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DEVELOPMENT OF A QUALITY IMPROVEMENT METHOD FOR
INTERNATIONAL MANUFACTURING

by

Andrew J. Strong

A thesis submitted to the faculty of

Brigham Young University

in partial fulfillment of the requirements for the degree of

Master of Science

School of Technology

Brigham Young University

April 2008

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BRIGHAM YOUNG UNIVERSITY

GRADUATE COMMITTEE APPROVAL

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This thesis has been read by each member of the following graduate committee and by majority vote has been found to be satisfactory.

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ABSTRACT

DEVELOPMENT OF A QUALITY IMPROVEMENT METHOD FOR INTERNATIONAL MANUFACTURING

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Master of Science

Many companies are entering the international manufacturing arena. The continued expansion of the global market suggests that international manufacturing will grow. Among other concerns, the difficulty of producing high quality in some countries suggests that it is critical that companies using international locations for manufacturing find methods to better monitor and improve quality.

The purpose of this research was to develop and test a method for quality improvement in an offshore environment. This method would be specifically applicable to a third-party logistics company (3PL), where the 3PL is a United States company that brokers manufacturing in China, networks to multiple manufacturers for a variety of products within that country, and is responsible for the final quality of the products made in China.

After designing a new quality method that focused on regular recording and reporting of data, it was implemented into a 3PL test-case company and tested and results reported. From the results salient points were identified that improve quality when working with a 3PL located in China with a parent company in the United States. These points include: structure for reporting quality, management involvement, employee dedication to quality, and cultural understanding and awareness.

Recommendations for further research are also outlined. These include: extended time (beyond three months) to implement the method and test it, larger sample size to improve the quantitative analysis, cost benefit analysis for the implementation of the method, implementation in different nations, and implementation in a manufacturing company specific to a product.

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1. INTRODUCTION

1.1 Background

Manufacturing is becoming a world-wide business. All countries are, or can potentially be, involved with all other nations in production and/or distribution of goods. The entire world is a network of manufacturing and sales potential. Clothing is manufactured in Cambodia and then sold in Europe; lighting fixtures are made in the Philippines and sold in America; and Ipods are manufactured in China and sold all over the world. Any country can be involved if it can supply one of the essential ingredients to manufacturing, which are raw materials, labor, overhead, or market.

Large companies, like WalMart, have a veritable army of employees who oversee their extensive manufacturing interests in foreign countries, but even a small entrepreneur can find a way to have a single product made overseas. There is a stampede of companies entering the international manufacturing sphere. It is inevitable that international manufacturing will grow.

However, when looking at international manufacturing, the disadvantages need to be understood as well as the advantages. There are many factors to be aware of when offshoring a product to be manufactured. Thorough evaluation of these factors will lead to success. These factors include: additional transportation costs, potential higher raw materials costs, new warehousing, living expenses for workers, and quality concessions.

The massive recalls from China are evidence of such challenges in quality control (Sun, 2007). Therefore, a thorough analysis is necessary before proceeding with off-shore manufacturing. Many companies who did not thoroughly investigate these hidden costs are now coming back to the United States in an attempt to correct their mistakes (Trent, 2007).

If a company concludes that moving manufacturing to an overseas market is a good idea, there are always changes and adjustments that must be made in order to be successful. For example, lead times inevitably increase when compared to a domestic supplier. Also, quality views may be different, which can give rise to serious problems. Cultural differences are real, and can affect the way the parent company views its foreign associates and vice versa. At a minimum, the parent company must find managers who can work with both the established culture of the parent and blend with the culture of the new manufacturing locale, seeking to understand both and working to eliminate the inevitable clashes of culture which will arise. This global manager may be a native of the new culture or may be of the parent company culture. Either way, the manager must be able to understand both cultures and bridge them (Blackwell, 2004).

United States companies in particular are usually seeking lower production costs through reduction of labor, lower-priced materials, reduced overhead, or a combination of all three. Therefore, manufacturing is constantly being pushed out of the United States to create a competitive advantage (Porter, 1990). While many companies see manufacturing overseas as less expensive, and a great competitive advantage, low cost with poor quality will result in disappointment.

Manufacturing overseas could also facilitate opening new markets within, or close to, the nation of production where shipping and other logistics costs would be significantly lower. Companies may seek to create a comparative advantage, a method of competing through differentiation more than a focus directly on costs. This method would be adding a value making the customer desire the product more than a competitor's (Porter, 1990). Hence overseas manufacturing has numerous advantages for United States companies if the situation is approached thoughtfully.

Seeing that "forty percent of the consumer goods Americans buy from abroad are produced in China" (Shirk, 2007), the United States is clearly well into a period in which some United States manufacturing is being relocated to China. Even through this linkage between United States manufacturers and China is large and growing, the problems that have been previously outlined are not diminished. The strong cultural differences, great distances, and language barrier continue to make the Chinese-American relationship challenging.

1.2 Problem statement

Recent media reports have highlighted quality problems with manufacturing in foreign countries (Sun, 2007). These problems seem to have resulted, in part, from poor communication between the parent company in the United States and the foreign manufacturing entity. Evidently the expected standards for quality are often not communicated well between the international and parent companies. This creates confusion as to the requirements that need to be emphasized in quality standards in the international location, and what is to be expected by the parent company.

In order for the consumer to remain satisfied, there must be effective quality control procedures in place. The procedures are more than just ensuring that good product is being made. While the procedures do this, they also ensure that product is manufactured on time, shipped on-time, and that management is handling manufacturing and logistical procedures in an ethical and effective manner.

Communication between a parent company and an overseas company is very important in order to reduce confusion. While there are many different aspects of communication in manufacturing, the establishment and maintenance of good quality are at the heart of good manufacturing. This good communication for quality underlies all other issues because without understandable quality procedures and standards, the customer is dissatisfied, the product is incorrect, and the money saved in moving manufacturing offshore is lost. Communicating and establishing a procedure of reporting and accountability will ensure that profit is not lost in mistakes and misunderstandings, and will also encourage ethical behavior.

It seems the ideal method to ensure communications are both timely and accurate is for the parent company to have a physical presence in the form of a representative in the overseas manufacturing facility. This helps ensure the effective communication that is so vital to a company. In one example, a company in China was producing stereo systems that were nearly identical for two different companies; one in the United States and one in Japan. The American company sent many detailed drawings and a thorough explanation of what was expected and what needed to be accomplished. The Japanese company sent an engineer to the facility. The Japanese company's quality was far

superior to the American company's, thanks to the presence of an engineer in the facility (Hawks, 2000).

The use of a parent company representative within the country of production is best. The lack of a physical presence in the overseas company can become crippling to the entire organization, both domestic and abroad. Culture clashes, language barriers, and differences in expertise often stand in the way of effective communication. A personal contact of the author's working in China emphasized the value of such a representative. This contact related a situation where the parent company found that parts were missing from the shipments. The missing parts were required for the assembly of the product. The parent informed the Chinese manufacturer of the shortages and was told that the problem was inadvertent and would be corrected. However, the problem was not corrected. Thus, the parent company attempted to implement a system that would guarantee completeness (quality) by using a checklist. However, the Chinese company resisted the checklist. According to the contact, whether the problem is malicious or not, the problem will not go away until the parent company places a representative in the manufacturing facility (Dayton, 2007).

Even with a parent company representative, there is rarely an effective quality method in place to fully identify and modify expectations and specifications, track manufacturing problems and their resolutions, effectively communicate information, and document the interactions between the United States firm and the international manufacturer. The usual practice is to only record problems with a very brief explanation, or sometimes no explanation at all.

Solving this quality communication problem is critical in maintaining quality. This is because quality is the heart of manufacturing acceptance, and ultimately profits. While a parent company representative is ideal and can help eliminate many of the communication problems, it is often not feasible. Hence, a method must be established that accomplishes the objectives of good quality communication and implementation without the need for a parent company representative to be constantly on-site in the foreign venue. This thesis proposes the development and evaluation of such a method.

1.3 Objective

The purpose of this research was to design and test a system that would improve the communication and understanding of quality control methods. Realizing that many companies can not realistically have a representative full time in China, the system was designed to work without constant supervision from a parent representative, but does require the parent company's involvement.

A system for monitoring and reporting quality in a foreign venue was developed as part of this thesis. This system is referred to as the "Record and Report Quality Method" (RRQM). This system establishes an alignment in understanding and reporting between the United States and foreign companies in terms of quality. The system also emphasized the importance of keeping a complete record of both good and bad quality results so that an accurate analysis of the quality control (QC) process can be accomplished.

1.4 Thesis statement

Because of the importance of quality control in manufacturing and of identifying the factors that affect good quality, effective communication between a parent company and the manufacturer is essential. Distance, time differences, and culture make this even more important in international manufacturing. Therefore, the primary question to be addressed in this research is: Can a system be developed that will improve quality in international manufacturing? Then, can this system be effectively implemented in China?

1.5 Null hypothesis

The hypothesis to be tested is: The Record and Report Quality Method will be shown to provide no measurable difference in quality when compared to current methods used in an international manufacturing environment.

1.6 Methodology

The methodology used for this thesis was three-fold – personal observations and interviews of the researcher, questionnaires, and a case study. Because of the need for better communication between a parent company and its international partners, a system was developed in theory that could address this issue. This is the Record and Report Quality Method (RRQM).

The development of this system used all three methods. The researcher first observed the need for a better communication system for quality needs. Then, through interviews with experts (primarily in China), refined the objective to develop such a quality system.

Next, an instrument was needed to communicate quality information and also for the sake of consistency. This instrument was in checklist form and was created through the combination of two checklists' strong-points; one of which already existed and the other was a theoretical checklist devised by the researcher. The analysis of the two separate checklists came from questionnaires distributed to experts in China. The experts filled out the questionnaires that corresponded with the individual checklists. Through the results of the questionnaire and observation of existing systems, a combined checklist was made and implemented in a case study to test the RRQM.

The next level of verification was to implement the combined checklist in an actual company using the case study method as a guide for gathering data. A case study is "an intensive and detailed study of one individual or of a group as an entity, through observations, self-reports, or any other means" (Tesch, 1990). This case study primarily focused on qualitative aspects of research, while utilizing some quantitative aspects.

The case study occurred with a test-case company in the United States. The test-case company has facilities in Shenzhen, China and Changshu, China, where the majority of research occurred. The total time in China was three months spent creating, evaluating, and observing the RRQM.

Along with the initial questionnaires given to international experts, another questionnaire was submitted to the test-case company's employees designed to measure the effectiveness of quality control information being reported to the parent company office. This form was submitted to test-case employees pre-implementation and post-implementation of the RRQM. The data collected was used to analyze change in the

quality for the test-case company. Observations and interviews were used in conjunction with the questionnaire to measure change in quality.

1.7 Scope and delimitations

The research was conducted only in China with one test-case company and the test-case company's suppliers. The time of implementation, testing, and observation lasted three months (May to July 2007). All business practices and observations of business methods may have an American/Western thinking bias. This is due to the researcher's native culture and despite his attempt to avoid such bias, it may exist.

2. REVIEW OF LITERATURE

2.1 International manufacturing

Many nations throughout the world are capitalizing on the ability to outsource jobs in search of cheaper labor, lower tooling costs, and new markets. In India there are call centers with native Indians speaking in American accents, technologists creating software that will never be used within their own nation, and accountants completing taxes for clients that are thousands of miles away. It is clear that competition is becoming global, and it is happening quickly and effectively. Friedman states that the world is flat, that Columbus had it wrong. What is meant in Friedman's words is, "The global competitive playing field [is] being leveled" (Friedman, 2006).

Not only is the global competitive world becoming flattened, but international companies are more effective and efficient in the implementation of new market opportunities and the ability to implement new strategies compared to their domestic competitors (Coyle et al., 2003). Because of this increased focus on global markets, it is critical that companies, whether they are strictly domestic or integrated in international markets, understand the international manufacturing world, and how it functions.

2.1.1 Lower costs versus hidden costs

Companies will do whatever possible to gain a competitive edge over other companies. Michael Porter, author of *The Competitive Advantage of Nations*, said, “The nature of competition is embodied in five forces: (1) the threat of new entrants, (2) the threat of substitute products or services, (3) the bargaining power of suppliers, (4) the bargaining power of buyers, and (5) the rivalry among existing competitors”. These five forces directly affect the profitability and success of a company within an industry. When a company positions itself within an industry, they must create a competitive advantage in order to survive. “There are two types of competitive advantage: lower cost and differentiation.” “Differentiation is the ability to provide unique and superior value to the buyer in terms of product quality, special features, or after-sale service” (Porter, 1990).

Seeking lower cost is clearly one of the reasons a company would pursue international manufacturing. There is no doubt that the labor rates overseas are usually less than labor rates in the United States. For example, the labor rate in China averages between \$0.33 and \$4.00 versus the American average of \$21.33 (Maniscalco, 2004). However, focusing primarily on low labor tends to be detrimental to a company. The authors of the book *Plowing the Sea* explain that as companies provide jobs in developing nations, the economy of the developing nations will grow. This growth in economy will increase the standard of living and wages for employees. The authors say that low labor, as a factor for competitive advantage, is not a bad thing. However, if low labor is the only factor for competitive advantage, it is a problem because companies will inherently attempt to keep wages low; this will stifle the economy and standard of living in the

developing nation. Such a situation is bad because the company should be fueling the economy, not trying to stop its growth. “Having cheap labor as the principal source of advantage [is bad]: it is not sustainable, and in fact it is not desirable to sustain” (Fairbanks and Stace, 1997).

In addition to not being able to sustain cheap labor, there are many hidden costs involved with manufacturing in a developing nation. Some of these hidden costs are travel expenses, new facilities, shipping costs, longer lead times, and higher inventory amounts. In order for a company to become profitable, these hidden costs must be analyzed and justified. Simply going overseas because they are trying to follow the perceived trend or looking at only one aspect of cost is highly ineffective, and will likely not yield benefits (Field, 2005). Globalization can be a complex problem with ever-changing security requirements, customs regulations, social and cultural considerations, and economic issues that constantly redefine its complexity (Stastny, 2004).

Outsourcing focused only on the concept that low-labor cost manufacturing will be cheaper when performed overseas can be detrimental to a company. As stated above, this is often the case; however, manufacturing can be done effectively overseas, and can result in a beneficial system. Because of the potential dangers in outsourcing and difficulties companies are having, a trend is developing where manufacturing is beginning to return to the United States. This creates the question: “Should all manufacturing stay domestic (from the perspective of a United States company)?” It is clear, based on the profitability of many international manufacturing companies, that the answer is, “No”. But companies need to know when or if it is wise to move manufacturing overseas. For example, the best products to move overseas might be those

that are stable in design and manufacturing process. Such products act as cash cows, consistently selling well, but changing little. Many changes to the product can complicate the system, and with such a long lag-time in the logistics and supply chain, it is difficult to make rapid changes with the international imports (Trent, 2007).

There are many jobs that are better suited for overseas manufacturing, and those that are better suited in their domestic environment. United Plastics Group has 10 plants in United States, Mexico, U.K., and China. The vice president of sales, Mike Langton, believes there are two kinds of applications that apply to low-cost countries: Labor-intensive jobs that aren't worth automating, and small products rather than bulky ones that are expensive to ship over long distances. "Products likely to stay in the U.S. are ones that involve special quality or regulatory standards, proprietary intellectual capital (patents), or potential for advanced automation" (Knights, 2007).

2.1.2 The invisible hand

This overseas movement may be a natural and inevitable phenomenon. "Work gets done where it can be done most effectively" (Friedman, 2006). This implies that an attempt to stop the rush of domestic companies moving into an international sphere is nearly impossible. This trend of companies moving to a lower labor rate is nothing new. "In the early days of the United States, manufacturing was centered in New England both because of the large population and the investments of English companies in an area (America) that had lower costs. In time, New England labor became more expensive and the manufacturing moved toward the Midwest where the population was newly arrived and willing to work for low wages. In the 1900s the low labor rates in the South drew

companies out of the Midwest. When the labor became relatively expensive in the South, the companies began moving to other countries” (Strong, 2005).

There are many people who feel that manufacturing should stop moving overseas. The difficulty is that stopping outsourcing is not always beneficial. In fact, Adam Smith says that people naturally pursue their best interest, referred to as being led by an invisible hand, which in this case is finding cheaper manufacturing costs. Smith states that “by pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.” Smith further explains that even though the individual is not intending to benefit society, they usually end up helping not only the society they are a part of, but both societies (Smith, 1791).

There are situations where the apparent force of keeping jobs within the United States can be more detrimental than the potential outsourcing of those same jobs. What many see as a collaboration of two nations both benefiting, many others see as a way to simply cut costs and exploit a workforce. Friedman relates a job struggle that occurred between India and Indiana which helps to show how all parties can benefit. The unemployment department of Indiana needed upgrading in technology and training, and when India bid on the project, they were \$8.1 million lower than any competitors. When the politicians of Indiana discovered the situation, they were furious, made the department of unemployment cancel the contract, and break it up into smaller sections so that Indiana could service the department themselves. So the question posed by Friedman is, “Who is the exploiter and who is the exploited in this India-Indiana story?” The end result showed a significant increase in the costs (costs that would have saved taxpayers significant amounts of money), the company would have grown faster, and the

relationship with the Indian consultancy would be greatly benefited. In this situation we see talented, well trained Indian engineers with the ability to use their skills in a flat world, being paid a decent wage, unable to take advantage of the flat world. We see Americans refusing to use the skill set of the flat world, and having to result in paying higher taxes to allegedly keep a job within America. Friedman asks a powerful question, “If you are against globalization because you think it harms people in developing countries, whose side are you on in this story: India’s or Indiana’s?” (Friedman, 2006).

Within the context of international manufacturing there are three major areas of special concern for manufacturers. These three areas are: logistics, ethics, and quality. These three areas require a re-thinking on the part of most Western manufacturing companies because they are the areas which are most different from their domestic experience. Therefore, each of these areas will be discussed in detail in the next sections. Then the specific case of manufacturing in China will be discussed with special emphasis on logistics, ethics, and quality.

2.2 Logistics

As we have seen, in light of the inevitability of companies moving manufacturing operations overseas to seek lower costs, the various hidden costs need to be understood and controlled. Analysis, control, and implementation of the movement of goods is called logistics. “Logistics are key to customer satisfaction” (Zacharia and Mentzer, 2004). According to a December 2001 Economic Intelligence Unit report, on average, 90 percent of a Chinese manufacturer's time is spent on logistics and 10 percent is spent on manufacturing (Bolton and Wei, 2003).

In the United States “logistics costs [in 2004] were \$1.1 trillion, or 9.5% of the current gross domestic product.” Logistics costs are rising as more and more products are being imported into the United States. International freight is estimated to grow at 85% versus the domestic growth of 65% to 70% by 2020 (Blanchard, 2006). The number of companies who say logistics costs are 10% or more of the company has doubled from 2003 to 2005 (Jusko, 2005). Morgan Stanley estimated that in 2001, logistics spending in China amounted to one-fifth of the nation's GDP and twice the proportion spent on logistics in the United States (Bolton and Wei, 2003).

Despite the growth in international manufacturing, many United States companies are still concerned with the logistical problems in developing nations. Some of these logistics problems include poor infrastructure, the costs associated with inventory in transit, and common delays in both shipping and receiving. Logistics issues are problems wherever manufacturing is done, but especially in developing nations. Most developing nations have difficulty correcting the problems because, of course, that is what developing means. China has recognized this problem and is working diligently to correct it. “Many of the remaining issues in Chinese logistics are “manageable” and can be overcome with significant (but not overwhelming) investment of resources, management and labor” (Daly and Cui, 2003/4). The logistical set-backs in developing nations can make manufacturing very difficult for entering companies. In addition to these set backs, surprisingly few companies have an effective way to manage the change in logistics that occurs when they move into an international market (Field, 2005).

