



IMPLEMENTATION OF QUALITY CONTROL TO ENHANCE
ORDER ACCURACY OF A JEWELRY FIRM

By
PATCHAREE TREEANEKCHAI

A Final Report of the Six-Credit Course
SCM 2202 Graduate Project

Submitted in Partial Fulfillment of the Requirements for the Degree of
MASTER OF SCIENCE IN SUPPLY CHAIN MANAGEMENT

Martin de Tours School of Management
Assumption University
Bangkok, Thailand

November, 2010

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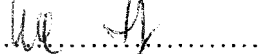
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Declaration of Authorship Form

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declare that this thesis/project and the work presented in it are my own and has been generated by me as the result of my own original research.

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ABSTRACT

The study is aimed at solving the problem of quality control in a jewelry business for a Small Medium Enterprise Company [SME] named "Silver Jewelry". The study implements a Quality Control Circle Model [QCC Model] to solve the problem of product quality which causes the company to pay more chargeback to the customer every month. In order to accomplish the aims of the research, document reviews and face to face interviews were selected for collecting data.

The findings indicate that there are five main quality problems in the company: 1) the product specification is erroneous, 2) the description on the box such as store number and product serial number is incorrect, 3) the product details in the document do not match with the product, 4) the description on the product label is wrong and 5) the purchase order number is missed or misplaced. In order to solve the problems, the QCC implementation plan was suggested.

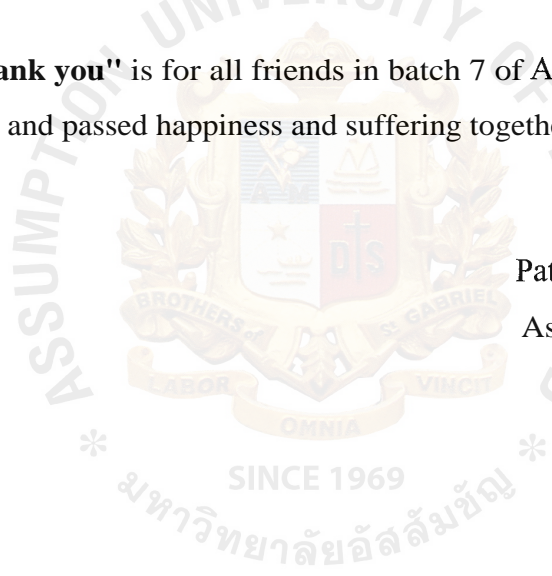
After implementing the QCC project, satisfactory results were illustrated. The product returned was reduced from 25.6 percent to 17.46 percent in the first month after implementing while 9.43 percent were reduced in the second month. This indicates the effectiveness and efficiency of the program.

ACKNOWLEDGEMENTS

First of all I would like to acknowledge my advisor Asst. Prof Dr. Nucharee Supatn for helping and supporting me while doing this research. She has advised and provided me much knowledge to complete this study. Her patience and persistence increased my motivation and enthusiasm to complete a research.

I would also like to thank my family who gave me moral support. I would like to thank friends for helping me to pass difficult moments. I really appreciate all teachers at ABAC SCM who trained me about everything in supply chain management.

The last "**Thank you**" is for all friends in batch 7 of ABAC SCM class who had the best moments and passed happiness and suffering together.

A large, faint watermark seal of Assumption University of Thailand is centered on the page. It features a circular border with the university's name in English and Thai. Inside the circle is a shield with various symbols, including a cross and a star. Below the shield is a banner with the motto 'LABOR OMNIA VINCIT'. The text 'SINCE 1969' is at the bottom of the seal.

Patcharee Treeanekchai
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November, 2010

TABLE OF CONTENTS

	Page
Committee's Approval Sheet	
ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vii
LIST OF FIGURES	viii
 CHAPTER I: GENERALITIES OF THE STUDY	
1.1 Background of the Study	1
1.2 Statement of the Problem	3
1.3 Research Objectives	4
1.4 Scope of the Study	4
1.5 Limitation of the Study	5
1.6 Significance of the Study	5
1.7 Definition of Terms	5
 CHAPTER II: REVIEW OF RELATED LITERATURE AND RESEARCH	
FRAMEWORKS	
2.1 Supply Chain Management (SCM)	7
2.2 Total Quality Management (TQM)	9
2.2.1 The Core Components of TQM	10
2.3 Quality Control Cycle (QCC)	16
2.4 The Step to Implement QCC	17
2.5 Summary	19

CHAPTER III: RESEARCH METHODOLOGY

3.1 Pre-Analysis Information	.....20
3.1.1 General Company Information	.....20
3.1.2 Exported and Returned Items	.....23
3.2 Work Process Mapping and problem identification	.....26
3.3 Data Collection	.....27
3.3.1 Document review	.....27
3.3.2 Interview	.....27
3.4 Data Analysis	.....27
3.5 QCC design	.....28
3.6 Possible improvement after application of the QCC model	.....28
3.7 Summary	.....28

CHAPTER IV: PRESENTATION AND CRITICAL DISCUSSION OF RESULTS

4.1 Operation Work Process and Process Mapping of Silver Jewelry Company	..... 30
4.2 Process Mapping	.....32
4.3 Problem Identifying and Analysis	.....33
4.4 QCC Implementation	.....36
4.5 Result of QCC Implementation	.....40
4.6 Summary	.....42

CHAPTER V: SUMMARY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions	.....43
5.2 Implication of This Research	.....44
5.3 Recommendations for Future Research	.....45

BIBLIOGRAPHY 46
--------------	----------

APPENDICES 48
------------	----------

Appendix A: Organization Structure49
------------------------------------	---------

LIST OF TABLES

TABLE	Page
3.1 The Total Exported Items and Returned Items from December 2008 to December 2009	.....23
3.2 Type of Chargeback from the Customers	.....25
3.3 The Chargeback Cost for Return Items from December 2008 to December 2009	.....26
4.1 Operation Work Processes	.....31
4.2 The 13 steps of QCC Implementation Plan	.....37
4.3 Total Sales and Returned Product in 2009-2010	.....41
4.4 Comparison of Cost Spent for the QCC Project and Product returned	.....42



LIST OF FIGURES

FIGURES		Page
2.1	Baldrige Criteria for Performance Excellence Framework	12
2.2	Plan-Do-Check-Act Cycle	16
2.3	13 Steps of QCC Implementation	18
3.1	The Exemplifying Pictures of the Company's Products	22
4.1	The Production Flow Process	32
4.2	Existing Problems in Work Operation Processes.....	35



CHAPTER I

GENERALITIES OF THE STUDY

1.1 Background of the Study

Currently, many business owners are facing high competition in the industry as the number of Jewelry manufacturers has increased significantly. According to Office of Small and Medium Enterprises Promotion (2010), in 2006, there were 10,077 of jewelry factories in Thailand and the number has continually increased by 5 percent annually. Jewelry business is also an industry that is facing high competition within the industry especially for its exports business. As jewelry is considered a luxurious, expensive, and "high value product", its creditability and high standard quality should be ensured, especially for the "fine jewelry" which is referred to as a high quality jewelry product. Currently the jewelry industry is encountering trade obstacles and high competition from many factors such as uncertain foreign competitors like China and India (Office of Small and Medium Enterprises Promotion, 2010), price sensitivity, product differentiation and so forth. In 2008, the value of Thai jewelry export for Thailand was US\$ 8,200 – 8,300 or about 230,000 - 240,000 million baht, so the export value from January 2009 – July 2009 expanded by 25 percent in the year 2008 (Department of Export Promotion, 2009).

Similar to other industries, quality standard is important for jewelry business and for the whole supply chain process, from upstream to downstream. Quality of raw materials from suppliers to the manufacturers in the upstream side would more or less influence production quality as the quality of the finished goods delivered to the customer in the downstream. As a high value product, quality of jewelry products is very important. The quality of this product can be verified from the following categories:

- Right style color and size
- The stones are not broken or missing
- The stones or semiprecious stones are clean and don't have any stains.
- The products do not have any scratches or are not damaged.
- The accessories for the products are complete. For example, springs or hinges for bangles, hooks for necklaces are not broken or missing, pins for earrings are not broken, and the earring backs are not missing from a pair of earring.
- The sizes of all product items with the same design are standardized. For example the width of bangle for each size (S, M, and L) can be measured and are equal in each size, or the weights of all product items with the same design are equal.

The measurement for quality focuses on specification-based performance. **It** emphasizes inspection to prevent delivering defected goods to customers. Quality inspections are counting, grading and sorting to ensure that customers do not receive defective products. The basic goal of quality control is to ensure that the products, services, or processes provided meet specific requirements and are dependable, satisfactory, and fiscally sound.

Silver Jewelry Company is a small multinational company that exports silver jewelry products to many countries. Its head office is in Singapore while the production branch is in Thailand. The production branch is only responsible for ordering raw material from suppliers and managing and monitoring each process in the internal and external the work flow, packaging and lastly shipping the finished products to customers. There are 14 employees who divided into 7 departments are:

- Production
- Stock and Inventory
- Quality Control
- Shipping

Silver Jewelry Company is the company name which is used for this project only.

