



PERCEIVE CRITICAL SUCCESS FACTORS OF TQM IMPLEMENTATION: A
CASE STUDY OF THE CANADIAN SOLAR MANUFACTURING (THAILAND)
CO., LTD.

WU XIAOCHUAN

AN INDEPENDENT STUDY SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE MASTER DEGREE OF BUSINESS
ADMINISTRATION (INTERNATIONAL PROGRAM)
IN BUSINESS ADMINISTRATION
GRADUATE SCHOOL OF COMMERCE
BURAPHA UNIVERSITY

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การรับรู้ปัจจัยความสำเร็จที่สำคัญของการใช้ TQM: กรณีศึกษา บริษัท แคนาเดียนโซลาร์
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The Independent Study of Wu Xiaochuan has been approved by the examining committee to be partial fulfillment of the requirements for the Master Degree of Business Administration (International Program) in Business Administration of Burapha University

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Total quality management has gained widespread acceptance and has been successfully adopted in a variety of modern businesses. Enterprises that apply complete quality management may maintain a competitive advantage in both local and international markets by producing high-quality products that suit the expectations of customers. How to implement total quality management quickly and effectively has become a key issue in all kinds of company.

Any enterprise manager needs to know what key factors and methods they must consider in order to successfully implement TQM in their company. Therefore, this independent research paper through the perception that CSI's implementation of TQM's methods and experience to get the key factors and methods to achieve the successful implementation of TQM for reference.

The study shows that there are eight factors influencing the success of TQM on CSI including Top management attention and leadership, establish an effective quality system, training and education, continuous improvement, teamwork, communication, customer focus, reward. This study suggests that for management who implement TQM in their organization should refer to the successful enterprise model and combine self-strategy and system to implement total quality management suitable for self-culture. Through investigating each TQM success factor and utilizing the findings of this study to create an optimization model to discover the element that has the least cost impact on TQM deployment. Pay attention to the factors that have the potential to help businesses grow and strengthen them with enough resources to help them create total quality management and get a competitive edge.

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CHAPTER 1

INTRODUCTION

Statements and significance of the problems

In the current global WTO environment, all countries are on the pace of integration with economic globalization. If an excellent enterprise wants to enter the international economic circle, the key is the products and services. Only when the products are of good quality and marketable, can it squeeze into the international market. It has become the goal of all companies to adhere to the principle of quality first and produce the most satisfactory products by the most economical method. The history of progress and nearly half-century of practical experience in industrialized countries have demonstrated that implementing complete quality management is an effective strategy to attain the above objectives.(Wang, 2018).

TQM (total quality management) is a long-term management method that has been demonstrated to work. To ensure long-term success, the organization prioritizes quality, which benefits all members of the organization and society by allowing all members to participate in addressing consumers' needs. Total quality management helps to establish a culture of self-confidence, dedication, cooperation, quality focus, enthusiasm for continuous improvement and continuous learning, and finally form a work culture, so that the company can achieve to success. (Shar'RI 2000).

Total quality management (TQM) is a widely recognized concept that has been effectively adopted in modern businesses. Customers' needs are met through creating high-quality items, enterprises implementing TQM can maintain a dominant position in local and international competition (Dale, 2003). To accomplish overall

quality management, the organization must acknowledge, adopt, and treat quality issues as fundamental. In fact, the benefits of implementing TQM are to reduce manufacturing costs, waste products and management costs. Management's visibility and support in developing a total quality environment are critical to total quality management's effectiveness. Take top management's commitment as the foundation for complete quality management. A home cannot stand without a sturdy foundation. Following the foundation, then employee training and authorization, quality measurement and benchmarking management, process management, and customer participation and satisfaction should all get more attention. As a result, TQM is highly suited to the execution of organizational transactions, particularly in manufacturing. Under this premise, how to swiftly and efficiently apply TQM has become a major concern in all walks of life.

Anyway, the TQM concept is a proven system approach for improving the organization's overall business processes. Any enterprise manager needs to know what key factors and methods they must consider in order to successfully implement TQM in their company. Therefore, this paper will analyze the successful enterprise experience and obtain the key factors and methods to achieve the successful implementation of TQM for reference.

The Canadian Solar Manufacturing (Thailand) Co., Ltd (CSI) is a completely owned subsidiary of Canadian Solar Inc. (NASDAQ: CSIQ), a worldwide energy company created in 2001 in Canada with successful commercial subsidiaries on six continents. In the last 18 years, Canadian Solar has exported more than 20 GW of solar modules to over 100 nations and has a global project pipeline of solar plant 9.8 GW. On November 20, 2015, invested 600 million dollars and incorporated a

company in Rojana Industrial Park Thailand as the Canadian solar manufacturing (Thailand) Co, Ltd, the company construction was divided into three phases, covering 287,788 m². It promotes the development of Thailand's foreign trade and helps to reduce Thailand's trade deficit. It also has created 3,500 high-tech jobs for the local community.

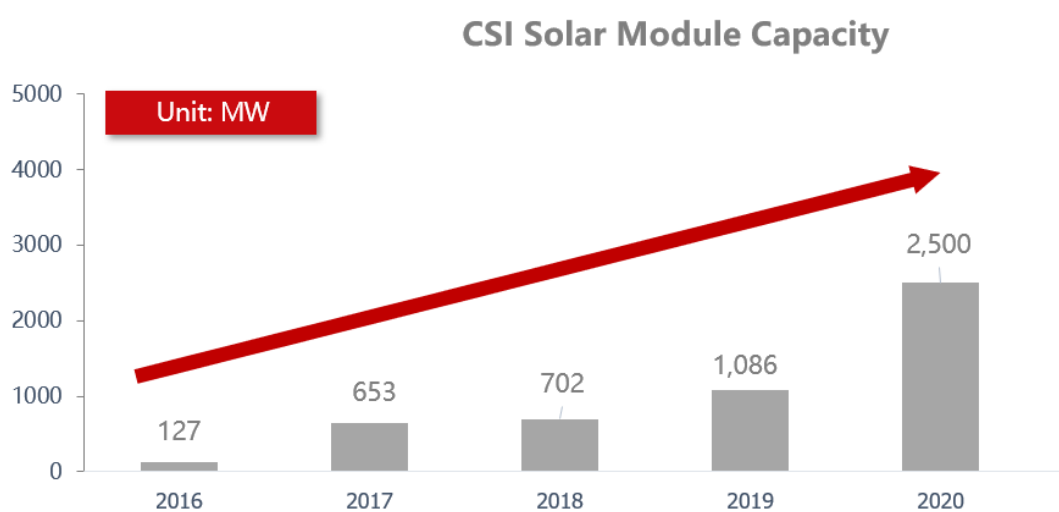
CSI attaches great importance to the quality of products. From the beginning of the company's establishment, it started to implement total quality management, requires all employees to commit to continual improvement in order to meet consumer needs. The start of TQM implementation plan is to improve the internal TQM of the company through the training of executive management personnel and the establishment of TQM system. In addition, in order to effectively implement total quality management, the company's headquarters arranges a large number of consultants and quality technicians with rich quality experience to provide technical assistance and consultation answers for the company's strategic and quality tool training and quality system construction.

Thailand CSI Company received full accreditation for ISO 9001:2015 quality management system at 2016, then the organization thereafter gained consumer and market recognition as a result of its strong quality management performance, and its solar module capacity continued to expand, from 127 MW to 2500 MW from 2016 to 2020.

Figure 1 International quality certificates of CSI

Quality, Environment Health & Safety Certifications	Product Testing Certifications	Product Highlights Certifications
<ul style="list-style-type: none"> • ISO 9001:2015 (TUV) • ISO 14001 (TUV) • OHSAS 18001 (TUV) 	<ul style="list-style-type: none"> • IEC 61215 & IEC 61730:2005 • IEC 61215 & IEC 61730:2016 • UL 1703 & UL 790 & CEC • CE conformity, MCS (EN45011) • REACH Compliance 	<ul style="list-style-type: none"> • Salt Mist Certificate • Ammonia Certificate • Blowing Sand Certificate • PID Certificate • Water Resistant IP67 • Fire C1D2

Figure 2 Solar Module Capacity of CSI



CSI it is a good organization as described above. The company output capacity continues growth and its many achievements in quality management also.

There are many main factors for the performance of the company, such as:

Leadership, clear target, local business policy, high-quality product awareness and

full involvement of employees. All these factors will make TQM implementing effective.

This case will study and analyze the successful sources of TQM implementation, which make CSI to be a successful enterprise.

Objectives

1. To analyze the factors of success of TQM implementation in CSI
2. Create a total quality management implementation model to serve as a guide for implementing total quality management effectively.
3. Popularize the application of total quality management and improve the efficiency and competitiveness of enterprises

Contribution to knowledge

The advantages this independent study predicts are:

1. Organizations that implement TQM can use the proposed model as a guideline to implement it.
2. Management of implementing organizations should concentrate on key success indicators and prepare and distribute the resources effectively.
3. As a study case, the general readers can apply in their organizations for effective implementation of TQM.

Conceptual framework

This research aims to examine CSI's performance in implementing TQM. Since its introduction to TQM, CSI has been paying attention to many factors. This research would concentrate on evaluating the TQM implementation factors that establish the TQM approach's success in CSI and become the main source of success for CSI.

The conceptual framework of this study is shown in Figure 3. It is divided into two parts: Perceived TQM implementation factors and TQM performance of CSI.

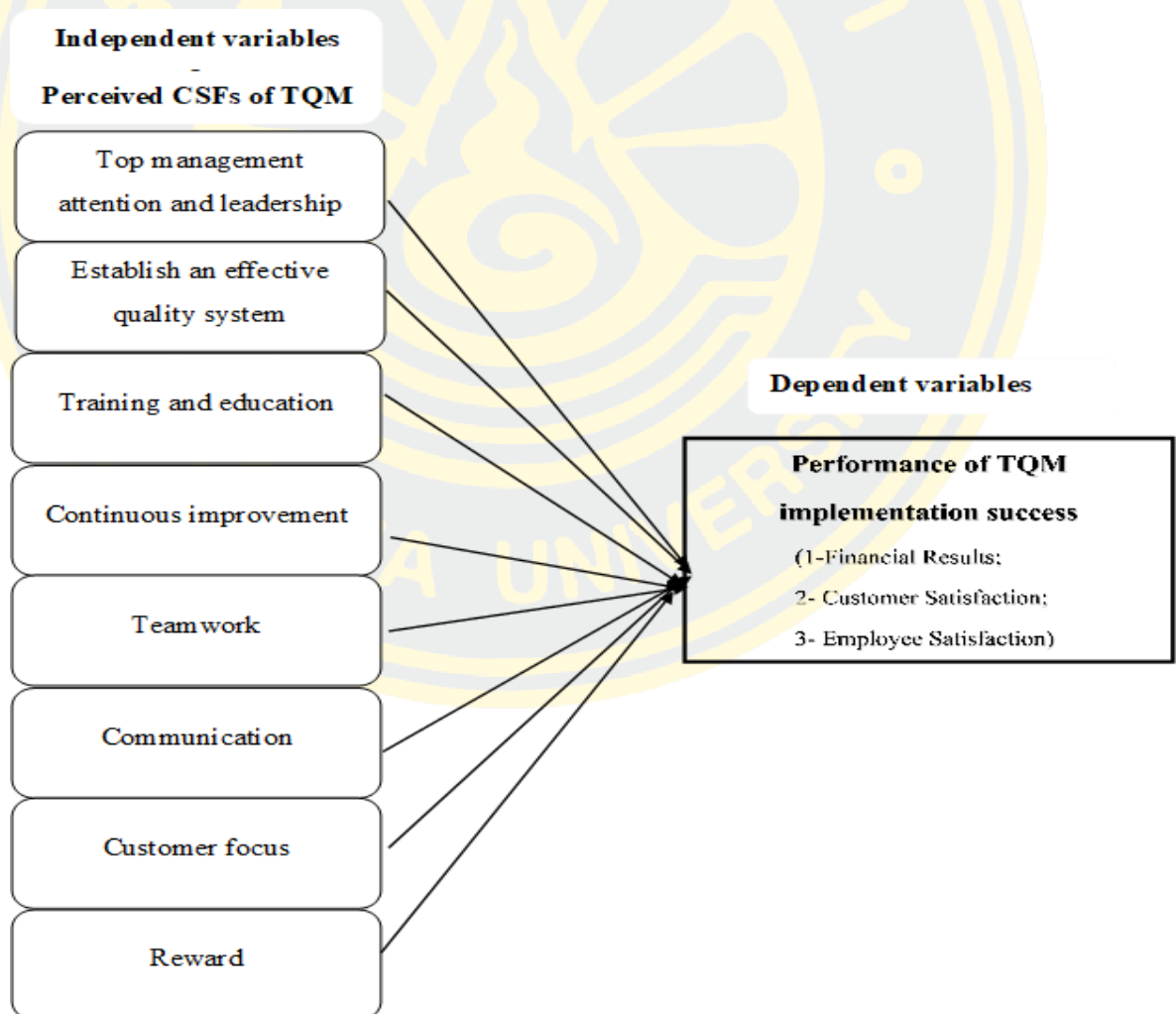


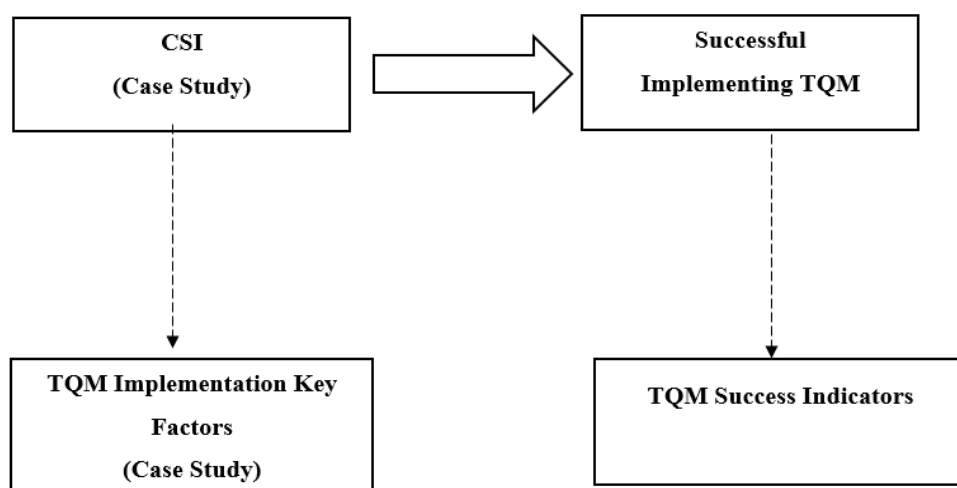
Figure 3 Conceptual Framework of the study

Scope of the study

This projects on total quality management (TQM) implementation success factors from CSI.

1. Scope of content: Independent variables consisted of Perceived Success factors of TQM implementation on CSI. Dependent variable consisted of Performance evaluation factors of TQM implementation on CSI.
2. Scope of population: The Population of this study is employees are working on Canadian solar company at Bowin Sriracha Thailand
3. Scope of location: The research collected data in Bowin Sriracha Thailand
4. Scope of time: The study was conducted in Apr - Jul 2021.

Figure 4 Scope of the study



Definition of terms

CSI means the Canadian solar manufacturing (Thailand) Co., Ltd.

CSF means the stands for Critical Success Factor.

Quality In manufacturing, quality refers to the product's applicability or the degree to which it can successfully meet the user's needs in usage.

TQM is an acronym meaning "total quality management."



CHAPTER 2

LITERATURE REVIEWS

The development and rise of TQM

From the literature review, the development of quality management has roughly experienced three stages as follows:

Stage 1: quality inspection (before 1940s)

Stage 2: quality control (1940s-1950s)

Stage 3: total quality management stage (from 1960s to now)

Total quality management was born in the United States in the 1960s. It is mainly applied to quality control in the process through mathematical statistical methods such as quantitative quality management. Due to its obvious advantages, total quality management is gradually accepted and vigorously developed by the public all over the world, and has become the main tool for modern enterprise management to enhance market competitive advantage. Total quality is the quality of the whole process, it is not limited to the quality of products and services provided in the process, but also covers the all-round quality management of other departments of the organization (such as procurement, design, warehousing, sales and after-sales). The quality of products or services is guaranteed by work quality. (Song, 2012).

Quality management needs to form a kind of consciousness. Good quality does not depend on inspection, but is designed and manufactured. Inspection data can only be used as objective data. The implementation of total quality management needs to cover full participation. Everything is based on PDCA mode as the core, so as to

continuously meet the needs of customers, improve customer satisfaction, treat customers as God, and continuously improve enterprise benefits.

The PDCA method was developed in the 1920s. At the time, Walter A. Shewhart, a well-known statistician considered as "the father of statistical quality control," established the "Plan-Do-See" idea. After that Edward S. Deming further developed Walter A. Shewhart's PDS cycle into "Plan -Do-Check-Act " (Wang.R, 2013).