2.2.1 Third-party logistics providers (3PLs)

A third-party logistics provider (3PL) is defined in many different ways. Broadly, a 3PL is “an external supplier that performs all or part of a company’s logistics functions” (Coyle et al., 2003). A more narrow approach is “a relationship between a shipper and third party which, compared with basic services, has more customized offerings, encompasses a broader number of services functions and is characterized by a longer-term, more mutually beneficial relationship” (Knemeyer and Murphy, 2005). There are some companies that would be considered 3PLs that are taking over everything from finding the company to manufacturing the product to shipping to storage. These 3PLs are providing a more thorough service to the end customer by taking advantage of their connections.

Companies are now beginning to expect more than just shipping and warehousing from their 3PLs. 3PLs are evolving from a service industry to “a solution-based industry capable of designing and executing sophisticated global supply chain solutions.” These 3PLs are no longer just moving boxes, but are working with the company to create a competitive supply chain (What your 3PL can do for you, 2004). “3PLs need to now go beyond just meeting the customer expectations. They need to meet the needs of customer now, and in the future. They need to meet the expanding needs of their customers” (Quinn, 2005).

Many companies have been hesitant to use 3PLs. Their primary concerns are loss of control, actual costs not being reduced, service commitments not being met, feeling of less expertise within the 3PL, and the feeling that logistics are too important to outsource (Coyle et al., 2003). Reducing costs with 3PLs is easier said than done. It is unlikely a

3PL will know a company's system better than the company. As such, it is critical that companies achieve control of their system before attempting to use a 3PL and outsource their production (Blanchard, 2004).

Despite these potential concerns, most companies see advantages in outsourcing some of their logistics. "Because of the immense complexity in international logistics, the use of 3PLs is growing in popularity" (Buyer's Market for Global 3PL Services Drives Outsourcing Trend, 2005) "Between 1996 and 2003 the total market for outsourced logistics grew from \$30.8 billion to \$76.9 billion" (What your 3PL can do for you, 2004). In 1990, 38% of *Fortune 500* companies worked with 3PLs. That figure is now about 80% to 90%, as indicated in multiple sources (What your 3PL can do for you, 2004; Quinn, 2005; Buyers market for Global 3PLs, 2005). 3PLs are known for their great customer satisfaction (Quinn, 2005) which is evident seeing that "70% of shippers report significant savings when using 3PLs" (Buyers market for Global 3PLs, 2005).

One of the primary advantages in using a 3PL utilizing is their expertise with the local environment. Local knowledge is critical because the moving of goods requires knowledge of the local infrastructure (Trunick, 2006). Heather Sheehan, a logistics worker for Danaher, says that "local knowledge is priceless. Running a swift, efficient supply chain comes with the local knowledge. The local knowledge can navigate you through the bureaucratic red tape that accompanies areas like China" (Hoffman, 2005). Many companies who rushed into China found it difficult to get items out because of poor infrastructure. 3PLs, and their local knowledge and ability to adapt to their known environment quickly, make overcoming this challenge possible (Quinn, 2005). 3PLs can

also contribute in the identification and control of manufacturing companies. This has proven to be equally important to the actual logistics function.

2.3 Ethics as a factor in international quality

“The area of ethics is the ultimate test of the ability to cope with the ambiguity of international business” (Blackwell, 2004).

“Ethics is two things. First, ethics refers to well-based standards of right and wrong that prescribe what humans ought to do... Secondly, ethics refers to the study and development of one’s ethical standards” (Velasquez et al, 1987a). When investigating what ethics are, it is also good to look at what ethics are not. Ethics are not religion, science, following the law, feelings, or following culturally accepted norms. Many people refer to these as ethics, but they are not (Velasquez et al., 1988a). Whether one is an atheist or a saint, ethics are applicable to all people (Velasquez et al., 1987a).

2.3.1 *Can ethics be taught?*

It has been asked if ethics can be taught. Socrates says that ethics is knowing what we ought to do, and that knowledge can be taught. As such, ethics can also be taught. However, a person’s ethical standing is not determined on their knowledge. Rather, it is based on their actions and their use of such knowledge. There are many levels that help people define what is right and wrong. In the earliest stage, they define what is right and wrong based on what authoritative people tell them. This is often a result of punishments that are attributed with certain actions. The second level of moral development is dependent on what people believe in the geographic area and social groups surrounding the person. If a person continues to develop, they will reach a level

where they stop defining right and wrong based on environment, and base it on the universal point of view of what is right and wrong. One of the biggest factors that determine a person's progression is education. When people were taught about ethics, they rise in the levels (Velasquez et al., 1987b).

Consistency and ethics go hand in hand. There are many experts who say that the core of ethics is consistency. Many say that all ethics is summed up in the golden rule concept of "do unto others as you would have them do unto you." If people treat others like they would like to be treated, ethics would abound (Velasquez et al., 1988b).

2.3.2 Ethical relativism

Ethical relativism is a theory that believes there are no universal standards of ethics. It believes that ethics are dependent on location and cultural norms. The only moral standard by which a society can be judged is the standard created within the society itself.

Most experts have rejected the concept of ethical relativism. While it is obvious that there are some moral principles that differ from culture to culture, the fundamental moral principles are the same. The way the Jews were treated by the Nazis and the way slavery existed in the pre-Civil War United States show that there are some principles that are universally wrong (Velasquez et al., 1992).

2.4 Quality

In the Industrial Revolution (18th and 19th century) production emphasis was on throughput rather than quality. As time went on, focus on quality became just as important as throughput. This focus on throughput leading to better quality is evident in

developments such as division of labor (Adam Smith and the pin factory), interchangeability of parts (both Johannes Gutenberg with the movable type printer and Eli Whitney and the rifles), mass production line (Henry Ford and the automobile), and worker efficiencies (Fredrick W. Taylor and his time/motion studies). Fredrick W. Taylor also started movement toward better inspection of parts. He emphasized end-line inspection in the last part of the 19th century. The focus on final inspection greatly improved productivity (Davies, 2003). These practices remained common until the 1940s and 1950s when, in Great Britain, quality was integrated into the process to emphasize prevention of quality problems rather than simple discovery of the problems (Davies, 2003).

These methods and concepts continued until further improvements came with W. Edwards Deming as he led the Japanese into the modern era of quality emphasis. Deming, and those who followed him (for example, Juran and Taguchi), preached statistics as a method of analyzing production to ensure quality. This statistical emphasis clearly changed the face of manufacturing around the world. The phrase “made in Japan” changed from one indicating a low-quality, low-priced good to one indicating a high-quality, low-priced good.

With the leadership and example of great quality minds of the past, quality assurance has evolved into a much better system. Rather than just finding a problem and eliminating it, quality assurance goes further. “Quality assurance is the prevention of quality problems through planned and systematic activities including documentation. This includes the establishment of a good quality management system and the assessment

of its adequacy, the audit of the system's operation and the review of the system itself' (Davies, 2003).

The success of this quality assurance system was seen at Gerber, the baby food manufacturer. Gerber was dedicated to quality and the improvement of quality within their company. They felt that a need of integrating quality into the system would improve the product on a consistent basis. "Gerber hoped to increase process control and reduce line inspections," which proved to be successful (Hagen, 2000). This action of putting quality into the workers throughout the production line is what truly brings constant improvement.

2.4.1 Responsibility of quality

Deming said the responsibility of quality control rests on the shoulders of management. In fact, success for quality programs is dependent on upper management involvement in the process. Ozden Bayazit conducted a survey among 100 large manufacturing companies in Turkey to determine how well they implemented total quality management (TQM) practices. The results showed that "upper management support, employee involvement and commitment, customer focus, quality education and training, teamwork and use of statistical techniques are the most important factors for a successful implementation process" (Bayazit, 2003). While management support is critical, it is clear that management will not micromanage by spending all their time of the floor. They must rely on quality personnel to implement proper quality procedures. To ensure that these managers can still properly oversee the quality, as is their responsibility, a system of recording and reporting must be implemented.

Deming also teaches that awarding work for manufacturing contracts should not be solely dependent on a price tag. Rather there should be a requirement for “meaningful measures of quality along with price” (Neave, 1990). Because products are useless if quality is insufficient, evaluation of a company’s quality capabilities ties to evaluation of management. This is because, as Deming explains, that management’s involvement in quality control is imperative. “The responsibility of managers and supervisors must be changed from sheer numbers to quality” (Neave, 1990).

2.4.2 Quality planning

One of the most important things that can be done in ensuring quality is to plan what needs to be done at each manufacturing step. This planning helps to move quality inspection solely from the end-of-the-line inspection to each procedure and places the responsibility in the hands of the workers. Gerber realized the value of this quality movement. Gerber decided to make quality a widespread focus and saw the importance of teaching these quality methods to front line employees. The employees were skeptical at first, but through training and more understanding, Gerber was eventually able to reduce the number of line inspectors because quality within the items had increased. This improvement was brought by the employees’ acceptance of the new system which involved statistical process control and recording (Hagen, 2000).

This method of establishing quality methods and recording them is similar to the International Standards Organizations (ISO) certifications. “The ISO 9000 standard requires firms have in-house standardized and replicable routines and procedures” (Naveh and Marcus, 2005). This need for in-house standards and replicable routines and procedures is evidence of the importance of thorough and careful documentation. Even

though ISO 9000 ratings are meant to maintain quality and not necessarily improve it (Thomas, 2006), complete documentation is required to ensure that the quality is not diminishing.

2.5 China

Today when overseas manufacturing is considered, the first location considered is often China. This rush to China is surprising in light of China's historical relationships with the West. Historically, China has chosen to be an isolated society. In the 1600s, China sent a naval exploration to find trading partners, only to return with the conclusion that China's goods were far superior to goods in the West, and that there was no advantage for China to participate in overseas trade. Therefore, China withdrew from extensive contact with the Western world. Shortly thereafter, the West experienced the Scientific Awakening and the Industrial Revolution. These created an explosion in manufacturing and product performance. Because of China's isolation, it did not benefit from this product revolution. Therefore, in the late 19th century, when China was forced to confront Western products, China's manufacturing was not able to compete. Then, just as China was struggling to implement modern manufacturing, the Chinese communist takeover (1949) delayed this nascent industrial movement. Only in the last few decades has the Communist Party leadership in China allowed, and then promoted, modern industrialization (Strong, 2006).

2.5.1 Why is manufacturing so popular in China

Comparing the labor rates of many of the countries in Southeast Asia (Cambodia, Vietnam, and the Philippines) to China, the labor rate in China is more expensive. Yet

many Western companies choosing to outsource are still choosing China. A primary reason for this is the efficiency within China. Kent Kedl, the general manager at a Shanghai consulting firm, says the surrounding countries with even lower wages than China are of little concern because “the value chain is in China” (Toloken, 2006a).

While it is true that the main reason people go to China is because of the low cost and the efficiency of the supply chain, it is also because of the high potential market there (Navarro, 2006). A potential market of 1 billion people is very appealing.

With the optimism and hope of many companies in China, there are some who are concerned with the rising wages of the Chinese workers. Klaus Porath, a German born executive at Profilix, a company in Zhuhai, China, says “When I compare the salaries five years ago and now, if China continues like this...in another five years China will not be very attractive to produce.” Toloken reports that an operations manager in China in 2001 made about US\$760. In 2006 that same employee made about US\$2,540 (Toloken, 2006b). So even though China is equipped with a powerful value chain intact, the costs and prices of doing business there are becoming a concern.

2.5.2 Where is it good to manufacture within China

China is still a communist country. That means, among other things, that capitalism exists in China by permission of the government rather than by the natural evolution of the marketplace which occurs when individuals can pursue their own benefit and self-interest (Smith, 1791). With Hong Kong’s return to China, the Communist Party decided not to change the economic status of Hong Kong. (This was part of the agreement for the return from Great Britain). The Chinese government then decided to establish a zone of capitalist manufacturing in the greater Pearl River Delta in

Guangdong province, just north of Hong Kong. Later, other capitalist economic zones were created in the provinces of Fujian, Hainan, Hunchun, and Pudong (near Shanghai). These were created because of the success of the southern capitalist zone. Today, we see that this capitalist mentality is permeating throughout the entire nation. However, foreign manufacturing enterprises are limited to the capitalistic, or economic, zones.

2.5.3 Concerns with manufacturing in China

There are many difficulties that can accompany manufacturing within China. These challenges can be overcome, but must be addressed by companies in order to be successful. The challenges outlined here focus on logistics (infrastructure, additional inventory, etc.), ethical issues (including cultural differences) and quality concerns. These challenges have proven to be the most important in manufacturing in China.

2.5.3.1 Logistics in China

A brief discussion of infrastructure has already been given, but the issue of infrastructure in China should be addressed specifically. According to the Aberdeen report, “Low cost countries often have underdeveloped infrastructures that can result in shipping delays and damaged or mishandled goods.” The lack of experience can be very damaging to the products low cost countries are manufacturing (Field, 2005).

China’s economy is rising quickly, and is expected to soon be the second largest economy in the world. China is constantly improving their relations with other nations, and improving the output of goods they deliver. Despite all of these rapid improvements, they are still a developing nation with a poor infrastructure, which greatly inhibits their potential to grow even faster (Daly and Cui, 2003/4).

Many companies rushed into China, only to discover the difficulty of getting items out due to the poor infrastructure (Quinn, 2005). Some companies solve this problem by employing locals (either a 3PL or actual employees of the foreign company) who are familiar with the infrastructure. These locals can help increase efficiency within a relatively inefficient environment.

“China’s underdeveloped transportation infrastructure, fragmented distribution systems, limited use of technology in the distribution and logistics sector, dearth of logistics talent, regulatory restrictions, and local protectionism combine to hinder the efficient distribution of domestic and imported products – and thus reduce returns on investment. The barriers have increased the cost of doing business in China and have restricted consumers' choices” (Bolton and Wei, 2003). Without a focused effort on improving the infrastructure, distribution of logistics, and many other fundamental problems, China’s customer service will continue to fall as the costs continue to rise.

C. John Langly points out that even though many companies manufacture in China, and often save a lot of money doing so, at the end of the day their product is still 10,000 miles away. Because of all the factors in the supply chain, movement over those 10,000 miles can be challenging and long (Shister, 2005). Because lead times are so long when using international manufacturing, there is always a need for more inventory. “There is much added inventory, because stuff sits on the boat for so long, there is inventory on both ends of the chain” (Knights, 2007). The ability to work just-in-time (JIT) is not feasible. The shipping lead time, infrastructure, and many other factors do not allow for quick response (Daly and Cui, 2003/4). As such, inventory amounts rise for both the international and domestic companies.

2.5.3.2 Ethics in China

Janet Carmosky, a specialist of Chinese culture having lived and worked in Shanghai, Hong Kong, and Xi'an, from 1985-2003, married 18 years to a Chinese CEO, and fluent in Mandarin, spoke at the *Plastics News* China Forum in 2006 on 'understanding the Chinese mind-set'. She acknowledged the loss of intellectual property, the kickbacks, and the bribery that is common in China. She said, "I do not approve of or think we should put up with [these things]. But I want us all as Americans to understand how everything works in China so we end up winning a little more, and losing our shirts and our patience a little less." She mentioned that we, as Americans, often get very upset because we feel that "the Chinese are lying, stealing, concealing information, and not keeping their word.... We have a lot of trouble respecting people whose values aren't the same as ours." She said that she has always been treated well and respected in China. She explained that "ethical conduct is guaranteed as long as you are a respected member of the relationship" (Grace, 2007). It is true that there are unethical people everywhere, but it is not fair to classify all Chinese in that category.

An excellent example of this difference of view points is given by Carmosky. She says, "Why do we think that a contract is the last word? ... A contract is an articulation of the best understanding between the people who negotiated it at a certain point in time. Everything changes... [so] why do we think that [a contract] solves everything?" (Grace, 2007).

In Carmosky's talk, she gives six attributes that she feels are consistent in the mind-set of most Chinese. "(1) Tomorrow never comes, and when it does you're free to start again like yesterday never happened. (2) Never tell anyone what you're thinking

unless you have some idea what they will do with that information. (3) Take whatever you can get when an opportunity is given to you regardless of what you've promised. It is more important to be true to the opportunity than to some agreement you made previously. (4) No one operates independently. Your survival is dependent upon maintaining a network of relationships. It's a very large multipoint network (5) Don't trust anyone, and respect only people who are a part of your network and are respected within it. (6) Teamwork and transparency are a drain on the spirit. We reserve those for mission critical situations like surviving after a flood.... It is quite possible to have a lot of teamwork in China, but it takes a lot of work. It's not innate behavior" (Carmosky, 2006). Understanding these characteristics can help Westerners working with the Chinese become more involved in their networks and develop positive relationships with them.

The relationships, or *guanxi*, that are developed in China are crucial for successful business. These relationships are said to be more important than money in the vast bureaucracy that is China. *Guanxi* is the process of using the network of personal people-connections to get things done. Often the favors that are asked of another require a gift, banquet, or other form of payment other than direct cash. Many Chinese people feel that these *guanxi* relationships are a bad thing, but the author of *Gifts, Favors, and Banquets* summarizes most Chinese people's feelings about the reality of *guanxi*. "Most people condemn it as a matter of principle, but when an opportunity arrives for them to engage in [*guanxi*], then they become realistic" (Seligman, 1999). In China, Americans need to understand that they are no longer in America, and as such they need to stretch themselves to mesh and understand the Chinese culture more thoroughly.

2.5.3.3 Quality in China

Anciently, the Chinese have understood and implemented quality control procedures in their society. “The origin of handicraft industries and their quality control in China’s history can be traced back from the...Shang Dynasty” (1600 B.C.) (Juran, 1990). In the 11th century B.C., a record system was enforced that established quality control for all of the handicrafts, with officials who ensured the standards were being followed (Juran, 1990). Emperor Qin established laws that enforced standards in carriages, utensils, and many other manufactured goods. He unified China and set standards that made manufacturing more uniform, enforced with quality control requirements. Manufactured goods were inscribed with the name of the workers so items could be traced back to the individual if something was done poorly (Juran, 1990). This is different now [1990] with the vast bureaucracy making the Chinese avoid responsibility and avoiding the need to stick their neck out for change or personal responsibility (Seligman, 1999).

Despite these ancient quality procedures, good quality is often not cohesive with China. Many try to excuse themselves because of the different culture, distance from customer/parent company, etc. Despite the reasons, the same quality standards can be expected of the workers within China as in America. Not only should the same quality standards be expected, but the same quality control methods should be used. This ensures that the quality system is uniform, and if there is something within the system that needs adjustment, change is easier to implement. The American customer/parent company must ensure the methods are understood, and if not, they need to teach them

effectively. It is the responsibility of the customer/parent company to be creative in the teaching and implementing of these standards.

There is a lack of competitive pressures in China, which allows many of the quality methods to remain primitive (Zhao et al., 1995). But with rising competition flowing into China from neighboring countries, China needs to realize the lack of quality and find a way to improve the methods. This can be difficult because many companies are subsidized by the government giving little motivation to improve or change (Zhao et al., 1995).

Khin Green is summarized by Zhao, Young, and Zhang, explaining four reasons why there is a struggle with quality in China: “[First], lack of quality commitment – the inability to make quality a universal priority results in ineffective management and inefficient supervision. [Second], lack of quality training–due to the low education level of the workers–it is difficult to train workers in quality management principles and techniques and it is difficult to find well qualified quality control personnel. Furthermore, the high turnover rate in many enterprises complicates efforts to ensure consistent quality. [Third], inadequate technology – many enterprises have old equipment and out-of-date production process. This makes the production of high quality products extremely difficult. [And finally], lack of communication in terms of quality standards – many Chinese companies are unaware of the quality standard of American companies and few American companies clarify exactly what they require from their Chinese vendors in terms of quality and product performance. Therefore, the Chinese companies are often confused about the quality standard” (Zhao et al., 1995).

There is a struggle with the attitude toward quality issues. For example, the statement “making a quality product is the responsibility of everyone” is not widely accepted. Only 60 of the 78 respondents in the survey conducted by Zhao, Young, and Zhang felt that quality is everyone’s responsibility. These results imply an “us” and “them” mentality, rather than a collaborative team. The results also show that most employees feel that the product produced in China is lower quality than product from other nations (Zhao et al., 1995).