- Marketing
- Accounting
- Designer
- Management

Major customers are the Jewelry distributors in America, Puerto Rico, United Kingdom, Singapore, Hong Kong, Japan, Malaysia, France, and Russia. Silver Jewelry Company in Thailand handles only the production and shipping tasks. All products are produced and shipped to the customer from Thailand by airfreight.

Silver Jewelry Company's products include bangles or bracelets, earrings, rings, necklaces, cufflinks, shoulder pads, brooches, hand bags, etc. which are made from silver and set with stones, enamel color which are later polished. The character of the products and especially the bangles are big and colorful in Gothic style. Some are designed based on the appearance of animals, flowers, and so forth.

1.2 Statement of the Problem

Silver Jewelry Companies in Thailand are now facing product quality problems. The products have lots of defects. Many pieces or even the whole lots of product were rejected and returned by the customers. Currently, companies had to pay for the penalty fee and/or chargeback to the customers every month. The Company recognized that the rejection by customers because of some defects as well as because of the misspecification of the products. These product returns would not only affect exporting cost that directly affects the Company's expenses but also affect the reputation of the Company as well as the level of customer satisfaction.

To solve the problem, Silver Jewelry Company is considering the application of Total Quality Management to reduce defects and misspecification problem as well as to ensure the quality of the product. Thus, the question, **"How could Quality Control Cycle be implemented to improve product quality of the Silver Jewelry Company?"** is focused.

Quality Control Cycle (QCC) is a process employed to ensure a certain level of quality in a product or service. It may include whatever actions a business deems necessary to provide for the control and verification of certain characteristics of a product or service. The measurement for quality focuses on specification-based performance. It emphasizes inspection to prevent delivering defect goods to customers. Quality inspections are counting, grading and sorting to ensure that customers do not receive defective products. The basic goal of quality control is to ensure that the products, services, or processes provided meet specific requirements and are dependable, satisfactory, and fiscally sound. Thus, the QCC Model is selected as the key quality system to improve and control the quality of the Silver Jewelry Company's production and distribution system.

1.3 Research Objectives

To achieve the main purpose of the study i.e. to apply the QCC model to solve the Company's problems, four specific objectives are set which are as follows:

1. To identify the core production and distribution processes of the Silver Jewelry Company.
2. To assess the possible causes of defects and misspecification of the products.
3. To design the suitable QCC plan for the Silver Jewelry Company.
4. To estimate the possible improvement of the production and delivering performance of the Silver Jewelry Company after application of the QCC model.

1.4 Scope of the Study

This study focuses on one jewelry company namely Silver Jewelry Company. The QCC model is selected to solve the problem of low product quality in the Company. The implementation plan of the QCC model will be designed based on the specific business context of the Silver Jewelry Company.

1.5 Limitations of the Study

There are four main limitations of the study. First of all, since this research only emphasized on the one company, the outcome may not be applied to others companies. The second limitation is the utilization of only one concept. QCC model is the main concept used for resolving product quality in this research. However, there are a number of quality management tools that can be applied to improve product quality. As the result of this, the outcome of this research may be limited. The final limitation is that this project does not include other cost such as transportation cost and rework cost which the company has to take responsibility of when the product is returned.

1.6 Significance of the Study

This study concentrates on the implementation of quality management activities that aims to reduce the defects of products in the Silver Jewelry Company. The result of the study should be used to solve the company problems as well as guideline and suggestion for the new or small-medium enterprises or SMEs jewelry companies who are concerned with quality control management.

The study helps to enhance the knowledge of quality management in details. The benefits, limitations, and the effect of the factors which are related to this implementation are analyzed and can be proof for this study. Furthermore, this study can be used for the other businesses besides jewelry, and who are considering using quality management systems.

1.7 Definition of Terms

Quality Control [QC]: is a procedure or set of procedures intended to ensure that a product or service adheres to a defined set of quality criteria or meets the requirements of the customer.

Quality Control Circle [QCC]: is a small group of workers [3-10 persons] from the same organization who meet regularly to identify, select and analyze work-related problems. The members prefer to implement and put the suggestion and solutions to the management for consideration, decision-making and implementation to improve the work quality.

Supply Chain Management [SCM]: is the network management of interconnected businesses involved in the ultimate provision of products and service packages required by end customers.

Total Quality Management [TQM]: includes a number of management practices, philosophies and methods to improve the organization business by making good products and interacting with the employees and customers by focusing on quality.

PDCA Deming Cycle: is a management quality cycle. This cycle include of Plan, Do, Check, and Action activities.

CHAPTER II

REVIEW OF RELATED LITERATURE AND RESEARCH FRAMEWORKS

Implementation of supply chain management and QCC model are the main tools utilized for solving problems in the study, the chapter reviews literature which are related to supply chain management and QCC. This chapter includes four main sections. The first section explains the general meaning of supply chain management. The second part mentions total quality management which includes core components of TQM. The third part gives an explanation of the QCC model and the final part mentions the step to implement in the QCC model.

2.1 Supply Chain Management

The term supply chain management originated in 1982 (Lee & Kincade, 2003 as cited in Vanichchinchai & Igel, 2009) by Toyota regarding the management of the relationship between its suppliers and customers (Vanichchinchai & Igel, 2009) to share normal practices with Toyota's JIT (Vanichchinchai & Igel, 2009). The term "supply chain management (SCM)" can be used to explain processes of planning and controlling the material flow of information and logistics activities that are both internal and external in the supply chain (Kannabiran & Bhaumik, 2005). In other words, a supply chain encompasses every effort involved in producing and delivering a final product from the supplier's supplier to the customer's customer. Many researchers also gave an importance to the need for coordinating among interdependence of different organizations' authorities and responsibilities in the chain, therefore, SCM has various levels of coordination within and between organizations (Kannabiran & Bhaumik, 2005).

In the greater view of SCM, Meyer, Ashleigh, George and Jones, (2007) pointed out that this chain management directly involves with managing the entire working operations, beginning at the point of acquiring raw materials, and then transforming those raw materials into finished products and services and, finally, delivering it to

customers. Meyer et al., (2007) as well suggested that there are three organizational functions to be focused on in order to enhance the firm's capability through the management of supply chain. Material management function is revealed as the beginning process of SCM. The critical point of this procedure is dealing with the firm's ability to appropriately and accurately acquire raw materials from suppliers that are required by the firm. The production function as the middle process of the chain is mainly accountable for transforming raw materials into finished products and services that meet customers' requirement. Marketing sales and service functions as the final process of SCM can be divided into two scopes of responsibilities. Marketing sales are mainly responsible for accurately advertising products or services to be consistent with the brand positioning. The task for taking care of customers both before and after points of sales, on the other hand, will be relied on service teams. The effective information management of the supply chain will also be required to enhance the entire work flow (Meyer et al., 2007). In addition, service teams essentially need excellent communication with the marketing teams as the former group has to responsible for ensuring the promise provided to customers by the latter group in order to satisfy customers. The accurate and effective SCM, hence, responds to the customer at the right time and place as fast as possible with the lowest cost (Vanichchinchai & Igel, 2009), which, in turn, creates value to customers as well as generates higher profits to the firm.

The knowledge of SCM will be used to identify the processes of work flow of the selected case in this study. The problematic issues of the firm will be mainly resolved by implementing the concept of TQM which will be explained in the next section.

2.2 Total Quality Management (TQM)

Total quality management (TQM) is one of the most well-known managerial systems which many managers are seeking to achieve. Goestch and Davis (2006) defined TQM as the managerial approach to operate business with the focus on maximizing the capability of a firm by continually improving the quality of people, processes, products and services as well as working environment. In other words, TQM is a strategic management primarily based on continual improvement in every working procedure. Prajogo and McDermott (2005) similarly termed TQM as the integration of every organizational function and process that aims to satisfy the change of customer's needs by persistently improving the quality of products and services. In short, it is the organizational commitment to pursue the concept of total quality by delivering error-free goods and services to customers (Sun, 2004). Douglas (2006) further extended the definition of TQM as a managerial philosophy contained with a number of tools and techniques used to enhance the organization's capability to meet or even exceed customers' satisfaction, both internal and external.

In the more organizational view towards TQM, Bou-Llusar, Escrig-Tena, Roca-Puig and Jimé'nez and Martí'nez-Costa (2009) mentioned that TQM can be characterized in two organizational dimensions which are soft and hard. The former dimension or social dimension emphasizes the efficiency of leadership, employee's commitment, teamwork as well as human resource management. The latter dimension or technical dimension, in contrast, underlines the idea of continual improvement of products and services through working procedures and systems. Prajogo and Sohal (2004) added that the success of TQM will genuinely require commitment from top management and workforces as well as collaboration between both of them. This means TQM's organizations demand everyone's engagement in total quality. Managers and employees, hence, will be learned, trained and given practice about how to trust and work together as a team in order to achieve the organization's objectives.