The four stages are as follows:

1. The planning stages (P) job is to set quality goals and build quality plans to achieve them. Quality objective plan and quality implementation plan are included in the plan. In the planning stage, there are four steps to follow: a. assesses the current situation and determines the problems that exist; b. determines the causes or influencing elements of the problems; c. determines the key factors of the difficulties; d. formulates measures and plans.

2. The plan implementation stage (D) is the most important stage in quality management. To guarantee that the plan is properly implemented, five aspects must be in place: personnel, organization, measures, supervision and incentives.

3. In the inspection stage (C), compare the results of implementation with the results of plan, evaluate the results and find out the problems.

4. Summary or processing stage (A) according to the results of the inspection stage, summarize the successful experience and the lessons of failure, and standardize them. Find out the reasons for the problems that have not been solved and put them into the next PDCA cycle to solve.

In addition, the action plan in the planning stage includes 5W2H, i.e., why to make the plan, what to achieve, when to implement it, who to implement it, where to implement it, how to implement it

At the same time, the seven steps of the specific implementation of the cycle are as follows:

- (1) Explore potential quality problems through current situation analysis
- (2) Check all relevant factors to find out the true cause of abnormal quality
- (3) Develop action plan for main reasons
- (4) Implementation plan
- (5) Check the actual implementation results
- (6) Summary of inspection results
- (7) Deal with remaining problems

The four stages of PDCA cycle are connected and executed in sequence. Every time a cycle is executed, a summary is made, new quality objectives are proposed, and new heights are constantly reached. In addition, the quality cycle is a process in which a large loop is sheathed with a small one and promoted continuously. The quality management activities of the whole enterprise can be regarded as a large PDCA cycle process, and each department or group also has a small PDCA cycle. The quality management of the enterprise drives the quality management of the Department and forms a virtuous circle process in which the big circle drives the small circle and the big circle guides the small circle. As shown in the figure 5.

Figure 5 PDCA



The concept of TQM

The core of total quality management implementation is a scientific method with quality at the center, full participation as the foundation, and long-term maintenance and promotion of customers' and interested parties' interests as the goal, with the goal of achieving all relevant organizational objectives through total quality management. (Song, 2012).

Feigenbaum, a well-known American specialist, coined the term "total quality management" in the early 1960s. Traditional quality is the foundation of whole quality management. Total quality management has evolved into a systematic management science as quality management consciousness, science, and technology have progressed.

In fact, the definition of quality is "meeting standards," not "being good." The process of achieving product and service requirements is referred to as a high-quality process. It will create poor quality and cause consumer unhappiness if it fails

to match the standards. Quality is not something that can be seen, but rather a process that can be improved to satisfy the standards. It encourages mutual understanding and benefit sharing between itself and customers and interested parties through a set of standard definitions, process input and output. The management involved here pertains to quality management in order to reach this goal.

The first step in quality management is to identify the needs of customer. Quality management begins with consumer demand, then expands that demand to each link in the process, ensuring that each link fulfills the standard standards through scientific management, and lastly output to the client. Our quality management degree is evaluated based on the level of client satisfaction.

"TQM is a wide collection of management and control processes meant to focus a complete business and all of its employees on providing products or services that perform the best possible job of pleasing the client," according to the TQM definition. (Talha, 2004).

Although each of the aforementioned definitions has its own distinct meaning, there are certain commonalities, such as total employee engagement (total), high-quality products and services to achieve customer satisfaction (quality), and an integrated system (Management).

In a nutshell, "total quality management" is a process-centered, complete management system in which all employees work together to create high-quality products and services that match consumers' needs.

Total quality management includes

First, quality design management

Quality is designed. Therefore, in total quality management, quality control is very important in all links of product design and the starting point of process quality control. Therefore, in all links of design, it is necessary to establish its quality objectives through market research and review, organize all departments to participate in and do a good job in the evaluation and response measures of various quality risks, and determine the product design scheme that meets the requirements of customers. All relevant standards shall be subject to written management and standardized supervision to ensure that the quality risk is minimized in the design management stage to meet the needs of customers.

The second step is to manage the process quality.

Process quality management is not only a necessary but also a vital link in total quality management. This stage is a crucial role in the production of product quality because it is the direct process of product processing. As a result, quality control is the most important component. Regular inspection in the process, coordinating the study of quality problems, counting quality trends, and regulating the quality process are the main methods of quality control. Establish a process quality production system and organize and encourage the consistent production of high-quality products and services.

Third, Supplementary process management

Supplementary process is meaning providing different kind of resources to keep the regular operation of the enterprise in the production process to meet the needs of customers, primarily manpower, materials, facilities and equipment, site, transportation, and storage, which is the driving force for the implementation of total quality management and the basic guarantee for the enterprise's operation. Material procurement management, for example, is a key aspect of quality management. First, ensure that material quality meets requirements by establishing tight inspection and acceptance procedures; second, ensure that material delivery is timely, ensuring that production will not be halted due to a material shortage; and third, ensure that material storage fulfills technical requirements. The shadow of quality management is inextricably linked to this set of operations. Total quality management encompasses all aspects of the business.

Fourth, employ process quality management to infiltrate effectively.

The essential point of overall quality management and the continuation of corporate quality management is process penetration. The purpose of quality management is to continuously enhance product and service quality while also ensuring that products and services match consumer needs. As a result, the content of process quality management should be reasonably penetrated into all levels of the enterprise in the actual management, and all employees should be continuously encouraged to participate in and carry out innovation, improve the quality of products and services, and remain invincible in the market competition.

So, in a nutshell, total quality management (TQM) refers to an organization that prioritizes quality and encourages complete participation. Its mission is to create long-term success in management by focusing on customer happiness as well as the needs of all members of the firm and society. (Song, 2012).

Six sigma concepts and theories

Six Sigma is the quality management method with the widest audience, the deepest influence, and the most obvious effect. Many people who have not contacted it should have heard the great reputation of Six Sigma. As one of the most successful quality management methods so far, although it has been born for more than 30 years, it still affects the current industrial management system(Chen, 2018).

In the 1970s, Japanese products began to enter the U.S. market for competition. Japanese automobile, electronic and other products constantly beat the U.S. domestic products with low price and excellent quality. Motorola's TV business was forced to be sold to Panasonic, Japan, but Panasonic made only modest adjustments to the bought Motorola TV business, reducing the defect rate in the manufacturing process from 15% to 4%. This discovery made Motorola invest a lot of resources to research, and finally found that in the manufacturing process, high quality and low cost are completely possible to exist at the same time, which is totally contrary to people's previous understanding. In 1981, Motorola engineers submitted to the president a mechanical document to reduce or eliminate defects, namely, 6 sigma (3.4 defects per million products). The company decided to implement the plan within six years and named it "Six Sigma scheme". At that time, Motorola's quality level was 4 sigma (6800 defects per million products). The goal was to increase product and

service quality by ten times in 1989, 100 times in 1991, and six times in 1992. At the same time, there are four other strategies: to shorten the production cycle, to link product design and manufacturing, to reform operating efficiency, and to fully involve employees in management.

Two years after the implementation of the Six Sigma strategy, Motorola has achieved remarkable results and won many quality awards. In 1994, the company achieved the goal of Six Sigma in many fields, saving manufacturing costs by \$2.4 billion. It is precisely because Motorola is exploring the pioneering work of Six Sigma that Motorola's name is always connected with six sigma.

Six Sigma uses the statistical method to solve the abnormal problem fundamentally. Sigma is a method for determining the quality of a product or service. When it reaches 6 Sigma, there will be 3.4 defects per million opportunities (PPM), 2 sigma quality level means 308537 defects per ppm, and 3 Sigma quality level means 66807 defects per ppm. It can be seen that the quality level of 6Sigma is more than 20000 times higher than that of 3sigma. Six Sigma is a symbol of high quality and near perfection.

The operation model of Six Sigma management method is DMAIC project improvement mode (Lv, 2014).

D: Definition. In the definition stage, should be find out who our customers are, what issues needs focus on, what customer needs are, and what is the process of investigation. The core tools are questionnaire method, histogram, hierarchical chart, bar chart, random sample and random sampling, AHP (Analytic Hierarchy Process) etc.

M: Measurement. The key work is to collect data, describe process, verify measurement, measure process capability, etc. Core tools include process flow chart, cause and effect chart, Pareto chart, scatter chart, failure mode analysis (FMEA), process capability index, customer satisfaction index, etc.

A: Analysis. In the analysis stage, it is necessary to sort out and analyze the data collected in the measurement stage, find out the factors that have special influence on the characteristics of the product in the analysis process, put forward the hypothesis and verify it. The core tools are brainstorming, histogram, multivariate graph, permutation graph, hypothesis test, etc.

I: Improvement. Mainly refers to the optimization of the results. The main tools are: quality function deployment, test design, etc.

C: Control. The main work is to formulate standards, clarify management responsibilities and implement monitoring. The main tools are control chart, process capability index, standard operation procedure and procedure document.

The relationship between TQM and quality management system

ISO9000 is a series of quality management standards, and the development of total quality management also.

Important achievements. Based on TQM, ISO9000 standard embodies TQM in many aspects and inherits the eight basic principles of TQM, which are customer focus, leadership, participation of all staff, process method, and introduction of system management, continuous improvement, and facts as the basis of decision-making and mutually beneficial supplier relationship. ISO9000 widely used reference TQM's Quality tools and used PDCA cycle method going to start work. In reality,

implementing the ISO9000 series is akin to implementing total quality management. They are complementary to one another. Both should be implemented with a robust internal structure and the ability to recognize quality elements. The systematic integration of the two will be the major development direction for modern enterprise management in the future. (Gotzamani, 2001).

ISO9000 and TQM have the same theoretical basis and use the same quality tools. The main differences between them are as follows:

1. ISO9000's full participation refers to the personnel related to the quality system, while TQM's full participation covers all personnel. ISO9000 is based on standards, while TQM pays more attention to the power of "people".

2. In the process-based control, ISO9000 pays more attention to the documentation of the system and the standardization of operation, TQM, on the other hand, places a greater emphasis on concept renewal and the implementation of innovative management processes and tools.

3. ISO9000 requires enterprises to have the ability to continuously provide products that meet customers' requirements. Passing the system certification is like getting a "quality assurance" certificate. TQM emphasizes to achieve and exceed customer satisfaction and maximize the quality benefits of the enterprise.

4. ISO9000 is a general standard and standardized requirement. It can be certified internationally, compared, and checked. TQM is a kind of scientific management theory and idea, and the operation method and technology of quality management.

5. ISO9000 is more specific and operable, while TQM is broader and more forward-looking.

Why do you want to conduct total quality management?

Total quality management is a science that follows a set of rules. Its own advantages are inseparable from the reasons why it is adored by many businesses all over the world and is constantly promoted and developed in depth. In general, organizations can profit from complete quality management in the following ways:

- (1) Make customers fully satisfied
- (2) Pursue corporate interests and success
- (3) Make internal fully satisfied
- (4) The cost of lowering quality
- (5) Shortening inventory turn times
- (6) Increasing productivity
- (7) Maximize profits continuous process improvement, supplier partnership and performance measures etc.

Perceived critical success factors of TQM implementation on CSI

Combined with the literature review of total quality management and the practical experience of CSI Company. The researcher perceived that critical success factors of TQM implementation on CSI mainly include the following aspects.

Top management attention and leadership

Top managers understand and are very important for the purpose of implementing TQM. The implementation of TQM needs resource conditions. Only when top managers attach importance to it can they ensure that they can get sufficient resource guarantee in the process of implementing TQM. Only when TQM implementers understand and attach importance to the purpose of TQM implementation, they can implement it. The implementation of TQM requires the participation of all staff, because the direct participation of management employees allows for swift decision-making and contributes to the TQM process. The support of senior management is necessary to prove the effectiveness of specific actions. According to (Besterfield, 2002) the skills of managers can significantly improve the level of staff. The management style emphasized by managers can provide incentives for employees. Within the organization, management is committed to promote cooperation rather than competition.

To explain the method of incorporating TQM into an organization, which suggested "Value Sweating Theory"(Kano, 1989) The concept is made up of two alternative approaches: crisis recognition and management make people sweat for value and vision, and leadership encourages people to sweat for performance. From both approaches, it is evident that TQM arises from leadership. So, the leadership may be the most significant aspect in TQM, and it can be found throughout the in anywhere of company. TQM leadership necessitates managers making inspiring strategic decisions that all subordinates can comprehend, as well as instilling values in the process of mentoring subordinates. To make TQM successful in the workplace, we must first comprehend it, trust it, and demonstrate our values and commitments to

subordinates through everyday TQM practice. Managers should ensure that TQM's strategy, philosophy, value, and objectives are fully applied in the business and that the organization has a centralized and clear direction. TQM can be recommended and supervised by top management, which is a significant feature.

Establish an effective quality system

All the resource structures needed by enterprises to implement quality management can be called system, which is the basis to ensure the implementation of quality management, and the primary task of the implementation of total quality management is to establish quality system. Total quality management becomes a shell without a quality system. So, businesses must construct a complete quality management system, which is the foundation for the execution and long-term development of total quality management (Zhang, 2014). The following factors are crucial to the quality system's implementation:

- 1) Leader's value and support participation and provide a good example for all members.
- 2) All employee training, strong and long-term leadership from top management, and education and training for all members of the company are critical to the success of TQM and must not be overlooked when developing a quality system.
- 2) Strengthen internal auditing to ensure that all employees are involved and that quality objectives are met.
- 3) Persistence, performing high-quality work is a never-ending task. Only by assuring the quality system's long-term and steady functioning can we assure that the company remains competitive in the market.

Training and education

Many individuals find education and training to be one of the most important aspects of TQM. More participation entails greater responsibility, which necessitates a better degree of ability, which can only be attained through training. As a result, education and training are critical components of comprehensive quality management. In fact, most organizations have realized its importance. For example, Motorola, a well-known company, places a high value on training and education. It used to spend \$120 million each year on employee training, with 40% of that going to high-quality training.

Training is a critical component in improving quality awareness and abilities. Quality training can assist employees in gaining quality professional knowledge, posting skills and professional knowledge, improving their own quality, bringing employees closer together in accordance with the enterprise's quality policy, vision, and mission, forming a unique corporate culture, and finally serving the quality, striving to improve quality and solve problems through a variety of training knowledge.

That continual training is not a particular activity, but rather a way of life for people who are ultimately responsible for their own knowledge. (Blanchard Thacker, 1999).

An organization that expects quality and employee growth, policy development, and planning will determine the distribution sample of training and strategic planning, which will not only focus on current training needs, but also on future training needs. Strategic planning will yield a strategic training plan that may

be used to estimate future training needs based on employee and customer requests. (Johnson, 1994).

Antony et al. determined the following education and training factors in 2002, based on the literature review that will lead to the successful implementation of TQM.

- (1) Develop teamwork among employees
- (2) Quality training for managers, supervisors and employees
- (3) Training on the "Total quality management"
- (4) Employee skills and professional knowledge training (such as pre job training, on-the-job training, promotion training, etc.)
- (5) Training on quality statistical tools (such as PDCA and QC)
- (6) Communication skills training
- (7) Quality anomaly identification, analysis, improvement ability training
- (8) Quality system training

So, training is very important to improve the productivity of employees. It is necessary to teach the TQM philosophy system to employees on a regular basis. To train employees, Employees must be able to communicate in a fundamental manner. They can strengthen their problem-solving, analysis, and technical skills in collaboration through communicating. In the initial stage of TQM establishment and formation, employees should receive corresponding training to become effective employees of the company.

Continuous improvement

One of the most fundamental aspects of TQM is continuous improvement.

Life of an enterprise is quality and that the driving force of its continuous development comes from total quality management. One of the keys for an enterprise to be invincible is whether it can implement the continuous improvement policy. Continuous improvement can make the role of total quality management more perfect and lasting. A good enterprise must have the continuous improvement ability to adapt to the market competition, while a successful and long-term enterprise the industry is bound to take the implementation of sustainability as one of the important ways of enterprise development.

Continuous improvement is required for businesses to maintain high levels of customer satisfaction. A continuous cycle of one or more operation processes is referred to as continuous improvement. Continuous improvement can assist in the implementation of total quality management, determining improvement objectives, investigating all factors, finding solutions, determining implementation plans, evaluating improvement results, and finally standardizing a series of operations. It not only creates an effective atmosphere and environment for all employees to participate in and actively improve, but it also ensures that quality management is implemented effectively. Continuous improvement is also one of the effective ways to improve employee performance.

The eight commonly used quality continuous improvement tools are as follows:

- 1) Six Sigma
- 2) PDCA (Plan, Do, Check, Act)

- 3) SPC (Statistical Process Control)
- 4) FMEA (Failure Mode & Effect Analyses)
- 5) 5W2H (What, Why, Who, When, Where, How, How much)
- 6) MSA (Measurement System Analyses)
- 7) Seven techniques of QC (Check List, Pareto Diagram, Characteristic Diagram, Scatter Diagram, Control Chart, Histogram, Stratification)
- 8) 6S (Seir, Seiton, Seiso, Seiketsu, Shitsuke, Safety)

The above most important PDCA and the most stringent Six Sigma have been introduced in detail above, and other common tools details are not introduced here.

