MÄLARDALENS HÖGSKOLA
Institution for Innovation, Design and Product Development

CONTINUOUS QUALITY IMPROVEMENT: IMPLEMENTATION AND SUSTAINABILITY

Masters Thesis Work

30 Credits, D-level

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ABSTRACT

As the philosophy of doing business shift from sell what you can produce to produce what you can sell so do the customers' specification continuously become a vital tool during product development process, hence increasing the volatility of the business environment. The objective of this thesis is to thoroughly review literature to be supported by cases why most companies fail in sustaining improvement programs then map out a pathway that will leads to successful implementation.

To achieve the aim of this thesis personal interview, phone calls were made and a structured questionnaire was distributed to a number of manufacturing and service companies. Among these companies, four actually responded to the questionnaire which are; ABB, Bombardier, SWEDBANK and Deva Mecaneyes. The analysis of the thesis was drawn based on the responses received from these four companies. A series of reasons were found which impedes the successful implementation of improvement programs which includes; management is unable to define the problem to be solve and the method of measurement, implementers chooses wrong parameters for improvement, implementers sub-optimize or may not involve everyone that will be affected by the program, top management gives little or no attention to improvement programs and at times they may even loose focus, so many concurrent improvement programs are executed which will result to resource overloading, teams members most often lack data integrity, and teams members are often scared to try new ideas hence prohibiting the chances of innovation. To minimize this cankerworm, a number of steps has been mentioned. The steps were divided into two phases, the selection phase and the implementation. The selection process includes; defining the program, focus program on improving shareholders' value and choose program base on a holistic perspective. The implementation phase includes; commitment of top management, prioritize projects, use critical chain project management to plan and execute project, lay emphasis on quality data, minimize the number of concurrent projects, encourage risk taking, and spend time and resources on value adding activities.

ACKNOWLEDGEMENT

First of all, our profound gratitude is extended to the Lord Almighty who has given us life and the energy required.

Special thanks to those staffs of ABB, Bombardier, SWEDBANK and Deva Mecaneyes who responded to the questionnaire.

Our next thanks go to Sabah Audo who serves as the supervisor and examiner, and to the entire Mälardalens Högskola community.

We would also like to extend gratitude to our families the Njang and the Yella back in Cameroon.

Special thanks to all our friends who has helped us directly or indirectly for the accomplishment of this task, and not forgetting those who consider us as their enemies because their evil thoughts against us have tended to be a blessing.

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1 CONTINUOUS IMPROVEMENT

1.1 INTRODUCTION

The art of meeting customers' specification, which today is termed "quality", has existed as long as the beginning of tool manufacturing. Tools made of bones and rocks were subject to failure. During the middle ages, guides (association of people of the same trade) controlled quality. The principle of all quality initiatives revolve around the philosophy that the success of a company is a function of how well the company satisfy or even exceed its customers needs and wants, and continuously improve in the achievement of this result. Juran (1995) identified five factors that have been the major drive for improving quality in the 20th century and he concluded that while the 20th century has been the century for productivity, the 21st century will be the century for quality. These forces that drove quality according to Juran include;

- greater complexity and precision of products
- threats to human safety and health, and to the environment
- government regulations of quality
- the rise of the consumerism movement
- intensified international competition on quality

Over the last three decades a lot of transition has occurred in improving processes from process routines, designs and quality. The advent of many improvement tools such as lean and Six Sigma methodologies has formed a core in many giant concerns in dealing with improvements. This research looks at the reasons behind failure to implement and sustain improvement programs. A review of theoretical literature including scientific techniques and tools for analysis involved. Understanding customers' needs and keeping track of value adding activities or processes in the supply chain. This encompasses disaggregating the chain and identifying critical value adding activities. The application of relevant optimization tools for processes and performing control operations. A vivid study of the roadmap to implement and sustain improvement programs is covered and applied to simple streamlined processes.

Quality tools for optimization can well be explain in a theoretical manner yet a successful implementation demands much from the underlying organization norms. It usually will require a re-evaluation of the norms and values, directing, involving, and shaping employee thoughts towards an ever improving quality perspective. Off course, leaning processes and applying quality management techniques to improve on them takes more than just replicating a set of tools. We would look at developing a methodology that will result to successful

implementation and sustainability of improvement programs hence paving the way to increase market share, revenue, and profit. With competition, innovation, and new challenges, customers' value will always continue to change and become more demanding requiring manufacturing and service concerns to integrate continuous improvement with their overall objective. Translating customers' value to employees' desire and target is the basis for our improvement study. This should be reflected by;

- Productivity improvement
- Market share growth
- Customer retention
- Cycle-time reduction
- Defect reduction
- Culture change
- Product/service development
- Cost reduction

Emphasis is placed on management technique for engaging employees' involvement and commitment in achieving corporate goal. Making employees know the "whys" and "how tos" of quality and what it means to the customer.
We would develop a strategy that ensures the objective of improvement projects always have a close link with the organizational goal of a company. How to engage top management in improvement projects that would otherwise be supervised only by a sub organizational unit. Our objective is to "chain up" continuous improvement with corporate priorities to ensure sustainability.

1.2 AIM OF THE RESEARCH

With customers yearning for continuous increase in quality and a corresponding decrease in price and delivery time, prevailing business strategies would always be unreliable to meet consumers' satisfaction. This obliges management of any firm who seeks to meet customers' needs to keep a watchful eye on windows of improvement. Since the enactment of Total Quality Management (TQM) by its proponents other quality programs have been introduced such as Lean and Six Sigma which are separate quality improvement tools that were enacted in separate business era by different authors. Today, there is an increasing trend of using both tools together with each serving as a wedge to the other. Research has proven that most companies fail when implementing quality programs and some are afraid to initiate the

implementation process. The aim of this thesis is to do a thorough literature review on why companies fail in sustaining improvement programs. With the help of questionnaire, we will develop a roadmap that will leads to the culture necessary to breed successful implementation and sustainability of improvement programs.

1.3 PROBLEM STATEMENT

The continuous implementation of improvement program is expected to yield increased benefits; studies have revealed that majority of these companies drop the program after the second or third year. What is sure is that minority of these companies benefited from the improvement but still keep the program for quite a short time as to what quality experts will recommend. The American monthly, Quality Digest, in its October 2006 issue for example published a survey of six sigma companies indicating most of the companies abandon the project after two to three years. The magazine's analyst propounded a hypothesis saying by "Not tying improvement projects to corporate goals and/or not leading the improvement program initiative by top management almost guarantees the program will fail". How well this can become factual is part of our research.

In many improvement mechanisms, companies may withdraw from the project at a point because of some preconceived or unforeseen reasons. Tom Pryor in his paper titled Improvement keepers pointed out why companies that have benefited from an optimization technique, in his case ABM/ABC specifically, abandon the system. He mentioned three basic reasons for abandonment;

- Some organizations abandoned the system because that was their plan all along. The program was intended to be a one-time project to address a specific business need, i.e. identify a targeted cost savings, reduce defects in a manufacturing product line, re-engineer a process, etc.
- Some organizations simply lost interest, focus or attention. They did not make a decision to stop the implementation. Instead, it just happened. "Just as attention deficit disorder is diagnosed with increasing frequency in individuals, organizations can suffer from 'organizational ADD'." (2)
- Some organizations abandoned the technique because their managers did not know how to sustain improvement. No one had compiled a list of what the "improvement keepers" do to successfully sustain the benefits of improvement programs.

Much can't be done about the first point than sensitizing these companies about the need for continuous improvement. Our research assumes its hypothesis on the last two senses to test its validity by seeking to optimize these functions and monitoring the outcome. The question now

is; how can the management of improvement companies design and improve on quality programs' in line with the organizational goal to guarantee sustainable implementation?

1.4 LIMITATIONS

The following points below are the barriers we have anticipated to hinder the smooth execution of the work, which are;

- The result and recommendations of this research will be based on the findings from a case studies and theoretical literature, therefore it will not be guaranteed that this is true for each individual company applying improvement programs
- The research findings will be based on questionnaire to be send out to the company in question; hence not all the employees will be willing or have the opportunity to response. And within those who will response, some will response with bias or special interest.
- Getting complete access to company's data bank will be difficult if not impossible since management may be scared of being expose if they have not been implementing the tools in the best possible method.
- Using questionnaire unlike personal interview will risk the questions of misinterpretation by the responder since the researchers will not be there to clarify issues, same is true when the researchers will be interpreting the result of the findings
- Another limiting factor is the fact that the researchers each lived in a different country when the research was being conducted. It will posse lot of problems to acquire and compromise data.
- Conducting a research of this magnitude entails a lot of finance for transportation and logistics. The lack of sufficient funds to finance this work will serve as a retarding factor, preventing the smooth execution of this task
- The research is qualitative meaning any suggestions will be based on the researchers' perception of the subject matter and the ability to draw meaningful conclusion
- Last but not the least; time will also be a limitation for this study. A greater response rate from the supervisory survey would have been desirable, as well as increasing the sample employees to be contacted.

1.5 THESIS OVERVIEW

The aim of this thesis is to diagnose the reasons behind failure to implement and sustain improvement programs, then develop a road map to successfully implement the programs. Chapter two will present a case-based literature couple with other literatures to give a clue on

the barriers of the implementing improvement programs. Chapter three will present the chosen methodology followed by the research design and the application of the method to the research. Chapter four gives an overview of the Malcolm Baldrige National Quality (MBNQ) criteria for rewarding performance excellence which will serve as a guide for companies wishing to implement improvement programs. The chapter then presents some improvement methodologies that have been used by some successful companies. The chapter ends with a roadmap for implementing improvement programs. Chapter five present the result of the findings which is based on the responses of the questionnaire sent out to some companies. Chapter six present the analysis and recommendation which is drawn from the result gotten from chapter five.

CHAPTER TWO

2 LITTERATURE REVIEW

2.1 DEFINITIONS

2.1.1 Quality

Quality is viewed by different people or different organization in various perspectives. As defined by the ISO 9000 standard, it is the features of a product that will meet customers' satisfaction. For example, products must be reliable, useable, and repairable. Similarly, service should be courteous, efficient, and effective.

In our view, quality is those characteristics of a product or service that will meet customer's needs and wants.

2.1.2 Continuous Improvement

According to the ISO 9000 standard, Continuous improvement is the everyday activities executed by a company in other to enhance it ability to meet customers' demands. Continual improvement can be achieved by carrying out internal audits, performing management reviews, analyzing data, and implementing corrective and preventive actions

In our view, it is the ability to continuously minimizing waste, reduce response time, simplify the design of both products/service and processes, and improve quality in order to meet customer's needs and wants more proficiently.

2.1.3 Quality Management

The ISO 9000 standard defines Quality Management (QM) as the entire activities that management execute in an effort to implement their quality policy. These activities include quality planning, quality control, quality assurance, and quality improvement.

In our view, it is the holistic or system approach of the application of quality control tools such as six sigma, lean, kaizen, just in time, etc to the process of an organization in order to deliver the right product, at the right time, at the right place and to the right customer.