To gain a better understanding of TQM's notion, Goestch and Davis (2006) gave the example of differences between TQM approach and the traditional approach towards total quality. In the traditional approach toward quality, employees will be recognized as inactive workforces who should act or perform only what they are told to do, whereas employees in the TQM approach will be encouraged to think, suggest as well as initiate their ideas related to quality. In other words, TQM organizations aim to create supportive culture where managers recognize employees as valuable input that can together lead to better competitive advantage. Apart from that, TQM approach focuses on reducing defective part per million, while the traditional one inspect error per hundred. TQM, for this reason, seems to be a comprehensive managerial system that can effectively maximize organizational capability which, in turn, leads to customer satisfaction.

Although the concept of TQM has been defined by various studies, those views are correspondingly similar. This means TQM as a contemporary managerial system emphasizes on continual improvement in every organizational aspect. For instance, TQM is the approach to maximize organizational ability by integrating all of organization's functions, including people, systems and processes together in order to continually deliver superior quality of products and services to satisfy customers. TQM organizations, moreover, focus on creating supportive working environment where workforces are recognized as active people. Employees, for this reason, should be encouraged to think and suggest opinions related to quality improvement. In addition, in order to successfully implement TQM, implementers need to understand the tools and techniques that lie within this management style. The core components of TQM provided by various sources will be discussed in the next section.

2.2.1 The Core Components of TQM

Although TQM is recognized as one of the most effective management systems widely applied by organizations, the argument regarding what are the most appropriate components to successfully achieve the concept of TQM still remains. The implementation of this managerial system is also far from simple due to its

3515 1

complexity in core components and processes. This part, therefore, attempts to acquire better knowledge of the components contained within the concept of TQM in order to apply it for enhancing the organization selected for the purpose of this research. The elements of TQM's framework identified by both researchers and one of the most reputable qualitative institutions are mainly discussed in this section.

TQM is the qualitative framework aimed to approach customer's satisfaction, hence, the success of this approach will be principally judged by customer's perception (Goestch & Davis, 2006). These experts also highlighted that the implementation of TQM is focused on three organizational aspects which are measurement, people and processes. The measurement in their theory stresses on fact that the organization needs to regularly measure and monitor its whole working processes that may affect quality (Goestch & Davis, 2006). Quality tools, such as check sheets, competency gap analysis or key performance indicators (KPIs) will be applied to yield the accuracy of measurement. The second aspect, on the other hand, informs that employees should be trusted and empowered in order to drive the quality system, since the top quality requires both people engagement and appropriate machines (Goestch & Davis, 2006). Processes as the final aspect of TQM's implementation guides that the organization needs to continually analyze and improve the entire working system (Goestch & Davis, 2006).

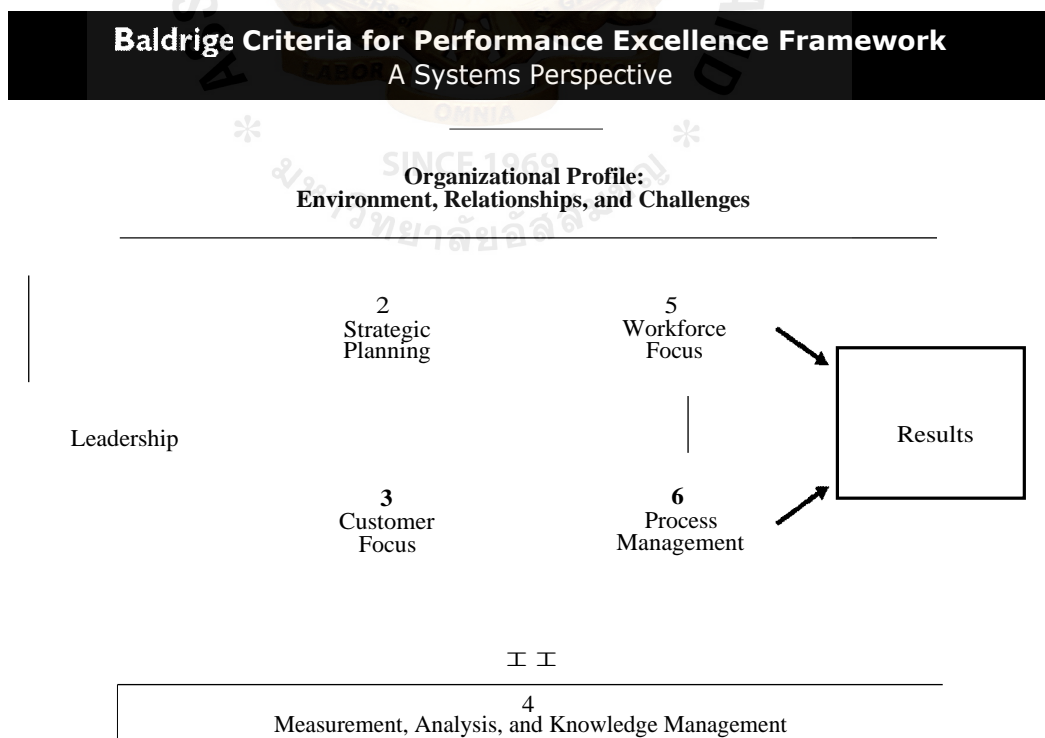
Saylor (1992 as cited in Ho & Fung, 1994) and Hakes (1991 as cited in Ho & Fung, 1994), in contrast, further argued that three aspects of TQM's implementation may not be adequate. They, hence, identify 10 key success factors of this concept as following.

1. Leadership
2. Commitment
3. Total customer satisfaction
4. Continuous improvement
5. Total involvement
6. Training and education

7. Ownership
8. Reward and recognition
9. Error prevention; and
10. Co-operation and teamwork

Apart from those elements of TQM provided by researchers, Malcolm Baldrige National Quality Award (MBNQA) as a recognized qualitative institution concluded that in order to successfully implement the TQM's concept, firms need to focus on seven organizational aspects which are (1) Leadership, (2) Strategic planning, (3) Customer and market focus, (4) Measurement, analysis and knowledge management, (5) Workforce focus, (6) Process management (7) Results (Baldrige National Quality Program, 2009). The quality framework provided by MNBQA can be seen in the Figure 2.1 below.

Figure 2.1: Baldrige Criteria for Performance Excellence Framework



Source: www.baldrige.nist.gov

From the Figure 1, leadership is the first element in this excellent framework, consisting of two focal areas which are senior leadership and governance and societal responsibilities. Senior leadership or top management, firstly, should be able to develop effective organizational plans and strategies that fundamentally focus on customers and support the notion of continual improvement in products and services (Baldrige National Quality Program, 2009). Those plans or strategies initiated must also be communicated throughout the organization. Besides, top management is responsible for building up safety and on secure working environment for every stakeholder in order to sustain the success of the organization. On the other hand, governance and social responsibilities means that leaders of the organization should act as role models by behaving legally and ethically. The ethical behavior in the governance structure, including the interaction with customers, suppliers as well as other stakeholders should as well be monitored and reported regularly to the board (Baldrige National Quality Program, 2009). Top management, in addition, should take the issue of economic and social impact into account when developing organizational strategies or plans for maintaining good relationship with the society (Baldrige National Quality Program, 2009).

The second element or strategic planning also highlights two key issues which are strategic development and strategic deployment. For the former issue, all key stakeholders, such as customers, employees, suppliers and shareholders should be considered before developing a strategy as well as the main objective of strategy developed should aim to continual improve every function in the working process (Baldrige National Quality Program, 2009). For instance, the organization should aim at developing employee's skills or working system consistently in order to meet the change in customer's expectation. For the latter issue, the organizational strategies should be communicated and deployed across the organization (Baldrige National Quality Program, 2009). The strategies deployed, additionally, should be regularly monitored and reported for the future improvement.

Customer focus, furthermore, is identified as the third critical element in this quality framework. It is as well combined with two concerning matters, one is customer engagement and another is voice of customer. Customer engagement notifies that the organization should create customer culture where both leaders and workforces concentrate on delivering products or services that truly meet customer's preferences (Baldrige National Quality Program, 2009). For voice of customer, the organization needs to find the way to obtain customers' attitudes and opinions toward the firm's products and services in order to measure their level of satisfaction for the further development (Baldrige National Quality Program, 2009).

The focus on measurement, analysis and knowledge management can be revealed as the following element. Two critical points are relied on this element. The first point is that the organization needs to regularly measure, analyze and improve its performance in every working operation (Baldrige National Quality Program, 2009). Whereas the second point concentrates on managing information, knowledge and information technology, meaning that the information and resources needed should be accuracy, integrity, timeliness and security (Baldrige National Quality Program, 2009). Notably, in TQM's organization, this element will be very essential, since accuracy measurement results in valuable inputs which, in turn, lead to better development of the firm's overall capability.

The further element mainly deals with workforce, including workforce engagement and workforce environment. The workforce engagement is another crucial point led to the success of TQM. Those employees, in other words, can be recognized as essential drivers of the company. For this reason, the firm has to motivate both leaders and employees to engage in the work process so as to create a supportive and secure working environment in order to support and maximize employees' capability (Baldrige National Quality Program, 2009). The firm, additionally, should measure and monitor the level of employee's engagement as well as how given are tasks achieved in order to further develop workforce's capability (Baldrige National Quality Program, 2009).