Teamwork

In order to succeed in business, teamwork is equally important in the implementation of total quality management. Using the team's advantages, the company's business will get benefit from faster and better problem-solving solutions, as well as longer-term performance enhancement in the operation processes also. When problems arise inside the group, it will be more natural for members to raise inquiries. They can also obtain solutions from other partners and implement improvement measures at the same time. (Bian, 2007) TQM can be implemented by three different sorts of teams as below:

A. Quality improvement teams (QITS) these are ephemeral groups formed to address specific issues that arise frequently. They normally take three to twelve months to start up.

B. Problem-solving teams (PSTS). These are transitory groups formed to address specific issues and to discover and address the root causes of those issues. Usually, they are set up for between a week and three months.

C. Natural work teams (NWTs) is a collection of highly skilled people who perform specific tasks and responsibilities. Employee engagement groups, self-management groups, and quality circles are examples of these groups, which typically include one to two hours of common work per week.

Communication

Communication can be utilized as a bridge in total quality management, and it can connect all of the total quality management's components in a logical and orderly manner. All layers of overall quality management need to be integrated, from the top to the lowest. As a result, communication is a crucial component in the overall quality management process. The sender and recipient of information must have a common understanding. Communication between members of the business, suppliers, and customers is essential for effective total quality management. All employees must be able to communicate and receive information regarding the TQM process, therefore senior management must ensure smooth information exchange. It's critical to have good communication and accurate information exchange. To communicate effectively, the information must be clear, and the receiver must be able to reinterpret the meaning of the information in accordance with the sender's goals. (Kano, 1989).

There are a variety of ways to communicate, including:

A. Communicate downward.

This is the most common mode of communication. This is how the introduction and discussion are typically done. Supervisors can use this method to ensure that staff understand TQM.

B. Communicate upward.

In this way, employees at a lower level can make effective suggestions to managers at a higher level about the impact of TQM. Because employees can put forward their own insights and constructive criticism, supervisors must listen effectively. This method establishes a level of confidence between managers and employees, similar to how authorization is communicated. Supervisors should always pay attention to the voices in their immediate environment.

C. Horizontal communication.

This method of communication is critical because it breaks down barriers across departments and allows for a more professional approach to dealing with customer and supplier relationships.

Therefore, it is critical for organizations to pay attention to communication from both a vertical and horizontal perspective.

Customer focus

The customer is the market, the customer is the market, so the enterprise must deeply understand, research the customer's demand orientation, establish good communication with the customer, pay attention to the customer, take the customer as the center, this is a very clear truth for many enterprises, now basically every

enterprise will also write the customer first as the value creed into the enterprise's core values. For example, China Huawei Co., Ltd., Huawei is a truly global company, and its secret to surpassing its competitors is three sentences: customer-oriented, struggling oriented, and long-term hard work.

A successful TQM organization is usually dedicated to meeting customers. It recognizes that in every decision it has to put the customer first. Customer needs and feedback are necessary information to determine product quality and improve it in the view of customers.

In total quality management, in order to reduce the occurrence of quality problems, at the early stage of product design, the organization should actively allow customers to participate in the design and development of products or services, let customers put forward their own needs and opinions at each stage, and eliminate all avoidable problems. Quality management will be relatively easier in mass production, It will also make customers feel they are the master of the product or service, which is conducive to improving customer satisfaction. (Flynn, 2007).

Furthermore, in order to improve the quality of products and services, businesses must increase their awareness of creativity, technical invention, system mechanisms, and development ability while implementing overall quality management. To better match customer wants and improve customer satisfaction in order to expand market share and win more consumers. As a result, in terms of production and operation, businesses should prioritize customer demands, treat customer needs as a starting point, constantly improve, raise innovation awareness, and place customers at the center. Customer demands are typically collected through market research, customer satisfaction surveys, and customer complaint data.

Reward

The main motivator for all employees to participate in quality management during the implementation of overall quality management is the possibility of receiving a reward. As a result, selecting the appropriate material and non-material rewards at the appropriate moment will have a good impact on the enterprise's performance, it can be seen that the degree of reward also directly affects the implementation of enterprise total quality management, because total quality is based on full participation. In enterprise organizations, enterprise incentive policies and policymakers are often human resource management departments. Therefore, human resource management needs to apply incentive methods to enterprise policies to promote employees' enthusiasm. As a result, determining how to develop and adjust incentive policies that are appropriate for TQM implementation necessitates communication and cooperation between enterprise functional management departments and TQM implementers, and there can be a variety of reward methods. At present, rewards are mainly divided into material rewards and non-material rewards. The specific forms are as shown in the table 1(Allen, 2001).

Practice types and specific forms of non-material rewards	Practice types and specific forms of material rewards
(1) Reward organizations and individuals recognized as achieving quality improvement goals, such as quality certification, praise letters, free shopping vouchers, etc.	(1) Profit sharing. Share part of the company's profits with employees. (2) Performance sharing. Significant achievements in output, cost, sales and other performance improvement of teams and individuals in the

<p>(2) Individuals or teams in the organization who have significantly improved or achieved the quality objectives will be rewarded, such as award, certificates of honor, outdoor team activities, dinners, etc.</p> <p>(3) The manager / leader shall appropriately praise the employees who have achieved the recognized quality improvement objectives, such as the praise meeting, monthly excellent employees, annual excellent employees, etc.</p> <p>(4) Formal suggestion system, general manager's mailbox, suggestion box and complaint box for quality improvement from employees.</p> <p>(5) Based on the development of performance evaluation system, evaluation is mainly to promote employees to better perform their duties in the future, rather than to evaluate past performance or errors.</p> <p>(6) Promotion based on quality mainly depends on the realization of quality objectives.</p>	<p>organization shall be shared with employees in the form of bonus.</p> <p>(3) Employee employment security. Enterprise policies or Union regulations to prevent employee unemployment in the form of system.</p> <p>(4) Time compensation (paid leave). Overtime hours are compensated for by additional hours rather than just extra pay.</p>
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Table 1 Types of Rewards

Performance of TQM implementation success

The business performance should be measured both by internal and external view point, so the effective operation evaluation of TQM should be measured from the internal and external perspectives also, the external perspective mainly includes financial performance and customer satisfaction, and the internal perspective mainly is employee satisfaction (McAdam, 2001).

Financial Results

Modern society mainly focuses on the financial indicators, cost, profit and return on investment to measure the performance of an organization. Financial performance can be measured by profit growth and sales revenue. Reduced costs and increased revenue are two of the key goals of TQM implementation.

Customer satisfaction

It is a metric for determining customer satisfaction. Customer satisfaction is at the heart of total quality management, as is the concept of "continuous improvement." Customer satisfaction is the ultimate indicator of a company's success.

Employee satisfaction

Employee satisfaction is a guarantee of enterprise end-user satisfaction because how employees are treated affects how they treat customers. Whether employees are satisfied or not is directly related to the enterprise's customer satisfaction, so employee satisfaction is a guarantee of enterprise end-user satisfaction.

Employee satisfaction surveys have a direct purpose of increasing employee loyalty. Satisfaction primarily refers to present satisfaction, which includes compensation, education, promotion, environment, status, business dedication, and other factors. The way we think about employee satisfaction can change, and without it, we won't be able to make progress. The indirect goal is customer satisfaction, which is a requirement for long-term and consistent business growth.

Employee job satisfaction is a subjective response to one's working environment that can also be used to gauge one's attitude. Structured and unstructured questionnaires, observation impressions, guidance and non-guidance interviews are among the assessment methods used. The following are some of the most frequent measurement tools:

(1) JSI

JSI full named be Job satisfaction index, this scale primarily assesses employees' total job satisfaction, and the most well-known employee satisfaction survey is this one. It has its own level of satisfaction with compensation, advancement, management, job, and the company group, and it may be applied in a variety of settings. (Brayfield, 1951).

(2) JDI

JDI full named be Job Descriptive Index, Employee happiness (or employee satisfaction) can be measured across five dimensions: the job itself, salary, promotion, supervisor, and coworkers. The total job satisfaction score is the sum of the satisfaction scores from these five dimensions. JDI is unique in that it does not

demand candidates to express their inner feelings, but rather to locate and select distinct descriptors from many elements (the number of questions does not have to be the same). As a result, applicants with less education can readily respond. (Smith, 1969).

(3) JDS (Job Diagnostic Survey)

JDS full named be Job Diagnostic Survey, Employees' overall satisfaction, intrinsic motivation, and special satisfaction (covering job stability, treatment, social interactions, supervision, and progress, among other things) can all be measured using the scale, as well as the features and severity of their personal growth demands. (Hackman, 1975).

CHAPTER 3

RESEARCH METHODOLOGY

Research design

In this study, quantitative method will be use as the methodology to acquire data from the sample, a quantitative approach allows the participants to precisely express and assess the level of their perception toward certain topic.

The researchers collected quantitative data through questionnaire survey to provide important data for perceiving the key factors affecting the success of TQM implementation in CSI Company.

Data sources

The information for this study was acquired from both primary and secondary sources. In this study that secondary data gather from inside CSI. CSI's internal information such as company background, company performance, quality policy and culture, company's annual strategy, etc. CSI internal information can be obtained from CSI's intranet and external websites at <https://www.canadiansolar.com/>.

Primary data:

Data collected from first-hand materials by researchers through surveys, interviews, or experiments.

Secondary data:

Data gathered from other people's studies, surveys, or trials.

Research procedure

As shown in Figure 6, following the topic selection, the first stage of the article identifies and outlines the issues and objectives of this study in order to build research suggestions and strategies.

The study's second stage comprises a detailed literature review to identify and analyze TQM implementation success factors.

Interviews with quality experience professionals and specialists are conducted in the third stage of the study to identify the contents of the investigation and the focus of attention.

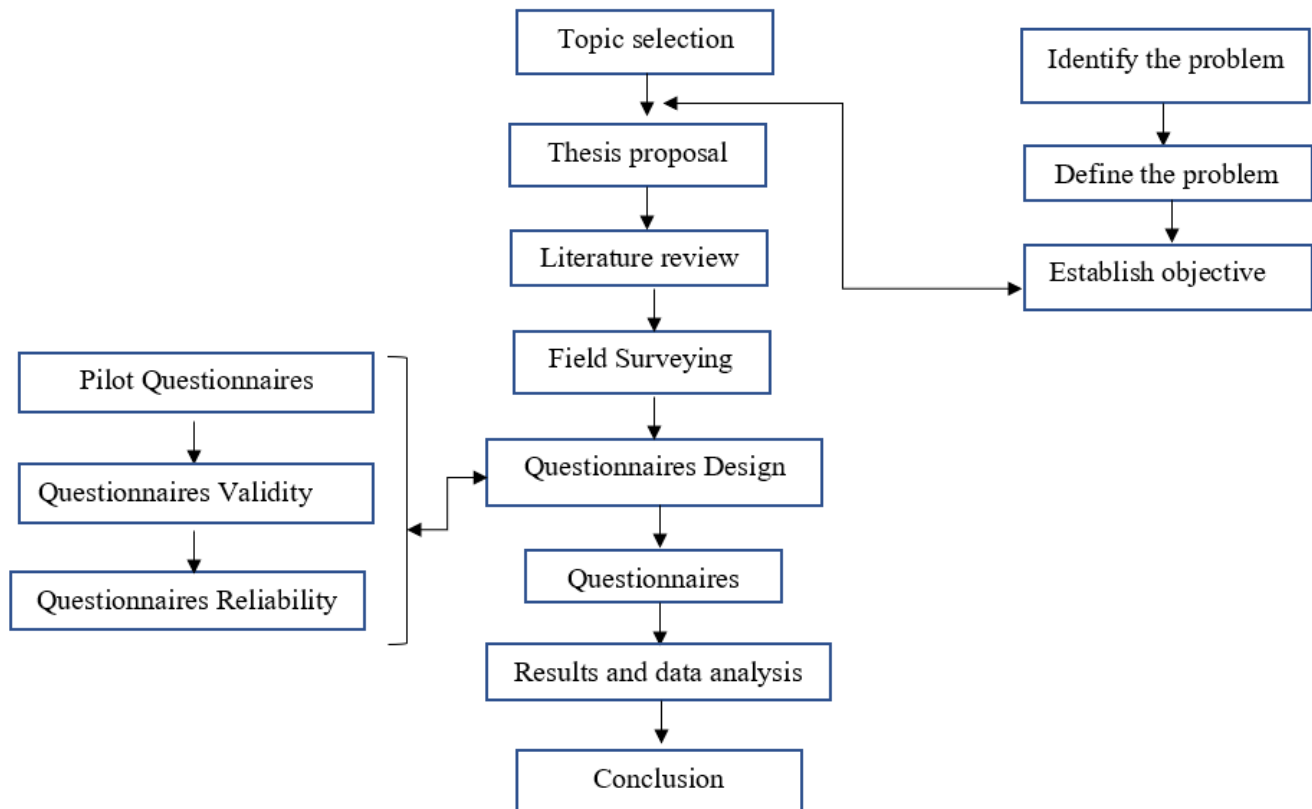
A questionnaire was prepared in the fourth stage, followed by a pilot study to test the phrasing of the questions, identify unclear questions, and refine the questionnaire. The questionnaire was tweaked in light of the pilot study's findings.

The study's fifth stage consists primarily of the distribution of questionnaires. The structural questionnaire survey approach, which is now the most extensively used survey data gathering method, is used in this study.

The data analysis and discussion stage are in the sixth stage.

Conclusions and recommendations are included in the last step.

Figure 6 Research process flow chart



Sample and population

About the research topic area, the research population is defined as work in CSI of Thailand. According to CSI'S HR latest statistics as of Nov 2019 that total number of employees is CIS was 3691 persons. The calculation of sample size based on known population by Slovin's formula (1960), the formula for sample size with a confidence level of 95 percent is shown in the equation below, the formula 3.1:

$$n = \frac{N}{1 + N * (e)^2} \quad (3.1)$$

n- The sample size

N-The population size

e-The acceptable sampling error (0.05)

This research is based on a confidence level 95% with N=3691, e=maximum acceptable error 5%, so e =0.05 and thus the calculation can be made as below:

$$n = \frac{3691}{1 + 3691 * (0.05)^2}$$

$$n = 360.89$$

Therefore, the sample size of this research is n=360.89, then the researcher applied 361 as the population, and to prevent failure the researcher also included a sample of 400 people.

Sampling method

The sampling method of this study is convenience sampling of non-probability sampling. The question tool is to collect the data of who working in Canadian solar company in Bowin through online questionnaire survey. There are 400 questionnaires.

Research instruments

To collect data, the researcher utilizes a questionnaire as a tool. The following are the three sections of the questionnaire:

Part one: General information (organizational background)

In order to better understand the basic information of the respondents, this part of the questionnaire is a multiple-choice question (nominal scale). Questions related to the respondents' gender, length of service, education level and current position. Having this part can provide a trend and provide in-depth analysis conducive to research.

For part two and part three to be easy understood and help record this study by all respondents. Respondents were asked to rate the value of each item using the Likert scale, as shown in Table 2. A closed-ended questionnaire was employed because it is straightforward to ask and quick to answer, and it requires no writing by either respondents or interviewees.

Part two: Perceived Success factors of TQM implementation on CSI.

There are 8 main factors includes 39 sub- factors focus on

- 1) The Top management attention and leadership (7 sub-factors)
- 2) Establish an effective quality system (5 sub-factors)
- 3) Training and education (5 sub-factors)
- 4) Continuous improvement (7 sub-factors)
- 5) Teamwork (6 sub-factors)
- 6) Communication (3 sub-factors)
- 7) Customer focus (4 sub-factors)
- 8) Reward (2 sub-factors)

The close-ended questions will allow respondents to only choose one answer from the chosen answer. The answer scale uses a “Likert Scale” which has 5 levels as follows:

- 1 Meaning Very low
- 2 Meaning Low
- 3 Meaning Medium
- 4 Meaning High
- 5 Meaning Very high

Table 2 Likert scale

Meaning	Very low	Low	Medium	High	Very high
Level	1	2	3	4	5

Part three: Performance evaluation factors of TQM implementation on CSI.

There are 1 main factor includes 3 sub- factors focus on

- 1) Performance evaluation factors of TQM implementation on CSI (3 sub-factors: Financial Results, Customer Satisfaction, and Employee Satisfaction)

The close-ended questions will allow respondents to only choose one answer from the chosen answer. The answer scale uses a “Likert Scale” which has 5 levels as follows:

- 1 Meaning Very low
- 2 Meaning Low
- 3 Meaning Medium
- 4 Meaning High
- 5 Meaning Very high

We use the class interval formula to determine whether each factor affects the performance of successful TQM implementation. A higher number indicates that this factor has a greater impact on TQM performance, while a lower number means that this factor has little impact on the performance of successful TQM implementation.