Quality management is a "process . . . to achieve maximum customer satisfaction at the lowest overall cost to the organization while continuing to improve the process." As evident in the definition, it's all about putting the customer first to achieve organization objectives. Today it is widely accepted that quality initiatives should no longer be a one time solution procedure to solve a particular problem but rather an inherent value assurance methodology in the production system. Continuous Quality Improvement (CQI) can be defined as a "management

approach to improving and maintaining quality that emphasizes internally driven and relatively constant (as contrasted with intermittent) assessments of potential causes of quality defects, followed by action aimed either at avoiding a decrease in quality or else correcting it at an early stage." It is a never-ending, long-term development that is evolutionary in implementation yet revolutionary in vision, scope, and impact.

2.2 WHY QUALITY MANAGEMENT

In the 18th century where automobiles were manufactured by craftsmen, the role of quality such as producing prototypes of a product was impossible even if these products were of the same blueprint. Producers of automobiles were more focused on customized product rather than focused on identical cars. The parts for an automobile were produced by different contractors using slightly different gauges, this causes slight difference in the sizes of the parts resulting to "dimensional creep" hence a larger different at the time the final car is produced. With the advent of mass production by Henry Ford, there was the need to mass produce and at lower cost. Ford insisted a standard gauge be use by all contractors producing similar parts. This eliminates filing that was done to let parts from different contractors fit to each other. According to Womack et al (1990), the interchangeability of parts must be flexible to allow the assembler to randomly select a part from a group and assemble it with a second randomly selected part, and to do this the machine must be capable of producing with minimal variation and within specification. This need of controlling the adherence to design specifications is given credit for igniting the evolution of quality principles hence the need for quality management.

Quality efforts in the Office of Physical Plant (OPP) had their origin in 1981 with the "Quality Circles" Program. In 1989, we continued with "Action Groups," and in 1990 and 1993, "CQI Teams" were formed.

In 1992 the Joint Commission on Accreditation of Healthcare Organizations based in the USA established CQI as its standard to meet its goal of reaching "optimal achievable levels of quality" rather than "minimum essential levels of quality." CQI accomplishes this by using small-steps improvements, rather than implementing one huge improvement. The Japanese have a term for this called "kaizen" which involves everyone, from the hourly workers to top-management.

2.3 WHY DOES CONTINUES PROCESS IMPROVEMENT PROGRAMS FAIL?

According to Stefan Stern, (2006), as the key to performance, organizations must increase predictability, increase process control, institutionalize best practices, and focus on execution. Lean Six Sigma should just well meet performance expectations by assuring these aforementioned requirements.

Reviewing the subject Womack et al, (1990), said quality has been evolving, shifting from just sell what you can produce to produce what will meet customers need. Today, lean and six sigma are the most alarming tools for controlling quality in an organization be it a manufacturing or a service concern. Their popularity is continuously eating deep into organization strategy as the demand for quality by customers continues to increase.

The implementation of quality tools is a major concern of most managers nowadays. It involves ambiguities, which usually set most management in frustration and they are bound to abandon the program just at the very beginning or somewhere after implementation. Some organizations manage to reap the low hanging fruits but couldn't go further to sustain the program to reap the higher hanging fruits. Theoretical literature has been investigated to understand the reasons why companies abandon or stop improvement project which otherwise may yield substantial benefits if kept. In this section we present this material and end up with a summary of the findings in a well structured pattern.

Various researches have been conducted on both success and failure companies and many articles have been presented as to why the expected sustainability of improvement programs has been maintained by only a few institutions. Some of the findings are presented below. In the later section we will endeavor to get into the root cause of these findings.

The introductions of quality program to an organization to a greater extend means introducing change, and the fact that people by nature will always like to maintain the statue quo means there is always a resistance force against any change initiative.

According to Marash, Berman, and Flynn there are four reasons why most companies couldn't succeed in their implementation of quality programs;

- Lack of executive leadership – the management of many companies implementing quality programs demonstrate very little commitments with regards to the program, they rather wholly or partially placed the coordination of the programs to middle level managers. This leads to a doubtful credibility of the program by floor workers.
- Failure to deploy – when management bother to show concern, they do so just at the initial deployment or not beyond training for worse cases and when the low hanging fruits have been achieved, no mechanism is set to keep the process going.

- Seeking shortcuts – management of some failure organizations in implementing a quality program that has been implemented successfully by its pioneer will based their program on some processes or tools while ignoring others and in some cases management try to introduce a new program using the old ways or custom of the organization.
- Inadequate measurement – management usually measure the success of the program inaccurately, for instance they may accurately measure or make the internal process more efficient but give little attention to customers satisfaction because it demands more to successfully measure.

BERRY Leonard L. (1991), states that the effort and resources rendered by some service companies in improvement programs has often resulted to destitution. This has been as a result of some mistakes the companies do which include;

- Some companies don't focus on research as a means for improvement; they don't conduct research as an ongoing program.
- Management doesn't see shop floor employees as the source of improvement suggestion of the job they are doing.
- Management at times couldn't focus wholly on improvement programs due to so many projects at hand hence as a solution they attempt to buy improvement programs.
- Top management at times do not value the support of middle management, and unfortunately, in the case that they do, they turn to over rely on them to foster cultural change that can breed improvement programs.
- Most companies invest very little in recovery.
- Management in most companies that fails instead of relying on taking action they rather over rely on rhetoric when trying to nurse the culture necessary for quality program implementation.
- Companies at times don't give priority to customers' problems hence leaving them unsatisfied.

Referring to Robert Spector and Mary West, (2006), most organizations that implement quality programs specifically Lean and Six Sigma don't reap the benefit associated with the success. Implementers tend to initiate so many improvement programs which are heavily financial and resource demanding, hence redistributing resources instead of pivoting them on the lever most important. In some cases, implementers lack the skills to prioritize their project. Spector and West recommend the Lean Program Management

(LPM) for quality program implementers. LPM identifies five prerequisites and six steps necessary for implementing quality programs.

2.4 INTEGRATING CUSTOMERS NEED IN DESIGN PHASE

Most companies that fails to implement quality program usually jumps into the program without clearly identify what made the program successful in the pioneer organization, because they quickly want success; they don't bother to invest the time and resources needed to execute the project.

A company that failed is not because of quality, cost or introducing product late in the market but because the company failed to analyze the customers requirements before designing the new product (Karl D. Williams, 2006). The very first step to introduce new product or making a change to an existing product is to identify the needs of the customers said Karl

According to Lawrence S. (1998), organizations nowadays focused mostly on the satisfaction of the customers as the key driver of product characteristics. The customer needs, wants, and preferences are translated into the input data for designers. The need for early incorporation of the customers desire has been emphasized by Markeset T. Stavanger and Kumar U., (2003), stating that dissatisfaction in customers is usually cause by unexpected failures leading to unexpected cost. Moreover, failure of products is usually ascribe to the designers and manufacturers inability to predict complication embedded during the future usage of the product. To minimize the variability of product from customer specification, it is important to integrate the customer priorities into the design stage as early as possible because product life cycle cost and customer satisfaction can easily be influence during this stage.

The secret to avoid field failure of product during its estimated lifetime is for management to concentrate on proactive methods that will build high reliability of products during the design phase. To get firm hold on proactive improvement method at the design phase, Necip et al, (2006), recommend warranty data as a possible means to mitigate product failure during usage, and map out a pathway on how to track the necessary data. With this it's possible to perform corrective action in design stage.

2.5 THE TEMPTATION OF AGGRESSIVELY BOOST PRODUCTION

Despite the growing innovation of the number of tools, techniques and technologies needed for improving organizational processes, many organizations are still face with lot of difficulties implementing the tools, though a few succeed.

According to Repenning N. and Sterman J., (2003), the root cause of failure to implement improvement tools is not ascribe to the particular tool use but as a result of how the tool interact with the environment in which it is being implemented, this environmental factors include; physical, social, economic and psychological environment. The performance of a system depends on two factors; the time spent working and the capability of the process. Performance of any process can be increase by dedicating additional time on either improvement or on normal work process and skill. Dedicating additional time to the latter will increase productivity and may not necessarily improve quality, and in case quality of product wasn't on specification, then, improving performance by this means will be worthless. On the other hand, if more time is dedicated on improvement, (for instance, finding the root cause of a defect, training of employees, doing repairs or buying new equipments and tools) performance will increase but may not increase instantly resulting to the worse before better dynamic. The most important thing to note is that increasing performance by dedicating more time on improvement will lead to lasting results said Repenning and Sterman. Despite the benefits embedded in increasing performance by dedicating more time on improvement most companies are still scared to embrace it because it is tedious and very risky. In most cases, when the production line is behind the schedule to serve an important customer's demand, managers will respond using overtime or try to double the work speed of employees instead of looking for the root cause which may require that employees be train. After the accomplishment of the task and the production line is back running, managers should trace out the fault and correct it to prevent future breakdown, but what they normally do is using overtime to meet production schedule, and has made this a routine hence relax from process capability improvement. It's clear that as the demand to meet customers request increase, organization spare less time for process improvement and employees continue to use breaks and weekends to meet up production. This can have a great negative impact on the organization in long run as employees become bore and unwilling to sacrifice their personal time, also, defects continue to accumulate only to be discovered after a reasonable production has been made. If more time is spend on work pressure instead of improvement, the deviation of target value continue to increase since root cause of problem is still manifesting, hence more and more time will be cut from improvement activities and personal time to speed up production through overtime. Repenning and Sterman cites a situation termed by psychologists "fundamental attribution error" where managers often attribute low performance of a system to the characteristics-and character flaws-of individuals in the system rather than to the system in which they operate. Low performance of a system can be upgraded in two ways;

- Getting people to work smarter i.e. introducing quality (improvement) programs, or

- Getting people to work harder i.e. pressuring employees to double their work force and even using overtime. The irony with work harder method is that, when managers apply it and production is temporary boosted as in most cases, then managers turn to believe that the true cause of low production is as a result of less committed and unmotivated workers. This method continuously downsizes resources from improvement process which will have an adverse effect in future.

At the end when most managers had exhausted the "work harder" as a means to boost production, and if the problem of low performance still persist, they will now turn to embrace quality programs as last resort. With the heavy workload they will introduce aggressive goals for both throughput and improvement as the authors quote one manager in one of the companies they studied "we need a development process that is fast, is the best in the industry, and it needs to increase throughput by 50% in two years, and everyone must adhere to the same process". The heavy workload and the heavy demand of time and finance by improvement programs often result to failure since one must be traded for another and managers are not ready to miss throughput target by an inch. The authors in their research interviewed a series of managers and engineers to know why improvement programs fail. Below is the quotes of managers interviewed cited in Repening and Sterman, (2003);

"Engineers-by trade, definition, and training-want to forever tweak things. It's a Wild West culture."-Manager A.

"We went through a period where we had so little discipline that we really had the 'process du jour.' Get the job done and how you did it was up to you." -Manager B

"A lot of the engineers felt that [the new process] was no value-add and that they should have spent all their time doing engineering and not filling out project worksheets. It's brushed off as bureaucratic."-Manager A

"It was fair to say that a lot of engineers viewed this as a neat way to get some fancy tools and to hell with process."-Manager C

Next is the reason behind failures according to engineers;

"We never had time to take the courses and get the equipment we needed to really make this stuff work.... it was really exhausting trying to learn how to use the tools and do the design at the same time."-Engineer A

"People had to do their normal work as well as [use the new project management system]. There just weren't enough hours in the day, and the work wasn't going to wait."-Engineer B

"Under this system ... the new workload was all increase.... In some cases your workload could have doubled."-Engineer C

“How did we catch up? We stayed late. Most of the team was working from 7:00 a.m. to 8:00 p.m. and on weekends. A lot of people worked right through the Christmas vacation.”-Engineer D

“The new process is a good one. Someday I’d like to work on a project that actually uses it.”-Engineer E

Some employees even complained that credit is never given to someone that fixed a problem that never happen; instead it is common to reward employees that solve problem reactively rather than preventively.