Another essential driver of organizations pursuing the notion of TQM can be pointed out as process management, entailing with working system and working process. At this point, the company needs to carefully design working systems that are flexible and be prepared for any immediate change as well as clearly identify key working processes (Baldrige National Quality Program, 2009). Those keys will facilitate the workforce to work more effectively and in turn will deliver value to customers. Importantly, effective working systems should be incorporated with inputs from stakeholders, such as employees, suppliers and other key partners. Working processes, furthermore, should also be carefully designed and managed to support the idea of continual improvement in key working procedures (Baldrige National Quality Program, 2009).

The ending element of the quality framework provided by MBNQA is results. This element concentrates on measuring six outcomes related to the organizational performance which are (1) products outcomes, questioning whether products or services satisfies customer's needs and whether products and services are comparable to rivals, (2) customer-focused outcomes, asking whether the level of customer satisfaction and customer engagement increased, (3) financial and market outcomes, measuring whether the overall financial situation improved after implementing TQM, (4) workforce-focused outcomes, questioning whether the level of employee engagement increased and whether the skill of employee improved, (5) process effectiveness outcomes, asking whether the overall working procedures improved, for instance, the productivity and the responsive time for emergency should be developed and (6) leadership outcomes, measuring whether the personal skill and capability of leaders developed (Baldrige National Quality Program, 2009). This final outcome can be criticized by measuring whether the strategic plans developed by leaders can be completed, whether the financial situation of the firm is better, whether leaders are responsible for society as well as whether leaders behave or act ethically.

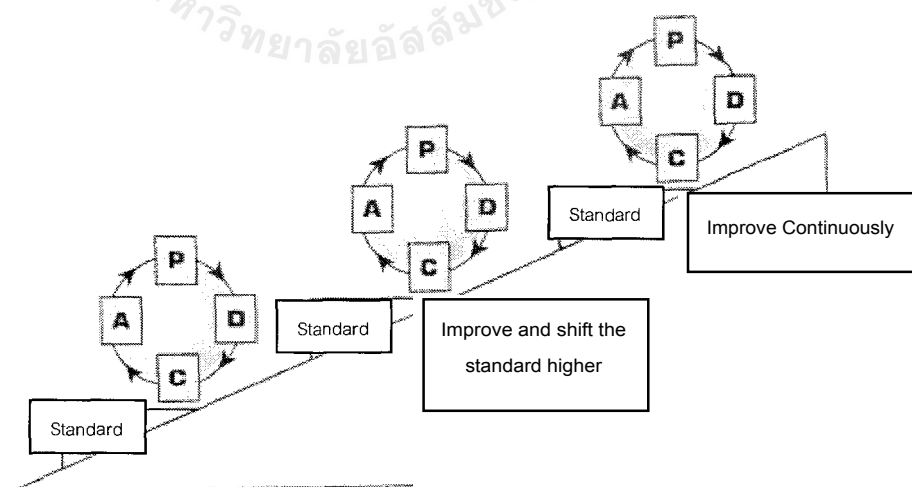
After examining the components of TQM identified variously by both previous studies and the qualitative institution, it was found that the major keys to TQM's success are fairly similar. In other words, TQM is a managerial system majorly based

on customer focus as well as the idea of continual improvement of the entire working processes related to products and services' quality. Leaders of the organization need to develop and set clear organizational strategies that are concerned with every stakeholder, such as customers, employees, suppliers, shareholders as well as society in order to sustain the success of the firm. Employees, moreover, need to be trusted, trained and practice together with top management to deliver superior quality requires collaboration between both employees and management and proper machines. For this reason, machines and the whole working system must be monitored, analyzed and reported regularly in order to find the way to improve the organizational capabilities. Supportive and ethical culture, in addition, is essential for the achievement of TQM.

2.3 Quality Control Cycle (QCC)

PDCA or Deming Cycle is selected in order to obtain continual and sustainable quality improvement. Deming (1986 as cited in Mazur et al., 2008) utilized the concept of continuous improvement (CI) as the initial quality principle by focusing on Plan-Do-Check-Act (PDCA) cycle.

Figure 2.2: Plan-Do-Check-Act cycle



Source: <http://eduserv.ku.ac.th/km>

This model later has been developed by a number of researchers. However, the main components of cycle remain the same. According to Benneyan and Chute (1993, as cited in Cheng, 2008), PDCA cycle comprises of 4 processes. It usually begins with the "Plan", involved with identifying problems and then planning the alternative ways to resolve problems. The second stage is "Do". Once the plan has been developed, the implementation of working process according to the plans then begins. This stage aims to test the plan in daily management proceeds to solve problems on an experimental scale. "Check" is the third step of this cycle. This stage reviews and rechecks results from those plans implemented. It as well identifies the most efficiency way to resolve those problems. The final process is "Act". This ending stage aims to implement the most appropriate plan reviewed. Besides, Deming (1986 as cited in Mazur et al., 2008) suggested that the cycle can be repeatedly implemented in order to generate higher benefits in terms of improving the processes and creating continual quality culture. The following chapter will discuss the method used in this research.

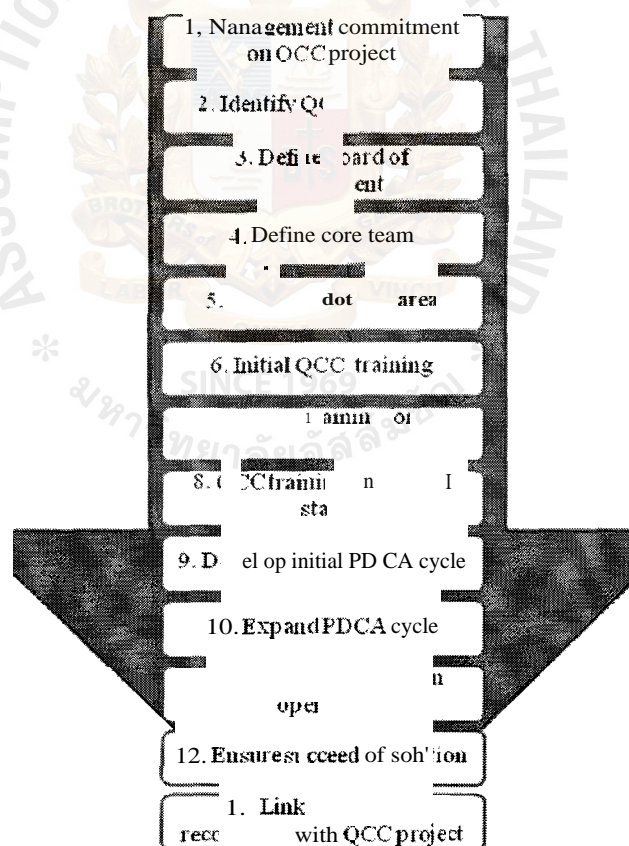
2.4 The Step to Implement QCC Model

The QCC implementation aims to encourage employee to maximize their capabilities to improve their work performance and solve the problem as well as give opportunities for sharing their knowledge and experiences (Chalermjirarat, 2001 as cited in Krudthong, 2007).

According to There are 13 steps of QCC implementation. Firstly, management in the company has to buy-in and show committed to the QCC model. Secondly, the possibility of QCC and problems are analyzed and identified. Thirdly, the board of committee for QCC project is defined. Fourthly, core team, co-coordinators and in-house instructors are selected. Fifthly, the pilot area of implementation is chosen. Sixthly, the initial training towards QCC processes is provided for staff in the divisions or departments that are about to implement the concept. Seventhly, the middle management is trained on the QCC processes that relates to their job function. Eighthly, QCC training course is provided for staff that are new and interested.

Ninthly, initial PDCA cycle is formed. Tenthly, PDCA cycle is expanding broadly. The next step is to apply PDCA into work operation in order to solve the problems and ensure that the cycle is operated systematically and practically. The twelfth step is that management team must ensure that solutions are successful. The final step is that the reward and recognition are developed and related to the QCC project (Chalermjirarat, 2001). The Figure 2.3 below shows the 13 steps of QCC implementation.

Figure 2.3: 13 steps of QCC implementation



Source: Chalermjirarat (2001)

2.5 Summary

This chapter reviews theory and concepts regarding supply chain management, TQM and QCC model from previous studies. Supply chain management and TQM are used as a guideline for better understanding the overview of a business. The QCC model is mentioned in order to employ it as a main framework to solve product quality problems for the Jewelry Company.



CHAPTER III

RESEARCH METHODOLOGY

This third chapter discusses information regarding the methods and techniques employed to collect and analyze the data of the research. In the first section, the pre analysis data is clarified. The second section briefly outlines the work process mapping and problem identification on which the research is based. The third section describes the techniques used for collecting the data. The fourth section then explains the technique for analyzing data. The fifth section mentions about QCC model. The sixth section states possible improvements of QCC implementation. The final part concludes the limitations of methods and techniques that occur during the period of this study.

