for rings in October 2022

Branch / Product	A	B	C
Total Successful Transactions (a)	9	9	8
Successful Preorders (b)	3	4	1
Unsuccessful Preorders (c)	1	2	1
% Total Preorders to Total Transactions (d) = [(b)+(c)]/[(a)+(c)]	40.0%	54.5%	22.2%
% Unsuccessful Preorders to Total Preorders (e) = (c)/[(b)+(c)]	25.0%	33.3%	50.0%

4.5.2 Data After the Implementation of the Computerised Software

Table 9: Number of preorder transactions for rings in February 2023

Branch / Month	A	B	C
Successful Preorders (b)	4	5	2
Unsuccessful Preorders (c)	0	1	0
% Unsuccessful Preorders to Total Preorders (e) = (c)/[(b)+(c)]	0.0%	16.7%	0.0%

Table 10: Number of preorder transactions for rings in March 2023

Branch / Month	A	B	C
Successful Preorders (b)	7	5	4
Unsuccessful Preorders (c)	0	0	1
% Unsuccessful Preorders to Total Preorders (e) = (c)/[(b)+(c)]	0.0%	0.0%	20.0%

CHAPTER 5
DISCUSSION AND CONCLUSION

The study was about the inter-branch inventory management of retail gold shops. There are several causes of unsuccessful preorder transactions as it requires some time for the products to be shipped. This leads to a loss of revenue for the retail jewelry business. To reduce the percentage of unsuccessful preorder transactions, the researcher implemented computerised software for interbranch inventory stock management to allow the sales to check the inventory stock in real-time.

The process of the study began with studying the statement of problems, specifying objectives, specifying the scope of the study, studying related theory and previous research, determining best-selling products, recording the percentages of unsuccessful transactions for two months prior to implementation of computerised inventory stock management software for all the three branches, record a second set of data for percentages of unsuccessful transactions for another two months, carry out the post-implementation review and focus group discussion for all the users, analyze the data and the responses from the interviews, compare the results, conclude and suggest.

Data including numbers of successful and unsuccessful transactions for each product were collected twice. The first data collection was in September and October 2022 while the second data collection was collected in January and February 2023. Between the period of these two data collections, the software was implemented in December. The initial database setup in the inventory stock management software only included one product which was the rings as it is the best-selling product.

5.1 Summary of Findings

The business operations and customer experience at a gold retail store can be greatly enhanced by the installation of a POS system. The following potential upgrades were determined and will be discussed as the summary of findings based on the collected data and the interview of the actual users after software B was implemented:

5.1.1 Efficiency Enhancement

The automation of operations by POS systems, including inventory control, sales processing, and report generation, reduces human labor and saves working time. The increase in productivity enables branch managers and sales assisstants to concentrate on providing customer service and other value-added tasks. The reduced workload further creates the ideal work-life balance for the sales representatives leading to better working environments.

5.1.2 Higher Accuracy of the Inventory Management

The technology offers real-time visibility into interbranch inventory stock levels, item specifications, and pricing, assisting in the proper tracking and management of gold inventories. This enables the store to have access to find out the available products at alternative branches. Furthermore, it eliminates inventory counting errors, prevents overstocking and understocking problems, and improves purchase choices.

5.1.3 Streamlined Sales Process

The sales process is sped up and streamlined with software B which was the selected POS system. Instantly generating invoices or receipts, precisely calculating taxes and discounts, and accepting a variety of payment options including cash, credit cards, or digital wallets are all capabilities of the system. This enhances client satisfaction and lowers the likelihood of mistakes or anomalies in transactions. The delivery of the products from alternative branches could also be done instantly, shortening the sales process in the case of product transfer.

5.1.4 Better Customer Service

The selected software gives the store instant access to consumer data, such as purchase history and preferences. By personalizing customer interactions, making recommendations, and putting loyalty programs into place, this data improves the overall customer experience and foster customer loyalty. The instant delivery of the products from alternative branches increases the satisfaction levels of the customers.

5.1.5 Real-time Reporting and Analytics

Real-time information and analytics on sales, inventory, and financial data are accessible through the system. This enables the store to evaluate employee performance, identify popular products, acquire insight into sales trends, and make data-driven business decisions. The data aids the shop owner in business expansion which could drive the revenue of the business. Additionally, it makes it possible to manage money more effectively and spot fraud or other irregularities.

5.1.6 Detailed Business Insights

With the software for gold retail stores, the marketing team has the visibility to examine trends, discover client buying patterns, and make educated decisions about pricing, promotions, and inventory management using the data collected by the system. As a result, operations are optimized, profitability is increased, and market competition is maintained.