2.6 CHANGE MANAGEMENT

Organizations nowadays are on their heels in order to remain operational. The precarious business environment created by the increasing demand of innovation by customers is continuously tightening competition between firms, and change management must be the watchword for production professionals. Andrew Skaff, the director of the material management of Denver based Frontier Airlines believes 35% of innovation comes from the supply base. Skaff recommended that in order to keep the supply chain as one of the main source of innovation, management must develop an active supplier development program. Suppliers can be arrange in-group of first tiers where each first tier may have a second tier, and the second tier may even engage helpers in a third or fourth tier of the supply pyramid, hence this will help to reduce conflict between suppliers and initiate innovation (Womack et al, 1990). Cutting down cost from the supply chain perspective must start by laying down an effective strategy, said James Stock et al, (2006). At the supply chain there are two basic areas that leads to unnecessary cost and any effort to minimize these cost must start by identifying these cost traps which are; controllable and uncontrollable returns

Surviving in business means keeping track of change as Rob Preston, (2006), quotes Charles Darwin “It is neither the strongest of the specie that survive, nor the most intelligent, but the one most responsive to change”. Change nowadays is the watchdog of every organization that needs to stay at the frontline of the industry.

Magnusson et al, (2003), found for a change to be effected in an organization middle management, operators and front line staff all must positively contribute and buy into the concept. They also outlined six aspect of change management that needs to be accommodated in most national culture, which are;

- Freedom
- Respect
- Feelings

- Time
- Credibility
- one language

Effecting change in an organization is the necessary evil management and employees can't do without, by nature, human beings will show a cunning attitude toward change especially if the present situation is perceived to be manageable. Nowadays change must not only focus on improving quality or quantity of a product or service directly.

One critical factor that affects operations is accidents. It is argued that accidents can't be wiped out yet it is evident that majority of accidents are preventable. According to Shannon Klie, (2006), accident in an organization can result to so many adverse effects which may include one or more of the following; plant shutdown, investigation, fines, bad public relations, lost opportunities and lost productivity. To increase work safety, education and awareness must be the first part, and enforcement the last. Enforcement will include; stop work order, safety compliance plans, and fines up to $500,000 if not jail sentence. This will directly or indirectly spare organizations from the trauma embedded in unsafe work environments.

The deployment of any quality tool is the major arch face by many organizations willing to reap the benefit of the tool. According to Magnusson et al, (2003), the main obstacles in implementing Six Sigma include;

- Overrepresentation of ongoing improvement with little breakthrough improvement.
- Lack of senior management commitment.
- Lack of dedicated employees.
- Lack of early results.
- No deployment to support functions or design and development functions.
- Little attention paid to change management.
- Lack of a comprehensive deployment plan.

Implementers of Lean and Six Sigma for example tend to initiate so many improvement programs which are heavily financial and resource demanding, hence redistributing resources instead of pivoting them on the lever most important. In some cases, implementers lack the skills to prioritize their project.

It is seemingly said by many authors and researchers that failure of quality programs should be attributed to management style and philosophy. Quality Digest's technology editor Dirk Dusharme in his Six Sigma Survey quoted the Mikel J. Harry, author of the best-selling book of Six Sigma, the Breakthrough Management Strategy Revolutionizing the World's Top Corporations (Doubleday, 1999) and founder of Six Sigma Academy; ""Leadership is 99 percent of getting Six Sigma installed," says Harry, summing up the importance of top-

management leadership. “It’s selling hope and then leading them [the employees] to it. Give them the vision of Oz, show them the direction it’s going and then convince them you can create the yellow brick road. The rest is just civil engineering.”” (Quality Digest, Feb. 2003).

Tom Pryor, founder of US based quality improvement firm, Integrated Cost Management Systems Inc. (ICMS), shares similar idea after conducting a research on companies that have been able to sustain ABM/ABC and other improvement programs, referring to the successful companies as ‘Improvement Keepers’. Pryor’s findings indicate success emanated from management style, attitude, values and credibility. He vividly stated that “Some organizations abandoned ABM because their managers did not know how to sustain improvement. No one had compiled a list of what the 10% do to successfully sustain the benefits of ABM, ABC and other continuous improvement tools.” In the next heading we would share some of Pryor’s Ten Traits of the Ten Percenters in which he outlines best management practices for sustainable improvement.

The fact of simply having a quality program doesn’t guarantee success (Stevens, David P., 1993). A common critical mistake committed by many companies is in employee training. Most companies fall prey of training all their employees at the same time for a quality program that may take months or years before the employees can be opportune to implement what they had learned. Due to this long waiting, most of the employees may forget some critical points they did learned. Some companies don’t bother to commit all the employees to be affected hence those who are not involve will criticize the program and show reluctant to implement any recommendation, said Stevens and David. They listed a series of companies that have tried some quality programs but couldn’t succeed such as Douglas Aircraft, Florida Power and Light slashed its program because workers complaints regarding paper works. Bell helicopter spent a considerate amount of time and money to train 3,000 employees but didn’t realize any benefit from its quality program instead it witnessed a fall in its market share. A quality consultant once said 11 out of 12 surveys of executive that have implemented quality programs revealed that “A majority of executives are disillusioned and/or disappointed with organization-level TQM result”.

As the need to implement CQI in an organization that seeks to stay at the forefront of innovation and remain competitive increase, many of these organizations and the proponents of this tool or philosophy view its framework and implementation in varying directions.

2.7 PERFORMANCE MEASUREMENT

In their Quality Focus, Neely A. and Bourne M (2000), said that despite the revolution that is been witnessed by the way business has been managed, the way business performances has

been measured had not been revolving since the initial inception of the measurement criteria in the 1900s by DuPont and General Motors. Performance, despite its importance to track down the direction or level of business operations could only be given a new look of measurement (the balanced scorecard - A model of business performance evaluation that balances measures of financial performance, internal operations, innovation and learning, and customer satisfaction) in the early 1990s by Drs Robert Kaplan (Harvard Business School) and David Norton. The balance scorecard provides a clear prescription of what companies should measure in order to know their financial level. Kaplan and Norton grouped the reasons behind failure in measuring organizational performance into two major headings;

- Management lacks the ability to decide what to measure
- Even if the right measure has been chosen, management may make wrong decision during the implementation phase resulting to an impractical implementation process. They further recommend the success map as the starting point for measuring performance successfully that will be discuss in a subsequent chapter of this thesis.

Don F Carlson, CEO of Acme Mfg Co. pointed out that some management fails to rightly estimate the resources that will be required, while John W. Fedor CEO of Masco Machine Inc. Cleveland emphasized on documentation and measurement.

2.8 ORGANIZATIONAL CULTURE

A lot of writers have talked of the importance of shaping organizational norms and value towards that of an ever improving perspective. Integrating change management into employees thinking is just a necessary fact to be able to achieve results. Those constituting the top executive can be the cornerstone. According to James G. (2006), the success of running a business solely depends on the personality type of the people, especially those at management position and in greater tone, the chief executive officer. Success start by the ability of board of directors to select the right person as chief executive, and this is the area where most organizations are dribbled. The key trait of selecting a competent person is receptivity to feedback ability in the individual, as a result, personality type such as authenticity, learning ability, ability to think conceptually, integrity, strategic thinking and a willingness to take a leadership role should be the yardstick for selection of executive officer. To complement the personality type, organizations should not have too many strategic goal (at most five), always measure result to keep track of performance, effective communication, and make the people responsible for their actions i.e. accountability.

Change is an important recipe for future success, and finding a vision in future will be base on the success of change initiatives today said James N., (2006). To map out a path to change, organizations will need to set a goal, and then plan backwardly to identify what is needed today for tomorrow's success. Deering listed four pillars for successful goal setting which include;

- Different thinking.
- Challenging different practices.
- Building the right team.
- Creating the right environment.

In an article Richbell S. and Ratsiatou I., (1999), clearly indicated "for organization to successfully implement TQM, a total change of the prevailing attitude and culture is required and must descent from top management to the employees at the shop floor and it must be permanent, consistence and visible. In addition, the TQM program must correspond to the company's policies and strategies".

Richbell and Ratsiatou conducted a research that show how an explicit and common goal (vision) could lead to the successful implementation of TQM program. This research was conducted in the subsidiary of an American Air Freight multinational based in Greece. They found out that beside an explicit goal, other factors too contributed to the success of the TQM program. These factors include;

Effective communication and full employees involvement – shop floor employees attend meetings that is aimed at encouraging them to make significant contributions on how to improve quality in the company, this was termed "listening culture" (means to get employees view)

Commitment of employees – despite the fact that employees' influence on decision-making was limited, they were still able to show full commitment. Clear goals and involvement in decision-making could motivate employees to commit wholly to the program.

Management organization and leadership – management could make the vision of TQM explicit. The organizational chart shifted from a hierarchical to a horizontal structure, this could facilitate information flow to and from shop flow employees.

Motivation – management could set aside special bonuses and incentives for employees as the program progresses successfully.

Achieving a successful organizational change will be base on effective communication on what the goal of the change is, and avoid using authoritarian management to drive change against resistance (Ian Smith, 2005). In general management or those effecting change have to understand how, where and why change resistance is occurring. Organizational resistance to change in most cases should be treated with the holistic perspective rather than the managerial

viewpoint. Miller Williams H, "Industry Week", (1993), indicated the success of the implementation of quality programs can be initiated by some issues that can be considered very minor by some chief executives. John Logan, CEO of Advance Assembly Automation Inc., Dayton, caution that to implement quality programs, management must first understand the concept of organizational culture. Changing the name of the program can have a power influence in the implementation like Logan change the program from a "Quality Program" to "Continuous Improvement" which became one of the motivations of the implementation. Aravindan et al, (1996), said the successes of quality programs only emerge if the entire organization is nurtured toward the program and the causes of unsatisfactory performance of quality programs is attributed to improper, inefficient, insufficient and incomprehensive expertise of those at the helm of implementing the program and develop a computer software, the Quality Circle Expert System (QCES), which could be use by quality managers during the implementation of quality program.

2.9 INITIATING CREATIVITY

According to Wayne Morris, (2005), creativity is the life blood of quality initiatives, and enhancing organizational creativity rest on 10factors;

- time
- competence
- space and resources
- open communication and power sharing
- supportive organizational structure
- individual empowerment
- committed leadership
- positive motivation
- clear organizational goal
- Appropriate reward.

BERRY Leonard L saidd out despite the vast majority that fails, few service companies still breakthrough. The forces behind their success are;

Senior management shows 100% involvement in the program and commits every other employee from middle management to shop floor.

Management defines explicitly the service standard needed.

Measurement is the key to keep track of progress. Management measures individual service level.

Management also rewards best performers which serve as a motivation for employees to give in their utmost effort.

Ignoring internal servers.