3.1 Pre- Analysis Information

This study aims to identify the main problem of product quality in a Jewelry Company as well as to implement the QCC model in order to solve the problems. The essential data regarding quality problem in the case study are demonstrated as below.

3.1.1 General Company Information

As mentioned earlier, the Silver Jewelry Company is a SMEs and its main product is silver jewelry. The company was established a decade ago. However, there are only 14 employees who are divided into 7 departments at the Thailand production branch. This is given below:

Production	4	employees
Stock and Inventory	2	employees
Quality Control	1	employee
Shipping	2	employees
Marketing	1	employee
Accounting	1	employee

Designer	1	employee
Management	2	employees

The main product for the company can be described into 4 categories which are: (1) bangles, (2) rings, (3) earrings and (4) necklaces. All products are exported to several countries. The major customers are jewelry distributors in America, Puerto Rico, United Kingdom, Singapore, Hong Kong, Japan, Malaysia, France and Russia. The company also has a future plan to expand its market to other countries in the next few years. The production branch, nonetheless, does not produce products by itself This branch is only responsible for ordering raw materials from suppliers, managing and monitoring each process in the work flow internal and external, packaging and lastly shipping the finished products to customers.

There are two essential raw materials for the company which are: (1) silver and (2) stones. For the silver, the Company has only one main supplier. Since the price of silver fluctuates, the Company usually checks the price, before deciding to purchase this raw material. For the stones i.e. sapphires and semi precious, the Company has only one major supplier as well. The sizes of stones are various and categorized by units which are called "carat (ct.)" and the metric unit of stones weight per product one piece is called "gram (g)". Most stones are supplied by the supplier in Thailand except some type of stones that has to be imported from other countries. Figure 3.1 illustrates some product pictures provided by the Silver Jewelry Company.

Figure 3.1: The Exemplifying Pictures of The Company's Products

Bangles



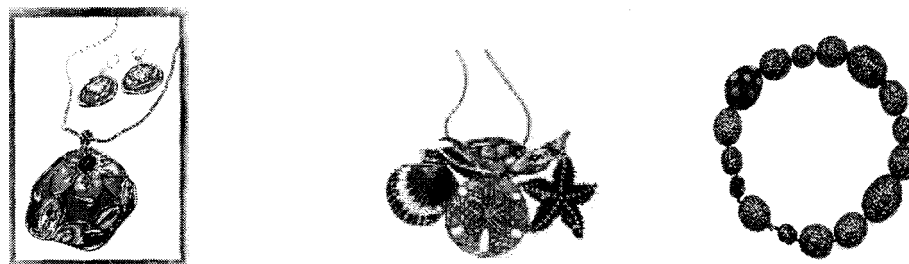
Rings



Earrings



Necklaces



Remarks: *These pictures are the product of the company, so use for the purpose of study for this project only*

3.1.2 Exported and Returned Items

In the year 2009, the company had many shipments which were exported to customers. The table below demonstrates the total exported items and returned items in 2009 which was categorized by products codes: (1) MBG refers to bangle, (2) MER refers to earring, (3) MNC refers to necklace and (4) MRG refers to ring.

Table 3.1: The Total Exported Items and Returned Items from 2008 to 2009

Month 2008-2009	Total Export (Pcs)					
		MBG	MER	MNC	MRG	Total (Percent)
December 2008	Exported	4,865	1,568	1,587	1,290	9,310
	Returned	N/A	N/A	N/A	N/A	N/A
January	Exported	5,013	673	337	1,178	7,201
	Returned	1,563	897	561	356	3,377 (46.9)
February	Exported	2,818	1,582	939	2,660	7,999
	Returned	1,889	150	33	535	2,607 (32.6)
March	Exported	3,205	1,294	451	3,050	8,000
	Returned	1,446	315	53	574	2,388 (29.9)
April	Exported	2,711	2,359	843	3,721	9,634
	Returned	1,269	500	9	97	1875 (19.5)
May	Exported	3,706	622	653	3,082	8,063
	Returned	1,356	168	40	570	2,134 (26.5)
June	Exported	1,172	5,820	95	105	7,192
	Returned	562	569	-	52	1,183 (16.4)
July	Exported	3,918	775	1,292	439	6,424
	Returned	1,672	412	16	113	2,213 (34.4)
August	Exported	2,504	4,329	75	1171	8,079
	Returned	539	471	7	334	1,351 (16.7)
September	Exported	3,455	2,627	1,763	215	8,060
	Returned	1,364	522	412	74	2,372 (29.4)
October	Exported	2,974	2,172	1,154	3,699	9,999
	Returned	289	253	195	261	998 (10.0)
November	Exported	3,541	2,268	875	3,316	10,000
	Returned	289	253	195	619	1,356 (13.6)
December	Exported	4,076	2,343	1,319	2,262	10,000
	Returned	280	246	106	370	1,002 (10.02)
Total	Exported	43,958	28,432	11,383	26,188	109,961
	Returned	12,518	4,756	1,627	3,955	22,856
	Percent (Return/Total)	28.48	16.73	14.29	15.10	20.78

Source: The Company export data

Data in Table 3.1 shows that more than 20 percent of the orders had been returned to the Company in the year 2009. One of the main reasons for returning the product was the low product quality.

Moreover, bangles had the highest return rate compared with other products. The evidence also illustrated that approximately 28 percent of bangles had been returned in 2009. However, the main problem of bangles was the hinges or springs. This is a link that welds a part of the bangle together and which is very sensitive and can be easily broken.

The second majority was earrings. About 16.73 percent of products were rejected. Pins were the major problem because they were made from small and soft silvers which weld with the earring. These pins broke easily.

The third majority of returned products were rings. The average return rate of this product was 15.1 percent in 2009. The highest return rate 25.7 percent was in July. The critical issue of the return was the wrong sizes, incorrect colors and grimy stones. The final product is necklace. The percentage of return was about 14 percent. Most of the defects occurred from a hook.

All returned items will be repaired and kept in the stock. The company will then send the new products instead of the repaired items to the customer immediately. Beside, customers will charge the company for the penalty or chargeback of disqualified items. The chargeback description can be seen in Table 3.1

Table 3.2: The Type of Chargeback from the Customers

Item	Information	Charge per piece [US\$]
1	Wrong color / stone / size / style or the quality not pass	100
2	Wrong description on product label	100
3	The product does not match with the style in the document	500
4	Wrong description on box label e.g. Store No. and other information	700/box
5	Wrong purchase order number or without purchase order number or misplace label	1000/box

The chargeback can be categorized into 5 main areas. Firstly, the company will be charged 100 US dollar per piece for the case of the wrong size, color, stone and quality of the product. This issue is the major problem that the company has been facing recently. According to the company chargeback record in 2009, it has been found that the company has been charged about 10 percent for this problem every month. Secondly, wrong description on the product label will as well cost 100 US dollar per piece. Thirdly, the company will be charged 500 US dollar per piece when the product does not match with the style in the document enclosed. The fourth and fifth issues are about wrong information of the store number, address, and purchase order (**PO**) number that can cause the shipment to the wrong time and place. The company will be charged 700 US dollar per box for wrong label description and 1000 US dollar per box for wrong PO number.

In 2009, it has been further found that the company has been facing quality standard of product which crucially causes financial loses. From the corporate data, the company has been paid chargeback fee every month which can be seen in the Table 3.3 below.

Table 3.3: The Chargeback Cost for Return Items in 2009

Defect	Chargeback Cost in US\$ (Month 2009)												Total	%
	1	2	3	4	5	6	7	8	9	10	11	12		
Wrong color, stone, size, style, or quality not pass	1200	1100	940	1500	1100	2400	8700	6500	4900	3800	3000	4500	39,640	46.30
Wrong description on product label	1300	-	-	2400	-	5600	-	1500	2700	3000	-	-	16,500	19.30
The product not match with the style in the document	-	-	-	-	-	-	1200	-	8000	2100	-	-	11,300	13.20
Wrong description on box label e.g. store no.	-	3500	-	-	-	-	-	-	2800	-	-	-	6,300	7.40
Wrong PO No. or without PO No. or misplace label	3500	3500	-	-	4900	-	-	-	-	-	-	-	11,900	13.90
Total	6,000	8,100	940	3,900	6,000	8,000	9,900	8,000	18,400	8,900	3,000	4,500	85,640	100

During the year 2009, the evidence from table 3.3 demonstrated that the company significantly suffered by paying large amounts of penalty costs due to low quality standard of products at the time of high orders from customers.

3.2 Work Process Mapping and problem identification

The work process mapping intends to identify the work process from the initial process; customer order until the end of the process; delivery goods to the customers. Process mapping is an important step as it helps the researcher to understand and identify each step of the work operation.

The work process mapping may consist of main activities, accountabilities and time duration. The outcome of the work process mapping is the work operation flow with time duration and main person responsible. This result is then used as an input to evaluate problems and processes, once the work processes are mapped. The further investigation of each process then occurs in order to identify aspects that may affect quality of the product.