In the survey by Zhao, Young, and Zhang, it is evident there is a lack of understanding of true quality principles. “The Japanese concept of stopping the line to correct quality problems (*jidoka*) found support with a majority of respondents, 63 of 78. Surprisingly, the majority also agreed that the line should run ‘continuously and defects pulled from the line.’ Here the respondents answered positively to two polar-opposite philosophies, illustrating their lack of clarity with quality principles” (Zhao et al., 1995). China still does not have very good quality control systems at the enterprise level despite the effort of the government to promote quality improvement. The results show that managers and workers do not have a good understanding of modern management quality principles.

Another issue with quality in China is the lack of understanding direction. The Chinese will usually do what is required, no more, no less. Often the Chinese have no idea what they are making. This means that details which may seem obvious to some (the customer) is not obvious to everyone (the manufacturer). “The Chinese do not pay attention to details unless they are clearly specified” (Baldinger, 1990). For example, Brian Brophy, a member of the SGS International Testing and Inspection Corp., relates a

story where batons were being made in China. These batons were filled with a liquid and glitter. The Chinese manufacturer used tap water which was contaminated with salmonella bacteria. The tap water was okay because the specification only called for liquid. The problem was discovered and the specification changed to distilled water. However, this was after 150,000 batons were rejected and seen as unusable (Baldinger, 1990). “Such errors could have been caught and corrected if the buyers had ... [conducted] an in-process inspection” (Baldinger, 1990). Communication with the customer, or with people who understand the requirements of the customer, can eliminate problems like this as they occur, not after it is too late.

Recent events have shown the importance of quality control in international manufacturing. Recently, Mattel announced a “recall of 18.2 million toys with magnets that could come loose and be swallowed by children... The company also issued a new global recall of 436,000 die-cast cars with components coated with lead paint” (Sun, 2007). In these massive recalls, it is not completely clear whether the mistake was in the manufacturing companies or in Mattel with poor direction. Either way, quality communication and acceptable quality control were lacking.

2.6 Specific implementation of a foreign quality system

In a study from Yeung and Chan (1999), the authors explored the implementation of a quality system (Total Quality Management [TQM]) in several Chinese manufacturing companies with foreign ownership. This research investigated how specific quality programs are implemented in China when a foreign firm is involved. Some steps which outlined the successful implementation of TQM were:

- planning for effective implementation

- top management involvement
- local management involvement
- use of materials (Yeung and Chan, 1999)

The first step outlined was planning for effective implementation. When the management responsible for implementing a new quality system was not prepared for the change and commitment that needed to take place throughout the organization, the system will not succeed.

Other authors have similarly pointed out that programs like statistical tools, customer focus, top management involvement, and focus on continual improvement have shown useful in TQM systems, but “simply adopting [these programs] will not guarantee success” (Shin et al., 1998).

As Yeung and Chan then observed, “if [management] themselves do not have an in-depth understanding of TQM, training will be ineffective since top management have to coach development of TQM themselves” (Yeung and Chan, 1999). This concept is reinforced by Glover who said that even though the idea of implementing an improvement system is good, if the leadership does not plan for the complexity of the cultural change needed it will not succeed (Glover, 1993).

The next step outlined by Yeung and Chan was the organization of a top management involvement. Research indicated that all successful TQM companies had clearly defined support from top management. Yet difficulties were often found because of lack of communication between departments. When top management took total authority and delegated direct responsibility, it helped solidify success (Yeung and Chan, 1999). This concept also was confirmed by Glover who said that top management

needed to create a bridge between themselves and local management/workers to enhance two-way communication and understanding (Glover, 1993).

This bridge incorporates the importance of local management involvement in order for a quality system to flourish. “For successful TQM implementation, effective communications between foreign senior executives and local staff are essential” (Yeung and Chan, 1999). Many of the local staff who actually implemented the quality programs are not considered to be the management of the local entity. Yet, the involvement of the local management is needed because they act as a communication bridge between the foreign senior executives and local staff (Yeung and Chan, 1999).

The last step outlined by Yeung and Chan was the use of materials within the system. Some of these materials include measuring devices, statistical analysis software, and quality checklists and forms. The materials guide the program and provide consistency for all parties involved within the communication loop. These materials will guide quality personnel in the work they must conduct for system success. “[T]he most important task of top management is to introduce, promote and guide the correct use of these [materials]” (Yeung and Chan, 1999).

The authors concluded that success in the implementation of TQM was the creation of an organizational culture within the company and the ability to overcome the cultural barriers (both traditional and interdepartmental) that limit progress. It was having commitment from all those involved, and maintaining the vision of success (Yeung and Chan, 1999).

It is interesting to note that Yeung and Chan suggested that there was a lack of additional research regarding the specific implementation of quality methods and systems

in China. They attributed this lack of prior research to the perception that quality methods in China are sub-standard when compared to Western methods, and, therefore, implementation studies would have little chance of success (Yeung and Chan, 1999).

2.7 Conclusions

International manufacturing can be a wise approach in the competitive marketplace, but if not approached well, it can be disastrous for a company trying to implement competitive advantage. Companies must be aware of the hidden costs that accompany international manufacturing: additional travel expenses, new facilities, shipping costs, longer lead times, and higher inventory amounts, among others. Without addressing these costs, the cost advantage the company was trying to attain can be swept away. Ignorance of these hidden costs is a primary reason for many manufacturing companies returning to the United States.

To better ensure profitability, companies need to understand that their logistical operations will change significantly when they move operations overseas. When they have reasonable control of the system within their own facilities, they can use the expertise of third-party logistics providers (3PLs) to become internationally competitive. Many experts on international manufacturing recommend the utilization of local knowledge in order to understand the new logistical operations that will be needed, and to make the most of their wisdom concerning local infrastructure, governmental procedures, and cultural etiquette.

Though international manufacturing is growing quickly all over the world, the country that seems to be growing the fastest (or seems to be the most prevalent) is China. Even with the growing economy of China, and the great opportunity that is potentially

available to many American companies, there are many challenges that come with manufacturing in China. These include a different infrastructure, cultural differences, additional inventory, and poor quality. All of these factors must be addressed, in addition to the hidden costs that accompany globalization, in order to be successful.

But by recognizing these potential problems, companies can address them, correct the difficulties they may have, and rise above their competitors by implementing a competitive advantage that works. China offers a relatively low labor rate, and provides an improving value chain, making the movement of product more efficient. There continue to be difficulties because China is a developing nation, but many of the problems that accompany developing nations are being addressed and improved, making China a very powerful force in the international manufacturing world.

3. RESEARCH METHODS

3.1 Introduction

The purpose of this research was to develop a method to improve quality in manufacturing being done in China. The focus of this research took a three-pronged approach for addressing quality manufacturing in a different nation. First, the researcher developed a model that could be used between two nations where the manufacturing is done in a nation other than the destination for the product. Second, the researcher gathered data concerning the appropriateness of the model through observations and interviews in the country of manufacture. Third, a case study was implemented in China to test the method developed by the researcher. The steps outlined above were all done simultaneously with the attitude of constant improvement to all facets.

The development of a system to monitor and report quality was developed from principles of quality and is referred to as the Record and Report Quality Method (RRQM). The RRQM fits well the principles outlined in the study of Yeung and Chan (1999) which was discussed in Chapter 2.

The RRQM also agrees with other experts in the field of quality and the researcher's previous experience (first approach). The model was refined and optimized using observations and interviews within China (second approach), and experience with the case study employees and companies (third approach).

After the development of the theoretical system, further observations and interviews were made and improvements to the RRQM were implemented. Some quantitative analysis was used to evaluate and correlate the opinions of experts which were given in response to a series of questionnaires about quality and the model.

One of the most common manufacturing systems in a foreign country, as has been discussed in Chapter 2, is the use of a third-party logistics provider (3PL) as the intermediary between the parent company and the manufacturing company. While obviously beneficial because the 3PL understands local culture, the disadvantage of a 3PL is that the personnel employed by the 3PL are not experts in the specific products being manufactured. Nevertheless, they have quality responsibility. A primarily qualitative case study research method was used to gather the data for this study. A test-case company in China, with the parent office in the United States, was used to test the implementation of such a system.

The method of this thesis is to first give a proposed RRQM with rationale behind each of the steps. The experimentation to test this method was implemented in actual use as a case study, which is primarily the subject of Chapter 4. Therefore, this thesis principally involves qualitative research.

3.2 Qualitative research

Qualitative research methods are more flexible and open in context and analysis, where quantitative methods focus more on numerical data to draw conclusions (Merriam, 2002). While the work of this thesis is primarily qualitative in both application and method, some quantitative aspects are utilized. Qualitative research tends to dig deep into subjects and concepts that exist in natural settings – or as they exist in the real world.

It goes beyond simple observations. Rather, it is becoming involved and making changes to a complex problem that may not hold only one ultimate truth (Leedy and Ormrod, 2005).

3.3 Case studies

“A case study is a type of qualitative research in which in-depth data are gathered relative to a...program” (Leedy and Ormrod, 2005). Case studies are useful because they “allow an investigation to retain the holistic and meaningful characteristics of real-life events” (Yin, 1994). Case studies can use a combination of documentation, archival records, interviews, direct observations, participant observation, and physical artifacts for gathering data (Yin, 1994).

“In a case study, a particular individual, program, or event is studied in depth for a defined period of time” (Leedy and Ormrod, 2005). While case studies are primarily qualitative, the combination of qualitative and quantitative research can be used in case studies. This is often defined as mixed methodology, which utilizes the quantitative and qualitative aspects of research in different phases of the research process (Tashakkori and Teddlie, 1998) (Yin, 1994). The quantitative and qualitative aspects of research do not need to be viewed as mutually exclusive in a case study. Having said that, the knowledge sought after differs between quantitative and qualitative. “Quantitative researchers have pressed for explanation and control; qualitative researchers have pressed for understanding...” (Stake, 1995).

3.3.1 Case study in China

This case study tested and verified the RRQM. The testing of the RRQM was done through observation, training, personal interviews, and questionnaires. These steps were outlined as methods for gathering data for a case study. Through these methods, improvements were made to the system, which were implemented into the quality program at the test-case company. While some aspects of quantitative research were used (questionnaires), an understanding of the quality control procedures and implementation of the RRQM were the researcher's primary focuses, which were primarily qualitative research methods.

While it may seem the amount of data is relatively small, "it is not uncommon for case study researchers to make assertions on a relatively small database, invoking the privilege and responsibility of interpretation" (Stake, 1995). This does not mean the information can not be useful. Conclusions are drawn through patient and complete analysis of the case study (Stake, 1995).

3.4 Developing an overall model for 3PL companies

The original research concept developed by the researcher was based on a communication system covering broad topics to address all potential issues of manufacturing, human relation, and new company qualification problems. The model is shown below (Figure 1).

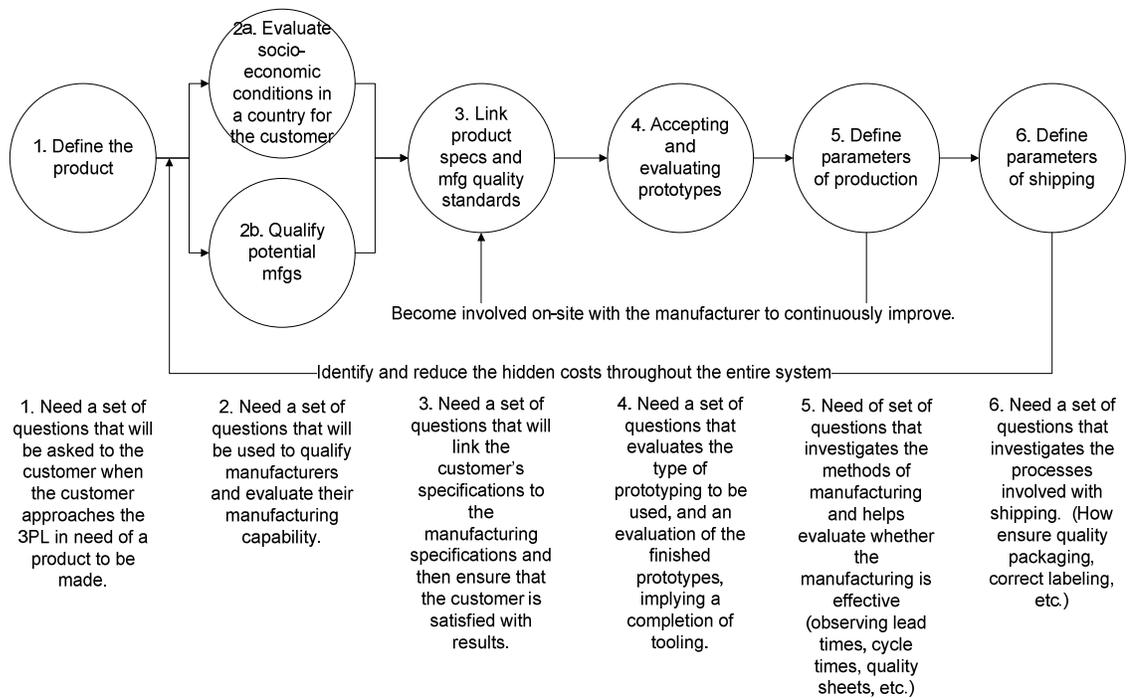


Figure 1 – A Model for Efficient Operation of a 3PL in Global Manufacturing

3.5 Development of the Record and Report Quality Method

It was quickly determined that while a broad approach (Figure 1) can be effective, critical points (mainly quality) can be easily overlooked. Because of the broad nature of the envisioned communication system, a more specific focus would be less prone to error. The basic model outlined was far too broad, so the model was reduced to focus on three aspects (steps 3, 5, and 6 of Figure 1), which developed into the RRQM.

The RRQM was developed from basic principles of quality which have been outlined in Chapter 2 and from personal experience of the researcher. The proposed method is outlined in Figure 2.

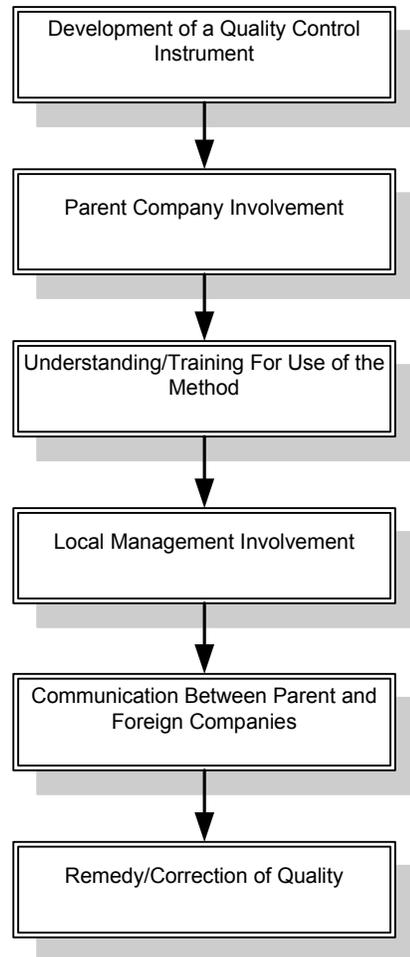


Figure 2 – Record and Report Quality Method

3.5.1 Development of a quality control instrument

The method involves the establishing of a quality control instrument (a form), usually a checklist that can be used to verify quality when personal visits are made to the manufacturer by the 3PL employee. This instrument, which should also include the supporting product specifications, becomes the standard against which quality judgments are made. As stated in Chapter 2 (in the baton example from Baldinger), without such standards, quality cannot be ensured.

The purpose of a quality form is to find any potential quality concerns and improve them before shipment from the origin of manufacturing. Furthermore, shipping specifications should also be included in the form.

Another advantage of a formal document as the quality instrument is the ability to provide a permanent record. Without an instrument there are no methods or records to track the progress or problems with quality.

3.5.2 Parent company involvement

Often, parent companies are unaware of the state of quality in foreign facilities when the foreign offices perform quality control checks. The lack of understanding in a parent company (in the United States) can easily arise from the brevity, or total lack, of the communications (this is especially true when communications are done by email).

Lack of parent office understanding of the quality problems might also arise because the communications of quality issues are not frequent. A standardized method of recording and reporting the quality procedures and information needs to be established.

The parent company represents the overall management of the organization. As discussed extensively in Chapter 2 (Neave and Bayazit), management involvement in quality is critical for quality success.

To check for the usefulness of the Combined QC Checklist and its communication back to the parent company, the researcher observed employees in the test-case company and the system of filling out the QC Checklist and reporting it back to the parent company. Because the employees of the test-case company in the United States made the majority of the decisions, it was important that they were deeply involved in the test of the control system. This system ensured that management could appropriately oversee

the quality functions within their facilities. This system of recording and then reporting relates to the issue of management having the fundamental responsibility for quality, as is stated in Chapter 2 by Deming. This process of management's involvement is critical to the success of such a system.

3.5.3 Understanding/training for use of the method

While it might seem intuitive that the quality inspector must understand the nature of good quality principles and be trained in the use of the quality instrument, the foreign nature of 3PL operations requires special focus in this area. As discussed in Chapter 2 (Carmosky) the cultural differences must also be addressed and understood by both the trainer and the trainee.

Understanding also involves the acceptance of quality procedures and the agreement to use the instrument that has been developed. As discussed in Chapter 2 (Hagan), Gerber, the baby foods company, worked to implement new and improved quality procedures with their employees. While there was some resistance to the new procedures, quality eventually was improved as the employees gained an appreciation of the new procedures.

3.5.4 Local management involvement

Just as the parent company management needs to be involved in quality, local management's involvement is just as important. Here, however, the aspects of understanding the principles of quality must be understood within the framework of the cultural issues cited previously. Moreover, there may be a requirement for extensive

training of local management. Therefore, this step (local management involvement) is identified as a unique and important separate step in the RRQM.

3.5.5 Communication between parent and foreign companies

While communications between parent and foreign offices could theoretically be done by anyone within the offices, it is the contention of the researcher that this communication should be carried out by management in both locations. The reason for this assertion is the necessity overcoming of cultural differences, language barriers, and the need for management's direct attention to quality (as discussed more fully in Chapter 2). Furthermore, the complexities of international manufacturing require the full engagement of management in both locations and this engagement is facilitated through quality involvement.

Also, the system of reporting needs to be regular. The local office needs the discipline of reporting regularly to the parent office, and the parent office needs a schedule of when to expect the reports.

Communication about quality issues will assist in ensuring that high-quality products will be made with no surprises as product arrives at the parent facility.

3.5.6 Remedy/correction of quality

As discussed in Chapter 2 (Sun and Baldinger), the knee-jerk response of quality problems (lead paint, dangerous water, etc.) may aggravate tensions between international manufacturing partners. On the other hand, the early detection of quality problems through the RRQM will tend to minimize the severity of the problems, reduce costs, and provide time for a rational and equitable solution to the quality problem.

3.6 Method of experimentation

In order to verify the appropriateness of the RRQM, the researcher traveled to China for three months (May-July 2007) to conduct research, develop the model (focusing on quality of the RRQM), and implement the RRQM.

One of the principal methods used for verification of the appropriateness of the RRQM was observations and personal interviews. These were established among acquaintances and contacts made both by the researcher and personnel from the researcher's university. A critical part of the method included the establishment of an instrument for quality assessment. This instrument was developed through a series of questionnaires administered to the various contacts consulted in this research program. Yet another verification of the RRQM was the actual implementation of the method in a 3PL environment in China, which became a case study.

3.6.1 Observations and personal interviews outside of the case study

Living in China for an extended period provided the opportunity to observe several United States/Chinese partnerships beyond the test-case company. These observations and personal interviews provided opportunities to verify each of the steps in the RRQM.

3.6.2 Questionnaires

To establish success in the RRQM, an instrument is needed to assist the quality control personnel in fulfilling their quality checks. Because of the importance of this

instrument, it is important that the instrument is well-conceived, easy to use, and easy to understand. Such an instrument is typically in checklist form.