Tom Pryor of Integrated Cost Management Systems Inc. (ICMS) cited ten critical qualities possessed by the few successful companies (Improvement Keepers) that have been able to retain improvement programs; in which he titled Ten Traits of the Ten Percenters. Below is a summary of Pryor's findings:

1. Improvement keepers are leaders, not just supporters of change.

It's not just about telling employees "I am behind the project 100%", signing purchase orders nor allocating resources. It takes more than just supporting the project to leading the change passionately. One of the best examples of an active, passionate leader of ABM is Mr. Larry Bossidy, CEO of Honeywell in USA. Larry led the use of ABM at Allied Signal and now Honeywell. Explaining in his book titled "Execution", Mr. Bossidy says success is not achieved with talk … instead it's achieved with walk. What he does is clearing a wide and straight path for his employees to walk the talk of ABM, Six Sigma and continuous improvement.

2. Improvement keepers have a servant attitude.

Success companies have humble servant leaders. Peculiar to this category of leaders is that they solely accept responsibility for failure and give glory to the whole team when positive results are achieved.

3. Improvement Keepers are committed to making things better.

We are neither going for the average, the same common achievements made by good companies nor just following the mass through the easy route to success. Improvement keepers are committed to moving away from mediocrity towards making a difference with continues improvement. Great companies use the appropriate tools to achieve excellence.

Pryor outlined three quotations describing a change committed management;

Improvement Keepers don't just analyze ……..… they act.
Improvement Keepers don't just think …… they do.
Improvement Keepers don't just consider …… they change.

4. Improvement Keepers reproduce themselves.

People turn to be more committed when they feel the responsibility of having to teach and pass over knowledge. Only such managers are able to impact employees' perceptions, norms and values.

5. Improvement Keepers are Accountable.

Improvement Keepers get measurable results because the have written goals linked to both positive and negative consequences. The programs should not only be able to account for cost but also being able to allocate and account for performance. Accountability helps organizations gain the extra results that optimize and sustain financial benefits.

6. Improvement keepers are reliable and trustworthy.

Improvement Keepers are straightforward, open and honest in all communications related to change. Sustained commitment to improvement requires honest answers, honest leaders and honest measures. Improvement Keepers know broken promises lead to broken projects. Peter Drucker says, "Innovation is not being brilliant, it's being conscientious." To build trust in your organization, reliably communicate and achieve goals, even if they are not lofty goals.

7. Improvement keepers are keepers not sitters.

Don't waste your time babysitting ABC, TQM or Six Sigma for a while. Keep it. Nurture it. Invest in it. Hold it. Use it. And watch the results grow!

8. Improvement Keepers are Joyful

The backbone behind improvement programs is to gain wisdom. Pryor quoted "Solomon, the wisest man in the Bible said, 'a joyful heart is good medicine' (Pro. 17:22)" He reported finding from interviews that joy is a common trait of many Improvement Keepers. Those you yoke with greatly influence your ideas and decisions. A wise manager should hang with positive people, improvement keepers, with wise and joyous attitude.

9. Improvement Keepers are disciplined.

Majority of organizations lack the required discipline to achieve and sustain benefits from improvement programs. Shaping values is much of developing a new habit which takes a focused effort to achieve. The CQI way of doing things demands for a disciplined management to create thinking people.

10. Improvement Keepers are non-conformist.

Under this heading Pryor clearly stated, "Improvement Keepers transform outdated practices, processes and procedures. They challenge the status quo, not afraid of being different. They "color outside the lines"." Non conformist don't learn for the purpose of being like others but rather to do better by continuously trying to amend existing weaknesses. Nonconformist figure out ways to have "A and B", not "A or B". Never drop value adding processes, products, rather keep and optimize them.

2.10 THE MENTAL MODEL

Repenning and Sterman provided a model that will enable managers and practitioners implement quality programs. They start by cautioning that once there is a problem, managers shouldn't take site at first instant, as is most common with managers blaming the employees that they don't fully commit to their job, they should rather trace the problem from its source, and they termed the situation where managers blame employees for a problem cause by the system as "capability trap". Managers are always myopic as they constantly trade off the time needed for training, experimenting, and process improvement for boosting throughput using the work harder method which is short live. According to their experience and findings from those who have successfully implemented quality programs such as DuPont, they noticed that initiating quality program, they mentioned some mile stones that must first be achieved for a successful quality program implementation.

1. Management must break the cycle of self-confirming attribution (a situation where once management use work harder method and throughput increase, they then conclude that truly low production is caused by employees instead of the capability of the process),
2. Define the problem that needs attention,
3. There must reign a complete change in mental models of those both leading and participating in the program,
4. Chose an appropriate approach or method to tackle the problem, and
5. Commit during training all employees to be involve in the implementation process

DuPont in 1991 successfully implemented a quality program. They used simulation to breakthrough the difficulties involve in the implementation. Using simulation, they developed and defined a system dynamic model with the help of an experienced modeler. The models as a laboratory enable them design and test factors (such as time, cost, etc) that impedes production in a matter of hours unlike months and even years in real plants. The simulation was run many times in a particular plant so that employees could grasp the basic and be motivated to implement the process in a real system. In the learning process, the material is presented in the form of lectures, skits and participative exercise in the simulation laboratory. While reaction maintenance was carried on where necessary the team was made to devote much time on preventive maintenance, training and even experimenting. The plants where the program was being carried started reaping the benefit only by 1993.

In 1994, Winsten Ledet implemented quality program in British Petroleum (BP). BP was a company that since the 1980s has been facing a continuous decrease in mean time between failure (MTBF), increase in total maintenance cost, and a constant drop in uptime. In 1994, BP introduces the simulation laboratory where 80% of the employees participated. Unfortunately,

by 1996, management couldn't start reaping the benefit of the quality program and opt to sell the branch, Lima, but no satisfactory bid was offered by prospective buyers. So, management drain experienced employees from the plant and assigned them to other branches of the company. The remaining employees, because they were desperate and had no where to go decided to dedicate everything it could take to reap from the quality program. It was a bit easier because they had already received training and management had already put in place all the necessary tools and equipment needed. Continuing the program to those who are left meant that they will not go back to reactive maintenance but try to continue with proactive (preventive) maintenance. By1998, the benefit started emerging. These cases shows the important of the mental model, i.e. everybody must have a common goal and dedicate everything it takes to achieve it

The process of quality implementation begins with analyzing the company's present situation. The Gironacel (a fictitious virtual company) identify six situations in the form of questions-asking that a company implementing the ISO 9001:2000 quality standard will likely find itself during the implementation process;

Do we need to get certified or which area(s) of the business needs improvement? Here management gather information by reading articles, books, attending seminal and even visit other successful companies that once had similar problem.

Where do we begin? Management draws up a plan, assign responsibility and inform the rest of the employees about the quality program.

Do we begin with the easiest procedures? Here management start with the easiest procedures and gradually move to the harder ones as the understanding of the process advance. Consultants, Power point, procedural manuals, checklist, FAQS, dictionary and other posters will be use to get employees alert on what to do.

Why not take advantage of what we are doing to improve further? Here management will dedicate efforts to improve the current process before attempting new areas.

The ISO inspector team is coming to audit us. Achieving the certificate is a combination of most people's commitment if not everybody.

Audit done, now what do we do? After this phase company will have the task of maintaining at least that quality standard if too difficult to advance.

2.11 EFFECTIVE PERSONNEL TRAINING

Critical to the understanding of what a quality program like Lean Six Sigma is and how an organization will use the improvement program is appropriate personnel training. Developing the appropriate training strategies and using the right staff to provide training is crucial.

APQC's 2001 Best-Practice Report Deploying Six Sigma to Bolster Business Processes and the Bottom Line stated that the goal of training is to reinforce Six Sigma as a mode of operations, not an additional task. Because the focus is on preparing employees to complete Six Sigma projects and not on training itself, best-practice organizations typically do not rely on human resources or training and development to establish Six Sigma practitioners. Outside the sphere of corporate training, it involves integrating quality principles into daily operations

Casadesus et al, editor of the TQM Magazine said, the success of implementing a quality program solely rely on the training to be given to the employees (The TQM, 2005). Training initiate the culture needed to breed the program highlighted Casadesus et al. To successfully deal with the cankerworm embedded in the process of training, the authors study the tool called Gironacel project initiated by the Catalonia local government in Spain, which aim to facilitate companies implementing the ISO 9001: 2000 quality standard. They start by focusing on the three areas of quality defined by Lewis (1992);

1. Training to gain quality awareness: This clearly defines the goal of the program i.e. mark out customers specification, TQM, etc.
2. Training to support quality improvement skills: This will lay down a solid foundation for effective communication, leadership, team working, etc.
3. Training to acquire quality improvement skills: This will teach employees and managers the tools and techniques of defining, documenting and improving processes, and reaching long-term quality goals.

Generally, training focuses on showing how tools fit into an overall methodology for all the improvement projects. Practitioners receive intervals of training, broken up by time for application. Most companies fall prey of training all their employees at the same time for a quality program that may take months or years before the employees can be opportune to implement what they had learned(Stevens, David P., 1993). Due to this long waiting, most of the employees may forget some critical points they did learned. Some companies don't bother to commit all the employees to be affected hence those who are not involve will criticize the program and show reluctant to implement any recommendation, said Stevens and David.

All of the organizations insist that with the initial project that practitioner not be able to shortcut the process and rush to analyze and improve stages. "One of the hardest things to do is train people to follow the process and not their intuition," said Crager. For example "New Six Sigma practitioners are chomping at the bit to solve the real problems without fully understanding the situation from a process definition and measurement standpoint. Six Sigma has been proven to work, with countless companies experiencing sustainable gains, but only when the complete process is followed without any shortcuts." In an ideal situation, executives

and champions receive one to four days of training. This training describes the basics of Six Sigma and its tools, the role of infrastructure and management, practitioners' selection, project management issues, and the implementation plan. Green Belt training, which varies widely among organizations in terms of course duration and content, may involve: process mapping, cause and effect, central limit theorem, sample size, failure mode and effects analysis, regression, mistake proofing, control plans, and T-tests. Although training may involve basic statistics, Green Belts require measures that will track day-to-day process flow improvements. Black Belts, building on the principles of Green Belt training, gain a more thorough understanding of Six Sigma methodologies in training and practical application of statistical techniques. Training may occur during four weeks over a four-month period. Course work involves: the Voice of the Customer, Lean Enterprise thinking, the theory of constraints, distributions, probability plotting, variance components, project management skills, control charting, long-term and short-term process capability, gauge reproducibility, inferences, reliability analysis overview, probability, comparison testing, metrics, confidence intervals, regression, randomized blocking, design of experiments, fractional factorials, statistical tolerance, and hypothesis testing. In addition to the previous principles referenced, Master Black Belts receive training in how to train others in the Six Sigma methodology, how to develop effective teams, and how to effectively mentor others. "The Master Black Belt is all about the long-term sustainability of the Six Sigma program after the initial training and round of projects are completed," said Crager. "Usually drawn from the ranks of successful Black Belts, the additional training each receives equips them with the tools necessary to efficiently begin spreading the Six Sigma methodology throughout the organization." Successful Six Sigma initiatives are not viewed as training programs, but as a new business strategy. Beyond training practitioners, this requires exposing the entire work force to the principles of Six Sigma. "Organizations that are considering deploying Six Sigma should consider placing a strong emphasis on training a larger number of employees to a Green Belt level rather that training a large initial cadre of Black Belts. This will allow organizations to establish a large group of potential Black Belts at a lower cost, while spreading the knowledge of Six Sigma concepts and tools to a greater pool of employees."