3.3 Data Collection

Since qualitative data are required in this research, there are 4 methods utilized to collect data; (1) group participation, (2) site observation, (3) in-depth interviewing and (4) document review (Marshall & Rossman, 1995). However, in this research document review and interviews are the most appropriate tools for gathering data. Document review is used to collect a number of essential data such as a number of exported and returned items while interview is utilized in order to examine operation processes and workforce problems.

3.3.1 Document Review

A number of documents from the company are required to use as supportive evidences. The data from these sources are employed as background for the discussion and interpretation of the research findings. The documents required in order to fulfill the research questions include: (1) organization structure, (2) the company policies and procedures (3) work flow, (4) exported data, (5) internal audit (optional), (6) strategy plan and (7) employee training programs.

3.3.2 Interview

Interview is a technique that helps researchers to collect in depth data (Bryman & Bell, 2003). The interviews were conducted with three heads of departments which are Production department, Shipping department and QC department. The interviews were conducted on 20th and 21st August 2010. Each interview took approximately 20 minutes. The interviewees were asked to describe their main responsibility, main processes, existing problems and solutions.

3.4 Data Analysis

Data analysis is a practice in which raw data is structured and organized with the intention that important data can be extracted from it. Data analysis is the critical process of qualitative research. The data needs to be ordered and structured. General

statements about correlation between themes of data are required in qualitative data analysis (Mile & Huberman, 1994).

At this point of the research, all of the collected data are converted to a form of text. In addition, the document review and data from interviews are used to identify incidents related to quality of products. The descriptive analysis and excel spreadsheet are then applied as a main tool to analyze and demonstrate the data.

3.5 QCC design

Once the problems in operational processes have been defined, QCC model that has been motioned in the chapter two is employed in order to solve product quality problems. The QCC process is implemented in each problem of the business operation process. The roadmap of QCC implementation plan is as well developed in order to be used as a guideline for implementation.

3.6 Possible improvement after application of the QCC model.

There are two main expectations of QCC implementation. Firstly, the author intends to employ QCC model in the Jewelry Company in order to improve quality of the product by reducing the number of default products. Since the company document demonstrated that about 20 percent of products have been returned because of product quality, the author then expects that after implementing the QCC model into the operation process the number of default products will decrease significantly. Another possible improvement is to reduce chargeback cost of the returned items.

3.7 Summary

This chapter gives an explanation of the methods and techniques employed in the research. With the aims of the research which are to identify the root causes of low quality products and find the solution to resolve these issues, the qualitative approach is primarily applied as the main strategy to collect data. There are several methods

that can be used to collect data for qualitative research. However, interviews and document reviews seem to be the most suitable methods for gathering data for this research. The data collected from the interviews and document reviews are then analyzed and interpreted into text.



CHAPTER IV

PRESENTATION AND CRITICAL DISCUSSION OF RESULTS

The purpose of this research is to improve the product quality in the Silver Jewelry Company. Document reviews and interviews were employed as the main strategies to collect data. This chapter consists of five sections which are: 1) operational work process of Silver Jewelry Company and process mapping; 2) problem identifying; 3) Application of the QCC model, 4) pilot test of QCC model and 5) summary.

4.1 Operational Work Processes and Process Mapping of Silver Jewelry Company

The Silver Jewelry Company divides its work into four departments; Marketing, Production, Quality control and Shipping. The working process begins at marketing department when the customer's order is received. The particular order is transmitted to the production department. Then, product specifications especially in the stone types and sizes are made. The specified raw materials i.e. stones and silver are ordered from one supplier. The Company, normally, receives raw materials within one week. Then all materials are sent to Supplier A to produce. All production process i.e. mounting, setting, and polishing are performed by Supplier A. The lead time to complete this process is approximately 4 weeks. After receiving the semi-finish products from Supplier A, Quality Control Department checks the quality of the products and sends them to Supplier B for the plating process.

The lead time for Supplier B to finish the plating task is approximately 1 day. However, in case that so many orders are placed, the total lead time may be extend to 2-3 days. After finishing this process, Supplier B returns the products to the Company to continue the last process that is "enamel color" which is done by Supplier C. Lead time for this process is similar to that of the plating process by Supplier B. One day is normally required. For a larger order size in 2-3 days are required.

After receiving finish products from Supplier C, the Quality Control Department checks the quality of the entire item and sends the products to the Shipping Department for labeling, packing, and shipping. For minor wrecking items i.e. the stones are missing, those items will be sent back and then repaired by the production department. However, for the major defect items, such as the product is scratched or spring and hinge are broken, the product will be send back to the suppliers who then repair it. This causes the company to delay another day or more. Table 4.1 demonstrates the main operation tasks, responsible departments, required employees and lead time.

Table 4.1: Operation Work Processes

Task	Responsible areas	Number of employee	Lead time
Receiving customer's order	Marketing Department	1	1 week
Ordering the raw materials (silver and stone)	Production Department	4	
Mounting	Supplier A	N/A	4 weeks
Setting	Supplier A	N/A	
Polishing	Supplier A	N/A	
Quality Checking Sending to supplier B	Quality control Department	1	2-4 hours
Plating	Supplier B	N/A	1 day
Quality Checking Sending to supplier C	Quality controller	1	2-4 hours
Enameling the color	Supplier C	N/A	1 days
Quality checking	Quality controller	1	2-4 hours
Repairing (if any)	Production Department (minor repair) Supplier (major repair)	4	Less than 1 day
Final quality checking	Quality Controller	1	2-4 hours
Labeling	Shipping Department	2	3 days
Packing	Shipping Department	2	1 week
Shipping	Shipping Department	2	
Product delivering	Courier logistics supplier	2	4 days

4.3 Problem Identifying and Analysis

In order to identify the quality problem in the company, document reviews and face to face interviews are performed. It is found from the document reviews that approximately 20 percent of the products have been returned in the year 2009. The main reasons for returns were low product quality i.e. wrecking and misspecification. The chargeback cost that the company paid was approximately 85,640 US dollars. The major cost is for wrong color/ stone/ size/ style, wrong description on the product label, wrong purchase order number or without purchase order number or misplace a label, the product does not match with the style in the document and wrong description on the box label respectively.

In addition, the results from the interview with the head of quality control, production and shipping also indicated the similar product quality problems from document reviews. The interviewees were asked to describe the main quality problem in the company. The examples below are the result from the interview.

Manager#1: *The main quality problem of this company is the wrong specification of product. In the production process, we use outsourcing therefore is hard to have control over the quality and standard. The Quality Control Department is supposed to take responsible for checking the product before sending and after receiving the product from the third part party. However, they do not do their work properly. The ending result is the increased number of returned products and cost of charge backs.*

Manager#2: *The wrong description, labels and documents are the main problem of my department. The reason for this problem is that there are time constrains. The prepared product for shipping is the final operation process. We should spend at least 4 days for checking and preparing documents before shipping the product to the customer. However, the final quality check point always finds products with lower quality. These products then need to be resent to the production department for repairing which usually take another 1 or 2 days of our there in the department. As the result, when the products return to our department, there is no time to check the label and document.*

The interviewees were further requested to identify the cause and position of quality problems in the operation processes. Below is the example of the answer from interview.

Manager#3: *I believe that the causes of wrong specification of the product such as wrong color/ size/ style are from various processes in the operation. For example the cause may be from: 1) the production department when they order the raw materials or when they receive the raw materials, 2) the quality control department when they receive or send the products to suppliers or 3) the process of final finished goods checking.*

Therefore, after the review of data from document reviews and face to face interviews. It can be concluded that the main existing product quality problems of Silver Jewelry Company are: 1) Wrong color / stone / size / style, 2) wrong description on the box label e.g. Store No. and other data, 3) the product does not match with the style in the document, 4) wrong description on the product label and 5) wrong Purchase Order number or without Purchase Order number or misplaced label. Each possible causes of each quality problem are mentioned in the following paragraph.