In order to create an effective checklist, the researcher sought the insight and opinion of experts. The use of a questionnaire, as it relates to the checklist, helped modify and clarify the instrument so that it would be more effective. The actual method of implementing and gathering data from the checklist is shown in Chapter 4.

3.6.2.1 Test-case company questionnaire

In order to help discover the effectiveness of the RRQM, a different questionnaire was used which was designed to measure the effectiveness of the quality control program. This questionnaire was submitted twice to employees at the test-case company. First, before the implementation of the RRQM, and then re-administered four months after the implementation of the method.

3.6.2.2 Statistical analysis of questionnaires

Because a Likert scale is used in this research, and averages of the scores are used to interpret data collected, statistical analysis was needed to ensure accuracy of results. An expert in statistics helped the researcher to analyze and report on data gathered.

With the exception of one question in the statistical analysis (question 10 of the expert questionnaire), all results were not significant. This meant that the data and information could not be applied to all experts in the population. This information was useful for the small population that was used and the information pointed the researcher in interesting directions and assisted in improving the system. As such, the averages, and

the differences of the averages, were used to help analyze and evaluate the quality system.

3.6.3 Test-case

The test-case (case study) occurred with the test-case company Ensign Group International (EGI) headquartered in Provo, Utah, with offices in Shenzhen, China and in Changshu, China. EGI is a third-party logistics provider (3PL). EGI is a broker of products and provides services between domestic and international suppliers.

3PLs in general will contact their associates in foreign nations, choose manufacturers to use, coordinate shipping and delivery, and solve any problems regarding shipping, logistics, and manufacturing. In the case of EGI, connections to manufacturing companies are made by office employees in China. These employees find manufacturing companies, qualify them (by deciding that the manufacturer is good enough to work with in terms of price, quality, and services), and then contract different goods to be produced by them, under the direction of EGI United States.

The office in Shenzhen had four employees. The manager of the Shenzhen Chinese facility handled discussions with customers, recommended new customers, oversaw quality control, and conducted basic finance as they oversaw the office. The assistant to the manager handled finding new customers, computer updates, and communication between the United States and China. Another worker established shipping and helped the assistant to the manager. The last employee worked exclusively with quality control as an on-site representative for EGI, going to various facilities and ensuring that the companies were making product properly, thus ensuring that EGI United States would approve the items.

Research was also conducted for two weeks in Changshu, where the test-case company had two employees. The manager of the Changshu office handled the orders, found needed customers, updated the computer systems, and established communication with the United States facility. The other employee in Changshu was dedicated to quality.

Testing of the quality program (any changes, adjustments, training) was formulated, taught, and enforced in Shenzhen in person, but was discussed and taught to employees in Changshu as well, although enforcement was conducted through email and telephone conferencing.

4. RESULTS

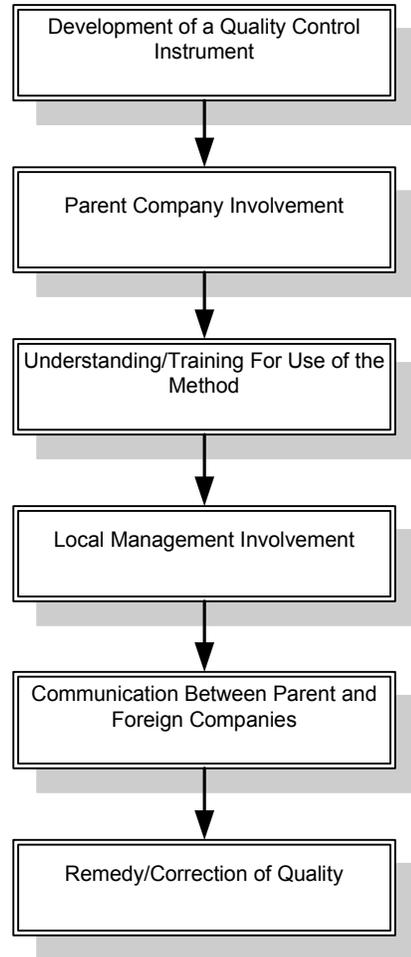
4.1 Introduction

A theoretical outline of the method used in developing the Record and Report Quality Method (RRQM) has been presented in Chapter 3. The experimental testing of this method was accomplished during the time that the researcher lived in China for a three month period (May-July 2007) and is presented here. The specific methods employed to test the appropriateness of the RRQM included:

1. observations and personal interviews
2. questionnaires
3. case study of a test-case company

4.2 Verification of the Record and Report Quality Method

The three methods of investigation – observations and personal interviews, questionnaires, and case study – were all used concurrently in the verification of the RRQM. For convenience, the method outlined in Chapter 3 is shown below (Figure 2). The combination and utilization of these methods provided the means and methods to verify all the steps of the RRQM. The verifications of these steps are shown below the diagram.



**Figure 2 (from Chapter 3) –
Record and Report Quality Method**

4.2.1 Development of a quality control instrument

As was outlined in Chapter 3, the use of an instrument (usually a form) to direct quality control personnel is needed so the implementation of the RRQM can be guided by an effective tool. In order to create this instrument, all three aspects of the implementation strategies – personal observations and interviews, questionnaires, and case study – were used.

Based upon the researcher's training and previous experience in international manufacturing (Philippines and Cambodia), he developed a theoretical quality control document designed specifically to be used by a 3PL in China. The design was built around the concept that a 3PL supervises the manufacturing of numerous and varied manufactured products for a variety of clients. This document was entitled QC Checklist A (Appendix A).

Before the arrival of the researcher, the test-case company had developed quality inspection forms that their employees were encouraged to use (Appendices B-D). For research purposes, these forms, which are nearly identical in layout and structure, have been combined into a working document entitled QC Checklist B. The forms were structured so that each form dealt with a specific type of product (stitched goods, printed goods, and hard goods).

However, the employees were not using the forms. Rather, quality checks were done by employees visiting factories and only looking for problems to the best of their capability without any formal documentation. If a problem was discovered, a picture was taken with a brief explanation of the problem (occasionally only one word), which was then sent to the United States facility. If quality seemed to be within specification, no explanation was given. This method of only looking for problems and not reporting on the general conditions of manufacturing and the status of orders was an inaccurate and insufficient measure of the quality.

Clearly the existence of both the theoretical form (QC Checklist A) and the forms created by the test-case company (QC Checklist B) would not work in any actual single

3PL. Therefore, the Checklists needed to be consolidated. The method employed to consolidate these forms is outlined in Figure 3.

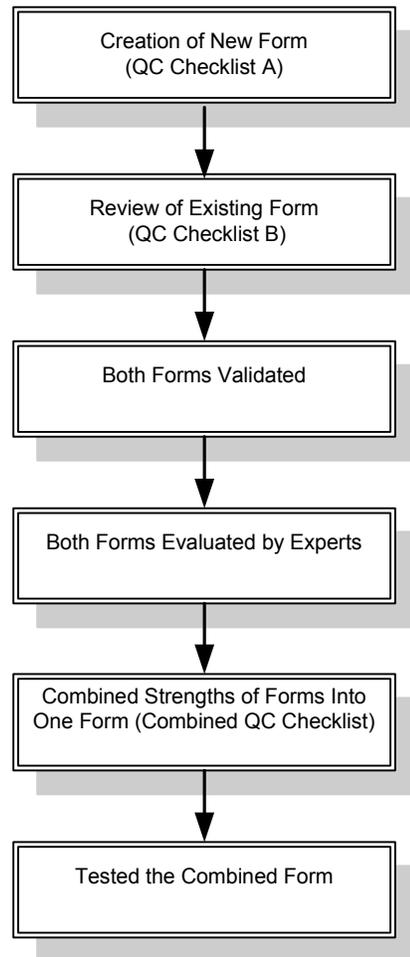


Figure 3 – Development of a Quality Control Instrument

The need for an instrument was identified as part of the procedures for creation of the RRQM. This instrument was a checklist for guiding quality control personnel through their quality checks and assists them in understanding the quality process.

The quality control form and questionnaires were validated by professors with experience in quality control and manufacturing. The quality control forms were then examined by experts to find which questions or procedures in the forms would be most effective. The researcher's former experience and observation at the test-case company also improved the forms. Then these "best" questions and procedures were combined into a single form. This procedure, therefore, took the best from a broad-based approach (QC Checklist A) and from a specific-oriented approach (QC Checklist B) to develop this combined form.

Before the Combined QC Checklist was created, QC Checklist B was immediately implemented to familiarize employees with the process of filling out a form. The observations that accompanied this immediate implementation brought changes and improvements to the combined form.

4.2.1.1 Questionnaire to develop instrument

The evaluation of the checklists and the questionnaires by professors was critical for the usability of the checklists and questionnaires because of the expertise these professors have in the fields of manufacturing and quality and in the process of data gathering. As such, the approval of the forms from these professors was needed to ensure the questionnaire was asking effective and useful questions.

The questionnaires were used to gather data from experts. These questionnaires asked the experts to compare QC Checklist A and QC Checklist B, question by question, using a Likert scale ranking. The scale was from 1 to 5, with 1 representing no agreement and 5 representing total agreement. In order for the questionnaire data to be comparable among experts and among forms, the questionnaires for the QC Checklists

were nearly identical. The experts evaluated which elements of each form were effective, and which were confusing, redundant, or otherwise ineffective. Experts were identified by their experience in quality and time in China (mostly expatriates currently living in China).

One of the experts, who has 22 years experience in China, mentioned that the QC program itself is flawed. This expert said, after answering the questionnaires and giving extremely low scores, “I disagree with the entire premise of QC as outlined here in the first place.... [Quality improvement] is [about] a new paradigm, not adjustments within the current system.” This expert felt this way because he saw the situation of quality control in China as a problem from a root cause: ethical standards. The relation to personal behavior is essential in quality because “it’s hard to be a lying, cheating [person] and then show up to produce awesome stuff.” The comments from this expert led the researcher to make the system as effective as possible through training and good questions, but because this expert had such a strong bias against the system, the expert’s numerical scores were discarded as an outlier.

Another expert who filled out the questionnaire was discarded because they only filled out one of the two questionnaires. As such, their scores were impossible to compare and their scores were also discarded.

The total number of experts who filled out the questionnaires was seven. Because of the two outliers, this made for a total of five responses from experts to be analyzed.

4.2.1.2 Statistical analysis

Statistical evaluation was completed in evaluation of the two questionnaires from experts. These questionnaires compared two sets of averages. These were the averages

of QC Checklist A and the averages of QC Checklist B. At a 95% confidence interval, there was found to be no significance. At a 90% confidence interval, there was only one question that showed significance: question 10.

4.2.1.3 Questionnaire results

The sixteen questions from the questionnaires are shown below with results and explanation. The questions are grouped in separate figures according to topic. Questions were often restated in different ways to emphasize certain points. The questions were also separated as much as possible to try and avoid repetition.

The averages of the scores in the questionnaires are shown in Figure 4 and the difference of the scores of the averages is shown in Figure 5.

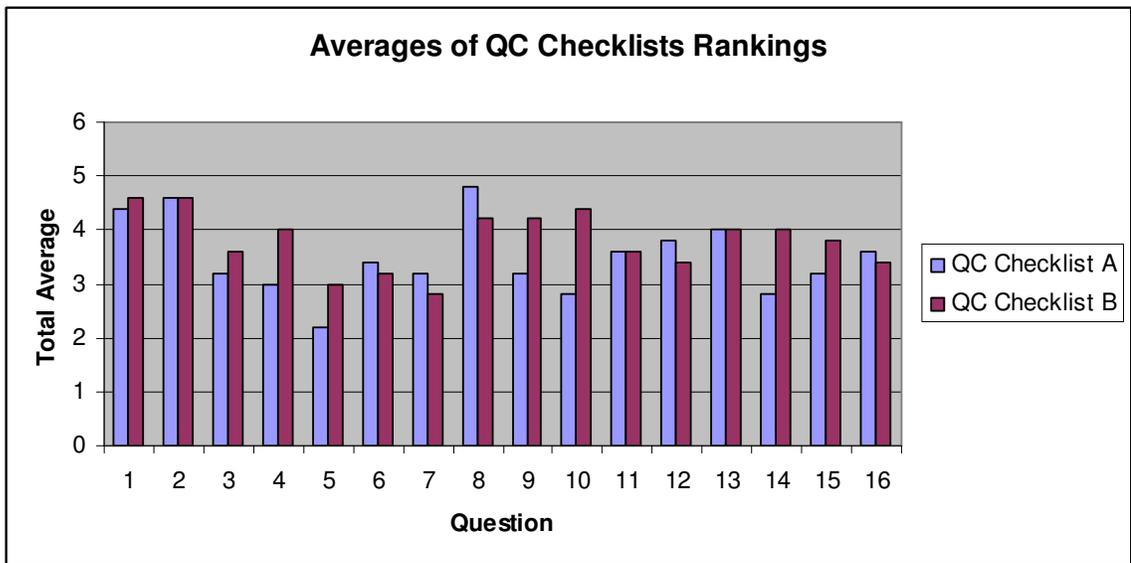


Figure 4 – Averages of questionnaire for QC Checklists A and B

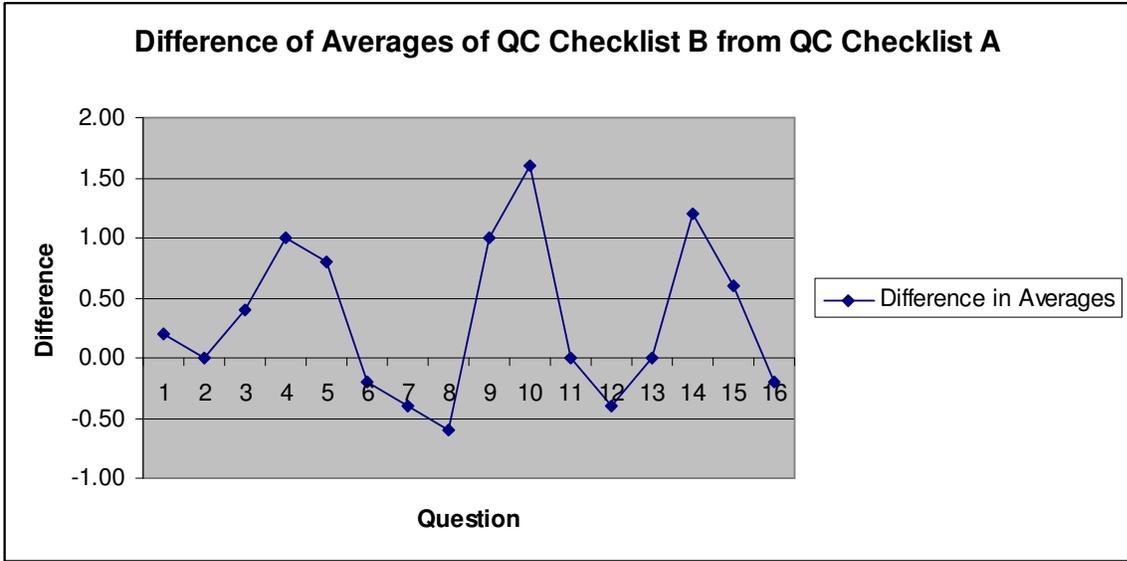


Figure 5 – Difference of averages of QC Checklist B from QC Checklist A

4.2.1.3.1 Checklists: Questions 1 and 16

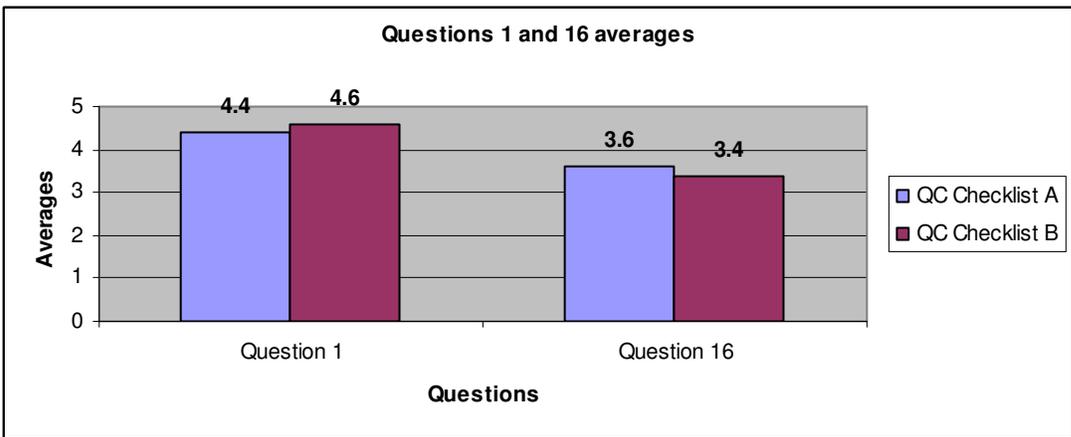


Figure 6 – Checklists: Questions 1 and 16 for QC Checklists A and B

Question 1: “The format of QC checklist A (QC Checklist B) is easy to read and understand.”

Question 16: “QC Checklist A (QC Checklist B) provides sufficient information for the parent company to understand the status of the quality relating to the product being evaluated.”

In both QC Checklists A and B, question 1 was trying to find if the forms were clear and easy to understand. This question was designed to analyze clarity of the form visually, and clarity in understanding of what the form is asking.

Question 16 addressed the overall feeling of the expert in regard to the checklist. The attempt was to gather a general feeling of which checklist seemed to provide more information for the parent company.

The results of question 1 showed that the average favored QC Checklist B by a score of 0.2. The results for question 16 showed that the average favored QC Checklist A by a score of 0.2. Even though one of the questions favored one checklist and the other question favored the other, the difference is so small it implies that experts feel the checklists can be nearly equally applicable to understand the status of quality control.

4.2.1.3.2 Statistics of inspections: Questions 2 and 3

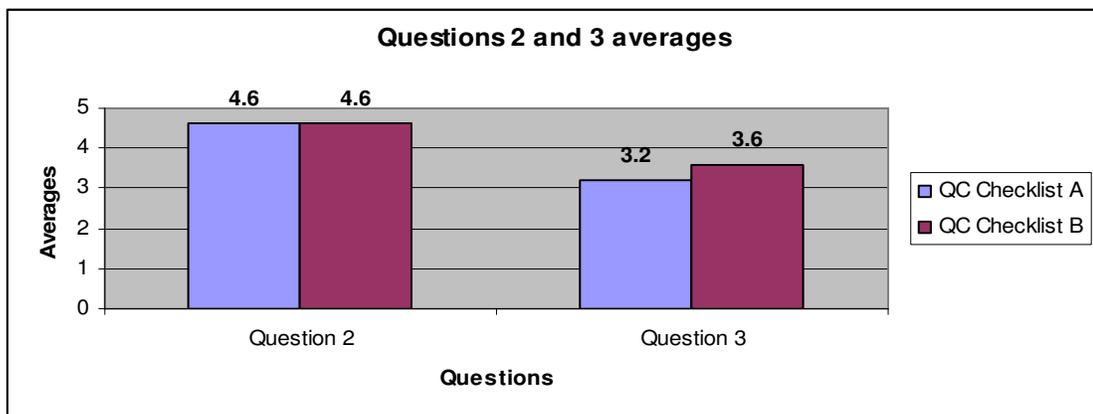


Figure 7 – Statistics of Inspections: Questions 2 and 3 for QC Checklists A and B

Question 2: “The communication of statistical data in a QC checklist is important.”

Question 3: “The form ensures sufficient statistical data of items to be inspected.”

These two questions dealt with the use of simple statistics in the QC Checklists. The use of statistical data is critical to more thoroughly understand the overall status of quality, especially in understanding specific quality issues, for example, when a defect is reported, understanding how many parts are affected and understanding how many parts were inspected. The statistical numbers also help management know if a sufficient number of items were inspected to know if the batch of items is good.