In summary form, we may say:

Train workers on the job by integrating quality techniques into daily operations.

There should be a mix of training sessions and application all the time, done within or close to the actual implementation date of the improvement program.

Define the training program in a clear and concise manner which should include quality awareness and quality improvement skills.

Try to commit all employees in the training program and always begin from the basics before seeking to acquire quality professionals.

2.12 BEHAVIORAL INTERVENTION BASED ON THE THEORY OF PLANNED BEHAVIOR (TPB)

Talking about people accepting new organizational norms and culture seems that simple but how well this can be made effective takes more. As we have said earlier people or workers are usually resistant to change due to the intentions that govern their behavior. The psychological technique needed to affect behavior in CQI programs shouldn't be undermined. In this topic we seek to structure the adaptability of the TPB to promote sustainability of continuous improvement programs. We would like to emphasis here that our goal in this area is for workers behavior to be driven by their intentions. That is to say the workers must be given adequate control over their behavior and all management should do is to affect their intentions with efficient managerial techniques, training and methods of operation.

The TPB is derived by Professor Icek Aizen, Head, Division of Personality & Social Psychology, University of Massachusetts at Amherst since 2001. A summary of the theory is presented as seen in the figure below.

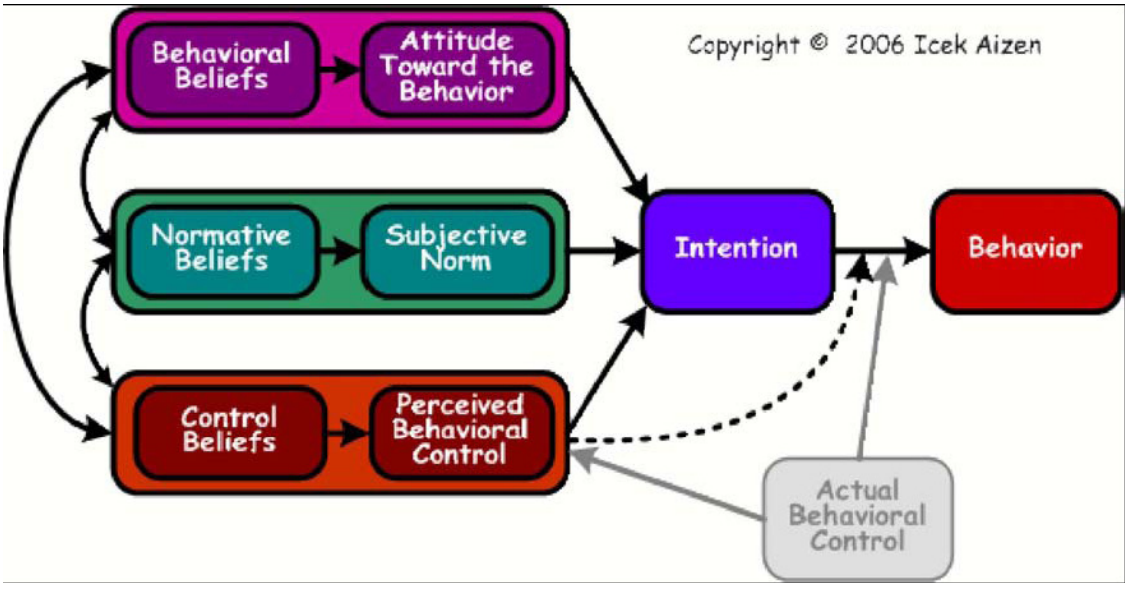


Figure 2-1: The theory of planned behavior

According to the TPB "interventions designed to change behavior can be directed at one or more of its determinants: attitudes, subjective norms, or perceptions of behavioral control. Changes in these factors should produce changes in behavioral intentions and, given adequate control over the behavior, the new intentions should be carried out under appropriate

circumstances". These jargons may seem ambiguous to the quality implementer but with the following explanation it should be relatively easy to apply in a change environment.

By theory, believes guide performance of behavior. The believe workers have concerning change attitudes, current subjective norms and perceived behavioral control will determine their intentions.

Before implementing cultural change for a an improvement program like lean six sigma to redirect employees norms and values, it's worth while to first examine what employees have as beliefs (accessible believe). A TPB questionnaire used to elicit accessible beliefs from respondents (employees) is constructed. Extracts on "Constructing a TPB questionnaire" and "Sample TPB Questionnaires" can be found in the appendix section of this report. Appropriate statistical methods are then used to identify accessible beliefs with which a standard TPB questionnaire is constructed. Once the three determinants of intention have been measured multiple regression or structural equation analysis can be used to determine the relative contributions of attitudes, subjective norms, and perceptions of behavioral control to the prediction of intentions; and the relative contributions of intentions and perceptions of control to the prediction of behavior. By measuring the various believes we can ascertain why people hold certain attitudes, subjective norms, and perception of behavioral control.

Management can now determine the degree to which various beliefs will affect the behavior expected and reasonably know which should be affected to get desired results. That is whether to target behavioral believe, normative believe or control believe. Developing a stronger belief in workers makes them have a greater perceived probability that the behavior will produce a given outcome. According to the various three determinants: The more favorable or unfavorable the outcome, the stronger the impact of the belief on the attitude. Similarly, subjective norms are determined by beliefs that specific referent individuals or groups approve of the behavior (belief strength) and motivation to comply with those referents. And perceived behavioral control is a function of the perceived probability that certain control factors are present (belief strength) and the power of these factors to facilitate or inhibit performance of the behavior.

The final stage of choosing a method of intervention rest on management effectively analyzing the particular change environment and find out what best fits. Generally the behavioral intervention should provide information that lead to change or the formation of new beliefs which may include likely consequences of the behavior, the normative expectations of others in performing the behavior, and the likely impediments to its performance. Methods of intervention can be through appropriate training programs, persuasive communications; sending memos, posting reports and notices. May even be through verbal or deed

communication. Changing the name of some processes or programs can equally produce great results. It is worth mentioning that only when the new beliefs accurately reflect reality can we expect that the effect of the intervention will persist over time.

2.13 CHAPTER SUMMARY

From the bulk of literature we have reviewed it is worth concluding as at this stage what authors and editors find as reasons for improvement programs to collapse in an outlined summary.

- Lack of top management commitment to the program. The improvement program should be designed in a way that mandates senior management participation and must be verified.
- Improper implementation. This is usually associated with ignoring very simple techniques and/or processes which is the backbone of lean tools.
- Lack of a well structured implementation plan, including risk assessment, and control procedures for taking corrective actions.
- The management system fail to explore employees creativity and gives no room for junior staffs' contribution or suggestion in the decision making process.
- They fail in creating thinking people, another core of lean. Management tactics in shaping employees value and changing the norms of the organization is what most line managers lack!
- Management usually concentrates on using short-term expansionary measures like overtime to meet demand and ignore getting into the route cause of the problem for improvement. Even when it's extremely necessary there must be a mechanism for tracking and recording pitfall for subsequent improvement.
- Involvement in multiple improvement programs at a time. Management should make a firm decision as to which improvement program it wants to use rather than involving executives in multiple projects which may pose conflict in implementation usually due to similarity of tools but different methods of analysis.
- Some companies fail in capturing customers' priority. It's not all about customer requirements, but what is critical to the customer is worth identifying before embarking on quality improvement. Worse of all, some managers totally loose track of the customer and rather concentrate uniquely on improving internal processes.
- Employees are overloaded. It is evident that running an improvement program and meeting production levels at same time demands a lot from corporate resources

(including finance). On the other hand, stressing employees with too much workload, pressure and overtime will surely cause the whole system to collapse. This is because improvement programs like Lean Six Sigma requires active employees' participation and contribution which can only be effective in a stress free environment unlike a routine process.

- Inadequate measurement of progress. What factors should be measured and how to measure them? Management must be trained on how to adequately measure performance in performing control operations. Appropriate performance measurement is critical for accountability and to gain support from executives.
- Always review safety procedures for the change environment and communicate accident preventive measures to the workforce.
- It is always going to be about the customer! Then know when to proceed to design for manufacturing (DFM) and perform improvement from product conception to avoid aborting projects at a very late stage. Today DFS (Design for Six Sigma) is being used to optimize and continuously improve product design and development. As the procedure requires employees to be acquainted with six sigma's DMAIC methodology before moving to DFS, it is management's responsibility to ascertain when this is most appropriate. This must be done at the right time to sustain CQI.
- When, how and which employees are trained can both affect their acceptance and contribution to the change program. Since all departmental goals must be geared towards a unique objective, all employees should be enacted into the value stream at least by changing organization norms and values.
- Top executives (e.g. CEO) must be quality driven and therefore should be both promoters and participators of change programs.
- Set clear and explicit goals that are understandable to all employees. Try to remove ambiguity in strategic goals so it can be understood by all when communicated. Involve as much as possible all employees in the improvement process.
- Organizational culture and value change should decent from top management to bottom line employees. It must be done in a way that is clearly visible and consistent to all employees.
- Organize quality driven meetings with maximum workforce participation including "shop floor" employees for sensitization and their own contribution on how the processes they are involved in can be improved.
- The decision making mechanism should be design in a manner that employees clearly see the need for their participation and inclusion of their ideas.

- Measure individual process levels and communicate results to the organization. The importance of precise, objective definitions of what is to be measured, valid data collection procedures and clear, credible data presentation cannot be overemphasized. Do not restrain in sending out memos, posting documents on performance indicator, targets, standards, and desired trend.
- Motivation is critical for CQI and a horizontal relationship between employees can be a driving force. Bonuses and incentive payment may work even better if directed towards group performance rather than individual achievement.
- Change resistance is bound to occur and management must seek to find the cause of the resistance rather than using authoritative methods to drive change.
- In understanding how to affect organizational culture management should look into the basics or common principles surrounding the psychological, ideological, and the physical operating environment of the change program. In process improvement, begin with the easiest procedures and move to the harder once.
- Let employees understand what the customers want and the need for their contributions towards improving product design. With the help of warranty data bank collect customers' feedback and communicate a summary of failure notices to workers. Where possible always define the problem that need attention.
- Management and team leaders should maintain a joyful and friendly attitude to enhance corporate relationship for optimal results.
- It's more of a self disciplined philosophy. Cultural change and value adherence can only be met by adopting a discipline approach which must begin and be promoted by management.