5.1.7 Enhancement of the Security and Accountability

By providing enhanced security features like user authentication and access controls, a computerised system lowers the risk of theft or unauthorized access to critical data. Additionally, it offers a digital record of all transactions and worker activity, encouraging accountability inside the company. Although there is no data on the improvements regarding security and accountability, the transaction records available clearly show how the system has helped in enhancing this perspective.

The implemented software helps Srimongkol-Chain Gold Retail Shops to operate more efficiently, provide better customer service, better management in the inventory, and have access to insightful business data. Processes are streamlined as the whole selling process is shortened. Apart from that, errors are reduced, and it helps the owner to find out room for improvements and the possibility of business expansion.

5.2 Limitations

For the information from focus group discussion, the attitudes and actions of participants can be influenced by the presence of others, potentially resulting in social desirability bias or conformity effects. Group dynamics may also cause dominant voices to dominate others or participants to feel hesitant to express opinions.

Time and resource limitations were the issues due to the scope of the research and the necessity. It can take a lot of time and computational resources to install and configure software on several devices or manage enormous databases. With their daily routine work, dedicating additional time for training sessions can disrupt their plan and this can create challenges in managing deadlines and meeting work-related commitments, leading to potential stress or overwhelm. Furthermore, some end users who needed training sessions were resistant to changes.

The users struggled to retain and transfer the knowledge gained from training sessions to their actual job tasks. Without ongoing reinforcement and practical application, the newly acquired skills and information were limited or suboptimal utilization of the training outcomes.

5.3 Suggestions and Recommendations for Research

The store manager is advised to ensure that information input should be more detailed to deepen the understanding and accuracy of the SKUs generated by the software. With more accurate SKUs, the branch managers and sales assistants will be able to look up the available inventory for the exact product the customer is looking for. To further improve the efficiency of SKUs generated, QR code or barcode could be added into the software for further classification of the products.

5.4 Conclusion

After replacing the old system with the new one, the errors have dramatically decreased. The new system allows branch managers and sales assistants to respond to customers more quickly and efficiently and helps to greatly reduce the daily workload of accountants and branch managers and sales assistants compared to the existing system which requires everything to be recorded down into pieces of paper and to collect all of them. Using a manual system, missing documents caused serious problems. Those problems have been eliminated since the computerized system has been used for operation. We can conclude that with this computerized system, all the errors have been eliminated. It provides effective inventory management control; the inventory stock and on-shelf are automatically updated in real-time.

Data including numbers of successful and unsuccessful transactions for each product were collected twice. The first data collection was in September and October 2022 while the second data collection was collected in February and March 2023. Between the period of these two data collections, the software was implemented and set up in December. The initial database setup in the inventory stock management software for all the products. However, only transactions for selling the rings as it is the best-selling product.

The percentages of successful transactions were compared for all three branches to determine if the software implemented could aid the company in increasing sales revenue.

From a logistics standpoint, installing the computerised software system in inter-branch gold retail shops has several administrative repercussions.

5.4.1 Visibility to Inventory Stock for Inventory Management

The system makes it possible to track inventory levels in real-time across all branches. As a result of inventory management and stock visibility, branch managers can keep track of stock levels, spot fast-moving, and slow-moving commodities, and make data-driven choices about replenishment and redistribution. This helps improve inventory management.

5.4.2 Forecasting Demand

Retail gold stores can thoroughly assess past sales patterns and client preferences with the use of accurate sales data collected by the software. This information can help forecast demand, allowing branch managers to optimise inventory levels and avoid situations where there are stockouts or excess supplies.

5.4.3 Inter-branch Transfers

Real-time data on inventory levels at various locations can help in inter-branch transfers. This enables branch managers to efficiently transfer inventory to satisfy consumer demand and balance stock among branches.

5.4.4 Supply Chain Coordination

Better collaboration with suppliers and distributors is made possible by the system's increased visibility. Suppliers might be assisted in matching up their production and delivery plans with actual demand by sharing accurate sales data with them in the future.

5.4.5 Customer Experience

Through the facilitation of quicker and more precise transactions, the system can enhance the customer experience. Customers can anticipate quicker checkouts and have access to information about current product availability.

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APPENDIX

APPENDIX A

CONSENT FORM

Title of Project Improving Interbranch Logistics Systems for Gold Retailers by Computerised Inventory Management

Name of Researcher Miss Punyavadee Srimongkol

1. I confirm that I have received, read and understand the Participant Information Leaflet. I am aware of the rights that I have while doing the interview.
2. I understand that my participation is not mandatory. I have the right to withdraw from the interview at any time without providing a reason and there will be no adverse consequences or penalty.
3. I understand that collected data for this research may be looked at by individuals from The University of Warwick. I give permission for these individuals to have access to my data for the research.
4. I understand that my information will be stored and processed for the research. The data will be kept anonymous for internal publication for the M.Sc. project, to be submitted for assessment for the M.Sc. degree. I also understand that such anonymous data may be used for future research, including that for publication.
5. I agree to take part in the interview for the mentioned research.