Question 2 asked if the statistical data itself is critical, and question 3 asked if the form ensures that sufficient statistical information will be relayed through the forms use.

The results from question 2 show that the importance of statistical data is significant, seeing that the scores on both QC Checklists are the same, 4.6 out of 5.0. The reporting of this statistical information, shown in question 3, favors QC Checklist B with a difference of 0.4.

Despite the advantage when filling out QC Checklist B, changes needed to be made in the incorporation into the Combined QC Checklist so the statistical numbers are obvious, specifically how many parts were made, how many parts were inspected, and how many parts had quality problems.

4.2.1.3.3 Production: Questions 4 – 6, 10

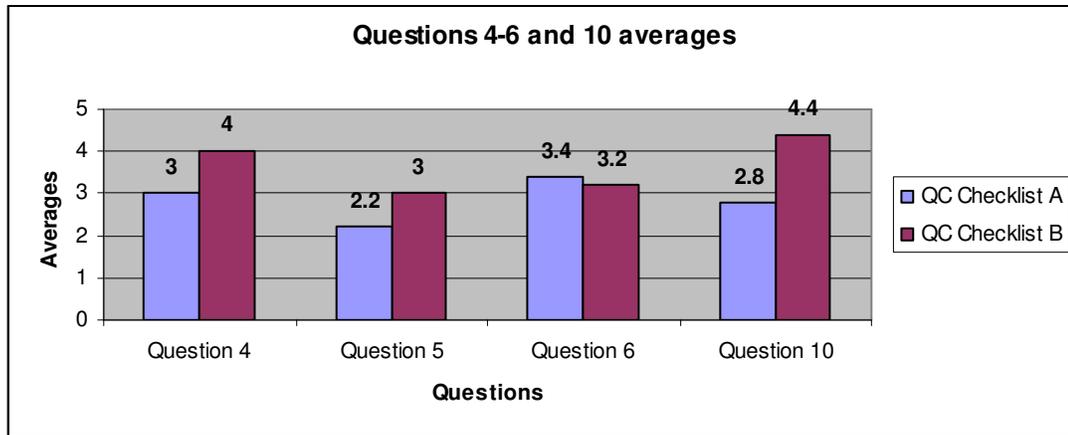


Figure 8 – Production: Questions 4-6 and 10 for QC Checklists A and B

Question 4: “The production (inspection) questions are detailed enough to understandably enter a QC analysis (pass or fail) on these points.”

Question 5: “The production (inspection) questions are applicable to all products.”

Question 6: “The notes (explanation) for failed inspection points are sufficient to explain the quality issue in enough detail for all potential readers to understand.”

Question 10: “The production (inspection) questions clearly identify what the QC problems are, if there are any.”

These questions dealt directly with inspection of the products. The QC Checklists both had questions relating to the item(s) inspected and both required a QC evaluation. QC Checklist A was broader in its approach to items and their inspection, and QC Checklist B was more detailed.

Question 4 addressed the detailed nature of the questions themselves and if they were able to fully analyze the quality issues and evaluate quality problems. Question 10

was a reiteration of question 4 to make sure it was understood. In the case of question 4, there was more favoritism to QC Checklist B by a score of 1.00. This favoritism was even greater in question 10 with a difference of 1.60. In fact, at a 90% confidence interval, question 10 was found to be statistically significant. This implied that more detail in the questions is seen as useful when employees are filling out a checklist.

Question 5 specifically addressed the applicability of the questions to all products. Question 6 addressed the ability and need for explanation of failed items in detailed notes, going beyond a simple pass/fail answer. Question 5 favored QC Checklist B with a score of 0.8. Question 6 showed favoritism for QC Checklist A by a score of 0.2.

It was interesting to observe the overall favoritism to QC Checklist B when QC Checklist A was a broader scope intended to apply to multiple products. The advantage to the more detailed QC Checklist B is the multiple forms (stitched goods, printed goods, and hard goods). QC Checklist B was not limited to only one form and one set of questions. Rather it has three forms with different points emphasized on each (appendices B-D). However, Question 6 implied that the broader nature of QC Checklist A was better when additional explanation was needed. There was an inherent need in QC Checklist A to fill out details when explaining what something was in non-compliance with quality standards.

4.2.1.3.4 Formulating a plan: Questions 7, 11, and 12

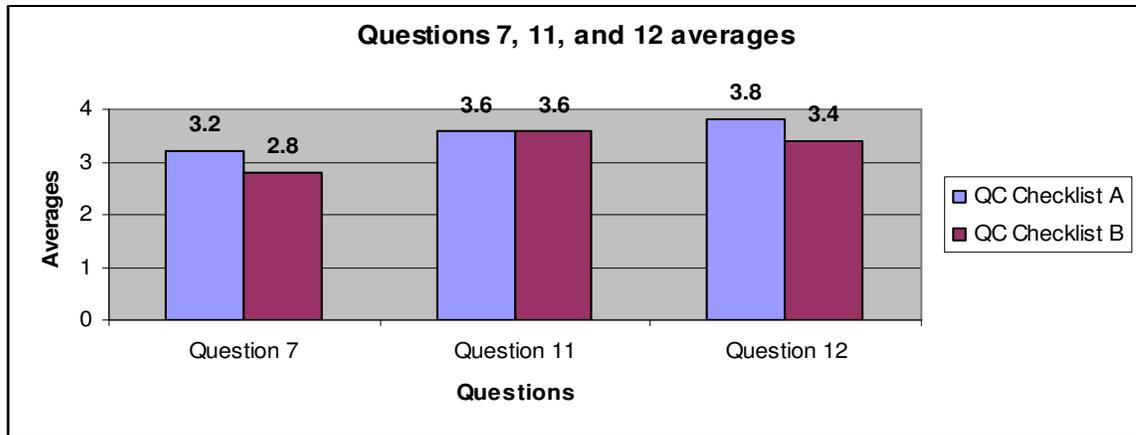


Figure 9 – Formulating a Plan: Questions 7, 11, and 12 for QC Checklists A and B

Question 7: “QC Checklist A (QC Checklist B) effectively identifies actions taken by the manufacturer to improve quality.”

Question 11: “It is important for a quality control checklist to formulate a plan to correct quality problems.”

Question 12: “A plan to correct quality problems is identified and outlined.”

Question 7 addressed potential ideas from the manufacturing company to correct problems discovered. Question 11 asked a similar question about finding solutions to the problem, but differed from question 7 by only focusing on solutions for correcting quality problems, not necessarily the manufacturer’s actions to correct problems. Question 12 asked if a plan to correct the quality issues was identified and outlined.

The problem of correcting quality issues is critical, and while QC Checklist A was better than QC Checklist B by a score of 0.4, both QC Checklists seemed to be weak in

this area. Question 11 showed no difference. Question 12 favored QC Checklist A with a score of 0.4.

QC Checklist A was better at finding potential ways to formulate a plan and correct problems. This favoritism was likely due to more direct and detailed questions about what the manufacturer will do in order to ensure high quality product. QC Checklist A also specifically asked what the manufacturer will do to correct a problem that may already exist. This type of pointed question is seen as effective in trying to find a solution for non-compliance.

4.2.1.3.5 Ethics: Questions 8 and 9

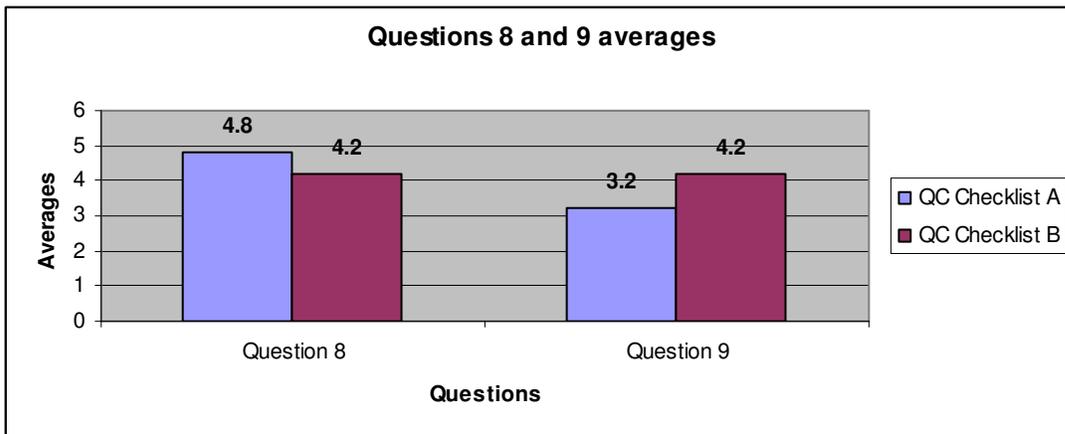


Figure 10 – Ethics: Questions 8 and 9 for QC Checklists A and B

Question 8: “Analyzing a manufacturer’s quality ethics is important for a quality control checklist.”

Question 9: “The production (inspection) questions help the parent company better understand and analyze the manufacturer’s quality ethics.”

These two questions addressed the ethical issues within a manufacturing company one may be working with. Question 8 asked whether ethical evaluation was important for quality control. Question 9 asked if the questions in QC Checklists A and B gave a better understanding of the ethical nature of the company.

The experts clearly felt that ethical understanding is important for quality control. Even the expert who gave extremely low scores and was treated as an outlier still gave a high rating to question 8, showing that identifying ethical values for a manufacturer is important. The scores from the two questionnaires were different on question 8 because of one person. Even though the question was the same on both questionnaires, one expert rated a 4 one time, and a 1 the next. Despite this difference, it was clear from all the scores (an average of about 4.5 out of 5.0 from the two checklists) that analysis of manufacturing companies' ethics is important.

Question 9 showed that QC Checklist B is better at evaluating the ethics of a manufacturer than QC Checklist A by a score of 1.0.

This difference was likely due to the more detailed nature of the questions. More detailed questions push the quality personnel to dig deeper in their inspection. As such, uncovering ethical issues likely will arise through the more detailed checklist rather than the broader checklist.

Ethical understanding of manufacturing companies is critical in international manufacturing. The test-case company faced some difficult situations with customers that acted in an unethical manner. For example, there was a company making a product that was very difficult to manufacture. The test-case company QC employee went to perform quality checks to find that most of the product needed to be rejected. Further

investigation showed that the manufacturer was trying to cut corners by using less expensive materials and not following the standards established for them. These ethical issues were identified because of the detailed quality procedures (Combined QC Checklist), reported to the parent company in the United States, who then worked with the Chinese office to discover the problem (using the RRQM).

While cultural differences are clearly evident in China versus the United States, the unethical behavior outlined above goes beyond the cultural differences into a universal understanding of ethical violations. In fact, as is seen in Chapter 2 (*Ethical relativism*), there are understood ethical principles that encompass all people, despite the culture. This manufacturer was in violation of these universal understandings and fundamental moral principles.

4.2.1.3.6 Shipping: Questions 13 and 14

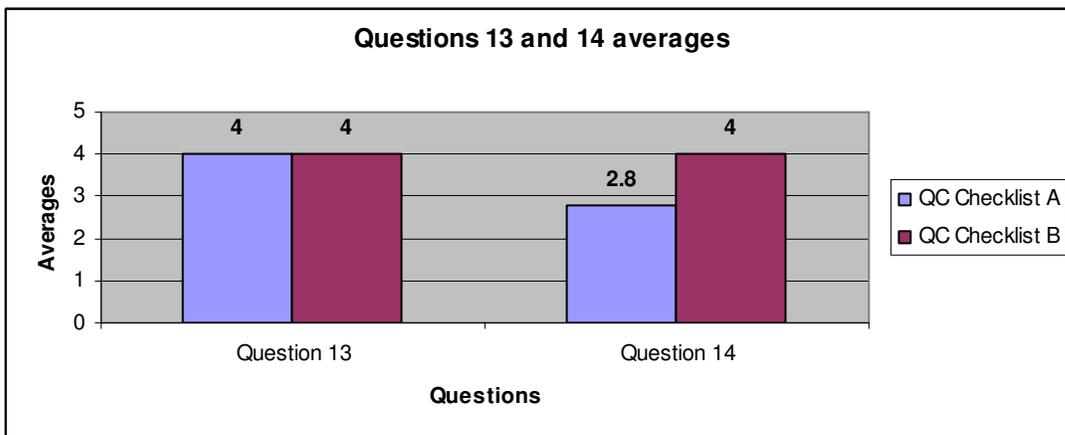


Figure 11 – Shipping: Questions 13 and 14 for QC Checklists A and B

Question 13: “The shipping questions are detailed enough to understandably enter a QC analysis (pass or fail) on these points.”

Question 14: “The shipping questions are applicable to all products.”

These two questions asked about the preparation for shipping. Question 13 asked if there was enough detail to understand the shipping situation as the product moves from the manufacturing company to the United States. Question 14 asked if the shipping questions could be applied to any product the inspectors may encounter.

Question 13 results showed no difference between QC Checklists.

Question 14 showed QC Checklist B to be stronger by a difference of 1.2. This result implied that the shipping questions in QC Checklist B were superior and helpful to those in QC Checklist A when applying the questions to a variety of products. This was likely due to the more detailed checklist forcing QC employees to be more thorough in their analysis and reporting. While a broader scope of questions can lead some employees to leave out details, a more detailed approach will fill in details that could have been overlooked.

4.2.1.3.7 Language: Question 15

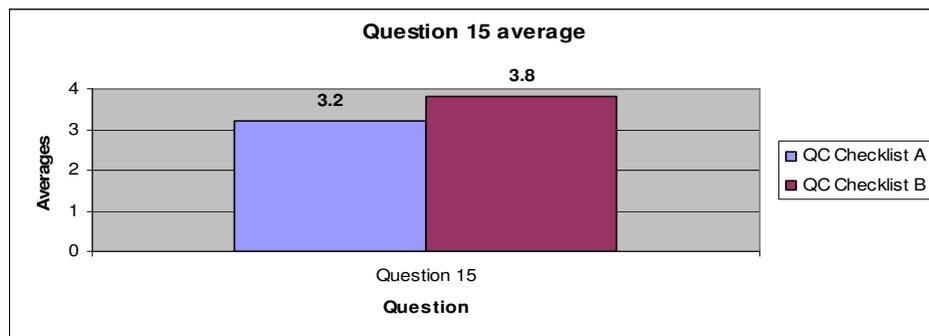


Figure 12 – Language: Question 15 for QC Checklists A and B

Question 15: “The questions on QC Checklist A (QC Checklist B) are appropriate for both native English speakers and, when translated, for non-native English speakers.”

This question referred to the understandability of the QC Checklists because of the language barriers associated with international manufacturing. As such, it was critical that, after translation, the QC Checklists be understood by non-native English speaking people.

The results of the experts showed that QC Checklist B was easier to understand than QC Checklist A by a difference of 0.6. This favoritism to QC Checklist B was likely due, once again, to the more detailed nature of QC Checklist B. More detail will overcome many of the translation and understanding differences that can be encountered in quality reporting. More detail will also require less expansion in explanation on the part of the QC personnel.

4.2.1.4 Creation of instrument for the RRQM

After gathering and evaluating the results from experts, and observing the already implemented QC Checklist B to familiarize the employees with a checklist, the researcher made a combined QC Checklist that unified the strong points from QC Checklist A with the strong points of QC Checklist B. QC Checklist B was taken as the base form and then adjustments from there, because the overall ranking for QC Checklist B was higher than QC Checklist A, implying fewer needed changes. Also, the more detailed nature of QC Checklist B was rated as being more effective for quality control employees when using the form for quality control inspections. Therefore, the Combined QC Checklist is a multi-page document in which each of the pages is a detailed checklist for a particular type of product. This implies that if the 3PL is to supervise the

manufacturing of products that are of a different class than those previously manufactured, a new form will need to be developed for that class. The Combined QC Checklist is found in appendices E-G.

Adjustments made to QC Checklist B to create the Combined QC Checklist were taken from evaluation of the expert analysis. For example, more detail was added regarding a corrective plan for quality problems, seeing that questions 7 and 12 scored higher on QC Checklist A than on B.

Because the checklist was used in China, the checklist needed to be translated into Chinese. Even though QC Checklist B was favored by experts for English, the Combined Checklist needed to be in Chinese as well to eliminate any language confusion. A native Chinese bi-lingual employee working for the test-case company in Shenzhen performed the translation. After the form was translated, the researcher sent the form to another native Chinese bi-lingual employee in Changshu and asked for verification of the translation. This second employee verified the form with only one correction, which change was agreed upon by the Shenzhen employee.

After the checklist was combined, it was explained to all the quality control personnel that the document was living and things may be added and taken away, but the basic document and the practice of reporting to the parent company in the United States would stay intact.

4.2.2 Parent company involvement

While in China a variety of companies and experts were interviewed regarding the quality of manufacturing in China and how a system of recording and then reporting

quality would work well. Most of the contacts were non-native Chinese working in China with a parent company outside of China.

As part of an independent observations method, the researcher visited a company who made bicycles for a major brand company in the United States. An employee of this company, who is American but has been working in China for about two years, was interviewed by the researcher about quality and reporting systems. The contact mentioned the difficulty in understanding what is wanted at his parent company because of the geographic separation. He shared a story where a particular test needed to be performed for a part on the bicycle. The test was discussed for months at the parent company and eventually became a standard, but he was never told about the test. In this particular example, he could have changed the outlook of his work based on the new, needed test and procedure. He related that there is a weekly meeting in the parent company that he is not a part of. When asked why he isn't, he replied that he has no idea, but that it would be helpful if he were included. He said the parent company often seems to "forget" him and that they lack the desire to understand the challenges he faces (Lewis, 2007).

Within the test-case company the lack of parent company involvement was evident, seeing that the test-case company was unsure what was expected of them in terms of quality expectations. The parent company had given a form to the foreign office quality control personnel (QC Checklist B), yet the form was rarely, if ever, being used. The implementation of the Combined QC Checklist as an instrument for the RRQM was an attempt to overcome this confusion through better communication with the parent company. The involvement from the parent company resulted in a clearer understanding

of quality, and resulted in better training opportunities for foreign office personnel by parent company employees when there was a lack of understanding within the RRQM.

4.2.3 Understanding/training for use of the method

The instructions at the test-case company for the RRQM outlined that the checklist should be filled out at every visit. This ensured full understanding of the quality procedure and showed an accurate display of quality, even if there were no problems. The employees were required to submit the form to the supervisor in China, who reviewed the form and then, if needed, translated it. The supervisor then submitted the form to the parent facility in the United States.

The employees had acquired some bad habits which made adjusting to the new system difficult for some. They tried to avoid what they saw as unnecessary work when no quality problems were encountered. For example, instruction was given to fill out every line on the form multiple times on multiple occasions. Because the Combined QC Checklist was quite detailed, there were often qualities highlighted on the checklist that were not applicable to the product being inspected. As such, there was a “not applicable” (N/A) column to be filled out, but it was often ignored or filled out incorrectly. This column was crucial because it conveyed a complete understanding of the inspected product, its components, and the checklist itself.

The employees at the test-case company also had to be reminded about filling out the numbers regarding statistical analysis. The employees were used to using pictures with one word explanations and had little regard for statistical support of quality findings. However, without more detail, management could not make a decision because they did not know the severity of the problems (if it is one item, all of the products, etc.).

Another part of the Combined QC Checklist that needed emphasis was the detailed explanation section and the statistical section when items were in non-compliance. Sometimes a box was simply checked indicating non-compliance, without the number of items that were poor quality (no statistical analysis). Also, no explanation of what was wrong was given. The researcher focused on this point (filling in the notes section was required when something is marked as poor quality) with quality employees as they filled-out the checklist, ensuring that explanation accompanied non-compliance.

Instructions (like filling out every line of the checklist, providing statistical analysis, and explaining non-compliance) were often given multiple times for test-case employees to fully understand how the QC Checklist should work. Because the researcher typically was able to go with quality employees to perform quality control checks, forms were filled out with the employees a few times, and then employees were observed filling out the forms on their own. Observation allowed for immediate correction (usually verbal) to improve the use of the checklist.