Class interval = (Highest data value – Lowest data value) / Number of classes

$$= (5-1) / 5$$

$$= 0.80$$

Score interval descriptions:

1.00-1.80 = Very low

1.81-2.60 = Low

2.61-3.40 = Medium

3.41-4.20 = High

4.21-5.00 = Very high

The meanings of the 5 levels as shown in Table 3.

Average score	Meaning
1.00-1.80	Very low
1.81-2.60	Low
2.61-3.40	Medium
3.41-4.20	High
4.21-5.00	Very high

Table 3 Scale interpretation

Data reliability and validity

Researchers will identify the characteristics that influence the effectiveness of CSI TQM implementation through perception and investigate whether they are important factors by establishing a link between these factors and the performance of TQM implementation success. To better understand the procedure, I'll sort the data by variable type as follows:

Variables of research on this study:

1. Independent variable

Perceived CSFs of TQM implementation

- 1.1.1 Top management attention and leadership
- 1.1.2 Establish an effective quality system
- 1.1.3 Training and education
- 1.1.4 Continuous improvement
- 1.1.5 Teamwork
- 1.1.6 Communication
- 1.1.7 Customer focus
- 1.1.8 Reward

2. Dependent variable

Performance of TQM implementation success

- 2.1.1 Financial results
- 2.1.2 Customer satisfaction
- 2.1.3 Employee satisfaction

1. Validity test:

The researcher proposes a questionnaire from the relevant research to discuss with the three advisors at least, and then modifies the questionnaire to make it relevant to the subject before collecting the data to make sure that questionnaire validity.

The researchers will use IOC (The Item-Objective Congruence) to verify the validity of the questionnaire data. The IOC form will send to three experts for review. The evaluation scores of all factors in the questionnaire are greater than 0.75, which means that the survey tool is effective for this study.

$$\begin{aligned} \text{IOC} &= \text{The sum up scores of experts} / \text{The numbers of all experts} \\ &= \Sigma R / N \end{aligned}$$

A scale was used to determine and explain the result of using the IOC test.

Appropriate = + 1

Uncertain = 0

Inappropriate = -1

2. Reliability test:

The researcher used questionnaire to survey a small sample of 30 respondents to check understanding to its content. Pre-test on the reliability test by using the alpha coefficient of Cronbach's alpha method (Cronbach, 2004) which that Cronbach's alpha results as determined by

SPSS program, that the coefficient is above 0.70 and that questionnaire can be accepted.

Method of analysis

In this study, method of analysis will use descriptive and inferential statistics. The statistics used in the analysis are as follows:

1. Descriptive statistics

Descriptive statistics is a simple statistical method, which mainly focuses on the frequency, mean and standard deviation of data. The first part of this questionnaire summarizes the frequency and percentage of use. Descriptive statistics do not provide any further information to summarize or answer any assumptions in the study. They are used to summarize the data and show any patterns that may be useful for our research.

1.1 Percentages: Percentages are defined as a part of a whole and are expressed by the symbol “%” This is the most used statistical tool.

1.2 The mean is the average of the total sum of the numbers and is known as the central value of a set of numbers. The mean of a sample can be found using a formula as illustrated below. $\bar{X} = \Sigma X_i / n$ Where, \bar{X} = Mean of sample Σ = add up X_i = all of the x-values n = the number of items in the sample.

1.3 Standard deviation: standard deviation refers to the calculated quantity to indicate the degree of deviation of the whole group. It just tells people how far the members of a group are from the average. The higher standard deviation indicates that these numbers are more widely distributed and farther from the average. On the

contrary, their average values are closer to the standard deviation. The formula for calculating the standard deviation is as follows:

$$\sigma = \sqrt{\frac{\sum(X - \bar{X})^2}{n}}$$

Where,

σ = Standard deviation

n = Total number from set

Σ = Add up

X = Mean of population

\bar{X} = Mean of sample

Table 4 Describe statistical types and methods

Question	Type	Method
Demographics	Nominal & Ordinal	Frequency & Percentage
Perceived CSFs of TQM implementation	Interval & Likert	Mean and Standard deviation

2. Inferential Statistics

In order to test the hypotheses of the study, a multiple regression analysis model was conducted to examine with the Perceived CSFs of TQM implementation

(independent variable) predicts Performance of TQM implementation success (dependent variable) and adding variables is enter regression.

The formula to predict standardized score :

$$\hat{Z}_y = \beta_1 (ZX_1) + \beta_2 (ZX_2) + \beta_3 (ZX_3) + \beta_4 (ZX_4) + \beta_5 (ZX_5) + \beta_6 (ZX_6)$$

Where,

Y = Dependent variable

X = Independent variable

β = The predictors are weighted by coefficients

Then use SPSS software for data processing and data analysis and compile statistical analysis table. The inferential statistical analysis to verify the hypothesis is as follows:

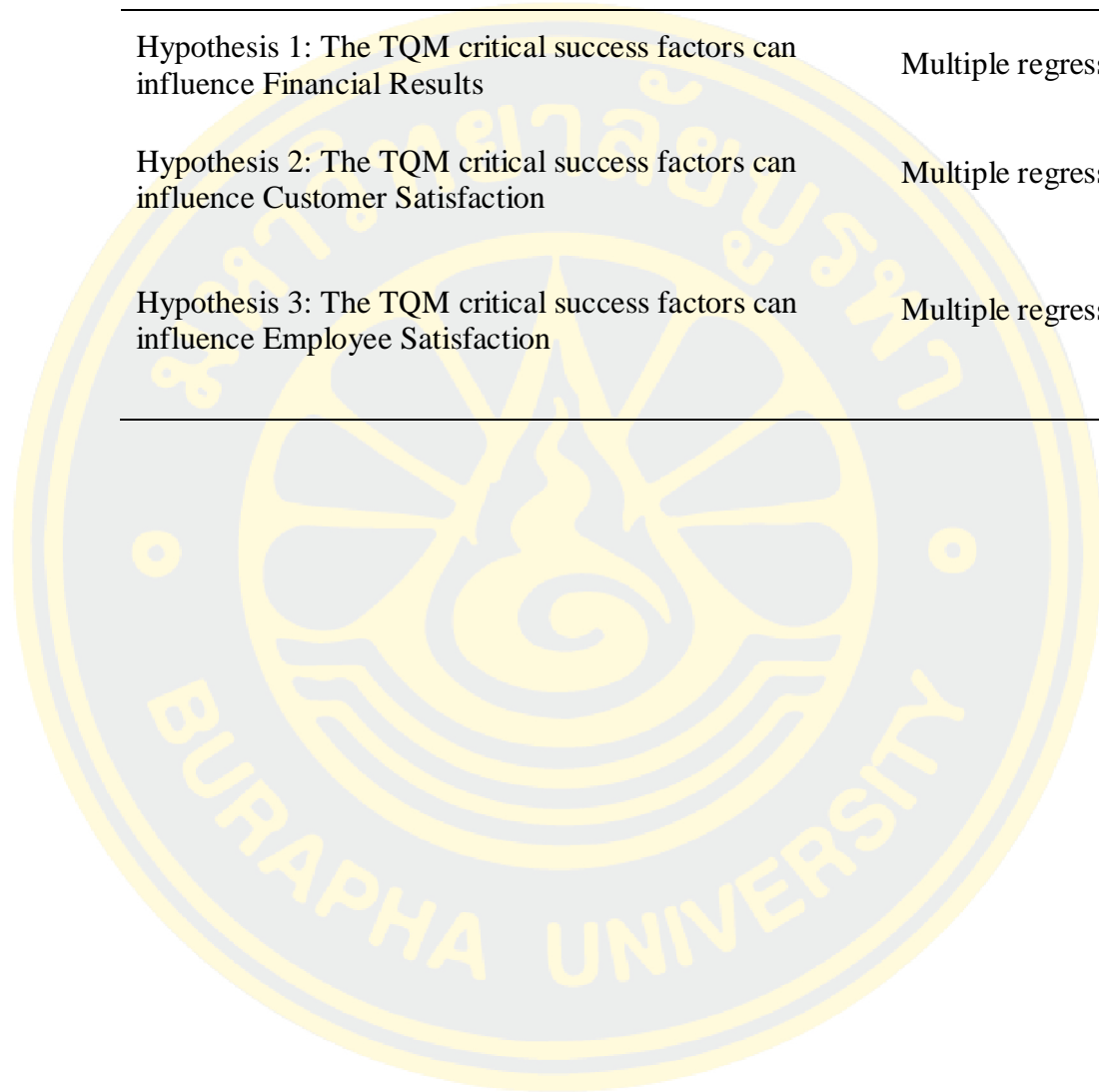
Hypothesis 1: The TQM critical success factors can influence Financial Results

Hypothesis 2: The TQM critical success factors can influence Customer Satisfaction

Hypothesis 3: The TQM critical success factors can influence Employee Satisfaction

Table 5 Inferential statistical types and methods

Hypothesis	Statistical
Hypothesis 1: The TQM critical success factors can influence Financial Results	Multiple regression
Hypothesis 2: The TQM critical success factors can influence Customer Satisfaction	Multiple regression
Hypothesis 3: The TQM critical success factors can influence Employee Satisfaction	Multiple regression



CHAPTER 4

DATA ANALYSIS AND RESULTS

This chapter primarily use descriptive and inferential statistical analysis to examine and summarize survey data, namely the relationship and influence between the critical factors for the successful implementation of total quality management and the performance of successful implementation.

The data validity analysis

Firstly, in order to confirm the validity of the data and conduct in-depth analysis normally, the researchers will use IOC (The Item-Objective Congruence)to verify the validity of the questionnaire data (Rovinelli, 1977). IOC is an evaluation process. Researchers will invite experts in relevant fields to evaluate the effectiveness of each element of the specified goal, so as to integrate the opinions of experts to confirm the overall effectiveness of the data. Each expert will score and evaluate the effectiveness of each project in turn and give a data rating. Rating 1 (mean Appropriate); Rating -1(mean Inappropriate); or Rating 0 (mean degree to which it measures the content area is Uncertain). Three specialists were given the IOC form of this report to review. Items with an IOC score of greater than 0.75 are regarded valid; items with an IOC score of less than 0.75 must be amended. The IOC form of this study data has been sent to three experts for review. The all-factors' IOC index, which include Top management attention and leadership, Establish an effective quality system, Training and education, Continuous improvement, Teamwork,

Communication, Customer focus, Reward and Performance of TQM implementation success, The evaluation scores of all factors in the questionnaire are greater than 0.75, which means that the survey tool is effective for this study.

Table 6 Score of IOC

Comment request list	Score of IOC	Results
Top management attention and leadership		
Top management attaches importance to quality management and participate in quality management	1.00	Validity
Top management commitment for TQM	1.00	Validity
Top management supports quality improvement activities	1.00	Validity
Top management make clear vision and policy	1.00	Validity
Quality objectives and policies from top management are communicated through the company.	1.00	Validity
The top management establish KPI system to review the performance by systematic and effective methods	1.00	Validity
Top management has provided sufficient resources for staff education and training.	1.00	Validity
Establish an effective quality system		
Regular internal audit of organization system operation	1.00	Validity
Full staff participation system construction	1.00	Validity
Management level attention and participates for TQM	1.00	Validity
Identifying the organization mission and vision	1.00	Validity

The internal and external environment analysis for organization	1.00	Validity
Training and education		
Training in the total quality concept	1.00	Validity
Training in quality problem identification, solving and improvement skills	1.00	Validity
Training in interactive skills such as communication skills, meeting skills, and leadership skills	1.00	Validity
Training in ISO quality system	1.00	Validity
Training in quality statistical analysis tools	1.00	Validity
Continuous improvement		
Working smoothly in teams	1.00	Validity
Searching for root causes when founded the quality issues	1.00	Validity
The initiative and undertake of the improvement project	1.00	Validity
Regular evaluation system	1.00	Validity
Management level support for resources	1.00	Validity
Clear objectives and improvement plan	1.00	Validity
Skilled use of quality tools and techniques	1.00	Validity
Teamwork		
The organization has a common goal	1.00	Validity
Cross cultural support, understanding and coordination among members of different nationalities in an organization	1.00	Validity

The organization has clarified team roles and tasks	1.00	Validity
Team members trust each other	1.00	Validity
Team members should be conscious and willing	1.00	Validity
Team members have clear Job description	1.00	Validity
Communication		
Establish effective communication channel to feedback quality issues	1.00	Validity
Good communication among departments	1.00	Validity
Quality technology / tools for effective communication	1.00	Validity
Customer focus		
The company focus on customer satisfaction	1.00	Validity
The company focus on customer needs	1.00	Validity
The company focus on solving customer problems	1.00	Validity
The company focus on customer participation in product design	1.00	Validity
Reward		
Material rewards (Such as bonus, salary promotion, overseas travel, valuable gifts etc.)	1.00	Validity
Non- material rewards (Such as verbally compliment, flextime, time off, Provide extensive training plans etc.)	1.00	Validity

Performance of TQM implementation success		
Financial Results (The company's product sales performance)	1.00	Validity
Customer Satisfaction	1.00	Validity
Employee Satisfaction	1.00	Validity

The data reliability analysis

Cronbach's alpha is a widely used approach for determining reliability. To find the coefficient can be done by using a statistical analysis program such as SPSS. The Cronbach's alphas should be at 0.70 or above (Eisinga R, 2013), and the corrected item-total correlation must be at 0.3 or above. In order to check the accuracy, the researcher verified the trial data (n=30) and real sampling (n=400). The analysis results shown in the following as below table:

Table 7 Summary of the reliability analysis results for the pre-test (n=30)

Criterion factor	Sub-criterion factor	CITC	Cronbach's alpha
Top management attention and leadership (CSF1)	CSF11	0.895	0.951
	CSF12	0.745	
	CSF13	0.898	
	CSF14	0.844	
	CSF15	0.774	
	CSF16	0.883	
	CSF17	0.831	

	CSF21	0.747	
	CSF22	0.809	
Establish an effective quality system (CSF2)	CSF23	0.931	0.940
	CSF24	0.921	
	CSF25	0.792	
	CSF31	0.891	
	CSF32	0.902	
Training and education (CSF3)	CSF33	0.884	0.958
	CSF34	0.943	
	CSF35	0.801	
	CSF41	0.868	
	CSF42	0.908	
Continuous improvement (CSF4)	CSF43	0.866	
	CSF44	0.788	0.953
	CSF45	0.812	
	CSF46	0.926	
	CSF47	0.728	
	CSF51	0.884	
	CSF52	0.818	
Teamwork (CSF5)	CSF53	0.768	
	CSF54	0.870	0.944
	CSF55	0.871	
	CSF56	0.773	
	CSF61	0.828	
Communication (CSF6)	CSF62	0.796	0.905
	CSF63	0.810	
	CSF71	0.952	
Customer focus (CSF7)	CSF72	0.917	0.960
	CSF73	0.959	
	CSF74	0.781	

Reward (CSF8)	CSF81	0.800	0.889
	CSF82	0.800	
Performance of TQM implementation success (PSF)	PSF11	0.726	0.880
	PSF12	0.768	
	PSF13	0.837	

The results of the analysis of reliability found that all questions passed the criteria which is that the corrected item-total correlation (CITC) must be at 0.3 or above and Cronbach's alphas must be at 0.70 or above. So that, no question has been cut off from the questionnaire to measurement the reliability. All the analysis results of the real sampling are shown in the table 8 below:

Table 8 Summary of the reliability analysis results for real sampling (n=400)

Criterion factor	Sub-criterion factor	CITC	Cronbach's alpha
Top management attention and leadership (CSF1)	CSF11	0.697	0.858
	CSF12	0.612	
	CSF13	0.597	
	CSF14	0.620	
	CSF15	0.604	
	CSF16	0.647	
	CSF17	0.600	
Establish an effective quality system (CSF2)	CSF21	0.670	0.811
	CSF22	0.545	
	CSF23	0.582	
	CSF24	0.565	
	CSF25	0.643	

	CSF31	0.648	
	CSF32	0.593	
Training and education (CSF3)	CSF33	0.571	0.820
	CSF34	0.653	
	CSF35	0.597	
	CSF41	0.670	
	CSF42	0.610	
	CSF43	0.621	
Continuous improvement (CSF4)	CSF44	0.528	0.841
	CSF45	0.516	
	CSF46	0.620	
	CSF47	0.591	
	CSF51	0.593	
	CSF52	0.591	
	CSF53	0.547	
Teamwork (CSF5)	CSF54	0.570	0.819
	CSF55	0.570	
	CSF56	0.636	
	CSF61	0.632	
Communication (CSF6)	CSF62	0.536	0.749
	CSF63	0.563	
	CSF71	0.646	
	CSF72	0.564	
Customer focus (CSF7)	CSF73	0.640	0.772
	CSF74	0.461	
	CSF81	0.571	
Reward (CSF8)	CSF82	0.571	0.726
	PSF11	0.530	
Performance of TQM implementation success (PSF)	PSF12	0.527	0.715
	PSF13	0.554	

According to Table 8 shows that results from the analysis corrected item-total correlation (CITC), the value of CITC must be less than 0.3, which shows that there is a reliable correlation between the analysis items.