CHAPTER THREE

3 RESEARCH METHODOLOGY

3.1 INTRODUCTION

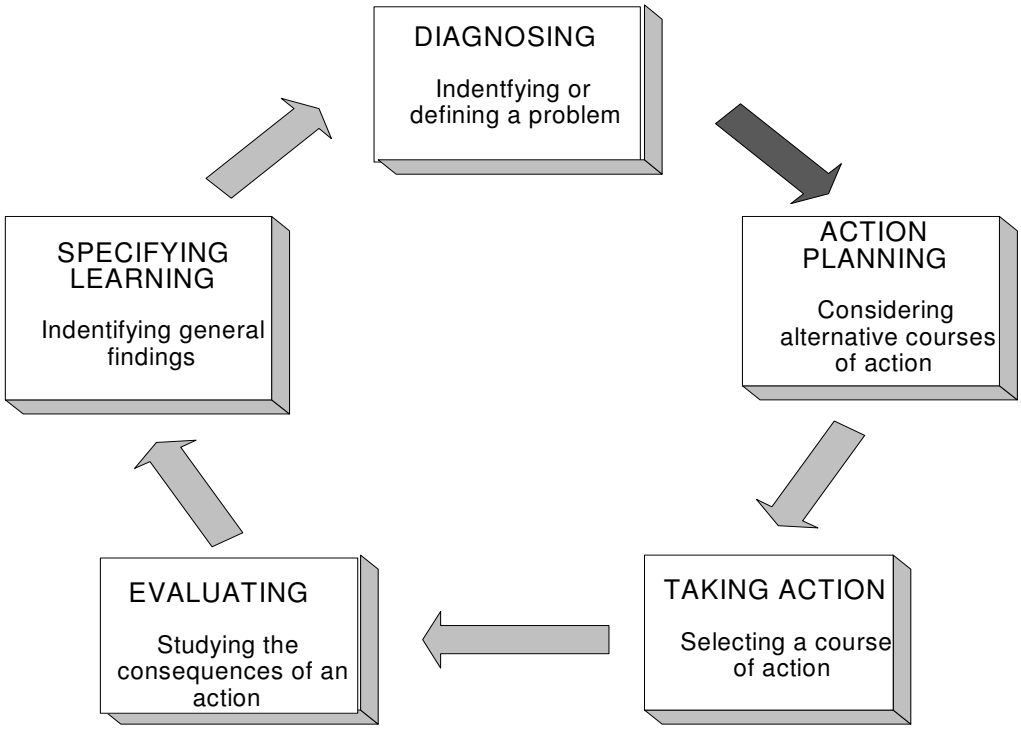
This chapter gives an overview of the research design and method of data collection. It also underpins the reasons for the choice of research method. Abnor and Bjerke (1994) identify three methods of research approaches; Analytical, Action and System approaches.

3.2 ANALYTICAL APPROACH

The analytical approach tends to break down a system to its elementary parts and try to study in detail the cause and effect of the interactions of the various parts by modifying one variable at a time to see the effect on the entire system. In the case of an organization, it is the breaking down of a system into the various workstations to get an understanding of their interactions, said, J. de Rosnay, (1997).

3.3 ACTION APPROACH

It has been defined and used by many researchers but the most simple and comprehensive definition is that of Rory O'Brien (1998) that says action research is "learning by doing". Action research is an approach with dual commitments where the researchers focus on studying the system then work together with other members to propose a possible solution to the problem. It is a series of continuous diagnosis, data collection, analysis and interpretation until the best result is obtained. It is use in real world situation not experimental and will best suit a situation where the problem is too ambiguous for a research question to be formulated. Below are the phases of action research as presented by Susman (1985).

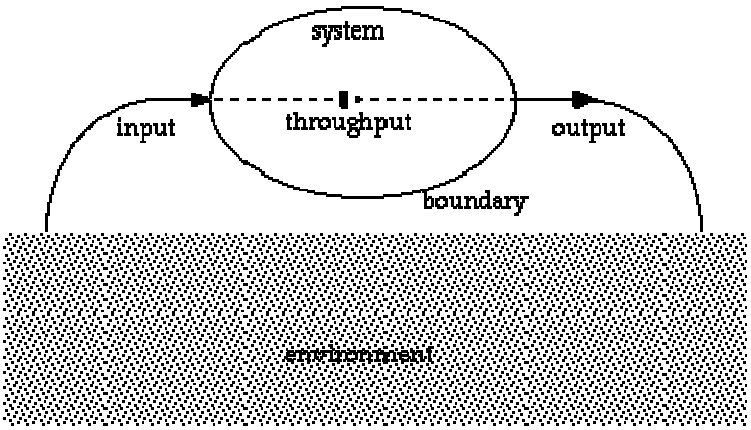


Source: Susman (1985).

Figure 3-1: Detail action research model

3.4 SYSTEM APPROACH

System is a dynamic and complex structural whole with subsystems that interact with each other. System approach is a situation where a component part will act differently when isolated from the entire whole. In organizational perspective and inline with this research work, management should view improvement programs in a holistic perspective (i.e. as an open system where subunits are affected by their immediate environment) by understanding the linkages and interaction between the various work stations in the whole organizational system. Viewing the system in a holistic manner facilitates communication in the entire system and avoids the silo effect said F. Heylighen (1998). Below are the basic components of a system view from the perspective of System Theory.



Source: F. Heylighen (1998).

Figure 3-2a system in interaction with its environment

3.5 CHOSEN METHOD

In the contemporary system of management, quality is not effected by a single individual or a single department despite the existence of quality control department mostly headed by the quality director, rather everybody and every department must contributes its own quota in order for a successful implementation of the quality program. The program must be viewed in a holistic perspective by those responsible for seeking solution. With this notion in mind, this research work will use the System Approach in solving the research question.

3.6 RESEARCH DESIGN

Here the method of data collection for solving the research problem is stated. The research is based on questionnaire and personal interview and it is centered on "why companies fail in sustaining improvement programs". Taking one company as a case study would have limited our research findings to that company alone, so we decided to chose at random some companies within the vicinity of Västerås and drop our questionnaire for responses, and also, personal interview was done with some.

In total, 21 large, medium and small companies were contacted through personal visit, phone calls and e-mails. We did chose at random some service companies owing to the fact that the way of measurement of quality in a manufacturing company is quite different from that of a service company, and also, measuring quality in a service company is more complex and risky than in a manufacturing point of view because with the service company, quality can only be measured through customers satisfaction. Within these 21 companies, 14 took the

questionnaire and 4 successfully responded to it. The questionnaire was meant for the shop floor employees and middle level management. Based on the rhetoric that improvement program implementation needs the contribution of every level of worker that supposed to be affected; from top management to shop floor workers. Due to time constraint of the researchers and the companies, we then excluded top management, but within the cover page we reiterates that top management can still response to it if they deem it necessary and have the time.
At the end of the cover page, a complete address; post box, e-mail and phone number were provided so that respondents could chose any of the means they deem convenient in sending their responses.

3.7 APPLICATION OF METHOD TO PROBLEM

The knowledge gathered from the literature coupled with that from the authors experience while working and during schooling, we could testify that in most companies today, there are significant number of quality inspectors, reworks, excessive bills, under utilize (or idle) personnel, low uptime, long cycle time, long lead time, under utilize (or idle) machinery and building, etc. All these result to excessive cost to the company and customers dissatisfaction. When management attempts to implement improvement programs such as Lean, Six Sigma, LSS, etc, so that they could curb down these wastes, unfortunately, the program usually result to abandonment or a source that further deteriorate the company's current performance. The abandonment of the program is because of one or more of the following reasons; management lost focus and/or implementers could not know how to sustain the program. From our literature review, personal interview and responses gotten from our questionnaire a number of cases have been mentioned which revealed why some companies failed in implementing and sustaining improvement programs. Failure is attributed to so many factors, and its magnitude depends on the environment in which the program is implemented. During our research we could revealed the following reigning conditions in companies that couldn't implement improvement programs; management is unable to define the problem to be solve and the method of measurement, implementers chooses wrong parameters for improvement, implementers sub-optimize or may not involve everyone that will be affected by the program, top management gives little or no attention to improvement programs and at times they may even loose focus, so many concurrent improvement programs are executed which will result to resource overloading, teams members most often lack data integrity, and teams members are often scared to try new ideas hence prohibiting the chances of innovation. With respect to these problems, the researchers have map out a methodology as shown below that will successfully minimize these shortcomings.

3.8 FRAMEWORK – SELECTION AND IMPLEMENTATION

In today's precarious business world, the level of near perfection consistency is a quality mandate required to compete effectively in the market place. Nowadays providing 3.4 Defects per Million Opportunity alone as iterated by Six Sigma propagandas doesn't suffice a firm to stay in business. The ability to eliminate process wastes from all the links of production while delivering Six Sigma specification will win the new end game. We will start by cautioning managers about the "worse-before-better dynamics", meaning at the initial inception of the program, they should be prepared to witness high cost, low uptimes, low turnover, etc, for instance, increasing planned maintenance reduces uptime in the short run because operable equipment must be taken off-line for the planned maintenance to be done. Only later, as the reinvestment loop begins to work in the virtuous direction, does the breakdown rate drop. Fewer unplanned breakdowns give mechanics more time for planned maintenance. As maintenance expenses drop the savings can be reinvested in training, parts quality, reliability engineering, planning and scheduling systems, and other activities that further reduce breakdowns. Unfortunately, getting the right project alone doesn't guarantee success. In this session we will provide a road map of implementing improvement programs, starting from selecting the program that fits with strategic goals of the company followed by execution.

3.9 SELECTION PROCESS

3.9.1 Define the problem/program

The success of any improvement program begins with the selection of the right program and then communicates it clearly. Unfortunately, most managers force programs to their current business problem hence letting staff to work on project that do not bring the most value. To eliminate this, management must define the objective of the program and communicate it consistently throughout the organization before launching of the program. Management must see that all the company's constituent parts align in the same strategic direction. During the planning stage the most important strategies can be named in phases;

What – the vision, mission, goals and the breakthrough strategy

How – the tactical plan and the key performance metrics

The Balance Scorecard – the measure that will be use to track the level of performance and weighing it against the benchmark or expectation.

3.9.2 Focused project on improving shareholders value

Money, directly or indirectly is the epistemic centre for any profit making organization for the measurement of progress, and progress can be measurable in the accounting perspective in three ways;

Throughput, which is the amount of work done measurable in cash through sales
Inventory, which is the amount of materials (raw materials, work in progress and finished goods) measurable in monetary value
Operating expenses, which is the amount of cash spent to convert raw materials to finished goods.

Hence improving the company's shareholders' value nowadays means increasing throughput, minimizing inventory and/or reducing operating expenses. It is advisable that for companies that seeks to take the edge of competition to focus on project that will improve throughput rather than projects that seeks to minimize operating expense since cost is everywhere in the organization, so focusing on them means spreading your resources thinly instead of acknowledging the philosophy of "Pareto Analysis" i.e. deploy the resources on the vital few. The Theory of Constraints (TOC) is a vital tool that will help management identify the most inevitable areas requiring improvement, those areas that impede the growth of throughput.

3.9.3 Holistic or Systematic Approach

To select areas requiring improvement, management is advice to check out opportunities based on the organizational viewpoint. They should map out the flow of materials from where raw materials come through to where finished goods exit. Searching for opportunities in this way permit them identify those constraints that limit the production capacity. To enable company wide view, the proper infrastructure for improvement programs should be establish i.e. the program management functions should be cross-functional so that the improvement programs are focused on improving process or value streams or flow of materials rather than being focused on a single department .

3.10 IMPLEMENTING IMPROVEMENT PROGRAMS

Selecting the right program doesn't guarantee success, therefore the program must be implemented rightly from the very beginning. Below is the guide to successfully implement improvement programs.

3.10.1 Commitment of top management

The poor performance experienced by most improvement program implementers is mostly caused by fading commitment and sponsorship of top management like the second arm of our problem statement which states that "some organizations simply lost interest, focus and attention". Since improvement programs cut across functional departments meaning the deployment of it must be overlook by the overall boss (CEO) who has the power to give instruction to every functional departments. To enable top management commitment glow till the end;

The improvement program must be considered the business priority in order for it to get the top management support it deserves.

An executive steering committee should oversee the deployment of the improvement program ensuring that goals are set, priorities are compromised, proper selection of projects, resources are made available, and results are weighed against plan.