Name of Participant .....

Signature .....

Date .....

APPENDIX B

Focus Group Discussion

1. Items that hold the highest percentage of the company's revenue
2. The main cause of the unsuccessful preorder transactions
3. The frequency of the unsuccessful preorder transactions
4. Acceptable maximum waiting time for delivery
5. The capabilities of the computerized inventory system
6. SKU Coding for each product
   6.1 What to include in the code other than types of products?
   6.2 How to categorise each product?
7. Possibility to use both systems simultaneously during the trial period (Manual and Computerized systems)
8. Stages of implementation
9. What are the unique selling points of the company's competitors?

In-Depth Interview

1. What do you think/feel about switching to a computerized system? Why?
2. What happened during the training period? Was the training helpful?
3. Do you have personal experiences with unsuccessful transactions?
4. Were there any issues that colleagues experienced during or after the implementation?

APPENDIX C

Post-Implementation Review by Employees

1. Is the computerized system easy to use? If not, why?

.....

2. What are the difficulties experienced?

.....

3. If one more function can be added to the software, what would it be?

.....

4. What are the advantages and disadvantages of the new system?

.....

5. Does the inventory stock in the software match the existing system? If not, what happened?

.....

6. How do customers respond to the new systems?

.....

APPENDIX D

Focus Group Discussion

1. Items that hold the highest percentage of the company's revenue

Branch A - In both months, rings were the most popular product for our branch.

We managed to sell 13 pieces which were 54% of the total sales in the first month. In the second month, we sold 9 rings which were 45%.

Branch B – We sold 11 and 9 rings which were about 61% and 56%, respectively.

Branch C – We sold 5 rings which accounts for about 33% of the total sales. It was not our bestseller product. The best-selling one was the necklace. Rings as the best-selling product in the following month. We sold 8 rings which accounts for 50% of the sales in that month.

2. The main cause of the unsuccessful preorder transactions

Branch B – The main causes are the unavailability of the preferred design or sizes which leads to unspecified waiting times in case of pre-ordering.

3. The frequency of the unsuccessful preorder transactions

Branch A – The unsuccessful preorder transactions is about 1-2 times a month. Most of the time, customers do not want to wait for the products to be delivered. They expect the delivery to be quicker than the delivery duration that the sales inform them upon purchasing. What some of the customers would do is revisit the shop again 1-2 days after making preorders and check if their items have arrived. They often cancel the transactions if the products have not arrived.

Branch B – It also happens 1-2 times a month at our branch. The main reason for the unsuccessful transaction is that when the customers pick up the preordered items, they do not like the actual design when they tried them on. As a result, they reject to purchase as they do not want to wait again for the next round of delivery. However, we ever experienced the same circumstance as Branch A, but it only happened a few times since I started working here.

Branch C – Our branch does not have many preorder transactions per month. Each time the preorder transaction is canceled, the reasons are different, and they vary. The most recent unsuccessful transaction I encountered was because the ring could not fit so he requested a refund rather than waiting for the bigger size ring to be delivered.

4. Acceptable maximum waiting time for delivery

Branch B – Most customers prefer to receive the product within the day they make the purchase.

Branch A – From my observation, it is the same as Branch B. However, they do not mind waiting for a day longer if the first delivered item is not what they are looking for or if the sizes are too big or too small.

Branch C – It really varies depending on the customers. Some can wait for a few days while some want to get the products instantly.

5. The capabilities of the computerized inventory system

- Selling transactions
- Buying transactions
- Exchanging transactions
- Pawning transactions
- Managing the inventory stock
- Daily cash flow statement
- Checking inventory stocks of other branches (Real-time)
- Categorising products according to their SKUs
- Summarizing the total leftover products according to their SKUs

6. SKU Coding for each product

6.1 What had been included in the SKUs other than types of products?

- Gold Purity (90%, 96.5% and 99.9%)
- Size
- Color
- Hollow and Solid

6.2 What are other possible elements to include in SKUs for more detailed codes?

- Design: New branch managers and sales assistants and customers do not know the names of each design

- Supplier: Customers do not usually pay attention to the supplier

7. Possibility to use both systems simultaneously during the trial period (Manual and Computerized systems)

- Time management as the daily workload is increased

- The number of branch managers and sales assistants is insufficient compared to the workload