And for Cronbach's alpha, the value of Cronbach's alpha must be greater than 0.7, which indicates that the reliability quality of the research data is very good.

So, after checking all factors analysis results that corrected item-total correlation (CITC) are greater than 0.3, indicating a solid correlation between the analysis items. And for Cronbach's alpha that value all more than 0.7, indicating all analysis's items are high level of reliability. Finally, the study data's reliability coefficient is greater than 0.7, indicating that the data's reliability quality is high and that it may be used for further investigation.

Descriptive analysis

In order to summarize the questionnaire closed-ended questions and characterize the behavior of the sample population on these questions, descriptive data analysis is utilized. To make the overall characteristics of this study survey easier to grasp, below is a preliminary sorting and distribution summary perceived success factors for the successful implementation of total quality management on CSI Company.

Table 9 Frequency and percentage classified by gender

Gender	Frequency	Percent
Female	234	58.5
Male	166	41.5
Total	400	100

Table 9 shows that most of the samples are Female and the proportion is 58.50% with 234 respondents and the proportion of Male samples is 41.50% with 166 respondents.

Table 10 Frequency and percentage classified by working years

Working years	Frequency	Percent
5 years or less	258	64.5
6-10 years	104	26
More than 10 years	38	9.5
Total	400	100

Table 10 shows that that the proportion of "5 years or less" in the sample was 64.50% with 258 respondents, Working Years 6-10 years with 104 respondents or 26%, and by respondents with more than 10 years was 38 or 9.5%.

Table 11 Frequency and percentage classified by educational level

Educational level	Frequency	Percent
Bachelor	281	70.25
Diploma	82	20.5
Master or above	37	9.25
Total	400	100

From Table 11, the results of the data analysis of a 400 sample sizes, it was found that most of the sample sizes were 281 people and were education level at Bachelor which is a percentage of 70.25, followed by the Diploma with numbering at 82 people and which is a percentage of 20.5, and the last, the Master or above was 37 people which is a percentage of 9.25.

Table 12 Frequency and percentage classified by position

Position	Frequency	Percent
Engineer	72	18
Manager	32	8
Operator	155	38.75
Other	51	12.75
Supervisor	90	22.5
Total	400	100

Table 12 shows the results that position was Operator with 155 people which is a percentage of 38.75 followed by Supervisor with 90 people which is a percentage

of 22.50, Engineer with 72 people which is a percentage of 18.00, other with 51 people which is a percentage of 12.75% and Manger with 32 people which is a percentage of 8.00 respectively.

Table 13 A Summary of Descriptive Statistics of TQM's CSF on CSI

CSFs	Mean	Standard Deviation	Level	Rank
Top management attention and leadership	3.825	0.701	High	5
Establish an effective quality system	3.722	0.750	High	6
Training and education	3.704	0.748	High	7
Continuous improvement	3.862	0.666	High	3
Teamwork	3.891	0.674	High	2
Communication	3.831	0.753	High	4
Customer focus	4.037	0.697	High	1
Reward	3.591	0.942	High	8
Total TQM CSFs	3.823	0.964	High	

Table 13 showed the highest Mean comparing with the other Mean was for Customer focus followed by Teamwork, Continuous improvement, Communication, Top management attention and leadership, Establish an effective quality system, Training and education and Reward. This means that the concentration is mainly distributed in the highest was Customer focus and the lowest was Reward.

Summary of Pearson correlation analysis among all variables

In this study, Pearson correlation coefficient is used to explain the linear relationship between key components, so as to propose the perceived critical success factors of implementing total quality management in CSI context. The Correlation among All Variables is seen in Table 8. There is a link between the variables. All factors appear to be related to each other, with correlation values ranging from 0.6 to 0.7. (Hauke J, 2011).

Table 14 Results from the Pearson Correlations

Correlation Among all Variables									
	PSF	CSF1	CSF2	CSF3	CSF4	CSF5	CSF6	CSF7	CSF8
PSF	1	0.717**	0.699**	0.707**	0.763**	0.706**	0.695**	0.676**	0.693**
CSF1	0.717**	1	0.809**	0.756**	0.790**	0.723**	0.650**	0.654**	0.617**
CSF2	0.699**	0.809**	1	0.790**	0.803**	0.768**	0.677**	0.599**	0.609**
CSF3	0.707**	0.756**	0.790**	1	0.818**	0.735**	0.699**	0.663**	0.646**
CSF4	0.763**	0.790**	0.803**	0.818**	1	0.840**	0.764**	0.696**	0.634**
CSF5	0.706**	0.723**	0.768**	0.735**	0.840**	1	0.764**	0.695**	0.587**
CSF6	0.695**	0.650**	0.677**	0.699**	0.764**	0.764**	1	0.620**	0.609**
CSF7	0.676**	0.654**	0.599**	0.663**	0.696**	0.695**	0.620**	1	0.499**
CSF8	0.693**	0.617**	0.609**	0.646**	0.634**	0.587**	0.609**	0.499**	1

Correlation is significant at the 0.01 level (2- tailed) * p<0.05 ** p<0.01

Table 14 Indicates that there are 36 significant correlations coefficient. The dependent variable Performance of TQM implementation success (PSF) has 8 significant correlations, The highest one with Continuous improvement (CSF4) ($r =$

0.763**), The second highest with Top management attention and leadership (CSF1) ($r = 0.717^{**}$), and the third highest with Training and education (CSF3) ($r = 0.707^{**}$), As the table indicates all factors appear to be related to each other, with correlation values ranging from 0.6 to 0.7 and showed a significant level of 0.05 at least.

Inferential statistical analysis

Multiple regression analysis of TQM's critical success factors and Performance of TQM implementation success

Hypothesis 1: The TQM critical success factors can influence Financial Results

H₀: The TQM critical success factors can't influence Financial Results

H₁: The TQM critical success factors can influence Financial Results

Table 15 The analysis results of the factors of TQM Influence financial results using Multiple Regression Analysis

Variables (CSFs)	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.975	0.182	-	5.364	0.000**
Top management attention and leadership (CSF1)	0.132	0.019	0.107	6.868	0.000**
Establish an effective quality system (CSF2)	0.042	0.017	0.036	2.393	0.017*
Training and education (CSF3)	0.080	0.018	0.069	4.564	0.000**
Continuous improvement (CSF4)	0.115	0.018	0.088	6.535	0.000**
Teamwork (CSF5)	0.073	0.019	0.056	3.777	0.000**
Communication (CSF6)	0.094	0.019	0.081	4.913	0.000**
Customer focus (CSF7)	0.131	0.022	0.105	6.024	0.000**
Reward (CSF8)	0.085	0.017	0.092	5.090	0.000**
R = 0.633, R-Sq = 0.401, Adjusted R-Sq= 0.389, F = 32.693, Sig. = .000					
Dependent Variable: Financial Results					

Predictors: (Constant)

* p<0.05 ** p<0.01

As can be seen from the above table 15, the R-square value of the model is 0.401, which means that Top management attention and leadership (CSF1), Establish an Effective quality system (CFS2), Training and education (CSF3), Continuous improvement (CSF4), Teamwork (CSF5), Communication (CSF6), Customer focus (CSF7) and Reward (CSF8) can explain 40.10% of the reasons for the change in Financial Results (Dao-de, 2000).

During the F-test on the model, it was found that the model passes the F-test ($F = 32.693$, $P = 0.000 < 0.05$), which means that the model is effective. (If the p-value (Sig.) is less than 0.05, the model is effective)(C., 2010) In other words, at least one variable comes from Top management attention and leadership (CSF1), Establish an Effective quality system (CFS2), Training and education (CSF3), Continuous improvement (CSF4), Teamwork (CSF5), Communication (CSF6), Customer focus (CSF7) and Reward (CSF8) may affect Financial Results at 0.05 level of statistical significance at least. In conclude that at least one independent variable influenced the dependent variable in a linear manner.

And according to the Table 15 shows the analysis of the factors of TQM Influence financial results using Multiple Regression Analysis. It was found that all independent variables influenced financial results were with statistical significance at 0.05 at least. Which mean each independent factors influenced with dependent variable. And, according to the beta value (more than 0), that all independent variables were positive influenced with the dependent variable.

So, Reject H_0 , Accept H_1 . The TQM critical success factors can influence Financial Results.

The Unstandardized model:

Financial results of TQM performance = $0.975 + 0.132$ (Top management attention and leadership) ** + 0.042 (Establish an effective quality system) * + 0.080 (Training and education) ** + 0.115 (Continuous improvement) ** + 0.073 (Teamwork) ** + 0.094 (Communication) ** + 0.131 (Customer focus) ** + 0.085 (Reward) **

The Standardized model:

Financial results of TQM performance = 0.107 (Top management attention and leadership) ** + 0.036 (Establish an effective quality system) * + 0.069 (Training and education) ** + 0.088 (Continuous improvement) ** + 0.056 (Teamwork) * ** + 0.081 (Communication) ** + 0.105 (Customer focus) ** + 0.092 (Reward) **

Hypothesis 2: The TQM critical success factors can influence Customer Satisfaction

H_0 : The TQM critical success factors can't influence Customer Satisfaction

H_1 : The TQM critical success factors can influence Customer Satisfaction

Table 16 The analysis results of the factors of TQM Influence Customer Satisfaction using Multiple Regression Analysis

Variables (CSFs)	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.816	0.177	-	4.625	0.000**
Top management attention and leadership (CSF1)	0.093	0.019	0.073	4.954	0.000**
Establish an effective quality system (CSF2)	0.066	0.017	0.056	3.887	0.000**

Training and education (CSF3)	0.071	0.017	0.060	4.164	0.000**
Continuous improvement (CSF4)	0.131	0.017	0.098	7.620	0.000**
Teamwork (CSF5)	0.105	0.019	0.080	5.633	0.000**
Communication (CSF6)	0.091	0.018	0.077	4.924	0.000**
Customer focus (CSF7)	0.192	0.021	0.150	9.041	0.000**
Reward (CSF8)	0.080	0.016	0.085	4.952	0.000**
R = 0.678, R-Sq = 0.460, Adjusted R-Sq= 0.449, F = 41.664, Sig. = .000					
Dependent Variable: Customer Satisfaction					
Predictors: (Constant)					
* p<0.05 ** p<0.01					

Table 16 shows the R-square value of the model is 0.460, which means that Top management attention and leadership (CSF1), Establish an Effective quality system (CFS2), Training and education (CSF3), Continuous improvement (CSF4), Teamwork (CSF5), Communication (CSF6), Customer focus (CSF7) and Reward (CSF8) can explain 46.00% of the reasons for the change in Customer Satisfaction.

For F-test on the model, it was found that F value was 41.664 and the Sig. value was 0.000, This means that any of the independent variables under study of TQM CSFs (Top management attention and leadership, Establish an Effective quality system, Training and education, Continuous improvement, Teamwork, Communication, Customer focus and Reward) could be a factor of influence at 0.05 level of statistical significance at least.

And the analysis of the factors of TQM Influence Customer Satisfaction using Multiple Regression Analysis. It was found that all independent variables influenced customer satisfaction results were with statistical significance at 0.05 at least. Which mean each independent factors influenced with dependent variable. And,

according to the beta value (more than 0), that all independent variables were positive influenced with the dependent variable.

So, Reject H_0 , Accept H_1 . The TQM critical success factors can influence Customer Satisfaction.

The Unstandardized model:

Customer Satisfaction of TQM performance = 0.816 + 0.093 (Top management attention and leadership) ** + 0.066 (Establish an effective quality system) ** + 0.071 (Training and education) ** + 0.131 (Continuous improvement) ** + 0.105 (Teamwork) ** + 0.091 (Communication) ** + 0.192 (Customer focus) ** + 0.080 (Reward) **

The Standardized model:

Customer Satisfaction of TQM performance = 0.073 (Top management attention and leadership) ** + 0.056 (Establish an effective quality system) ** + 0.060 (Training and education) ** + 0.098 (Continuous improvement) ** + 0.080 (Teamwork) ** + 0.077 (Communication) ** + 0.150 (Customer focus) ** + 0.085 (Reward) **

Hypothesis 3: The TQM critical success factors can influence Employee Satisfaction

H_0 : The TQM critical success factors can't influence Employee Satisfaction

H_1 : The TQM critical success factors can influence Employee Satisfaction

Table 17 The analysis results of the factors of TQM Influence Employee Satisfaction using Multiple Regression Analysis

Variables (CSFs)	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.308	0.199	-	1.546	0.123
Top management attention and leadership (CSF1)	0.101	0.021	0.070	4.772	0.000**
Establish an effective quality system (CSF2)	0.142	0.019	0.105	7.390	0.000**
Training and education (CSF3)	0.098	0.019	0.073	5.088	0.000**
Continuous improvement (CSF4)	0.131	0.019	0.087	6.800	0.000**
Teamwork (CSF5)	0.099	0.021	0.066	4.673	0.000**
Communication (CSF6)	0.114	0.021	0.085	5.467	0.000**
Customer focus (CSF7)	0.046	0.024	0.032	1.929	0.054
Reward (CSF8)	0.170	0.018	0.158	9.308	0.000**
R = 0.683, R-Sq = 0.466, Adjusted R-Sq= 0.455, F = 42.707, Sig. = .000					
Dependent Variable: Employee Satisfaction					
Predictors: (Constant)					
* p<0.05 ** p<0.01					

Form the Table 17 The R-square value of the model is 0.466, which means that Top management attention and leadership (CSF1), Establish an Effective quality system (CFS2), Training and education (CSF3), Continuous improvement (CSF4), Teamwork (CSF5), Communication (CSF6) and Reward (CSF8) can explain 46.60% of the reasons for the change in Employee Satisfaction.

For F-test on the model, it was found that F value was 42.707 and the Sig. value was 0.000, This means the independent variable analysis results at least one of the independent variables influence to dependent variable at a statistically significant level of 0.05 at least or conclude that at least one independent variable influence the

dependent variable in a linear form.

And the analysis of the factors of TQM Influence Employee Satisfaction. using Multiple Regression Analysis. It was found that 7 variables influenced Employee Satisfaction which were Top management attention and leadership (CSF1), Establish an Effective quality system (CFS2), Training and education (CSF3), Continuous improvement (CSF4), Teamwork (CSF5), Communication (CSF6) and Reward (CSF8) with statistical significance at 0.05 at least. Which mean these 7 independent factors influenced with dependent variable. And, according to the beta value (more than 0), that 7 independent variables were positive influenced with the dependent variable.

So, Reject H_0 , Accept H_1 . The TQM critical success factors can influence Employee Satisfaction.

The Unstandardized model:

Employee Satisfaction of TQM performance = 0.308 + 0.101 (Top management attention and leadership) ** + 0.142 (Establish an effective quality system) ** + 0.098 (Training and education) ** + 0.131 (Continuous improvement) ** + 0.099 (Teamwork) ** + 0.114 (Communication) ** + 0.170 (Reward) **

The Standardized model:

Employee Satisfaction of TQM performance = 0.070 (Top management attention and leadership) ** + 0.105 (Establish an effective quality system) ** + 0.073 (Training and education) ** + 0.087 (Continuous improvement) ** + 0.066 (Teamwork) ** + 0.085 (Communication) ** + 0.158 (Reward) **

CHAPTER 5

CONCLUSIONS, DISCUSSION AND RECOMMENDATIONS

The objective of this chapter is to go through the topic in depth and develop appropriate conclusions based on the survey results. Research direction of this chapter by perceiving the critical success factors of CSI's TQM implementation, and to provide these factors are effective through data collection and verification, and also have relevance and positive impact on the performance of successful implementation of TQM. Internal employees of the CSI Company in Thailand make up the study's sample population. The total sample size of this study is 400 employees. In order to evaluate the sample size required for the survey, the researchers applied Slovin's formula (1960). With an error of no more than 5% and a confidence level of 95%. Research tools, the data collection research of this survey adopts the online questionnaire. Using the questionnaire will ensure that each respondent is anonymous and answers questions in their free time.

The questionnaire adopts quantitative research tools and includes the following three parts:

Part one: General information (organizational background)

Part two: Perceive the success factors of implementing total quality management in CSI

Part three: Performance evaluation factors of TQM implementation on CSI

The core research part of the questionnaire is the part two and part three.

In addition, three university specialists checked the questionnaire's validity to see if the project accurately measured the study's unique objectives. Researchers

tested and confirmed the questionnaire's dependability in a small sample of 30 persons.

The researchers utilized two different statistical methodologies after the questionnaire survey, namely descriptive statistical analysis and inferential statistical analysis.

Descriptive statistics is a simple statistical method that focuses on frequency, mean and standard deviation of data. The mean and standard deviation are mainly used to describe and compare the concentration performance between different critical factors for the success of TQM implementation in CSI.