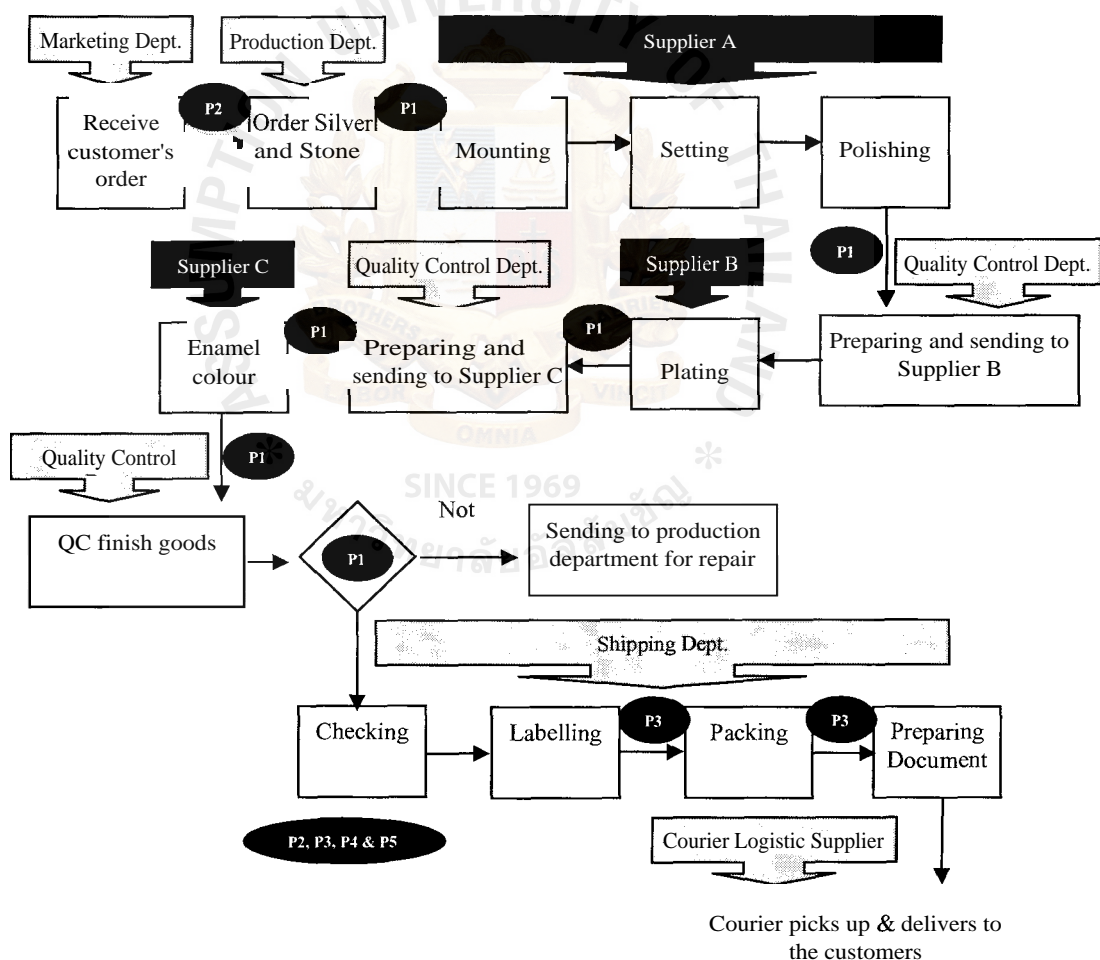
For the product specification standard such as color, stone, size or style of product, the quality control and production department are mainly accountable. It can be concluded that there are three main prospects of this problem. Firstly, there was no double proof of order details when purchasing raw materials. Secondly, quality controller does not verify the product properly before passing it to supplier or receiving it from suppliers. Thirdly, the final check is done improperly or without rechecking.

In terms of wrong description on the box label such as customer details and information, the potential causes are that there is no reconfirmation of customer details such as address, contact person, store number and order specification.

For the other problems which are: 1) the product does not match with the style in the document, 2) wrong description on product label and 3) wrong purchase order number or without Purchase Order number or misplaced label, the possible causes is that shipping department who is the mainly responsible for labeling and packing the product may not recheck the information before shipping out the product.

Moreover, the figure 4.2 below identifies the main quality problem in the work operation processes.

Figure 4.2: Existing Problem in Work Operation Processes



- Remarks:
- P1** refers to wrong color / stone / size / style
 - P2** refers to wrong description on box, store No. and other information
 - P3** refers to the product not match with the style in the document
 - P4** refers to wrong description on product label

refers to wrong Purchase Order number or without Purchase Order number or misplace label.

Figure 4.2 shows the main quality problems in the operation work processes. The main quality problem can be categorized into: 1) wrong color/ stone/ size/ style, 2) wrong description on box, store No. and other information, 3) the product not match with the style in the document, 4) wrong description on product label and 5) wrong Purchase Order number or without Purchase Order number or misplaced label. After analysis and data collected from both document reviews and interview, it can be assumed that the wrong color/ style and size may occur in the process of ordering material, checking the product before sending out the suppliers, checking the products when received from the supplier and checking the finish goods. The second quality problem which is wrong description on box, store No. and other information is presumed to occur when taking the customer details at the beginning of process or while checking the process in the shipping department. While checking processes in the shipping department, there are other three quality problems that may arise in this process which are: 1) the product not matches with the style in the document, 2) wrong description on product label and 3) wrong purchase order number or without purchase order number or misplaced label. Moreover, the quality problem in terms of the product not matches with the style in the document. It can be assumed that this happen in the processes of labeling and packing in the shipping department.

4.4 QCC Implementation

Based on the results from investigation, there are a number of quality problem in the operation processes. As the result, QCC model is applied in order to solve those problems. The QCC model is principally employed throughout the operational processes. The QCC implementation report can be seen in the following section.

Table 4.2: The 13 Steps of QCC Implementation Report

Main Task	Details of the Task	Main Accountability
1. Require commitment on QCC projects	The top management shows the commitment in QCC project. For example, formulate and communicate QCC policy	Management team
2. Identify quality problems	The main problem was identified as mentioned earlier.	Quality control Department
3. Define board of committee for QCC project	The management sets up board of committee in order to monitor the project	Management team
4. Define core team	The board of committee then establishes the QCC core team. This team is the main responsible to manage and control the project.	The board of committee
5. Identify pilot test area	The core team identifies the pilot test area.	Core team
6. Initiate QCC training	The initial training is provided for core team.	Core team
7. QCC training for management	The second training is provided for management team.	Management team
8. QCC training for general staff	The third section is offered for general staff.	General staff
9. Develop initial PDCA cycle	The initial PDCA cycle is applied in the pilot test area	Core team and department
10. Expand PDCA cycle	The PDCA cycle is expanded to the second area	Core team and department
11. Apply PDCA cycle to all operation	The PDCA cycle is applied to all business operation	All
12. Ensure success of solution	Core team investigates and monitors the success of solution.	Core team
13. Link reward and incentive system with QCC project	The management should link reward and incentive system to QCC project in order to motivate staff	Management team

Source: Chalermjirarat (2001)

The process of QCC implementation plan chiefly involves 13 steps. The initial step is to seek for genuine commitment on QCC projects, mainly from the management team. Top management, in other words, needs to trust in the effectiveness of QCC as well as demonstrate their commitment towards the implementation of this project. Those managing people, for instance, communicate the plan clearly throughout the organization so as to develop policies for supporting the QCC implementation plan.

The second step identifies problems related to quality. Misspecification such as wrong color and size were identified as the organization main quality problem from the examination of the organization's work processes. Specifically, the quality control department should be the main accountability for this second task.

The management team, moreover, takes responsibility for the third step as its task is to define the board of committee for the QCC project. Since the management team is mainly accountable for managing and communicating most of activities in the organization, this task is suitable for this team. The board of committee is set up in order to monitor the success of the QCC implementation project. For this reason, members of the board could be those with high positions in the organization, for instance, head of each department. The fourth step, furthermore, is to define core teams. Boards of committees, at this essence, should establish core teams in order to manage and control the entire project. Members of the core team should be those who are directly involved with quality control or those who specialize in quality control such as staff in quality control departments.

After defining the board of committee as well as identifying core teams, the next step is to identify pilot test area. To achieve this step, core teams should be able to highlight a defective area that has the most negative effect on the organization's performance in order to launch pilot test of the QCC project. Core teams, once again, should be responsible for initiating QCC training programs which is the middle step of the QCC implementation plan. The organization may employ QCC experts for training staff involved with the project or core team's staff, in other words. The objectives of this training program should achieve the following purposes; what is

QCC? What is the purpose of QCC? How to achieve quality? How to track and monitor QCC implementation? and How to measure the success of QCC?

The seventh and eight steps of QCC implementation plan both involves the QCC training program by focusing on training for management and general staff, respectively. For the management teams, the key to this training is to acknowledge and depict an overview as well as to predict the expected outcomes of the QCC project to the management teams. This is to give the management teams an idea of QCC project so as to recognize results. For the general staff, on the other hand, the aim of training course is to help them understand and get familiar with the concept of QCC. The training course, in other words, should help every staff in the organization to be ready for future implementation of QCC in other departments.

A further step focuses on the development of PDCA cycle. At this stage, PCDA is initiated and implemented in the pilot test area and, thus, those who work in the selected departments and core teams of the QCC project should be responsible for this task. Importantly, the outcome of the implementation of PDCA cycle needs to be critically examined and analyzed in order to decide whether this tool should be expanded to other departments or it should be reconsidered due to the unexpected outcome. If the execution of PDCA cycle is able to yield positive result for the organization, then the tenth step is to implement this tool to the second area or department in the organization. Similarly, the core teams and staff working in the second department will be responsible for this implementation.

Furthermore, if the second area of PDCA implementation has succeeded, the organization should adopt this tool in the entire business operation in order to create quality culture as the eleventh step of QCC implementation plan. Everyone in the organization should be responsible for this event. The twelfth step, moreover, to ensure the success of QCC implementation in every department. To succeed in this activity, the core team needs to investigate and monitor the success of the QCC implementation in the whole business operation in order to recognize errors and to resolve problems instantly. The final step of the QCC implementation project is to

introduce rewards and incentive schemes for everyone in the organization. Management teams may provide recognition scheme or bonuses to a particular department that can enhance performance after implementing the project in order to motivate other departments to show true commitment toward the implementation of the project as well as encourage long-term success.