3.10.2 Priority chart

Projects should be rank according to their demand of strategic resources (mostly labour). This is done by weighing the input against the output and implements the one with the most output while avoiding concurrent project that requires so much of the strategic resource. Note that the pace of the project will be determined by the most capacity of the constrained resource, and not proactively dealing with the interactions between different projects greatly increases the risk of project failure. It's vital to identify the organization's strategic resources and to have the program manager use this information when prioritizing projects.

3.10.3 Use critical chain project management (CCPM) to plan and execute the project

A project critical chain is defined by the mismatch of two main arms of tasks;

- The tasks that are assigned to a project's critical resources
- The tasks that are in a project's critical path

The CCPM technique takes into cognizance the dependencies between tasks and resources and makes sure that conflicts are eliminated before tasks' deadlines are calculated. The technique also provide buffers to the critical activities which together with the resource conflict resolution helps to mitigate the risk of wrong scheduling or the extending of project duration in case critical activities' deadlines are missed. The focal point of the CCPM is the avoidance of multitasking and tasks padding. Multitasking result to lost productivity and the scope creep effect of padding tasks is a projection of the project completion date. Multitasking is a situation

where individuals especially a project's critical resource is assigned to work on two or more critical activities, and reducing it alone guarantee a reduction of project cycle time between 35% and 50%. On the other hand, task padding is a situation where team members caution the duration of each task to cater for unforeseen delays. To guarantee a 90% chance of finishing a project within deadline is by minimizing the padding workers who are involved in multitasking. Conclusively, CCPM technique provides a shock-absorber which mitigates schedule risk and guarantees the finish of project within deadlines. For a detail case study on the implementation of CCPM, consult the publication of Andrew G. Hagemann, "Use of the Critical Chain Project Management Technique at Nasal", Langley Research Centre, Hampton, Virginia. (http://ieeexplore.ieee.org/iel5/7625/20788/00963368.pdf) (Downloaded January 10, 2007)

3.10.4 Minimize the number of concurrent projects

Recent researches have shown that selecting the right project and implementing is where the misery of failure is entangled not with the program itself. Nowadays companies are always caught in the trap of implementing so many improvement programs simultaneously despite the fact that implementing and sustaining one entails lot of resources and stakes of failure. Notwithstanding, they set very high priorities and want significant result from the programs as soon as possible. It is certain that too many projects at the same time result to excessive multitasking and thinly spreading of resources hence retarding the progress of the process with a general effect of a longer lead time of the project. To avoid the effect of multi project it is indispensable that management prioritize projects according to the net reward to be benefited. If projects are prioritized and implemented sequentially, the results are conspicuous; multitasking is minimized with accurate job scheduling, the program manager is capable of overseeing through all the activities of the projects effectively and when the right resources are devoted to a limited number of projects, learning and results are maximized by a shorter cycle time.

3.10.5 Lay emphasis on high quality data

It has been noticed that data driven projects such as Six Sigma takes longer time than planned because the teams lack data integrity. To condense the problem of data quality, organizations are caution to first run a companywide data quality initiative by incorporating it into a corporate data administration program. Such efforts are designed to establish and maintain consistence data definition and business rules so that the firm can achieve a single version of the real data and save time developing new application and searching for data.

3.10.6 Spend time and resources on activities that add value to project

Most companies that couldn't meet deadline spend mush of their time collecting and analyzing unnecessary data i.e. data that are not directly linked to the original problem. For instant during Six Sigma implementation, black belts practitioners tend to focus so much on the analytical part of the methodology such as data and tools, and give less attention to important aspect like scope creep. To minimize this it is imperative that certain questions should be asked when getting information, such as; what do we need to know to solve the problem? How will the information help us solve the problem? What is the scope of the information we need? Where will we get the information? Etc.

3.10.7 Encourage risk taking

The implementation of improvement programs most at times requires the complete restructuring of the organization, the total change of the mentality (i.e. the culture) of the people to implement it and a host of other risky issues like the fear of lost of jobs, the high cost, the fear of failure of the process, etc. Some improvement programs even lead to the shut down of the host companies if they are not properly executed. With the possibility of all these negative outcomes, team members become scared to take the risk. To mesmerize team members to take the risk, management must create a culture of continuous improvement by adopting a formal structure of project management that recognizes mistakes so that they won't be repeated, and encourage team members to take the risk without thinking about the consequences. It is imperative that at the end of each project a lesson learned exercise should be performed and recorded, make them a formal part of the project and then forward them to the program manager for filing and review in subsequent similar projects. Most proponents of improvement programs prescribe that it is indispensable for project teams to always seek windows for improvement and then try to record actions to make them standardized and repeatable. Conclusively, future projects will include researching lessons learned from projects of a similar nature, ensuring that the mistakes of the past are not repeated.

3.11 PROBLEM ENCOUNTERED

The source of information for the entire thesis is based on literature review, questionnaire and personal interview, which implies that the research is qualitative, hence analyzing a qualitative work stakes of error and solely depends on the researchers' perception of the subject matter and ability to interpret the responses they receive. The thorough review of literature, the knowledge gathered as students and as employees has equipped the researchers with the necessary skills to overcome this dread.

3.12 CHAPTER SUMMARY

The chapter focuses on the methodology used. It starts by presenting the various methods of tackling a research which include; analytical approach, action approach and system approach. The chosen method for the research is the system approach which maps out the activities of the organization for improvement holistically. The research design was also presented which gives the method of data collection, which is followed by the application of method to the problem; here a keen analysis is made on how the method of approach will lead to a possible solution to the research question. The chapter ends with problem encountered; like any other qualitative research, the conclusion and recommendations stakes of errors since it is based on the researchers' understanding of the subject matter and their ability to analyze the result.

CHAPTER FOUR

4 THE PRESENT AND FUTURE SCENARIOS OF QUALITY TOOLS

4.1 INTRODUCTION

In this chapter we will present some common improvement tools that are used by most successful business enterprises to combat competition and gain a greater share of the market. We will start by presenting the Malcolm Baldrige National Quality Award (MBNQA) criteria which is the most popular yardstick for rewarding quality excellence to companies especially in the USA. These criteria as outlined below will permit companies to be able to assess their present quality performance level and then use it as input to their own list of criteria. We will end the chapter with a description of Lean Six Sigma (LSS) which nowadays is the most alarming tool for implementing and sustaining continues improvement.

4.2 OVERVIEW OF THE BALDRIGE CRITERIA FOR PERFORMANCE EXCELLENCE

The Malcolm Baldrige National Quality (MBNQ) Criteria for Performance Excellence will provide organizations with a framework that will enable them to implement, sustain and assess their processes for managing all operations in the company. The MBNQ criteria is preferred in this research to the ISO criteria because the MBNQ encompasses all the criteria of ISO plus some additional points which distinct it from ISO, and any company that wins the MBNQ award must meet the ISO standard. The criteria consist of seven categories which are;

- Leadership: the Company's leadership system, values, expectations, and public responsibilities.
- Strategic Planning: The effectiveness of strategic and business planning and deployment of plans, with a strong focus on customer and operational performance requirements.
- Customer and Market Focus: How the company determines customer and market requirements and expectations, enhances relationships with customers, and determines their satisfaction.
- Information and Analysis: The effectiveness of information collection and analysis to support customer driven performance excellence and marketplace success.
- Human Resource Focus: The success of efforts to realize the full potential of the work force to create a high performance organization.

- Process Management: The effectiveness of systems and processes for assuring the quality of products and services.
- Business Results: Performance results, trends, and comparison to competitors in key business areas— customer satisfaction, financial and marketplace, human resources, suppliers and partners, and operations.

Source: NIST (2001).

Despite the huddles involved in implementing and sustaining improvement programs, the tools for improving product quality in a business concern are continuously increasing since the initial inception of Total Quality Management (TQM) by Joseph M. Juran in the mid 19th century. Before the inception of TQM, tools made of bones and rocks were subject to failure therefore the need for improving quality had existed earlier and were been combated in some way.

Nowadays quality improvement is the watchword for companies that seek to stay competitive and remain in business. We will dwell into TQM, Lean and Six Sigma and the trend of the evolution of these quality tools will be presented in the Appendix. At the end of the session we shall talk on Lean Six Sigma which is becoming the most dominant improvement program to be in use.

4.3 TOTAL QUALITY MANAGEMENT (TQM)

According to Raphael L. Vitalo (2005), all quality improvement programs (TQM, Lean, Six Sigma, etc) use the same tools (such as process charting, Pareto analysis, Histograms, cause and effect diagrams, etc) applied by Walters Shewhart in his Statistical Quality Control (SQC) and Statistical Process Control (SPC) in the early 19th century. He concluded that what differs is the method of implementation which is the backbone for success of the programs. In 1954 Joseph M. Juran formalized the SQC and SPC models that initially look at quality only at the factory floor to a systematic quality model that considers quality in a holistic perspective. With this notion in mind, we will present the general tools for achieving increase product quality in a business followed by methodologies of implementing the tools.

4.4 TOOLS FOR QUALITY IMPROVEMENT

The number of tools for improvement is continuously increasing as the quest for improved quality and low cost of customers continues to increase. Despite this increase, companies are bound to select only a limited number of these tools that will best suit their business problem at hand to be use. Management should bear in mind that some factors that worked in a previous

successful company might not work with their company rather they should select the best that will fit in their business environment. Examples of some improvement tools are listed below;

4.4.1 Checklist

This is a list of items carried out in a particular operation. It primary purpose is not for collecting data rather it is to guide operations. They provide a snapshot of the process being studied and reveal underlying patterns including the frequency of an event or activity. They are used under operational conditions to ensure that all necessary actions have been taken before decisions can be taken. It enables decision making simple and effective.

Figure 4-1: Checklist

4.4.2 Pareto Analysis

It is a graph of bar chart that rank causes of a problem in descending order of significant that reflects impact, frequency or importance. The Pareto analysis states that 80% of the wealth is owned by 20% of the people, which implies that 80% of the problem comes from 20% of the causes. The Pareto principle enables effort to be designated to the vital 20% of the causes of the problem.

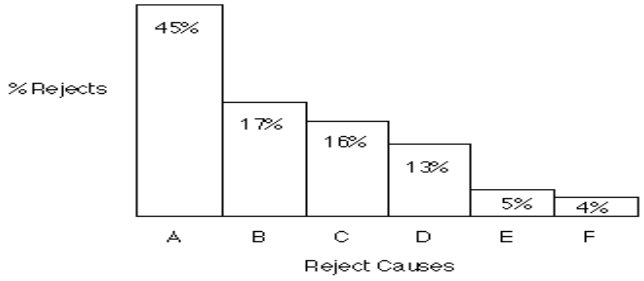


Figure 4-2: Pareto Analysis

4.4.3 Scatter Plot

It is a graph with an X and Y-axes showing the relationship between two variables. The Y-axis represent the variable we wish to determine better known as the dependent variable while the X-axis represent the values of the variable we want to use to determine our dependent variable

better known as the independent variable. When plotted the graph will show possible relationship between the two variables and expert can determine if the two various have any relationship. The point of intersection of the two data plotted will be the relationship of the variables.