Constant supervision and follow-up was initially required to make sure the employees were doing what was required in the RRQM. For example, the employees knew that the QC Checklist needed to be filled out at every quality control visit. One time a quality control employee simply sent pictures to the employee who translated the form, but did not fill out the form. The translator knew that the United States facility, and the researcher, would expect a QC Checklist, so they filled one out. The problem was that the employee who filled out the checklist did not actually visit the company. Rather they assumed things were okay, and made further assumptions based on the pictures sent by the quality control employee. When problems like this one occurred they seemed to

get worked out and fixed quickly because of the physical presence of the researcher. Because of the detailed nature of the form, continuing training can occur when things are not reported correctly, as long as parent company involvement remains strong.

4.2.4 Local management involvement

In the test-case company a step in the RRQM instructions is outlined where the supervisor receives the form, translates it (if needed), and then submits the form to the parent company management. This step of supervisor review, translation, and submission of the form was necessary to keep the supervisor involved in the quality control process.

The supervisor at the test-case company's facility in Shenzhen was accustomed to delegating responsibilities. As such, there was a difficulty in learning unfamiliar technology, specifically email. The supervisor was good at translating the documents from Chinese to English, but then had one of the other employees write it up and send it. Even when management asked the supervisor to use email, this supervisor resisted. The supervisor did not seem to see the value in personally using email, and how this would enable him to be regularly involved with management and involved in the QC process. Because the supervisor's job meant being deeply involved with quality and communication with management, the disregard for email was unacceptable. The supervisor was trained on using email, and was taught why his using email was critical. After many discussions over these weeks, and continued resistance from the local supervisor, the researcher explained to the entire staff that the parent company management saw it critical that the local management is deeply involved in the RRQM. Two steps in the RRQM are *local management involvement* and *parent company*

involvement. The use of email by the local supervisor is one way these two critical steps can be bridged. After this explanation, and further training, the local supervisor saw the importance and complied with the instruction.

4.2.5 Communication between parent and foreign companies

Communication between entities was fundamental for the success of the RRQM. The other steps of the process rest on clear communication between entities.

A 3PL will incur loss of profits as a result of poor communication. For example, the test-case company worked with a Chinese company that manufactured leather bags. The test-case company needed a bag with a design that was familiar to this manufacturer, but needed the bags produced in different colors. The parent company was well aware of the change, and they assumed the Chinese office and manufacturer were also aware of the change. However, they were not. Therefore, the manufacturer made the entire lot under the old specification. Compounding the problem, the error was not discovered until the container was opened at test-case company in the United States. Such problems are avoidable with communication as it follows the reporting of what the statuses of projects are.

Another problem later emerged in communication at the test-case company. The parent company was not receiving sufficient information from the Chinese offices. The problem was that the communications were infrequent and erratic. As a result, the parent company was under the false impression that their projects were proceeding without quality problems because they had not heard anything bad. In truth there were many quality problems going unreported by the Chinese offices. This failure to communicate did not seem to be malicious, but, rather, reflected the erratic and infrequent nature of

reports passed on from Chinese employees regarding manufacturing partners. This situation occurred after the implementation of the RRQM, thus illustrating the need for regular and frequent communication.

Regular communication is needed to keep parent company management fully informed of all projects. This helps keep management involved, maintains training for employees performing quality checks, and allows for an open discourse for solving any potential quality issues.

4.2.6 *Remedy/correction of quality*

When problems are discovered, corrective action must be taken. With many of the test-case company employees being new to quality control, the parent company involvement was crucial. The employees were often unsure what needed to be addressed and what didn't, but through the use of the RRQM, training was given and regular communication occurred. As such, the quality control employees learned patterns of quality acceptance and non-compliance.

For example, a quality control employee in China noticed that a leather binder had stitching that was not straight and was unsure if action was needed. He filled out the QC checklist, took some photos, and asked the parent company for direction. Approval was given to not reject as long as the stitching was strong and the straightness was within a newly outlined specification. Later this employee was checking stitching on a side-bag at a different company. The employee saw that the stitching this time was straight enough (to fall within compliance), but appeared to not be strong enough. As such, he flagged the shipment until repairs were made. The RRQM (communication and parent company

feedback) put this employee in a situation where he was able to make a judgment based on management direction and experience.

By catching problems at the source of manufacturing, significant savings can be made. This was obvious in the case of the side-bags. The losses are also seen in the case of the leather bags that were made in the wrong color and not discovered till arrival at the parent company, outlined in the *Communication within 3PL* section.

4.3 Evaluation of the Record and Report Quality Method

The RRQM was tested through observation and personal interviews, questionnaires, and case study. The verification and usefulness of the RRQM needed to also be evaluated. This was done through the same methods outlined above – observations and interviews, questionnaires, and case study.

4.3.1 Questionnaire to evaluate usefulness of RRQM

The use of another questionnaire developed by the researcher was designed to measure the opinions of the test-case company employees regarding usefulness of the RRQM. It was important to inquire about their opinions because these were the people involved with quality control daily. As such, they had a deep knowledge of quality control results and procedures.

This questionnaire was given to test-case company employees in China and in the United States. The employees filled out the questionnaire pre-implementation of the RRQM (in July), and then reconsidered the system a few months later, post-implementation (in November) and completed an identical questionnaire. The ranking system for this questionnaire was based on a Likert scale from 1 to 5, where 1 shows little

improvement in quality and 5 shows significant improvement in quality. The pre-implementation scores were compared to the post-implementation scores to measure change.

Employees in both China and the United States offices were asked the same questions. All six Chinese employees responded to the questionnaire both times. However, one of the employees from China had to be treated as an outlier. When asked the first time to fill out the questionnaire, this employee marked a perfect 5 for every question, and then explained that she thought the researcher was doing a good job. She clearly did not understand the objective of the questionnaire. The second time this employee was much more critical. The fact that she was more critical implied that after the four months of implementation she had a better knowledge of quality control, but because of the first questionnaire incident, her scores were disregarded.

In the United States, seven employees answered the first time, and the same seven answered four months later, with one additional commenter. The comments of the extra employee who did not answer the first time are helpful in understanding quality in more depth at the test case company, but are not included in the scoring because of lack of comparability. Another employee who filled out the questionnaire the first time changed the second time by writing “not applicable” in certain questions that he felt were not relevant to his job. Because full answers were not given, the scores were not comparable, and so this employee was also treated as an outlier.

4.3.2 *Statistical analysis*

Statistical evaluation was completed in evaluation of the questionnaire regarding RRQM usefulness. This questionnaire compared two sets of averages, one pre-

implementation and one post-implementation of the RRQM. At both 95% and 90% confidence intervals, there was found to be no significance.

4.3.3 Questionnaire results

The ten questions from the questionnaire are shown hereafter with results and explanation. Excluding the outliers, there was information used from ten different employees: five in China and five in the USA. Questions were sometimes restated in different ways to emphasize certain points. The questions were also separated as much as possible to try and avoid repetition.

The score averages from Chinese employees are shown in Figure 13, the score averages from the USA employees are shown in Figure 14, and the pre- and post-implementation scores are compared in Figure 15.

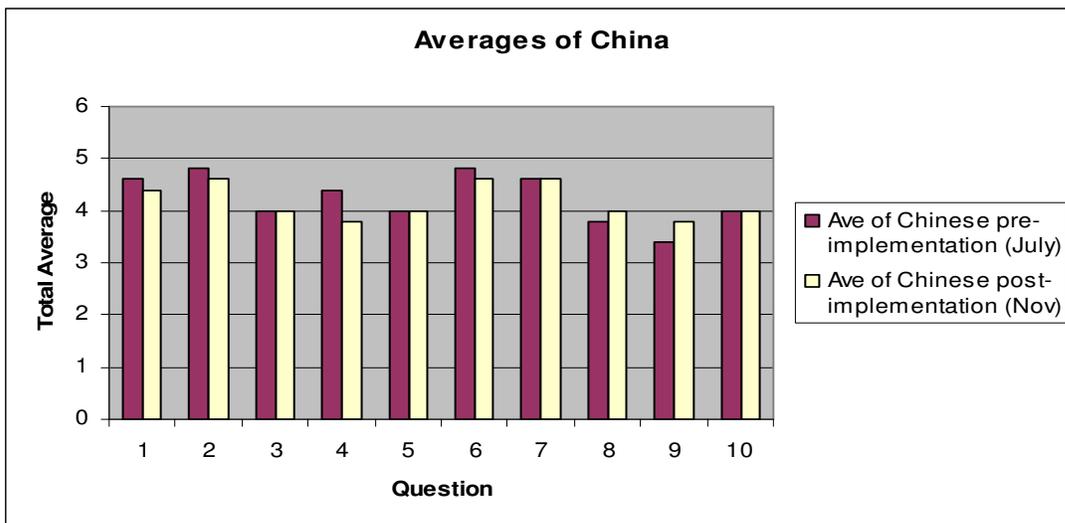


Figure 13 – Questionnaire Results for Pre- and Post-Implementation in China

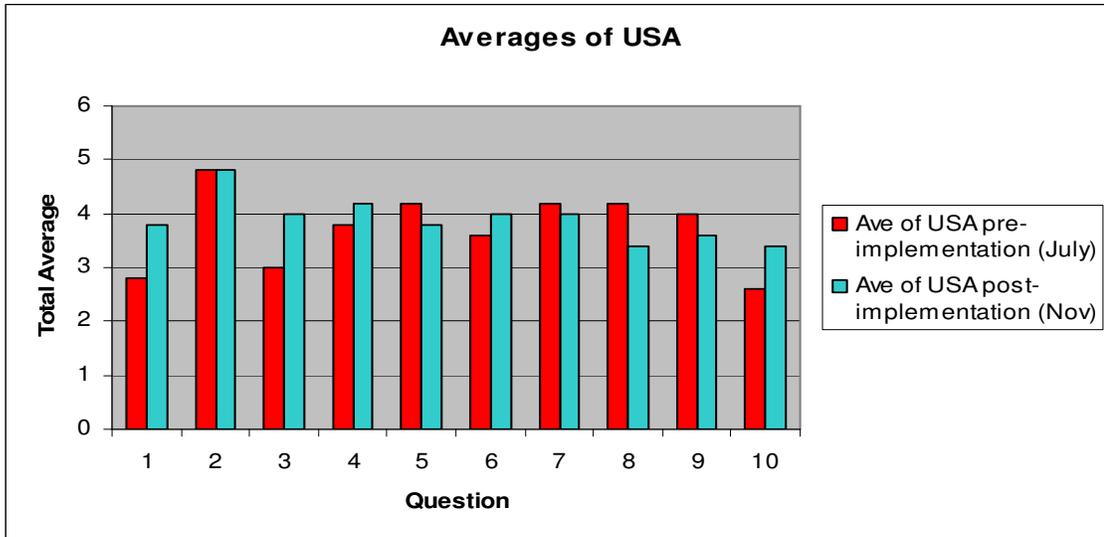


Figure 14 – Questionnaire Results for Pre- and Post-Implementation in USA

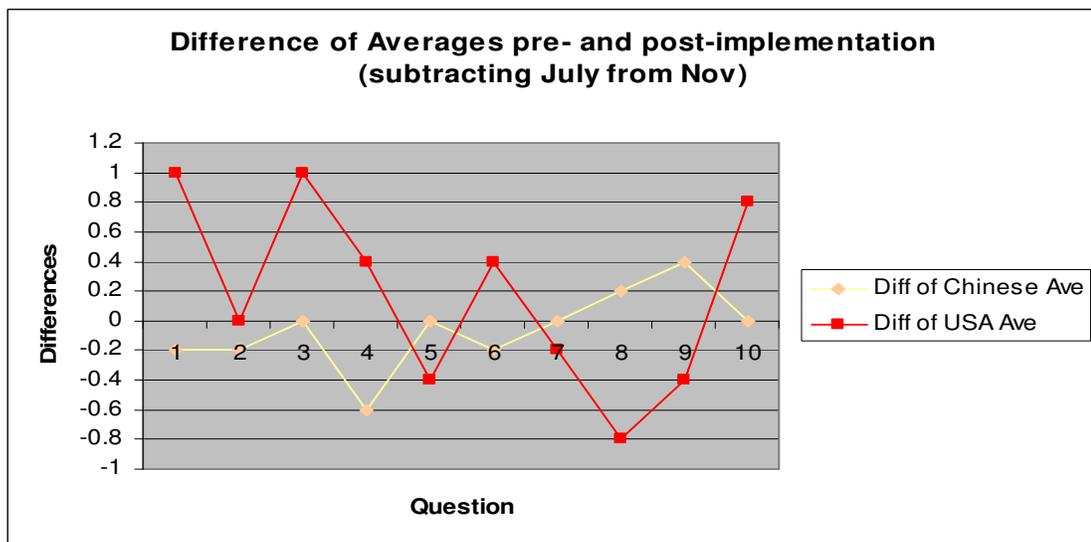


Figure 15 – Differences of Averages from Pre- and Post-Implementation Questionnaire in China and USA

4.3.3.1 Quality recording and reporting: Questions 1-3 and 10

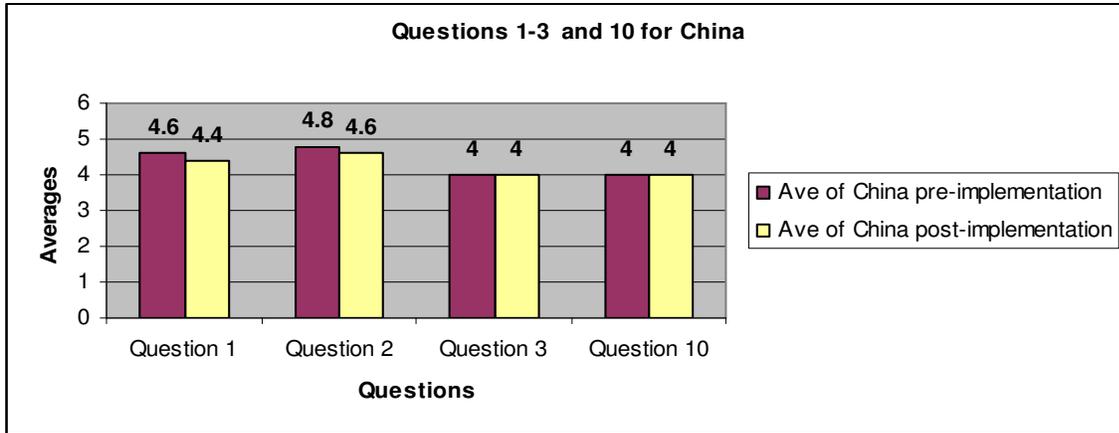


Figure 16 – Quality Recording and Reporting: Questions 1-3 and 10 for China

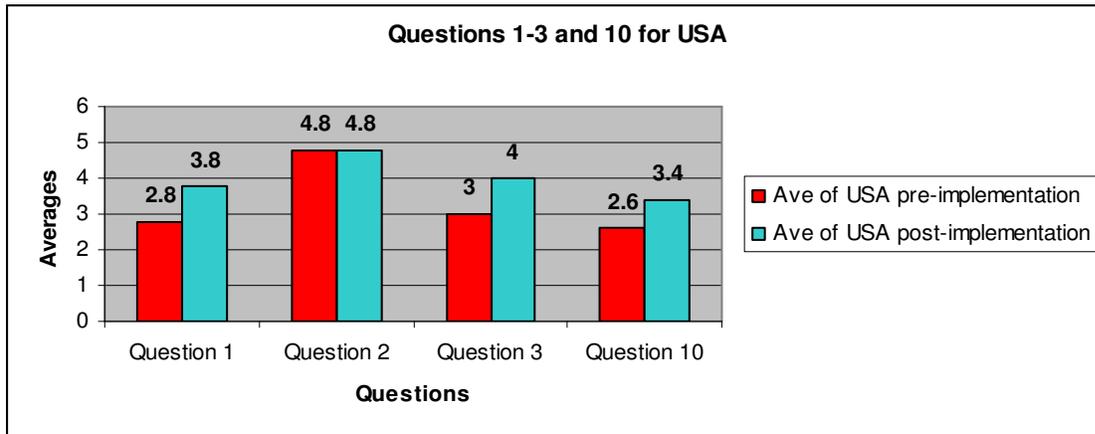


Figure 17 – Quality Recording and Reporting: Questions 1-3 and 10 for USA

Question 1: “Quality control forms are filled out by EGI employees on every quality control visit.”

Question 2: “It is important that all quality control forms are reported to the United States.”

Question 3: “All of these quality control forms are forwarded to the United States through some systematic communication procedure.”

Question 10: “Even without quality control problems, the EGI USA office is aware of the status of every order in terms of efficiencies (quality, on-time delivery, etc.)”

Question 1 was designed to probe employees on the importance of filling out the QC Checklist at all quality control visits. Even if no quality issues were found, it was still important to report quality so there was an accurate record of quality control.

Question 10 is designed to ask again if the forms are filled out at every quality control visit. It also checked that the United States office was involved in the quality control process and that communication between the United States and China was open and clear.

Question 2 ensured that there was constant communication between the United States and Chinese offices. This placed the Chinese offices closer to the end customer, who essentially drives the quality requirements. Constant communication also helps the Chinese employees work closer with management, which is essential for quality to succeed.

Question 3 ensured that the forms were being reported regularly and in a systematic way, so that the United States office received reports in a standard method. This made it easier to report back to China, and easier to interpret.

In China, questions 1 and 2 showed a difference of 0.2. In both cases the numbers came out negative, meaning the pre-implementation was favored over post implementation. Questions 3 and 10 scored the same for the Chinese offices.

The United States offices questions 1 and 3 resulted in a difference of 1.0.

Unlike the Chinese offices, the results were a positive number, meaning higher results in the post-implementation. Question 2 showed no difference, but still was seen as important having a score of 4.8 out of 5.0. Question 10 showed a difference of 0.8.

4.3.3.2 Understanding quality: Questions 4 and 6

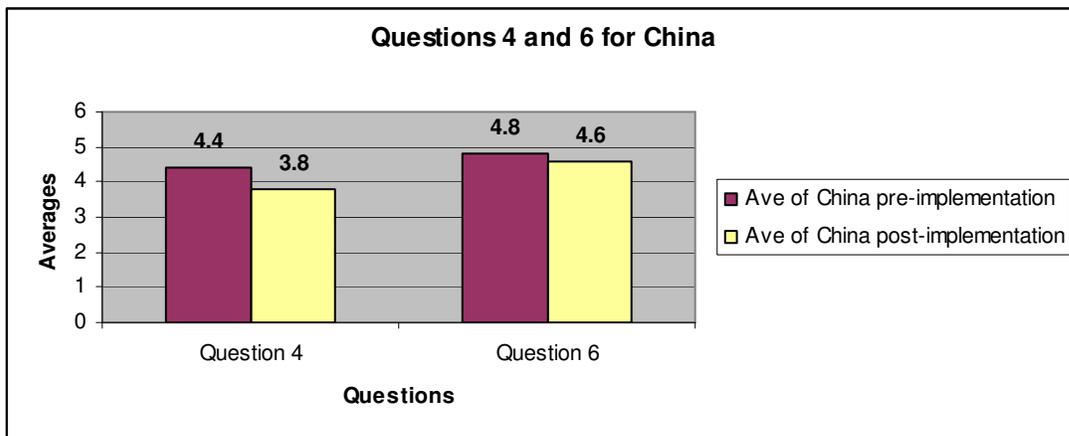


Figure 18 – Understanding Quality: Questions 4 and 6 for China

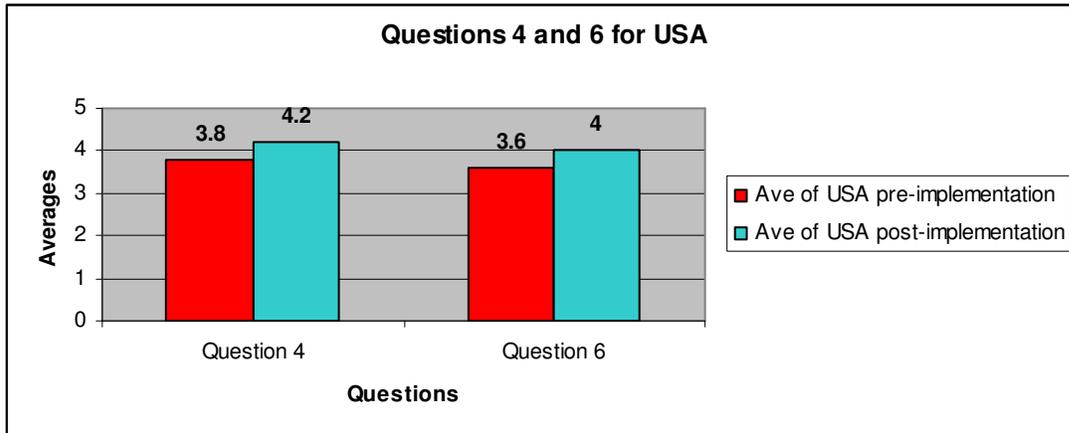


Figure 19 – Understanding Quality: Questions 4 and 6 for USA

Question 4: “The forms are adequate to fully communicate the severity of quality problems.”