Moreover, there is some operation cost of the QCC project. The operation cost occurs from: (1) the QCC training and (2) recognition scheme. The initial QCC training is managed by the external trainer which cost the company 50,000 baht or 1450 US dollars. The second and third training was conducted by internal trainer. The company also develops the recognition scheme which rewards the best department who can reduce defects in products. The reward is set up at 10,000 baht or 250 US dollars quarterly.

4.5 Results of the QCC Implementation

In order to ensure the effectiveness of the QCC model, a pilot project of the QCC model was developed at Silver Jewelry Company in July 2010. The production and shipping departments are selected as the pilot areas. The results of implementation are positive for the company. The positive impacts are better in cooperation of the employees in the company and a decrease in the number of defects products. In addition, in order to verify the positive consequences gained from the QCC plan, number of sales and returned data of August and September 2010 are gathered and compared with the sales and return data of the previous period. Table 4.3 below shows the total sales and returned products in 2009 to 2010.

Table 4.3: Total Sales and Returned Product in 2009-2010

Product type	Before Implementation QCC Program				Implementing QCC		After Implementing QCC					
	2009		January-June 2010		July 2010		August 2010		September 2010		October 2010	
	Sales	Returned	Sales	Returned	Sales	Returned	Sales	Returned	Sales	Returned	Sales	Returned
MBG¹	3,258	889	3,125	627	3,011	723	4,216	859	5,877	175	6,897	514
MER²	2,264	322	2,005	546	1,895	295	873	121	2,392	79	3,191	68
MNC³	816	89	1,150	289	956	198	303	67	1,908	233	916	49
MRG⁴	2,075	299	1373	498	1,190	257	2,158	271	2,550	535	1,456	67
Total (Pcs)	8,413	1,599	7,653	1,960	7,052	1473	7,550	1,318	12,727	1,022	12,460	698
Return	19 %		25.6%		20.89%		17.46 %		8.03 %		5.6%	

Remarks: * Average/month

Table 4.3 indicates the results of the pilot project in the first two months of implementation which upshot in the positive way. In the year 2009, it is revealed that the number of sales products were 8,413 while the returned products were 1,599. In other words, there were approximately 19 percent of returned products. Besides, at the first two quarter of 2010, it was found that the number of defected products increased to 25.6 percent and in July which is the month of QCC implementation the number of returned products were decreased to 20.89 percent.

Furthermore, in the first month after QCC implementation, it is found that the number of returned products decreased significantly. In August 2010 which is the first month after implementing QCC plan, the number of returned products dropped to 3.43 percent compared to previous months. Interestingly, in September 2010, the number of returned products sharply reduced to 8.03 percent or 9.43 percent when compared to the previous months. Interestingly, the numbers of returned products were reduced to 5.6 percent in the third month of implementation.

Besides, the comparisons of cost spent for the QCC pilot projects and expected charge backs is compared in order to demonstrate the success of the program. The comparison results can be seen in Table 4.4 given below.

Table 4.4: The Comparisons of Cost Spent for the QCC Pilot project and Expected Saving

The First two month after QCC implementation			
Estimated chargeback cost August-September 2010 (THB)	Operation cost (THB)	Actual chargeback cost August-September 2010	Saving (THB)
		(THB)	
542,390	70,000	128,000	344,390

Remarks: **Estimated chargeback cost on August-September 2010** is estimated base on average chargeback of previous year

In order to see the effectiveness of QCC pilot project, the comparison between cost spent for the project and expected savings are compared. According to the company document, the average chargeback cost per month is about 271,195 baht. For this reason, the estimated chargeback cost from August to September 2010 is approximately 542,390 baht. Besides, the operation cost of QCC implementation done by the external training and recognition scheme is 70,000 baht. Moreover, the actual chargeback cost of these two months is 128,000 baht. Therefore, the expected saving for this pilot project is 344,390 baht and can be concluded that this project is successfully implemented.

4.6 Summary

Data collected from document reviews and face to face interviews are used to develop work operation processes as well as identify the main quality problems at the Silver Jewelry Company. The main quality problem of the company are: (1) wrong color / stone / size / style, (2) wrong description on box label e.g. Store No. and other information, (3) the product does not match with the style in the document, (4) wrong description on product labels and (5) wrong Purchase Order number or without Purchase Order number or misplaced label. Each problem then identified in to the work operation processes. The QCC implementation plan was developed in order to solve the problems. The pilot area is selected and implemented in order to ensure the reliability and effectiveness of QCC model. The results were positive. In the first two months of the implementation, the number of defected products decreased by 20.98 percent in the month of July 2010 and to 8.03 percent and in September 2010.

CHAPTER V

SUMMARY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The final chapter includes the conclusion and discussion of this study. It consists of three main parts. The first section concludes and discusses the data findings for this research. Secondly, the implications for this research are further discussed. The final section mentions the recommendation for future research.

5.1 Conclusions

The Silver Jewelry Company has a waste of more than US\$ 85,000 for defected products in 2009. The research aims to identify the main quality problems in the company as well as to implement the QCC model in order to solve the problems and implement the QCC pilot project.

The finding indicates that there are five main quality problems in the company. First, the product specification is erroneous for instance color, stone, size and style. Second, the description on the box such as store number, contact detail and product serial number is incorrect. Third, the product details in the document does not match with the product. Fourth, the description on the product label is wrong. Fifth, the purchase order number is missing or misplaced. It can be concluded that the quality problems mainly occur in the quality control department, shipping department and production department. To solve the problem, the QCC implementation plan was suggested. The 13 steps of QCC implantation which includes the main activities, the details of each task and the main person responsible / department were utilized in order to solve and enhance the product quality in the company. These 13 steps include; 1) building up commitment on QCC projects from the management team, 2) identifying quality problem in the operation processes, 3) defining board of committee for QCC project, 4) defining core team who are the main responsible for the QCC project, 5) identifying pilot test area, 6) initiating QCC training program for core team, 7) developing QCC training for management, 8) developing QCC training for general staff, 9) developing initial PDCA cycle for the pilot area, 10) expanding PDCA cycle

to the second area, 11) applying PDCA cycle to all operational processes, 12) ensuring success of solution by measuring the results and 13) linking rewards and incentives system with the QCC project.

The QCC pilot project was implemented in the production and shipping department in order to see the improvement. After implementing the QCC project, satisfactory results were illustrated. The product returned was reduced from 25.6 percent to 17.46 percent in the first month after implementation and 9.43 percent in the second month. This indicates the effectiveness and efficiency of the program. Apart from the decreasing number of returned products, there are other benefits that company gained from QCC implementation plan. The first positive impact is the cooperation among the employee for implementing QCC projects. Since the reward and incentive system is linked to the success of QCC project, employees are eager to participate in the project.

5.2 Implications of this Research

The implication of this study can be concluded into three issues. It is mainly for Silver Jewelry Company as well as other companies that have similar work process with this company since the QCC implementation plan is drawn up from Silver Jewelry Company's work processes. However, other researches or those who are interested in the concept of QCC may find the implication of this research useful. Firstly, since the outcome of this study demonstrated that QCC can effectively help increase the performance of production in the shipping department of the company. The company should expand the implementation of QCC in other departments or the whole departments in order to maximize the company's performance as well as create quality culture.

Secondly, the interview with leaders of three departments in the company (QC control, production line and shipping department) revealed that the quality problem mainly occurred from inadequate lead time. In other words, those leaders admitted that they do not have enough time to recheck each work process properly. For this

reason, the company should reconsider lead time or assign more staff to assist leaders. Finally, other companies who aim to implement QCC model can adopt the methodology of QCC implementation developed in this research as a guideline for mapping their work operations as well as identifying quality problems.

5.3 Recommendations for Future Research

After the process of conducting this research, the researcher then suggests interesting areas of study which should be valuable for further investigation. The suggestion is classified into five areas. Firstly, future research may identify factors affecting success or failure of QCC implementation, for example, whether culture can influence the success of QCC adoption. Secondly, since this research revealed that reward and recognition schemes are essential for achieving QCC implementation, further study may attempt to discover the most appropriate and effective motivating scheme so as to investigate whether this scheme can truly encourage long-term success.

Thirdly, the attempt to compare the effectiveness of QCC model with other tools of TQM such as control charts or cause and effect fishbone should be valuable for further research. In other words, future research may implement other tools of TQM to solve the same quality problem to find out the most effective tool for solving this specific problem. Fourthly, future study can adopt the process of QCC implementation developed in this study with other companies with a more complex work structure. Since the focused company of this study only operates with 10 staff and most of its work is done by outsourcing, future research may focus on the company with more staff which operates with its internal production line because QCC is mainly developed for resolving the problem from production department. The final recommendation concentrates on the implementation of QCC in other industries. The aim is to enlighten whether QCC can genuinely offer benefits to other industries apart from the jewelry industry.

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APPENDICES



APPENDIX A

Organization Structure

Silver Jewelry Co., Ltd.