- The capability of the branch managers and sales assistants to learn how to use the new software

8. Stages of implementation

- Implemented branch by branch with one week lead time for each implementation

9. What are the unique selling points of the company's competitors?

- Respond to customers' orders quickly as they only have one store

- No shipping time is required for product transfer

- Able to check their inventory in real-time

In-Depth Interview

1. What do you think/feel about switching to a computerized system? Why?	
Group 1	It is easier to compile documents. However, the participants were not quite sure about the improvement in selling as they were not involved.
Group 2	Everyone struggled through the first period while adapting to the new system. There was confusion and many mistakes were made in the initiating phase. As a result, it took some time before the new system could settle. Regarding the level of service, numerous customers expressed satisfaction with the promptness of their order responses, finding them faster than their experiences at other shops they had visited.
Group 3	While participants in Group 3 encountered challenges in using the software, those from Group 2 offered valuable assistance by guiding them, even beyond the initial training sessions.
2. What happened during the training period? Was the training helpful?	
Group 1	Only a quick briefing was provided to the participants in Group 1 as the main users are the managers in headquarters. The session was helpful in guiding the users on how to utilise the software.
Group 2	The training session covered all the potential capabilities of the software. Everyone had a chance to try using the software on the trial system. It was adequate for the learning needs of the branch managers
Group 3	The trainer did a remarkable job of breaking down the concepts and using real-world examples, which made it simpler to understand the software. The sales assistants, however, believed that the training was too brief for them to fully comprehend everything that was taught. If more time for hands-on practice and in-depth discussions were provided, it would have been more beneficial.

3. Do you have personal experiences with unsuccessful transactions?	
Group 1	No personal experience on unsuccessful transactions but they lead to loss of revenue which affect the overall profit of the company. The main reasons for unsuccessful transactions were studied based on the feedback from branch managers and sales assistant of every branch.
Group 2	The primary cause of unsuccessful preorder transactions was the significantly extended waiting time. During the preorder process, customers encountered considerable delays, leading to dissatisfaction and impatience. As a result, they either abandoned the transaction altogether or expressed frustration with the excessive waiting periods.
Group 3	The sales assistants were unable to promptly respond to customers' orders as it was impossible to check the available products in the inventory. In addition, the prolonged waiting time seemed to be a major pain point for customers, impacting their overall experience with the service. While preordering is meant to streamline the purchasing process, the lengthy delays proved counterproductive and deterred potential buyers from completing their transactions.
4. Were there any issues that colleagues experienced during or after the implementation?	
Group 1	Colleagues' ability to finish duties quickly had been hampered by slow performance or delays when utilising the new program.
Group 2	The problems faced were related to the data transfer. It was expected to take 2-3 days. However, it took about a week to completely transfer all the data. In addition, the learning curve was too steep for some users. As a result, it was challenging for users to adapt to the new software's interface and functionalities, leading to a temporary decrease in productivity as they learned how to use it effectively.
Group 3	Some users resisted the changes and were not opened to the new system. It caused reluctance in adopting the new software and slowing down the transition process.

Post-Implementation Review by Employees

1. Is the computerized system easy to use? If not, why?	
Group 1	Yes, it is easier in terms of gathering summary of financial information and available inventory in the stock.
Group 2	The software was in Thai language, so it was not too difficult to learn and adapt.
Group 3	It is difficult at first and it took some time for everyone to adapt and familiarize with the software.
2. What are the difficulties experienced?	
Group 1	The transition was not difficult, yet it was not seamless. The only concern during the transition was the data transfer which was the process that took the longest time.
Group 2	It was difficult to work using both systems during the first month due to the increased workload.
Group 3	The team struggled through the first week as everyone was new to the software.
3. What are the advantages and disadvantages of the new system?	
Group 1	It becomes easier for the team to trace the transactions and the revenue.
Group 2	Keeping in mind the objective of software installation, its benefits outweigh the disadvantages. It improves the successful rate of preorder transactions as delivery time is shortened.
Group 3	The team can respond to customers much more promptly and efficiently.

4. Does the inventory stock in the software match the existing system? If not, what happened?	
Group 1	There was no concern regarding the correctness of the inventory stock.
Group 2	There was no concern regarding the correctness of the inventory stock.
Group 3	There was no concern regarding the correctness of the inventory stock.
5. How do customers respond to the new systems?	
Group 1	There was no direct communication between participants in Group 1 and customers.
Group 2	The customers could find out immediately if the products they are looking for are available and they were more satisfied with the service level.
Group 3	There are no more complaints regarding long delivery lead time as the customers could pick up the items for their preorder transactions on the following day.

VITA

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