Question 6: “The consequences (shipping time delays, rework of product, additional costs, etc.) of quality problems are understood by the Chinese and American employees.”

Question 4 measured the usefulness of the QC Checklists, and ensured that the employees felt that the forms fully communicated quality to all test-case company employees involved.

Question 6 gave an indication of the understanding between Chinese and United States employees regarding quality problems. Often, it seemed like the severity of problems were not fully understood on both ends, and this question addressed that issue.

In China the difference in question 4 was 0.6. In question 6 the difference was 0.2. In both cases the scores were negative, indicating favoritism to the pre-implementation questionnaire.

In the United States questions 4 and 6 were given the same score. The score was a positive 0.4, showing favoritism to the post-implementation questionnaire.

4.3.3.3 Resolving quality problems: Questions 5 and 7

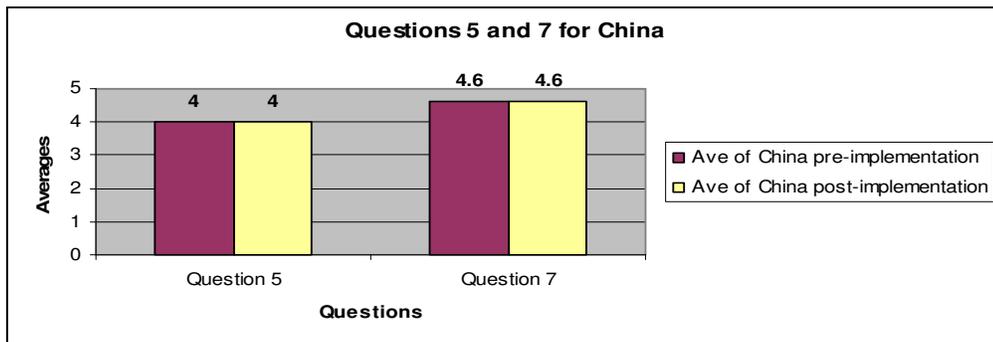


Figure 20 – Resolving Quality Problems: Questions 5 and 7 for China

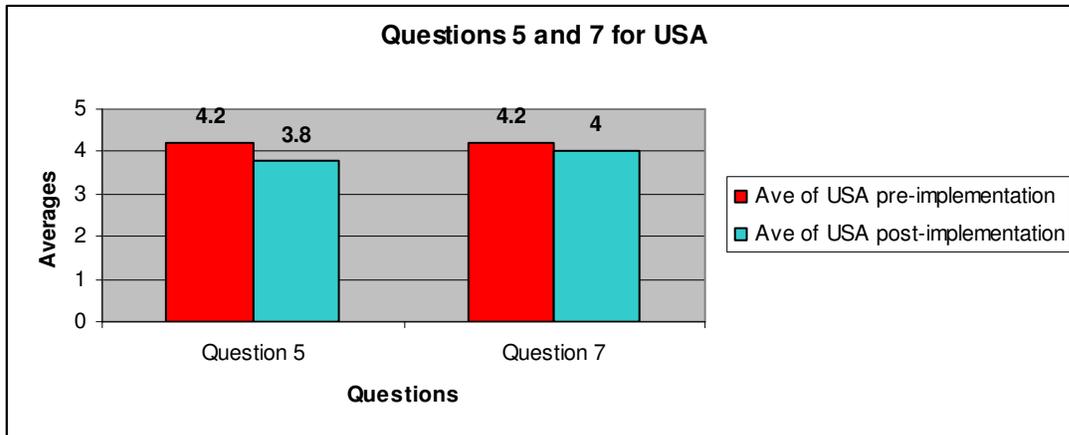


Figure 21 – Resolving Quality Problems: Questions 5 and 7 for USA

Question 5: “As a consequence of using the quality control forms, methods for resolving quality control problems are clearly understood by both Chinese and United States employees.”

Question 7: “Formulating a plan of correction for quality problems is facilitated by the use of the quality control form.”

Question 5 assured that the use of the quality control forms identified quality control issues, and question 7, along with 5, helped develop methods to resolve any quality control problems that may have been encountered. Then, when a method is discovered, it is clearly understood by all members involved in the quality control process.

In China, in both questions 5 and 7, there was no change in scores.

In the United States question 5 had a difference of 0.4, and question 2 had a difference of 0.2. The difference of these averages was negative, showing the pre-implementation scores were favored over the post-implementation scores.

4.3.3.4 Manufacturers' ethics and culture: Questions 8 and 9

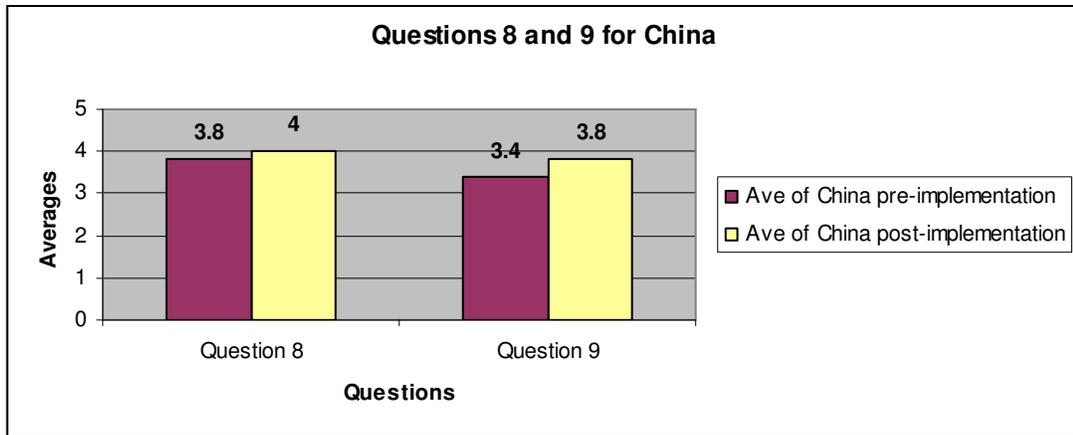


Figure 22 – Manufacturers' Ethics and Culture: Questions 8 and 9 for China

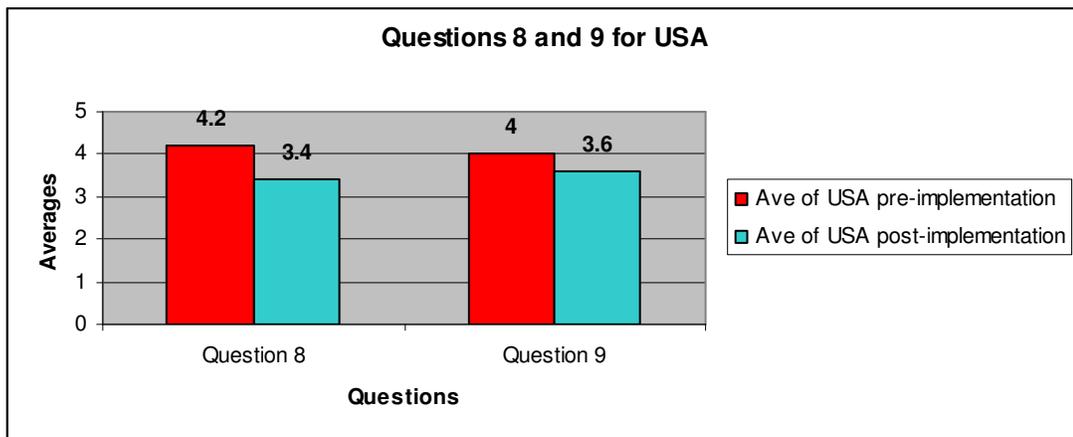


Figure 23 – Manufacturers' Ethics and Culture: Questions 8 and 9 for USA

Question 8: "The form assists in communicating the management practices of the manufacturer so that they are understood by EGI China as well as EGI USA."

Question 9: “The form assists in communicating ethical or cultural misunderstanding between the manufacturer and EGI which might arise in the resolution of the quality problem.”

These questions addressed any problems that may be encountered by the Chinese employees while working with different manufacturers. While these manufacturing companies must be verified by the test-case company before the manufacturing process begins, the quality control employees, who work with the manufacturers regularly, will ensure that the decision of who was chosen is a good choice. They ensure the manufacture is still acting appropriately and ethically.

In China the score for question 8 was 0.2, and question 9 was 0.4. This time both scores were positive, meaning the averages pre-implementation were better than post-implementation. These were the only questions that averaged out to be positive in China.

In the United States the score for question 8 was 0.8, and question 9 was 0.4. These averages were negative, meaning the pre-implementation scores were higher than the post-implementation scores.

4.3.4 Analysis of questionnaire results

Because of lack of statistical significance, it is difficult to draw many conclusions from the results given in the questionnaire. Yet, the results show a decrease in Chinese employees overall score from 42.4 to 41.8, and small improvement in the USA from 37.2 to 39.

This small change and opposite orientation between China and the United States was confusing because it appeared to the researcher that overall quality had improved. More reports were being sent to the parent company, implying use of the instrument and

also involvement of the parent company. Local management was involved, regularly assisting the quality control personnel on quality control visits. The United States employees were giving feedback and helping the Chinese offices to solve any problems. Yet, despite all of these observations and the use and improvement within the RRQM, the scores barely moved, going slightly down in one case and slightly up in the other.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

As shown in Chapter 4, the various observations, questionnaires, and studies that have been done in this work have shown that a quality control system like the Record and Report Quality Method (RRQM) and open, regular communication are useful in understanding and ensuring quality products. The success of this system goes beyond merely the presence of a quality control form. The involvement of management, both in China and in the United States, is also critical as anticipated by the literature studies reported in Chapter 2 (Neave, 1990). Management involvement is especially important in international manufacturing with the common separation of management and quality personnel. Due to the quality difficulties faced by international companies, this research attempted to address quality control understanding in a global context where the decision-making management is in one nation and the quality personnel were located in another.

Personal observations and interviews with experts, questionnaires, and case study were all used in the development of the actual quality control instrument (Combined QC Checklist) which was a major component of the development of the RRQM. Two preliminary QC Checklists, differing in the level of detail, were developed and compared as part of this process (QC Checklists A and B). These checklists were then quantitatively evaluated. While the results were not statistically significant, the

opinions of experts given through interviews and their numerical evaluation of the QC Checklists showed that a more detailed checklist would be better in conveying information so quality can be understood by all people involved. However, if the level of detail is too severe, the QC personnel will likely not complete the entire checklist. If employees are focused on quality and they are trained how the form (in all its detail) is useful, the recording and then reporting is effective.

After implementation of the instrument (Combined QC Checklist) into the test-case company, additional information and training were given so the instrument could be utilized within the RRQM. A number of methods were used in an attempt to evaluate the effectiveness of the RRQM. These methods were questionnaires, personal observations, and interviews. These methods and results were used to address the null hypothesis: *The Record and Report Quality Method will be shown to provide no measurable difference in quality when compared to current methods used in an international manufacturing environment.*

A different questionnaire was submitted to test-case company employees to assess the pre-implementation and post-implementation effectiveness of the RRQM. The questionnaire was based on a Likert scale ranging from 1 and 5. The scores of the employees of the test-case company implied that they felt there had been little improvement in the system after the new Combined QC Checklist had been implemented. Because there was no *measurable difference*, it showed that there was not enough information to reject the null hypothesis.

This inability to reject the null hypothesis based on quantitative results was puzzling because the other data including observations, notes, and interviews, which

indicated that there had been significant improvement in quality. For example, there was more communication between upper management and foreign employees. There was more involvement of local management in the quality control process. There was a more thorough understanding of quality issues by quality personnel. As another example, a story related in Chapter 4 under *Remedy/correction of quality* illustrated a case where the QC employee was not sure about the straightness and strength required in stitched goods. As this parent company-Chinese company communication continued, the training and understanding of the quality personnel improved. They were able to make the necessary decisions to send good quality products.

Another reason the non-rejection of the null hypothesis was puzzling was due to the fact that the owner of the test-case company asserted that incredible improvement had occurred in the quality of the company. The owner insisted that there was a deeper awareness and understanding of the quality control system. The implementation of the QC Checklist and the RRQM caused the employees to become more critical of the quality system, improving overall quality (Jakins, 2007). Furthermore, when asked, all employees at the test-case company indicated that they believed quality had improved.

These observations and interviews would cause one to reject the null hypothesis because according to these data, there had been a change in quality procedures and understanding comparing to the previous methods they used. This is exactly the opposite conclusion one would arrive at using quantitative analysis, discussed above, concerning the null hypothesis.

This difference between the quantitative numbers in the survey showing an inability to reject the null hypothesis and the qualitative data showing a rejection of the

null hypothesis led to further analysis in attempt to discover why the difference existed. The answer was because the employees became more aware of quality, more conscious of their quality system, and therefore, became more focused on improving quality. This implementation of the RRQM also made employees more aware of the need for all employees (including management) to have involvement and understanding of quality.

When the employees first took the questionnaire, they felt as though they were doing well in quality. As such, there was no dramatic improvement needed in quality. Yet, a deeper understanding of quality clearly developed due to the implementation of the RRQM. This deeper understanding of quality was not only shown through the explanation of the owner of the test-case company, but was also evidenced in the employee in China who was treated as an outlier for making a perfect score of 50 the first evaluation, and was much more critical the second time. The more critical evaluation showed that the employee had a better understanding of the quality procedures and could see that quality could be improved. This resulted in a lower quantitative comparison of the pre- and post-implementation status.

This situation was similar to the Hawthorne Effect. The Hawthorne Effect describes the phenomenon that employees work harder when they believe they are being observed. This effect seemed to occur with the test-case company. Although the employees had a checklist before this study, the checklist was not being used. There was no true quality program in effect. The researcher established, taught, and then implemented the RRQM with vigor. The employees saw that the use of a quality system was critical to the company and important to management. As a result, the employees responded with improved quality control. However, when they took the pre-

implementation survey, this entire situation was not apparent to them. They believed that they were doing a fine job with quality. Hence, they rated their performance high at that time. To quote from an old homily “Ignorance is bliss!” When the employees later realized the importance of quality, they responded more appropriately and the quality improved. Hence, when they took the post-implementation survey, they correctly rated themselves higher. The result was that the pre- and post-implementation questionnaires both scored high, although the first was erroneously high. The employees realized this and, therefore, correctly understood the improvement in quality and reported this in the personal interviews.

Through these findings we can conclude that the thesis statement of the study has been successfully accomplished. That statement was: *Can a system be developed that will improve quality in international manufacturing? Then, can this system be effectively implemented in China?*

Because of the doubt inherent in the quality control performance in international manufacturing, a system that will force engagement with quality on a regular basis will be useful. The RRQM is the right thing to implement in an international setting because all employees at the test-case company recognized that quality had gotten better. The mere action of implementing the system forced all employees to look more closely at quality, which improved quality performance.

5.2 Salient points

This research has been about improvement of quality for a third-party logistics provider (3PL) located in China with a parent company in the United States. While the RRQM is a broad method for addressing quality, what specific things must be done that

will result in improved quality in such a situation? The following four points are shown to improve quality in a 3PL between the parent company and foreign facility.

- Organized structure for consistently reporting quality
- Management involvement
- Employee dedication to quality
- Cultural understanding and awareness

5.2.1 Organized structure for consistently reporting quality

Part of establishing structure for reporting quality is establishing a means of understanding between the parent company in the United States and the foreign office in China. An effective way to do this is through the establishment of a quality control/inspection instrument. In the test-case company a quality inspection report/checklist was the instrument. This checklist was intended to be filled out every quality visit. The regular nature of recording quality, good or bad, was necessary for a truer representation of the status of projects' quality.

Having the instrument and filling it out are not alone sufficient to provide structure for quality. There must also be a structured reporting system. The structure in the reporting system allows the parent company management and the local management to communicate regularly and with equal understanding. In the test-case company, the employees were required to report their quality checklists after every visit. This maintained both local management involvement and parent company involvement, and kept all parties involved with the quality status of projects.

5.2.2 Management involvement

Much of the research found in Chapter 2 identified the importance of management involvement. But what does being involved mean? Involvement is showing an indication by management that the work being performed by the quality control personnel is important. This concept relates to the Hawthorne Effect. In that study, when the lighting in the room was changed, the employees performed better. The researchers found that this was because of the perception that management cared about the work being performed.

In the test-case company that was part of the present research, employees showed that the feedback from parent company management in the United States was important to them. When they received regular feedback and comments, their reporting to the United States became more consistent.

Another way the parent company showed their involvement and appreciation was by focusing on the employee responsible for quality checks. As this employee began to understand quality more thoroughly and reported more accurately, the parent company gave him a raise. When he received additional money, he recognized the work he was doing was appreciated and important, which made him work even harder and improved his performance even more.

Involvement is also taking the time to make sure employees are performing as they are expected. Taking the time to observe will improve the current system and correct confusion or problems. For example, observations made in China led to the establishment of a new instrument, training on how to use the instrument, and reporting

of the instrument's results to management. Without the observations being made by the parent company, the quality would not have improved as rapidly.

5.2.3 Employee dedication to quality

Employees' dedication to quality is important because if the employees do not capture the vision of quality standards, they will not take the steps to improve quality. Part of employee dedication is knowledge. Employees need to be taught what quality is and why quality is at the heart of manufacturing. The responsibility of management to teach is outlined in Chapter 2 (Neave, 1990) (Yeung and Chan, 1999). As employees gain this knowledge, they see what the expectation of management is and employees will learn how to fulfill those expectations. Management is also dedicated to teaching the employees what is expected.

Even with the use of structure and an instrument to help guide the quality procedures, without knowledge and a dedication to quality improvement, the checklist will prove useless. When the employees at the test-case company started using the newer Combined QC Checklist they made many mistakes and errors while filling it out. For example, they didn't use the N/A column, they didn't fill out numbers relating to the number of defects versus the total number manufactured, and they didn't give a detailed explanation of defects. Additional training, adding to the employees' knowledge, helped solve such issues.

5.2.4 Cultural understanding and awareness

Overcoming cultural boundaries that separate nations must occur for success in the implementation of a quality method. Management needs to take the time to

understand what is different in China and the United States. For example, in the test-case company there was difficulty teaching a local Chinese manager how to use email. He was unfamiliar with email and didn't see the importance of learning to use it. In addition, he was hesitant to ask for help because he needed to "save face" by not having to admit he didn't know how to do such a task. While maintaining cultural awareness and under the direction of parent company management, the researcher approached this manager through training and conversation to convince him of the importance of learning email, and discussed how learning email would improve quality. He eventually committed to the new task and in turn improved quality. To be an effective manager, it is critical to understand the culture and become involved in the culture (Blackwell, 2004). This understanding of culture should come from parent company management as well as local management.