Inferential statistical analysis for answer the research goal that test the research hypothesis through correlation and Ridge multiple regression analysis. The researchers used the social science statistical software package (SPSS) to analysis the data.

Conclusions

1. Summary of Descriptive Statistics of General information on CSI

Results of the data analysis of a 400 sample sizes of general information, Female and the proportion is 58.50% with 234 respondents and the proportion of Male samples is 41.50% with 166 respondents. For work age the proportion of "5 years or less" in the sample was 64.50% with 258 respondents, Working Years 6-10 years with 104 respondents or 26%, and by respondents with more than 10 years was 38 or 9.5%. it was found that most of the sample sizes were 281 people and were education level at Bachelor which is a percentage of 70.25, followed by the Diploma with numbering at 82 people and which is a percentage of 20.5 and the last Master or

above was 37 people which is a percentage of 9.25. And for work position of sample was Operator with 155 people which is a percentage of 38.75 followed by Supervisor with 90 people which is a percentage of 22.50, Engineer with 72 people which is a percentage of 18.00, other with 51 people which is a percentage of 12.75% and Manger with 32 people which is a percentage of 8.00 respectively.

2. Summary of Descriptive Statistics of TQM's CSF on CSI

The overall opinion level of the perceived critical factors of effective implementation of total quality management on CSI company was at a high level, with the mean equal to 3.823 (SD = 0.964), according to the research on the opinion level of 400 samples. When considering each item, the research found that the highest score is "Customer focus" it was level at the High ($\bar{X} = 4.037$, SD = 0.697), followed by "Teamwork" at the level High ($\bar{X} = 3.891$, SD = 0.674), "Continuous improvement" at the level High ($\bar{X} = 3.862$, SD = 0.666), "Communication" at the level High ($\bar{X} = 3.831$, SD = 0.753), "Top management attention and leadership" at the level High ($\bar{X} = 3.825$, SD = 0.701), "Establish an effective quality system" at the level High ($\bar{X} = 3.722$, SD = 0.750), "Training and education" at the level High ($\bar{X} = 3.704$, SD = 0.748), and "Reward" at the level High ($\bar{X} = 3.591$, SD = 0.942).

3. Summary of research hypothesis test results.

Hypothesis 1: The TQM critical success factors can influence Financial Results

Hypothesis 2: The TQM critical success factors can influence Customer Satisfaction

Hypothesis 3: The TQM critical success factors can influence Employee Satisfaction

Table 18 Summary of research hypothesis test results.

Variables	Hypothesis 1	Hypothesis 2	Hypothesis 3
Top management attention and leadership (CSF1)	Influenced	Influenced	Influenced
Establish an effective quality system (CSF2)	Influenced	Influenced	Influenced
Training and education (CSF3)	Influenced	Influenced	Influenced
Continuous improvement (CSF4)	Influenced	Influenced	Influenced
Teamwork (CSF5)	Influenced	Influenced	Influenced
Communication (CSF6)	Influenced	Influenced	Influenced
Customer focus (CSF7)	Influenced	Influenced	Uninfluenced
Reward (CSF8)	Influenced	Influenced	Influenced

Table 18 presents the results from the hypothesis testing. The results are as follows:

Hypothesis Test Results 1: The TQM critical success factors can influence Financial Results, the hypothesis testing through Multiple Regression Analysis. The result shows that: Hypothesis 1 “The TQM critical success factors can influence Financial Results”. all independent variables Top management attention and leadership (CSF1), Establish an Effective quality system (CFS2), Training and education (CSF3), Continuous improvement (CSF4), Teamwork (CSF5),

Communication (CSF6), Customer focus (CSF7) and Reward (CSF8) influenced financial results were with statistical significance at 0.05 at least. Which mean each independent factors influenced with dependent variable. And, according to the beta value (more than 0), that all independent variables were positive influenced with the dependent variable. R-Sq = 0.401, the regression model can forecast the change in the dependent variable at 40.10%, and F = 32.693, Sig. = .000, Reject H₀, Accept H₁. The TQM critical success factors can influence Financial Results.

A multiple linear regression equation:

The Unstandardized model:

Financial results of TQM performance = 0.975 + 0.132 (Top management attention and leadership) ** + 0.042 (Establish an effective quality system) * + 0.080 (Training and education) ** + 0.115 (Continuous improvement) ** + 0.073 (Teamwork) ** + 0.094 (Communication) ** + 0.131 (Customer focus) ** + 0.085 (Reward) **

The Standardized model:

Financial results of TQM performance = 0.107 (Top management attention and leadership) ** + 0.036 (Establish an effective quality system) * + 0.069 (Training and education) ** + 0.088 (Continuous improvement) ** + 0.056 (Teamwork) * + 0.081 (Communication) ** + 0.105 (Customer focus) ** + 0.092 (Reward) **

Hypothesis Test Results 2: The TQM critical success factors can influence Customer Satisfaction, the hypothesis testing through Multiple Regression Analysis. The result shows that: Hypothesis 2 “The TQM critical success factors can influence Customer Satisfaction”. all independent variables Top management attention and leadership (CSF1), Establish an Effective quality system (CFS2), Training and

education (CSF3), Continuous improvement (CSF4), Teamwork (CSF5), Communication (CSF6), Customer focus (CSF7) and Reward (CSF8) influenced financial results were with statistical significance at 0.05 at least. Which mean each independent factors influenced with dependent variable. And, according to the beta value (more than 0), that all independent variables were positive influenced with the dependent variable. R-Sq = 0.460, the regression model can forecast the change in the dependent variable at 46.00%, and F = 41.664, Sig. = .000, Reject H₀, Accept H₁. The TQM critical success factors can influence Customer Satisfaction.

A multiple linear regression equation:

The Unstandardized model:

Customer Satisfaction of TQM performance = 0.816 + 0.093 (Top management attention and leadership) ** + 0.066 (Establish an effective quality system) ** + 0.071 (Training and education) ** + 0.131 (Continuous improvement) ** + 0.105 (Teamwork) ** + 0.091 (Communication) ** + 0.192 (Customer focus) ** + 0.080 (Reward) **

The Standardized model:

Customer Satisfaction of TQM performance = 0.073 (Top management attention and leadership) ** + 0.056 (Establish an effective quality system) ** + 0.060 (Training and education) ** + 0.098 (Continuous improvement) ** + 0.080 (Teamwork) ** + 0.077 (Communication) ** + 0.150 (Customer focus) ** + 0.085 (Reward) **

Hypothesis Test Results 3: The TQM critical success factors can influence Employee Satisfaction, the hypothesis testing through Multiple Regression Analysis. The result shows that: Hypothesis 3 “The TQM critical success factors can influence

Employee Satisfaction”. It was found 7 variables Top management attention and leadership (CSF1), Establish an Effective quality system (CFS2), Training and education (CSF3), Continuous improvement (CSF4), Teamwork (CSF5), Communication (CSF6) and Reward (CSF8) influenced financial results were with statistical significance at 0.05 at least. Which mean these 7 independent factors influenced with dependent variable. And, according to the beta value (more than 0), that 7 independent variables were positive influenced with the dependent variable. $R^2 = 0.466$, the regression model can forecast the change in the dependent variable at 46.60%, and $F = 42.707$, $\text{Sig.} = .000$, Reject H_0 , Accept H_1 . The TQM critical success factors can influence Employee Satisfaction.

A multiple linear regression equation:

The Unstandardized model:

Employee Satisfaction of TQM performance = 0.308 + 0.101 (Top management attention and leadership) ** + 0.142 (Establish an effective quality system) ** + 0.098 (Training and education) ** + 0.131 (Continuous improvement) ** + 0.099 (Teamwork) ** + 0.114 (Communication) ** + 0.170 (Reward) **

The Standardized model:

Employee Satisfaction of TQM performance = 0.070 (Top management attention and leadership) ** + 0.105 (Establish an effective quality system) ** + 0.073 (Training and education) ** + 0.087 (Continuous improvement) ** + 0.066 (Teamwork) ** + 0.085 (Communication) ** + 0.158 (Reward) **

Discussion

The research findings in this report emphasize the most critical factors for a successful implementation of total quality management. TQM is a process-centered integrated management system in which all employees work together to create high-quality products and services that match customers' needs. Through planning, coordinating, and comprehending each action with the involvement of each individual at every level, this strategy will boost the company's competitiveness, effectiveness, and adaptability of the entire organization. Total quality management guarantees that management has a strategic view of quality, that all employees are encouraged to engage actively, that plan and implementation are not separated, and that the focus is on problem prevention rather than detection.

Through perceived critical factors of successful implementation of total quality management from CSI company and after a thorough examination of both the validity and the reliability of the survey's data have been conducted eight key success factors were identified, including Top management attention and leadership (CSF1), Establish an Effective quality system (CFS2), Training and education (CSF3), Continuous improvement (CSF4), Teamwork (CSF5), Communication (CSF6), Customer focus (CSF7) and Reward (CSF8). And explore the correlation between these critical success factors and the Performance of TQM implementation success. Multiple linear regression analysis was used by using the collected data. The key statistical results show that TQM CSFs can influence the Performance of TQM implementation success.

Top management attention and leadership can positively influence TQM effect with Performance for Financial Results, Customer Satisfaction and Employee Satisfaction

This result confirms the top management attention and leadership has positive relationship on the performance of implementation success of TQM. "Total quality management must start from the top management. At the top management, it must show serious persistence and commitment to quality and leadership. The middle management also plays a key role in conveying information." (Oakland, 2011) Therefore, the top management attention and leadership are the key support ability to achieve organizational goals and inspire employees' confidence, it is also one of the most important factors to promote the successful implementation of total quality management.

The function of top management in a CSI organization is equally critical in the context of this study. They set the quality mission and vision and defined the company's future in the enterprise vision statement. The top management also paid great attention to quality management activities, invested resources in quality management, established quality rewards for employees who can achieve quality operation objectives within the organization, and supported and encouraged employees to actively participate in quality management activities.

As below table 19 was CSI - Corporate Vision, Mission, Values and Policy:

Table 19 CSI - Corporate Vision, Mission, Values and Policy

Corporate Vision	To be global solar energy expert, Brighten our Future
Corporate Mission	Make solar energy into every household Bring a more beautiful and cleaner Earth to future generations
Corporate Values	Professionalization, High-Efficiency, , Honest, Harmonization, Innovation
Quality Policy	Co-development with Customers Focus on Science and Technology Obsess to Continuous Improvement Effective and Accurate Execution CSI-Provider of innovation solar power solutions to worldwide clients

As can be seen from the above table, the top management of CSI Company closely linked the quality policy with the company's vision to serve global customers by providing high-quality products and service quality. This is also the premise for CSI to successfully promote total quality management.

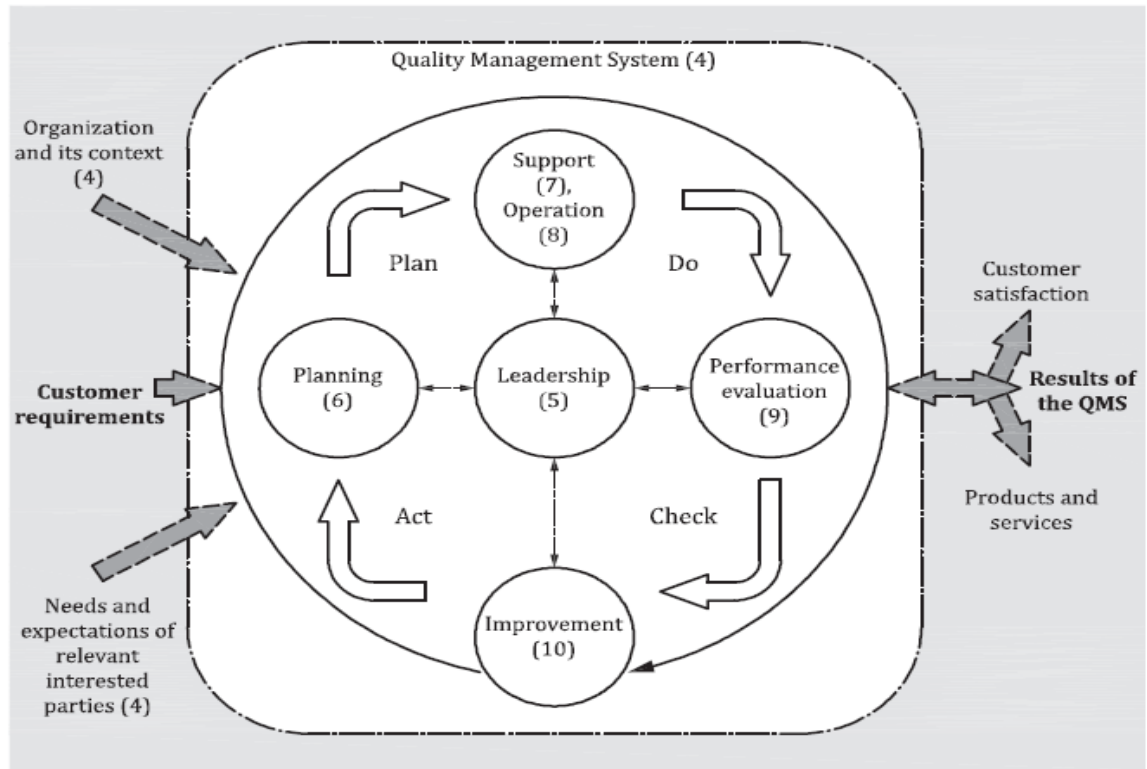
Establish an effective quality can positively influence TQM effect with Performance for Financial Results, Customer Satisfaction and Employee Satisfaction

To establishment of quality management system is the basic requirement of total quality management. Also, for implement total quality management must establish a perfect and efficient quality management system. An effective quality management system is not only the needs of customers, also the needs of organizations, the effective assurance of total quality management implementation.

To create a quality management system, should be first determine the various elements of the quality management system and construct a perfect quality management system structure. Both the structure and the selection of elements should be closely combined with the organization's quality policy, quality objectives, product types and requirements for the product realization process. Through the optimal allocation of quality management system structure and reasonable planning of system elements, the quality management system can operate effectively as a whole. CSI Company is a high-quality system based on PDCA mode. To meets the needs and expectations of customers and other parties (such as employees, society, owners, etc.) through effective or efficient operation in the organization. Simultaneously, on the basis of realizing and maintaining the overall performance and ability of the organization, continuously optimize and continuously improve the performance and ability of the organization, so as to provide customers with high-quality products or services and obtain benefits.

As below Figure 7 show that PDCA model below for quality management system in CSI:

Figure 7 PDCA model below for quality management system in CSI:



Any organization, no matter what environment it is in, will pay great attention to the quality of products. To succeed, its products must follow:

- ① Meet the appropriate specified needs, uses or purposes.
- ② Meet customer expectations.
- ③ Comply with applicable standards and specifications.
- ④ Compliance with social requirements, including obligations under laws, norms, rules, regulations, and other considerations.
- ⑤ Reflect environmental needs.
- ⑥ Timely supply at competitive prices.
- ⑦ Economic provision.

To sum up, the above objectives are nothing more than two parts: good quality and low cost. Only to achieve this goal, enterprises must establish an effective quality management system. This is not only the guarantee for the success of the total quality management implementation, but also the main advantage for enterprises to survive and develop in an invincible position in the fierce market competition.

Training & education can positively influence TQM effect with Performance for Financial Results, Customer Satisfaction and Employee Satisfaction

The research shows that the staff related factors in the implementation of TQM are generally reflected in staff training and education; In other words, the emphasis is on employee involvement. Employees can gain new knowledge, learn how to discover quality concerns, and solve problems more effectively by actively participating. As a result of this increasing awareness of the importance of quality, there is a greater commitment to comprehensive quality management. This shift in attitude makes employees feel like they're a part of the team, and it fosters a high-quality culture throughout the organization. "The key to the successful application of overall quality management in decreasing costs and boosting revenues" is training and education (Kassicieh, 1998). It is also the most important one of aspect of human resource management. In the context of CSI company, through the collection of employees' training intentions, training and education generally have two modes: external training and internal training, Internal training mainly takes experienced qualified employees as lecturers (such as engineers, supervisors and managers), mainly trains about quality knowledge and problem handling methods in related processes, so as to ensure that employees meet job skills, also ,identify quality

problems and improve, while external qualified institutions generally focus on quality tools, statistical analysis, quality system and other relative professional knowledge, such as six sigma, FMEA(Failure Mode and Effects Analysis), internal auditor, etc.

Continuous improvement can positively influence TQM effect with Performance for Financial Results, Customer Satisfaction and Employee Satisfaction

Research shows that continuous improvement is a very important factor of total quality management. To increase performance must practice continuous improvement through total quality management. Learning and ongoing improvement are key to total quality management. The long-term viability of businesses depends on treating quality improvement as a never-ending process. There are always chances to improve working practices, and a dedication to continual improvement guarantees that employees never stop learning. Continuous improvement entails not only enhancing current results but also improving future capabilities to deliver better results. (Tran Van TRANG, 2020)

Continuous improvement is based on the principle of PDCA. For example, CSI Company, the continuous improvement measures of enterprise total quality management system generally focus on the following aspects:

1. Continuous improvement of related party services

In the actual work, continuously improve from the aspects of investigation, mutual visits and complaints, regularly or irregularly investigate the relevant parties every year and issue satisfaction questionnaires; Investigate the service quality, service attitude, customer opinions and needs, analyze the satisfaction of the collected questionnaire with effective statistical methods, evaluate the objectives, and use them

as the input of management review to find ways to improve. Investigate and feedback the problems reflected by customers in the process of customer investigation, mutual visits and complaints, analyze and evaluate the opinions, suggestions and new needs provided, and take corrective and preventive measures, improve service attitude and workflow if necessary.

2. Internal audit and external audit improvement

Carry out and organize 1 to 2 internal audits and self-inspections within the company in a planned manner every year; for the observed items or nonconformities found in the external audit, corrective or preventive measures shall be taken to improve the conformity and effectiveness of the management system. For nonconformities, corrective measures shall be taken to eliminate the root causes of problems. For potential problems, preventive measures shall be formulated to prevent them. Both internal audit and external audit are important opportunities for system improvement, Take the audit process as a good opportunity for learning and improvement. Each time, take the audit opportunity as an opportunity to learn from the beneficial experience of others with an open mind.

3. Policy and objective improvement

In the actual work, all employees of the company shall publicize and implement each other's goals and objectives, so that each employee of the company can understand and make efforts to implement the policies and achieve the goals, make statistical analysis on the completion of the goals, and make some adjustments to the goals if necessary, according to the changes of internal and external environment, so as to gradually improve and improve the quality goals.

4. Management review and improvement

The company shall take improvement measures and make necessary changes for the problems found in the annual management review. The top management shall ensure that these Measures shall be implemented and accepted within a certain time limit

5. Corrective and actions

Correct and prevent document revision, personnel introduction and training, personnel supervision, process supervision, equipment development and improvement of introduction environment. Continuous improvement shall be carried out according to the following steps: 1) analyze and evaluate the current situation to identify the improvement area; 2) The manager determines the improvement objectives; 3) Find solutions that may achieve these goals, scientifically and realistically evaluate these solutions and make choices; 4) Organize relevant personnel to implement the selected solutions; 5) Through measurement, analysis, verification and evaluation of the implementation results, it is determined that these objectives have been achieved; 6) Formally adopt improvement methods and take corresponding incentive measures; 7) Review the results for further control.

Teamwork can positively influence TQM effect with Performance for Financial Results, Customer Satisfaction and Employee Satisfaction

Teamwork is an important part of the implementation of total quality management. The successful team of any matter is much more effective than the individual (Al-Nofal, 2005). Teamwork encourages all employees to participate in total quality management, also give full play to the potential of the team. TQM emphasizes teamwork and coordination. Many cross departmental improvement

working groups need to be established in TQM operation, such as QCC (quality control cycle). Therefore, quality management lies in teamwork. Through using the ability of teamwork, enterprises will obtain faster and better problem solutions. In the team, everyone can help each other, or ask questions in team, and get help from other employees to find solutions and put it into practice. (Nawal Gherbal 2012)

QCC group: refer to staff working in production line or engaging in all kinds of labor work organize activities with quality management theory and method so as to improve company and human quality and economic effectiveness, reduce cost around current existing problems on company's business strategy and policy. As below was CSI company QCC organization and workflow:

Figure 8 Management committee organization structure of quality in CSI.

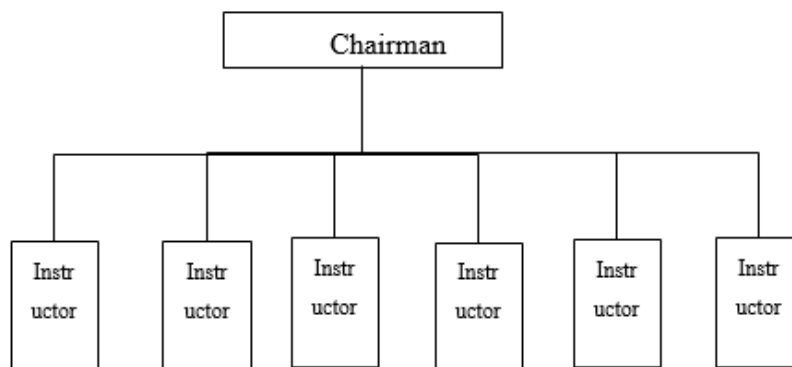


Table 20 QCC Workflow

Workflow		Activity	Responsible person
Project identification optimization	Project identification	<ul style="list-style-type: none"> ◆ Directive project (supervisor assign) ◆ Instructive project (Policy/target/KPI) ◆ autonomy project (TEAM autonomous recognition) 	Supervisor

	Project designate and register	<ul style="list-style-type: none"> ◆ Choose according to analysis of project benefits and support of strategy ◆ Project types determine (problem solving or project achievement), and select project leader and members and recorded in <Quality register card> 	Supervisor
Project implement process	P→D→C→A ◆ P evaluation ↓ (Pass) ◆ D→C→A execution ↓ ◆ Project reach a proposal ↓	Complete project according to (Plan→ Do→ Check→ Action) through team power and execution group give guidance Evaluation item: team organization, procedures, statistical methods, activities, process management records, team training	QCC Team
		After the completion of the project circle leader put forward the QCC results report	Circle leader
Project evaluation	Beneficiary evaluation ↓	Supervisor evaluate from sustainable aspects such as project improvement process, performance and control methods.	Supervisor
	Review ↓	Reviewer gives the evaluation on project from on-site team management, expertise, professional skill and other logical items.	Management committee
	performance evaluation ↓	Evaluate actual financial benefit according to team achievements of improving projects	Management committee
	Award		Management committee

Communication can positively influence TQM effect with Performance for Financial Results, Customer Satisfaction and Employee Satisfaction

Communication is a vital connect link in every level of total quality management and another key component for TQM implementation success, according to the findings of the study. The term "communication" refers to the mutual understanding of the sender and receiver of information. Communication between organization members, suppliers, and customers is essential for successful total quality management. There are many ways of communication, take CSI Company for example:

1) Downward communication: this method through top-down communication can effectively publicize and let employees clearly understand total quality management, such as Daily meeting, internal improvement meeting, etc.

2) Upward communication: in this way, subordinate employees can put forward effective suggestions affecting total quality management to the top management, such as general manager's suggestion box, monthly all staff meeting, monthly quality activities, etc.

3) Horizontal communication: this communication mode is very important because it breaks the barriers between departments, such as the company's monthly meeting, management review meeting, internal and external communication meeting, supplier communication monthly meeting, etc.

Customer focus can positively influence TQM effect with Performance for Financial Results and Customer Satisfaction

Customer focus is an essential component of total quality management, as well as the starting point and end point of quality management. Because the survival and development of enterprises depend on customers. Only with customers can there be a market and benefits. This is why customer focus is an important factor of total quality management.

Customer focus is a constant transformation, dynamic management, and improvement process. A successful company will realize that customers must be put in the first place in every decision. In this researcher found that CSI also defines that quality is the foundation of the company. The quality of excellent products is the confidence of the company and the cornerstone of honest treatment of customers. It can be reflected in CSI's quality policy and vision. The quality management main

points are to keep close contact with customers, grasp customer needs and focus on customers, Continuous quality improvement through PDCA cycle to meet the needs of customers, which is also the main goal and reason for the implementation of TQM.

So how should be truly customer-focus? From the perspective of researchers' suggestions should consider the following four aspects, serve customers from heart and action, and solve customers' actual needs.

1、 Establish the enterprise's customer-focus values.

Employees should form the ideology of "customer-focus", regard it as a kind of normalization consciousness, and be able to stand on the position of customers when dealing with problems, and work together towards the enterprise's ability to produce high-quality products that satisfy customers.

2、 Practice under the ideological guidance of "customer-focus values", and prove everything with action, taking customers as the starting point. Here suggestion do it in two points:

1) Pay great attention to the current product's quality. At present, market competitiveness is centered on quality. For existing product technology has been mature. Next, should be try the best to stabilize the product quality, make the quality consistent and win with quality.

2) Flexible deployment according to market demand. Think what the customer thinks develop new products based on customer needs.

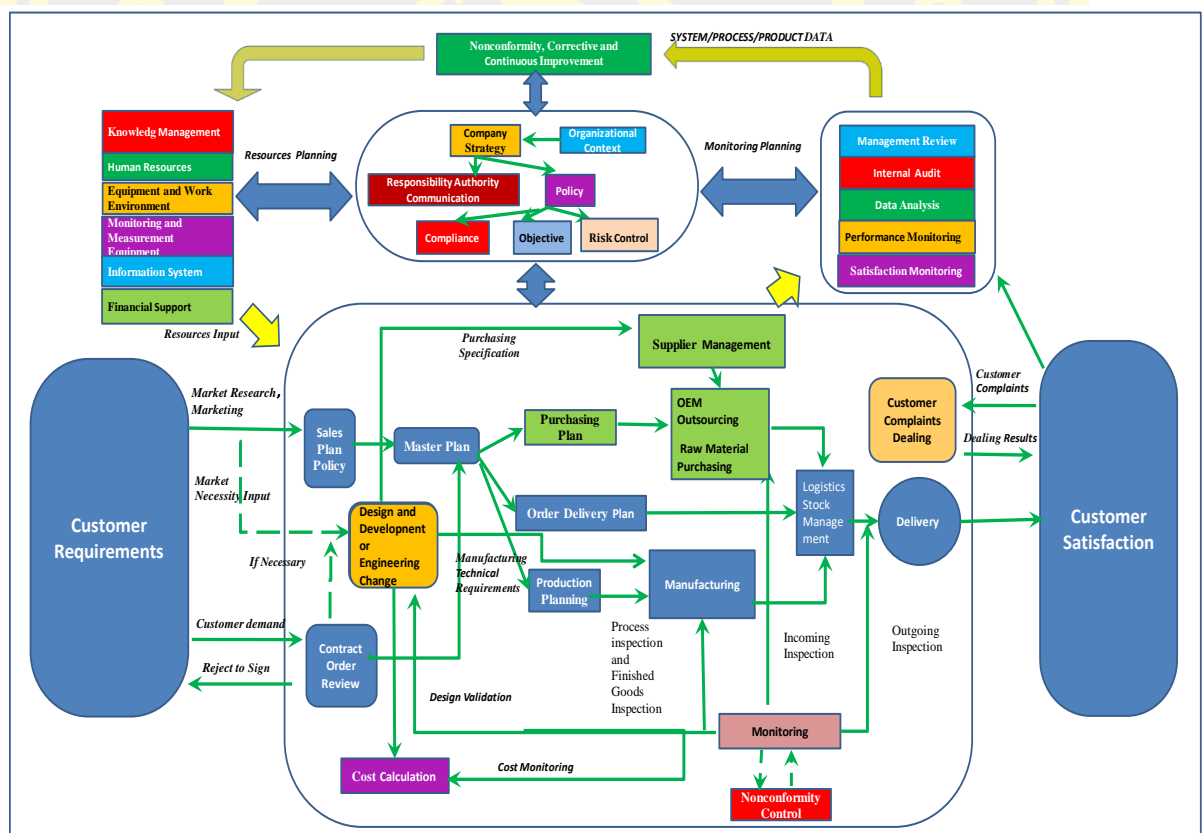
3、 Innovation

Innovation is to form new advantages and become more competitive.

4、 Open cooperation and form an advantageous industrial chain

"Continuous improvement" means that should continue to learn from others to make up for shortcomings, even in the form of cooperation. Now the market competition is very fierce. In order to address client needs, also should be collaborate with other partners to establish a win-win situation.

Figure 9 Customer oriented flow chart of CSI



Reward can positively influence TQM effect with Performance for Financial Results, Customer Satisfaction and Employee Satisfaction

It can be seen from this study that in CSI company, reward is the biggest factor affecting the success of TQM implementation, which also shows that incentive is the greatest encouragement to employees and one of the main driving forces for employees to actively participate in total quality management activities, in order to provide employees a sense of belonging and accomplishment while participating in management and to promote job satisfaction, Increase employee passion and creativity, which ensures the achievement of company goals. Therefore, incentive system is an incentive factor for employee participation. Whether or not there is a reward, as well as the amount and type of reward, has a direct impact on employees' willingness to participate. Lack of material reward or no difference in compensation will not motivate employees to participate if the company does not pay enough attention to the reward system. The performance of any individual, Department, team, department or department in the organization can be improved by providing incentives to achieve or achieve established goals. Rewarding employees or commending them for completing tasks is an important part of the quality improvement plan. The organization should have a formal compensation system to motivate individuals or teams to work harder for quality improvement and customer satisfaction. The system can be used to encourage and evaluate employees in the enterprise. Employees of the organization should be aware that there is also a punishment system for mistakes. Employees should be encouraged to put forward suggestions conducive to business development, and excellent suggestions should be recognized and rewarded. Such an incentive system could include improved working

conditions, monetary and non-monetary incentives and salary increases. Some companies have profit-sharing plans in place to encourage employees to take ownership of their work and quality-improvement efforts.

Based on CSI Company, enterprise reward categories can refer to the following:

- A. Ideal and goal incentive
- B. Honor incentive
- C. Material incentive
- D. Care and support incentives
- E. Training incentive
- F. Organizational incentive

Summarize the hypothesis test results and answer the following objectives:

The TQM CSFs have correlation and effect with Performance of TQM implementation success, with a significant level of 0.05 at least.

In a word, this study is helpful to broaden and guide the enterprises as their model to be reference when implementing total quality management. Similarly, the research results also provide management enlightenment for CSI Company. The management should focus on the key success indicators, effectively going to prepare and allocate resources, maintain the sustainable development of total quality management, and pursue higher competitive advantage in the marketplace.

CSI Performances

This study focuses on the financial performance of CSI's successful implementation of TQM: mainly from the company's manufacturing capacity and company assets.

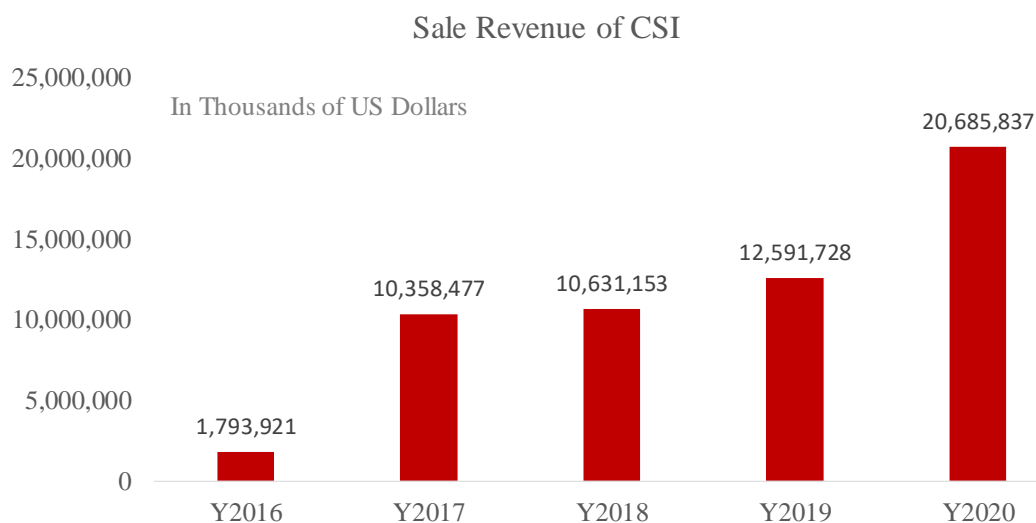
Since its establishment in 2016, CSI Thailand Company has continuously expanded its manufacturing capacity. By 2020, the company's component capacity has expanded from 127 MW to 2500 MW.