Along with the dedication required comes a need to follow up regularly, being firm but still allowing for respect in the culture (saving face). An example was overcoming the "yes sir" syndrome. The employees in the test-case company tended to tell parent company management what they wanted to hear. When the local manager was being trained to use email (this is the same manager referred to above), and after a few days of instruction, the researcher asked one of the secretaries if this manager was comfortable with email. She responded that he had emailed earlier that day, and was comfortable with the system. The researcher immediately inquired about the sent email, only to find the manager still had no idea how to use it. In other words, the manager was still delegating the task to the secretaries, and the secretaries were lying in order to prevent embarrassment or loss of face for the manager. The manager clearly needed

additional training and understanding so the system would work, which as was indicated earlier eventually did happen. While the email issue needed to be addressed and corrected, attention to cultural differences and maintaining respect were critical for long term success.

A large part of cultural understanding and awareness is taking the time to learn about the other cultures and what to expect when working with other people from different cultures. Knowing and caring to act on such knowledge are a large part of overcoming the potential cultural boundaries.

5.2.5 Communication within the salient points

While it may have seemed that communication should be one of the salient points, it was determined that communication is a means of making the other salient points possible rather than being a salient point itself.

There must be an organized structure for reporting quality from China to the parent company. Without a systematic communication method, there will be constant confusion. The use of a form helps minimize the confusion and brings consistency to the communication.

Management must show their involvement by discussing expectations to the foreign company. But they also give praise and encouragement through communication means by responding to the quality data being sent. Thus communication is a vehicle for involvement, not necessarily a salient point in and of itself

Employee dedication to quality is improved through knowledge and understanding of quality. The knowledge comes through communication from those who understand quality and customer expectations (parent company) to those performing

quality (employees in China). Therefore, communication is again the vehicle by which knowledge is increased.

Cultural understanding and awareness is crucial for success in China. Such understanding can occur only as one becomes familiar with the culture and communicates effectively with the citizens of China, and in this case employees of the test-case company in China. Therefore, as we have seen again in previous instances, effective communication serves as the vehicle by which cultural understanding and awareness is achieved.

5.3 Recommendations for further research

The following are ideas for further research:

- Research for the RRQM was implemented and then observed in China for a short time. The researcher was in China for three months, but the system was not in-place until the last month of research. As such, a longer time period of observation and training could yield different quality results and/or changes to the details of the system. Therefore, the system should be viewed as a living document and monitored for an extended period.
- The researcher conducted a primarily qualitative study with some quantitative aspects utilized. The numerical data used a small sample size, which was not statistically significant. A larger sample size could be used with the focus of research being primarily quantitative rather than qualitative. To do this will also require re-examination of the questionnaires and systematic collection of data pre- and post-implementation of the quality system.

- Thorough analysis of the cost benefits to implement the RRQM would allow the parent company to evaluate the cost benefit of a full-time expatriate employee versus a regular employee who might take occasional trips to coordinate quality in the foreign location.
- While the RRQM was implemented in a Chinese-American company, the system could likely work in any international relationship with the parent company located in another nation. This should be confirmed.
- This system was implemented in a company that actually did not manufacture a specific product, but contracted with many different manufacturers. With minor modifications, the system could likely be used for a company that manufactures a specific product and reports to a foreign owner.
- In order to facilitate interpretation of the pre-implementation questionnaires in the future, it would be useful to have a data-base of both pre- and post-implementation results from a variety of companies. This should be implemented as part of a general program of collecting international manufacturing data.
- The focus of this research was founded in quality control improvement. The researcher conducted some work in the qualifying of new manufacturing companies, but was unable to complete this work because of limited time. As such, further research could be conducted in the finding and qualifying of manufacturing companies when involved in a contract setting (Appendix H).

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APPENDICES

Appendix A

QC Checklist A

Revision
Date: 19
June 2007

Instructions: This checklist is designed to provide a systematic method for checking the quality of production parts. The checklist is provided with empty lines so instructions can be entered depending on the product being manufactured and which critical factors need specific QC attention.

Date of inspection: _____ In-Production
check: ___ <or> Final check: ___

Quantity of products checked	
Total quantity of products produced	

Person performing the QC? _____

Product and Company: _____
PO# _____

	If all inspected items pass, put check here	If any fail, put number of items that failed	Explanation: (If failed, did all the failures happen in the same location on the part, why did they fail, severity of the failure, what was done to fix it, change of delivery date, and any additional needed notes?)
Production			
Do all the parts of the product function correctly? (Buttons, zippers, handles, wheels, etc.)			
Is the color correct?			

Are the dimensions correct?		
Are there surface defects? (Scratches, dents, etc.)		
Are there defects in manufacturing? (Improper stitching, cutting, joining, etc.)		
Are there defects with the product not otherwise identified?		

Shipping

Is the packaging labeled correctly?		
Is the packaging protected correctly?		
Are the number of items per box correct?		
Is the number on the UPC barcode correct?		
Boxes filled to capacity?		
Container filled to capacity?		
Are all of the necessary parts included in the box?		
Products are placed in the boxes		

correctly?			
What QC documentation does the factory have up to this point for our product?			
What actions is the manufacturer taking to ensure high quality product?			
Were photographs taken?	Yes _____ _____	No _____ _____	If pictures taken, why and who were they sent to?
Is there a new shipping date expected?	Yes _____ _____	No _____ _____	If yes, what is the new expected date?

Appendix B

QC Checklist B Stitched Goods



Project name: _____
 Project Id#: _____
 Customer: _____
 Date of inspection _____

Inspected by: _____

Stage								
Project Stage:	Pre-sales	<input type="checkbox"/>	Production	<input type="checkbox"/>	Post-Production	<input type="checkbox"/>	Delivery	<input type="checkbox"/>
Category								
Product:	Bag	<input type="checkbox"/>	Binder	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
	Case	<input type="checkbox"/>	Portfolio	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
	Tote	<input type="checkbox"/>	Journal	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
	Wallet	<input type="checkbox"/>	Print	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

Project Documents				
<i>For the inspection did you have a...</i>	Yes	No	N/A	Notes
Specifications Sheet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Bill of materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Approved Sample?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Inspection				
<i>Do the following meet specifications?</i>	Pass	Fail	N/A	Notes (If Fail, must have an explanation)
Body materials (Leather, PU, etc..)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Lining (Color, etc..)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Zippers (Color, ribbon, etc..)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Clasps/Buckles/Buttons/Snaps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Handles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Wheels (if applicable)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Trim	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Color	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Configuration exterior	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Configuration interior	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Interior label	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Stitching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Embroidery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Patch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Emboss/Deboss	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Size	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Accessory components	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Hardware				
Print				
Edging				
Finish				
Gluing				
Drilling				
Hinges				
Packaging				
UPC Barcode label				
Attached marketing tags/labels				
Protective Packaging				
Correct product number				
Product Packaging				
Shipping Carton				
Shipping label				
PO number				
Box quantity				
Product dimensions				
Shipping carton dimensions				
Shipping documents				
Notes				

Appendix C

QC Checklist B Print



Project name: _____
 Project Id#: _____
 Customer: _____
 Date of inspection _____

Inspected by: _____

Stage								
Project Stage:	Pre-sales	<input type="checkbox"/>	Production	<input type="checkbox"/>	Post-Production	<input type="checkbox"/>	Delivery	<input type="checkbox"/>
Category								
Product:	Book	<input type="checkbox"/>	Sheets	<input type="checkbox"/>				
	Pamphlet	<input type="checkbox"/>		<input type="checkbox"/>				
	Cover	<input type="checkbox"/>		<input type="checkbox"/>				
	Pad/Journal	<input type="checkbox"/>		<input type="checkbox"/>				

Project Documents				
<i>For the inspection did you have a...</i>	Yes	No	N/A	Notes
Specifications Sheet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Bill of materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Approved Sample?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Print Proofs/Matchprints/Color Draw downs/Press Sheet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Inspection				
<i>Do the following meet specifications?</i>	Pass	Fail	N/A	Notes (If Fail, must have an explanation)
Trim size - finished	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Page Count	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Text Paper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Text Ink	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cover Paper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cover Ink	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Jacket Paper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Jacket Ink	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Coating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Endsheet Paper				
Endsheet Ink				
Binding (Perfect Bound, Sewn, etc..)				
Foil stamp				
Emboss/Deboss				
Gluing				
Stitching				
Gilting				
Drill holes				
Trim finish (i.e round corners)				
Die cuts				
Folds				
Scores				
Collation				
Other				
Packaging				
UPC Barcode label				
Attached marketing tags/labels				
Protective Packaging				
Correct product number				
Product Packaging				
Shipping Carton				
Shipping label				
PO number				
Box quantity				
Product dimensions				
Shipping carton dimensions				
Shipping documents				
Notes				

Appendix D

QC Checklist B Hard Goods Manufacturing



Project name: _____
 Project Id#: _____
 Customer: _____
 Date of inspection _____

Inspected by: _____

Stage								
Project Stage:	Pre-sales	<input type="checkbox"/>	Production	<input type="checkbox"/>	Post-Production	<input type="checkbox"/>	Delivery	<input type="checkbox"/>
Category								
Product:	Cabinet	<input type="checkbox"/>	Other	<input type="checkbox"/>	Acrylic	<input type="checkbox"/>		<input type="checkbox"/>
	Furniture	<input type="checkbox"/>	Metal	<input type="checkbox"/>	Resin	<input type="checkbox"/>		<input type="checkbox"/>
	Cart	<input type="checkbox"/>	Wood	<input type="checkbox"/>	Other	<input type="checkbox"/>		<input type="checkbox"/>
	Shelf	<input type="checkbox"/>	Plastic	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

Project Documents				
<i>For the inspection did you have a...</i>	Yes	No	N/A	Notes
Specifications Sheet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Bill of materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Approved Sample?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Print Proofs/Matchprints/Color Draw downs/Press Sheet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Inspection				
<i>Do the following meet specifications?</i>	Pass	Fail	N/A	Notes (If Fail, must have an explanation)
Finished size	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Material match	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Material Specifications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Hardware	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Wheels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Accessories	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Manual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Appendix E

Combined QC Checklist Stitched Goods



Project name: _____ Project owner: _____

Project Id#: _____

Customer: _____ Inspected by: _____

Date of inspection _____

Stage							
Project Stage:	Pre-sales		Production		Post-Production		Delivery
Category							
Product:	Bag		Binder				
	Case		Portfolio				
	Tote		Journal				
	Wallet		Print				

Project Documents				
<i>For the inspection did you have a...</i>	Yes	No	N/A	Notes
Specifications Sheet?				
Bill of materials?				
Approved Sample?				

Inspection				
Number of items inspected:				
<i>Do the following meet specifications?</i>	Pass	Fail	N/A	Notes (If Fail, must have an explanation and Number of Failures)
Body materials (Leather, PU, etc..)				
Lining (Color, etc..)				
Zippers (Function and Color)				
Clasps/Buckles/Buttons/Snaps				
Handles				
Wheels (if applicable)				
Trim				
Color				

Configuration exterior				
Configuration interior				
Interior label				
Stitching				
Embroidery				
Patch				
Emboss/Deboss				
Size				
Accessory components				
Hardware				
Print				
Edging				
Finish				
Gluing				
Drilling				
Hinges				
Packaging				
UPC Barcode label				
Attached marketing tags/labels				
Protective Packaging				
UPC/SKU is applied to correct items				
Product Packaging				
Shipping Carton				
Shipping label				
PO number				
Box quantity				
Product dimensions				
Shipping carton dimensions				
Shipping documents				
Are there problems with factory management	YES	NO		
Has the shipping date been changed due to failures?	YES	NO		If Yes, what is the new shipping date:
If there are failures, list the item and the corrective action that will be taken by the company to fix the problems? Please explain in detail.				

Appendix F

Combined QC Checklist Print



Project name: _____ Project owner: _____

Project Id#: _____

Customer: _____

Inspected by: _____

Date of inspection _____

Stage

Project Stage:	Pre-sales		Production		Post-Production				Delivery

Category

Product:	Book		Cover		Sheets			
	Pamphlet		Pad/Journal					

Project Documents

<i>For the inspection did you have a...</i>	Yes	No	N/A	Notes
Specifications Sheet?				
Bill of materials?				
Approved Sample?				
Print Proofs/Matchprints/Color Draw downs/Press Sheet?				

Inspection

Number of items inspected:	Pass	Fail	N/A	Notes (If Fail, must have an explanation and Number of Failures)
Do the following meet specifications?				
Trim size - finished				
Page Count				
Text Paper				
Text Ink				
Cover Paper				
Cover Ink				

Jacket Paper				
Jacket Ink				
Coating				
Endsheet Paper				
Endsheet Ink				
Binding (Perfect Bound, Sewn, etc..)				
Foil stamp				
Emboss/Deboss				
Gluing				
Stitching				
Gilting				
Drill holes				
Trim finish (i.e round corners)				
Die cuts				
Folds				
Scores				
Collation				
Other				
Packaging				
UPC Barcode label				
Attached marketing tags/labels				
Protective Packaging				
UPC/SKU is applied to correct items				
Product Packaging				
Shipping Carton				
Shipping label				
PO number				
Box quantity				
Product dimensions				
Shipping carton dimensions				
Shipping documents				
Are there problems with factory management	YES	NO		
Has the shipping date been changed due to failures?	YES	NO		If Yes, what is the new shipping date:
If there are failures, list the item and the corrective action that will be taken by the company to fix the problems? Please explain in detail.				

Appendix G

Combined QC Checklist Hard Goods Manufacturing



Project name: _____ Project owner: _____
 Project Id#: _____
 Customer: _____ Inspected by: _____
 Date of inspection _____

Stage

Project Stage: Pre-sales Production Post-Production Delivery

Category

Product:	Cabinet	<input type="checkbox"/>	Other	<input type="checkbox"/>	Acrylic	<input type="checkbox"/>	<input type="checkbox"/>
	Furniture	<input type="checkbox"/>	Metal	<input type="checkbox"/>	Resin	<input type="checkbox"/>	<input type="checkbox"/>
	Cart	<input type="checkbox"/>	Wood	<input type="checkbox"/>	Other	<input type="checkbox"/>	<input type="checkbox"/>
	Shelf	<input type="checkbox"/>	Plastic	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>

Project Documents

<i>For the inspection did you have a...</i>	Yes	No	N/A	Notes
Specifications Sheet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Bill of materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Approved Sample?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Print Proofs/Matchprints/Color Draw downs/Press Sheet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Inspection

Number of items inspected:				
<i>Do the following meet specifications?</i>	Pass	Fail	N/A	Notes (If Fail, must have an explanation and Number of Failures)
Finished size	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Material Specifications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Hardware	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Wheels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Accessories	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Manual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Color	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Adhesive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Stitching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Welds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Joints	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Appendix H

New Company Evaluation

Person completing form: _____

Date: _____

Name of Company and
Product: _____

How was this company
discovered: _____

Instructions

This form is to be used to evaluate potential new suppliers. It is to be filled out by an employee of the company seeking to purchase business from the new suppliers.

Price

-Samples	
What is the quoted price for the samples?	
Will the cost of the samples be credited back if they receive the full order?	
-Finished Product	
What is the quoted price per item?	
What is the number of items used for this price quote?	
Minimum Order Quantity (MOQ)?	
What is the number of items that will give a price decrease? What is the new price?	

Quality

-Samples	
Are the samples made for previous customers good? Why are they good or not good? Rate the company's ability to make samples on a scale of 1=poor to 10=excellent samples . (Example: 1=Samples are not correct. 5=Samples are correct, but are scratched and not taken care of. Not good workmanship. 10=Sample is clearly well made. Good quality materials and workmanship.	
Do the finished samples meet your approval and are therefore ready to receive final approval?	
-Quality system	
Is the current work being made for different customers good? Why is it good or not good? Rate the company's ability to manufacture on a scale of 1=poor to 10=excellent manufacturing systems . (Example: 1=Products are being moved through the factory even though they are made wrong and poorly. 5=Some products are incorrect, and there is a lot of time spent on rework and correction of poor quality. 10=There are almost no quality problems, and everything is manufactured well).	
Total number of employees at this location. Total QC people at this location? (A QC person can be anyone, except an operator, who ensures the part is being made correctly)	
Where do the QC checks occur? (Do they happen at the end of the process, throughout the process, or both?)	
How carefully do the operators check for the correctness of their task? Rate their carefulness on a scale of 1=no care to 10=extremely careful . (Example: 1=Operator is not checking any item they are working on; they are just "going through the motions." 5=operator is looking over the work, but is more concerned with going fast than with paying attention to the detail. 10=operator is looking closely at all of the work they have accomplished and is making sure it was done correctly; they are doing QC on their own work).	
Does the company have QC documentation? If yes, ask to see the documentation. Rate the completeness of the QC documentation on a scale of 1=poor to 10=very well done . (Example: 1=QC documentation does not exist, or was made-up quickly to make the company appear to be good. 5=QC documentation does exist, but the company does not use it to better the quality. 10=Company is using the QC documentation as a tool for improvement throughout the company).	

Service

-Samples	
How long is the estimated time to complete the samples we are requesting?	
-Manufacturing Capability	
What is the capacity of the factory according to the company? Do the production records of the company confirm this capacity estimate? Do your personal observations confirm this capacity estimate?	

Can they meet the needed quantity?	
What is the estimated ship time?	
Do they have documentation regarding past shipments? Rate how well they meet the ship times of previous orders on a scale of 1=poor to 10=always on time. (Example: 1=Company is always late or the records are incomplete. 5=Company is late about half of the time. 10=Company is always on-time).	

General Company Characteristics

Rate the cooperativeness of the management of the factory on a scale of 1=difficult to work with to 10=very easy to work with . (Example: 1=Management seems to be dishonest. They are more concerned about money than about making good product and working cooperatively. 5=Company is helpful, but not open about business and deals. They struggle to commit, and if they do commit, it is likely they will not fulfill their commitment. 10=Company is focused on getting our business and making sure things are done right. They are anxious to help and up-front with all business deals. They fulfill their commitments).	
Rate how the company treats its employees on a scale of 1=oppressive to 10=enlightened . (Example: 1=Management is mean to their employees. They underpay and do not pay overtime. 5=Management is passive toward their employees. They pay, but do not go out of their way for employees. 10=Management is working to make employees healthy and happy).	
Rate the overall physical environment of the factory considering items such as lighting, noise, work station comfort, etc. on a scale of 1=poor to 10=excellent . (Example: 1=Lighting is dim and it is hard to see the work being done; noise is loud without any ear protection; workplaces are cramped and hard to work at. 5=Lighting is okay, but could be better; area is a little cluttered and a little dirty. 10=Factory is clean; workplaces are easy to work in and the space is large enough to work at).	
Are there obvious and significant safety problems? Is there equipment on which the safety devices have been turned-off or by-passed?	
Rate the cleanliness of the manufacturing area on a scale of 1=dirty to 10=very clean . (Example: 1=No cleaning supplies and no cleaning people. 5=Evidence of cleaning supplies and some cleaning exists, but only because employees have to. 10=Clean factory, everywhere. Employees personal work areas and working space is clean).	
Orderliness is having equipment in a organized order, having the product move through the factory logically, and having a specific place where things are stored. Rate the companies orderliness on a scale of 1=chaos to 10=highly organized . (Example: 1=No order to the factory; nothing has a specific spot, things are put anywhere with no attention to organization; products are scattered throughout the company rather than having a logical order moving from workstation to workstation. 5=Things are given a place to be put, but often the organization is not followed; order for workstations is not as good as it can be, and so is still a little confusing. 10=Everything has a specific place and it is always put there; as product moves through the factory, the order is logical and efficient).	

<p>Rate the overall ethics of this company on a scale of 1=not ethical to 10=always ethical. (Example: 1=The management and company does not seem honest. 5=The management and company may be somewhat honest, but there are still some concerns with how they treat companies and how they perform business. 10=Company is totally honest with everyone else they do business with).</p>	
<p>Additional Comments or Observations: (continue on back of paper, or at the bottom if typed)</p>	