Table 21 Manufacturing Module Capacity, MW

	<u>Y2016</u>	<u>Y2017</u>	<u>Y2018</u>	<u>Y2019</u>	<u>Y2020</u>
Manufacturing Module Capacity, MW	127	653	702	1086	2500

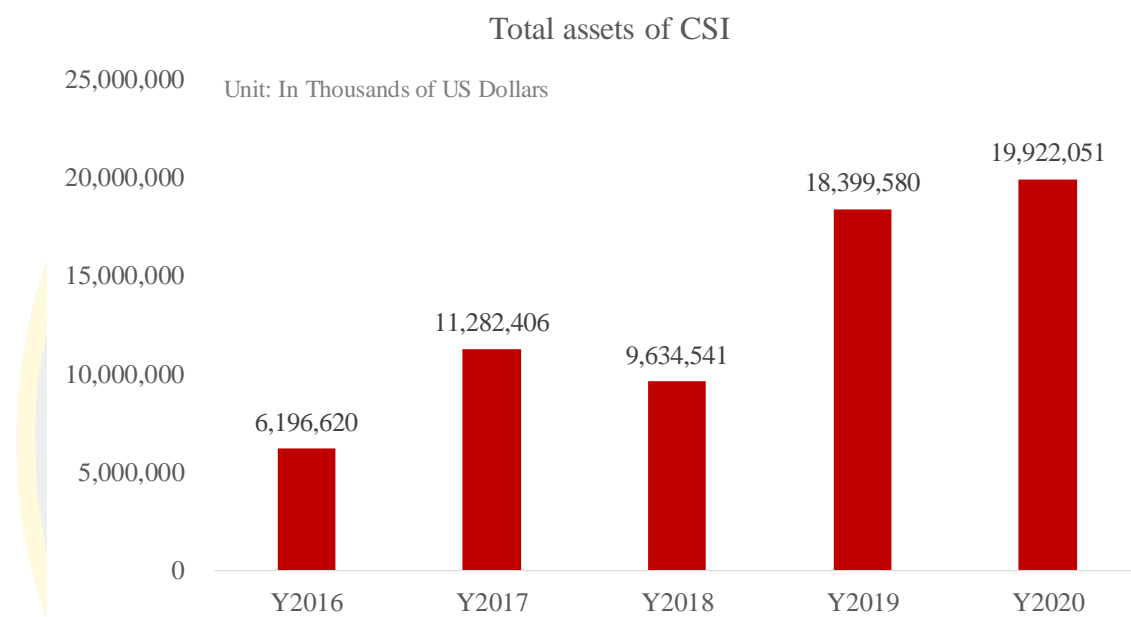
Since the successful implementation of TQM Total quality management, CSI company has successfully obtained ISO quality qualification certification, also obtained many kinds of product qualification certification in different countries and regions. The sales channels are expanding and the sales revenue is increasing.

Figure 10 Sale revenue of CSI



CSI company's total assets are accumulating continuously, showing an overall upward trend. At the same time, it also indicates that the economic resources that can be measured in money owned or controlled by the enterprise are increasing.

Figure 11 Total assets of CSI



In conclusion, in the view of the owner, the management performance of CSI is considered as strong management. CSI performed well in this financial result.

Limitations of the study

First, for understanding of overall quality management is rudimentary. Quality management has a long history of development and has amassed a wealth of practical and theoretical knowledge. This paper cannot introduce all total quality management knowledge in detail.

Second, this research survey is only based on a successful company as a model analysis. The data only have reference in specific fields and cannot fully express the application of TQM.

Third, because the data is collected through online survey, researchers cannot directly meet and persuade people to complete the survey. Some people do not understand the significance of the research and do not want to participate in the research. The recycle of questionnaire results takes a long time.

Recommendations

Suggestions for Enterprises who want to implement TQM

The following are some recommendations for organization who want to implement TQM:

1. The company shall implement total quality management from the top management, who must lead and support the company's total quality management plan. The implementation process will be aided by clear advice and support from top management, which will encourage all staff to engage in the entire quality management plan.
2. Enterprises should create an environment of total quality management in the workplace, such as formulating many quality improvement incentives to encouraging all employees to participate in total quality management activities and bearing in mind the concept of total quality management.

3. Companies should focus on customer satisfaction rather than profit itself.
Take a long-term view and use total quality management to support the company's long-term and stable development.

4. To implement total quality management, should refer to the successful enterprise model and combine self-strategy and system to implement total quality management suitable for self-culture. Pay attention to the factors that enterprises have the potential to become powerful and strengthen them with sufficient resources.

Suggestions for further research

1. Read a lot of TQM related literature and combine with practice to summarize the all-round core of TQM
2. Analyze TQM implementation experience in different industries, summarize methods, and promote the application of total quality management
3. Data collection adopts the method of offline and online synchronization to more intuitively understand the real ideas of participants and improve the reliability of data

REFERENCES

- Al-Nofal, A., Al Omaim, N. and Zairi, M. (2005) (2005). Critical Factors of TQM An International Comparative Benchmarking Analysis. *Paper for National Conference on Quality*, 10-11.
- Allen, R. S., & Kilmann, R.H. (2001). Aligning Reward Practices in Support of Total Quality Management. *Journal of Business Horizons*, 77-84.
- Besterfield, D. H. (2002). *Total Quality Management* (3rd Edition): Prentice Hall.
- Bian, X. (2007). The factors influencing TQM successful implementation. *Journal of Commercial research*, 1001-148X.
- Blanchard, P. N. Thacker, J. W. (1999). *Effective Training: Systems, Strategies, and Practices*: Prentice Hall.
- Brayfield, A. H., & Rothe, H. F. (1951). An index of job satisfaction. *Journal of Applied Psychology*, 35(307-311).
- C., M. G. (2010). Ridge regression. *Wiley Interdisciplinary Reviews Computational Statistics*, 1(1), 93-100.
- Chen, M. (2018). *Study on the continuous improvement strategy of total quality management in Hg medical device company*. Master's thesis, Nanchang University, China.
- Cronbach, L. J. S., R.J. (2004). My Current Thoughts on Coefficient Alpha and Successor Procedures. *Educational and Psychological Measurement*, 64(3), 391-418.
- Dale, B. G. (2003). *Managing Quality* (4th ed.). New York: Blackwell Publishing.
- Dao-de, S. (2000). Selection of the Linear Regression Model According to the Parameter Estimation. *Wuhan University Journal of Natural Sciences*, 5(4), 400-405.
- Eisinga R, T. G. M., Pelzer B. . (2013). The reliability of a two-item scale: Pearson, Cronbach, or Spearman-Brown? *International Journal of Public Health*, 58(4), 637-642.
- Flynn, B., Schroeder, Roger., & Sakakibara, Sadao. (2007). The Impact of Quality Management Practices on Performance and Competitive Advantage. *Decision Sciences*, 26. doi:10.1111/j.1540-5915.1995.tb01445.x
- Gotzamani, K. D., & Tsiotras. G.D. (2001). An empirical study of the ISO 9000 standards' contribution towards total quality management. *International Journal of Operations & Production Management*, Vol. 21 (No. 10: 1326-1342.).
- Hackman, J. R., & Oldham, G. R. (1975). Development of the Job Diagnostic Survey. *Journal of Applied Psychology*, 60, 159-170.
- Hauke J, K. T. (2011). Comparison of Values of Pearson's and Spearman's Correlation Coefficients on the Same Sets of Data. *Quaestiones Geographicae*, 30(2), 87-93.
- Johnson, D. W., & Johson, R.T. (1994). *Learning Together and Alone. Cooperative, Competitive, and Individualistic Learning* (Fourth Edition): Edina, Minn.: Interaction Book Company (4th ed.).
- Kano, N., & Lillrank. P. (1989). *Continuous Improvement: Quality Control Circles in Japanese Industry*.
- Kassicieh, S. K. a. Y., S.A., . (1998). Training, performance evaluation, rewards, and TQM implementation success. *Journal of Quality Management*, 3(1), 25-38.

doi:0.1016/S1084-8568(99)80102-3

- Lv, Y., & Ba,Liwei. (2014). An empirical study on the improvement of quality management based on Lean Six Sigma. *Journal of Research on science and technology management*, 32(2), 226-232.
- McAdam, R., & Bannister .A. (2001). Business performance measurement and change management within a TQM framework. *International Journal of Operations & Production Management*, Vol. 21 (No. 1/2: 88-107).
- Nawal Gherbal , A. S. (2012). Critical Success Factors of Implementing Total Quality Management in Libyan Organisations. *International Conference on Industrial Engineering and Operations Management Istanbul, Turkey*.
- Oakland, J. S. (2011). Leadership and policy deployment: the backbone of TQM. *Total Quality Management & Business Excellence. E-journal*, 22(5), 517-534.
doi:10.1080/14783363.2011.579407
- Rovinelli, R. J. a. H., R.K. . (1977). On the Use of Content Specialists in the Assessment of Criterion-Referenced Test Item Validity. *Tijdschrift Voor Onderwijs Research*, 2, 49-60.
- Shar'RI , M. Y., & Elaine, Aspinwall. (2000). TQM implementation Issue:Review and case study. *International Journal of Operation and Production Management*, Vol 2.
- Smith, p. c., Kendall, L. M., & Hullin, C. T. (1969). *The measurement of Satisfaction in Work & Retirement*. Chicago: Rand McNally.
- Song, M., Zhou,L.,&Zhang,Y. (2012). *Quality Management* (2th ed.). China: Science Press.
- Talha, M. (2004). Total quality management (TQM): an overview. *The Bottom Line*, Vol.17(No.1), pp.15-19.
- Tran Van TRANG, Q. H. (2020). Critical Success Factors of TQM Implementation in Vietnamese Supporting Industries *Journal of Asian Finance, Economics and Business*, 7, 391 – 401.
- Wang, Z. (2018). *Project Quality Management* (2th ed.). China: Mechanical Industry Press.
- Wang.R. (2013). *Essentials of commodity science* (4th ed). China: China Renmin University Press.
- Zhang, h., & Zhao,Puguang. (2014). Research on the quality assurance system of MPA dissertation based on total quality management. *Journal of Shandong High education*, 05, 61-68.



APPENDIX



APPENDIX 1 QUESTIONNAIRE

Questionnaire

Topic “Perceive Critical success factors of TQM implementation: A case study of the Canadian solar manufacturing (Thailand) CO., LTD”

This questionnaire is for independent study, which is a part of the thesis the Business Administration Program of the Graduate School of Commerce, Burapha University. The researcher would like to request your assistance to answer this questionnaire. Thank you very much for your cooperation.

Section 1: Organization background

Explanation Please make a tick (✓) in the parenthesis or fill in the blanks the information that is true for you.

1.1 Gender

Male Female

1.2 How long have you worked in the company?

5 years or less 6-10 years More than 10 years

1.3 Educational level

Diploma Bachelor Master or above

1.4 What is your position in the company?

Manager Supervisor Engineer Operator Other.....

Section 2: Success factors of TQM implementation on CSI

Explanation Please make a tick (√) in the score level box that is true for you

Score level: 5= Very high 4= High 3= Medium

2= Low 1= Very low

2.1 Top management attention and leadership

Main factor	NO	Factors	Score Level				
			1	2	3	4	5
Top management attention and leadership	1	Top management attaches importance to quality management and participate in quality management					
	2	Top management commitment for TQM					
	3	Top management supports quality improvement activities					
	4	Top management make clear vision and policy					
	5	Quality objectives and policies from top management are communicated through the company.					
	6	The top management establish KPI system to review the performance by systematic and effective methods					
	7	Top management has provided sufficient resources for staff education and training.					

2.2 Establish an effective quality system

Main factor	NO	Factors	Score Level				
			1	2	3	4	5
An effective quality system	1	Regular internal audit of organization system operation					
	2	Full staff participation system construction					
	3	Management level attention and					

		participates for TQM					
	4	Identifying the organization mission and vision					
	5	The internal and external environment analysis for organization					

2.3 Training and education

Main factor	NO	Factors	Score Level				
			1	2	3	4	5
Training and education	1	Training in the total quality concept					
	2	Training in quality problem identification, solving and improvement skills					
	3	Training in interactive skills such as communication skills, meeting skills, and leadership skills					
	4	Training in ISO quality system					
	5	Training in quality statistical analysis tools					

2.4 Continuous improvement

Main factor	NO	Factors	Score Level				
			1	2	3	4	5
Continuous improvement	1	Working smoothly in teams					
	2	Searching for root causes when founded the quality issues					
	3	The initiative and undertake of the improvement project					
	4	Regular evaluation system					
	5	Management level support for resources					
	6	Clear objectives and improvement plan					
	7	Skilled use of quality tools and techniques					

2.5 Teamwork

Main factor	NO	Factors	Score Level				
			1	2	3	4	5
Teamwork	1	The organization has a common goal					
	2	Cross cultural support, understanding and coordination among members of different nationalities in an organization					
	3	The organization has clarified team roles and tasks					
	4	Team members trust each other					
	5	Team members should be conscious and willing					
	6	Team members have clear Job description					

2.6 Communication

Main factor	NO	Factors	Score Level				
			1	2	3	4	5
Communication	1	Establish effective communication channel to feedback quality issues					
	2	Good communication among departments					
	3	Quality technology / tools for effective communication					

2.7 Customer focus

Main factor	NO	Factors	Score Level				
			1	2	3	4	5
Customer focus	1	The company focus on customer satisfaction					
	2	The company focus on customer needs					
	3	The company focus on solving customer problems					
	4	The company focus on customer participation in product design					

2.8 Reward

Main factor	NO	Factors	Score Level				
			1	2	3	4	5
Reward	1	2.8.1 Material rewards (Such as bonus, salary promotion, overseas travel, valuable gifts etc.)					
	2	2.8.2 Non- material rewards (Such as verbally compliment, flextime, time off, Provide extensive training plans etc.)					

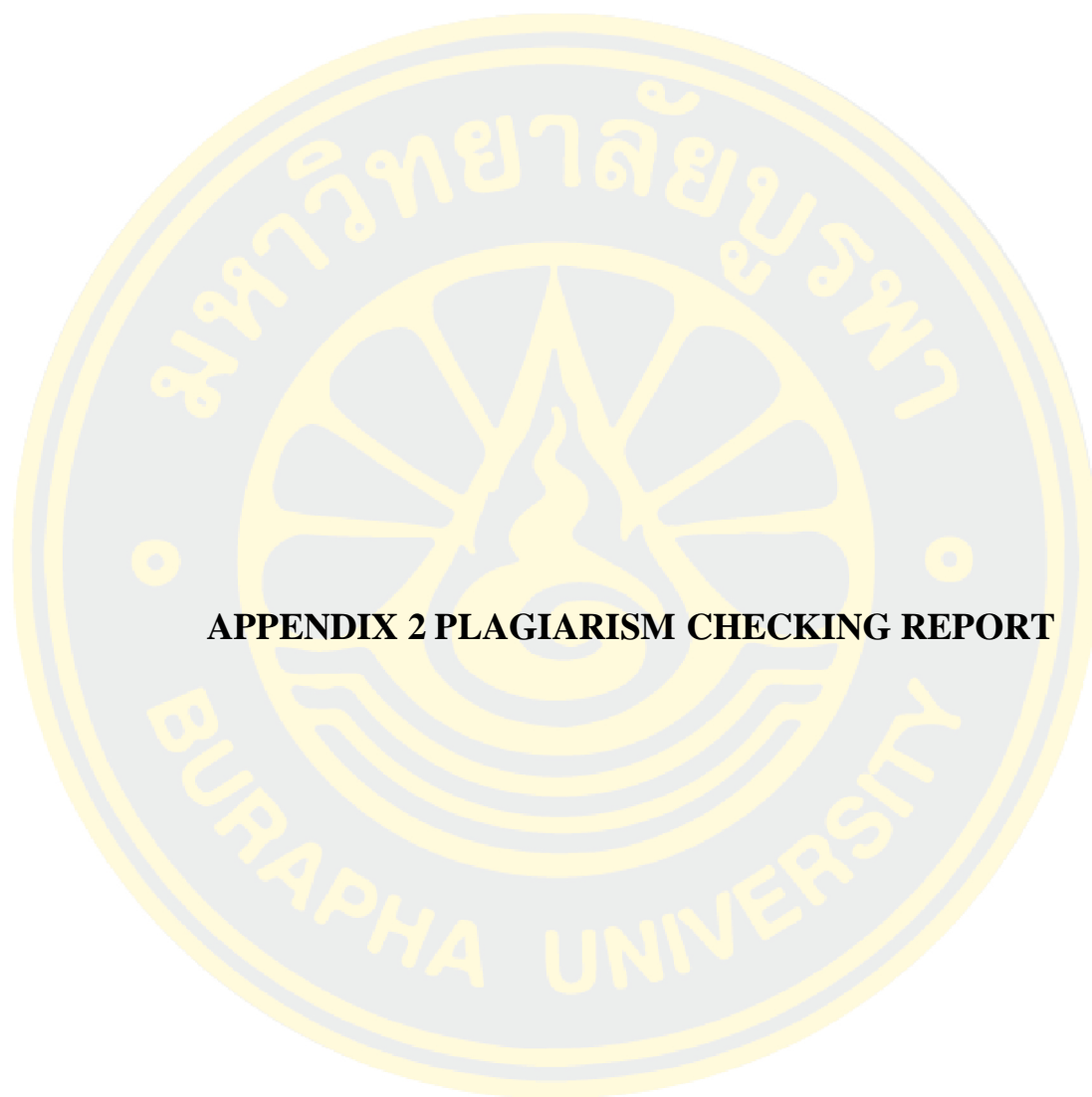
Section 3: Performance evaluation factors of TQM implementation on CSI.

Explanation Please make a tick (√) in the score level box that is true for you

Score level: 5= Very high 4= High 3= Medium

2= Low 1= Very low

Main factor	NO	Factors	Score Level				
			1	2	3	4	5
Performance evaluation factors of TQM	1	Financial Results (The company's product sales performance)					
	2	Customer Satisfaction					
	3	Employee Satisfaction					



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Quek Eng Eng, Sha'ri Yusof. "A survey of TQM
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