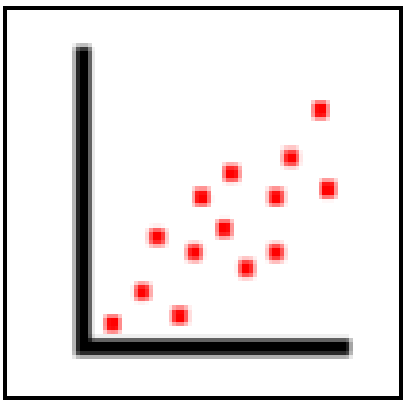
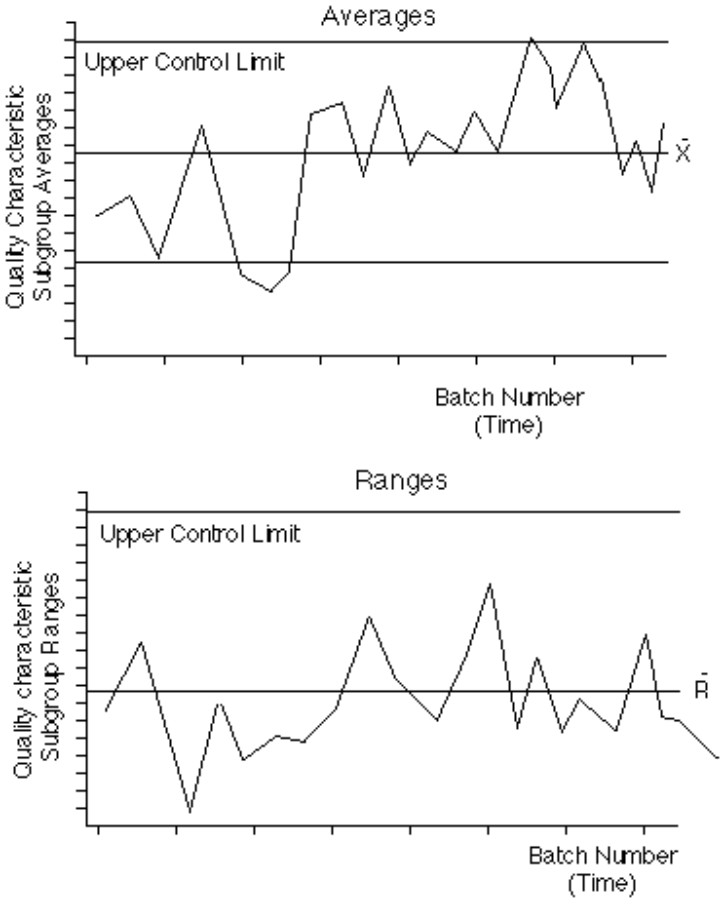


Figure 4-3: Scatter Diagram

4.4.4 Control Chart

They are Statistical Process Control (SPC) method with an upper and lower tolerance limit design for the process to operate between. It consists of some values of statistical measures for a series of sample or subgroups plotted on it. The plotted values are drawn between them a common central line which shows the trend of the process with time. The common line (trend) at a glance quickly detect whether there have been a deviance in the process then calls for corrective action if necessary. The trend prevents the call for corrective action pending to a single data deviation from the mean thus preventing over correction/compensation.



Where; X-bar and R-bar are the means of the distributions.

Figure 4-4: Control Chart

4.4.5 Flow Chart or Process Mapping

This is a diagram that shows the flow of material or information in a process from input to output. It enables an individual or group to see the relationship between the various activities, then uncover the sources of problem and/or discover areas that can be improve.

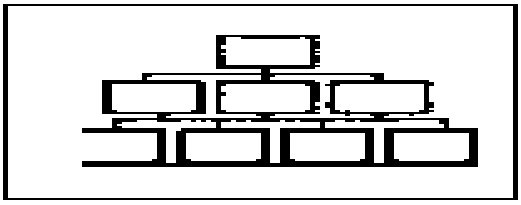


Figure 4-5: Flow Chart

4.4.6 Cause and Effect or Fish Bone Diagram

It was developed by Kauro Ishikawa and it is a method for analyzing a process showing the main and sub causes of a problem and their effects.

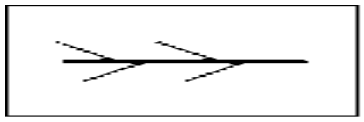


Figure 4-6: Fish Bone Diagram

4.4.7 Histogram

It is a graphical summary of a set of data that reveals the amount of variation that a process has. The peaks allow individual to see the patterns that are difficult to identify from a table. They usually have an upper and lower tolerance limits that is allowed to operate within.

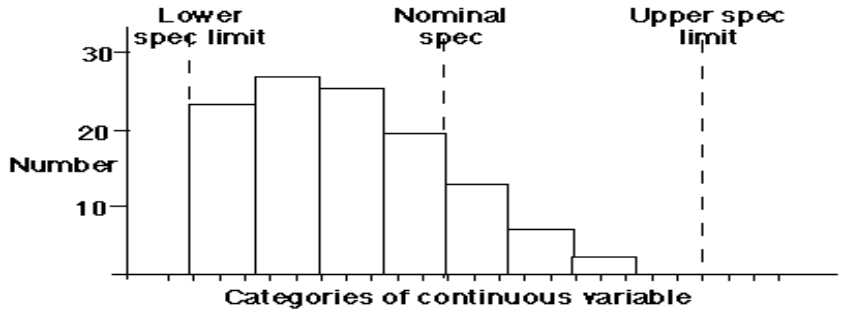


Figure 4-7: Histogram

4.5 SIX SIGMA

Six Sigma is a statistical quality control technique with a methodology to reduce variation, improving quality and eliminating waste in any system be it a manufacturing or service concern. The tool was pioneered by Bill Smith working under the banner of Motorola in 1986. General Electric (GE)-an early adopter of the program referred to Six Sigma as a "disciplined methodology of defining, measuring, analyzing, improving and controlling the quality in every one of the company's products, processes and transactions; with the ultimate goal of virtually eliminating all defects. Statistically, Six Sigma refers to the reduction of errors to six standard deviations from the mean value of a process output, i.e. about 3.4 Defects per Million Opportunity (DPMO) defined as
follows:

dpmo = DPU X 1,000,000/opportunities for error

Where:

DPU = Defects per unit = Number of defects discovered / Number of units produced
In modern practice, this terminology has been applied to a quality improvement methodology for industry. Six Sigma was originally design as a metric for measuring defects and improving quality. Nowadays, Six Sigma goes beyond this level with an objective to deliver high performance and reliability aimed at adding value to the end customer. It has as main tools DMAIC (Define, Measure, Analyze, Improve and Control).

Define

- scope and boundary
- define defects
- team members and champion
- estimate project impact
- leadership approval

Measure

- map process and identify inputs and outputs
- cause and effect matrix
- establish measurement system capability
- establish process capability baseline

Analyze

- complete FMEA
- perform multi-vary analysis
- identify potential critical inputs
- analyze project performance in relation to operational goals
- develop plan for next phase

Improve

- verify critical inputs
- optimize critical inputs
- improve the overall Six Sigma project management

Control

- implement control plan
- verify long term capability
- continuously improve process

4.6 LEAN PRODUCTION

It originated from Japan initiated by Eiji Toyoda and Taiichi Ohno both from the Toyota Company. The term “Lean” that refers to the Toyota production system was coined by John

Krafcik a researcher at the International Motor Vehicle Program (IMVP), because the Toyota production system uses less of everything compared with mass production. It is a system that combines the advantages of both craft and mass production while avoiding their pitfalls.
The main goal of the TPS is to eliminate waste (muda). There are 7 kinds of waste targeted in the TPS:

- Defects.
- Overproduction
- Transportation
- Waiting
- Inventory
- Motion
- Over-processing

Toyota was able to greatly reduce cost and inventory using the TPS, enabling it to become one of the three largest companies in the world. Due to this stellar success of the production philosophy many of these methods have been copied by other manufacturing companies.

4.6.1 Just In Time (JIT)

It is an inventory strategy executed to upgrade the return on investment of a business by minimizing in-process inventory and its associated costs. The process is led by a series of signals, or kanban that tells production process to make the part. Kanban is usually a simple visual signal, such as the presence or absence of a part on a shelf. JIT causes dramatic improvement in a manufacturing organization's return on investment, quality, and efficiency.
The approach of JIT is a method that allows the rewrite of parts of a running system which helps to shorten the development cycle of products hence provoking a staunch feedback between the program construction and the effects. The system was first applied by the Toyota Motor Company in Japan and the company witness tremendous positive effect, which include;
Huge saving resulting from the building and selling of in-process inventory. This huge saving motivated top management on the forthcoming enormous benefits. Beside the savings made, the company's throughput also felt to an unimaginable one day, hence improving customers' satisfaction by providing cars within one to two days of the lowest economic shipping delay. The company also began to build to order hence eliminating the risk of finished products not keeping the taste of time. This drastically increases the company's return on equity by minimizing the risk of waste of resources. The risk of producing poor quality products was reduced because assemblers has little or no option of which part to use, every part had to fit perfectly. Toyota then widens the tolerance limits and simultaneously implementing statistical

controls by redesigning the manufacturing of its parts. To widen the chances of good parts on the supplier perspective, the company test and train suppliers, and even eliminate multiple suppliers where necessary. The assembly line workers were empowered to stop the moving line whenever a problem or bad part is seen using an installed overhead pull-line similar to a buss bell pull. The fact that one of the Lean System wastes is inventory means it must be reduced to the barest minimum therefore no inventory means a line couldn't operate from in-process inventory while production process was being fixed. During the initial week line stops were rampant and it reduces as the workers understanding of the process grew.

JIT didn't just ended with assembly line or manufacturing companies per se, it was extended to the supply chain in several types of businesses, for instance, in the commercial sector it means eliminating one or all the of the warehouses in the link between a factory and retail establishment. Despite the overwhelming advantages of JIT, there is also a drawback, since the philosophy capitalizes on eliminating surpluses there will be a halt in production in a case there is a disruption at a given point in the supply chain.

4.6.2 Some Key Elements of JIT

Leveling of the manufacturing production system (heijunka in Japanese): constant daily production enables a uniform workload on all the production centers and produces almost the same blend of products everyday if varieties are produced in the same line. JIT uses end item inventory to meet demand fluctuations rather than using fluctuation in production level and with the help of a stable production schedule back-flushing is use to manage inventory level while the materials that were used are calculated using the bill of materials minimizing the collection of detail material usage information from the shop floor. Good planning, process design and product redesign reduce the setup time with the aim of a single digit setup time (i.e. below 10minutes). The reduction of setup time permit for the economical production of smaller lots, and a smaller lot size can only be achieve through close cooperation with suppliers since it will demand for frequent delivery of consignments. The reduction of lead time or throughputs was achieved by the elimination of wastes such as movement. To achieve this, workstations are move closer to each other, improve the coordination and cooperation between work processes and reducing queue length, also inducing suppliers to relocate closer to the factory can to a greater extend reduce delivery lead time. Preventive maintenance was achieved using the idle time of machines and workers to conduct maintenance of machines. The flexibility of workers was achieved by training workers to perform several tasks which range from operating various machines through performing maintenance and quality inspection. The system demands for a team with empowered members who are competent and have more responsibility for their own

work. JIT implement a zero defects philosophy and requires supplier quality assurance since there is no buffers and therefore errors leading to defective parts must be eliminated. This is facilitated by empowering workers to stop the assembly line or production whenever a defective part surfaced. To facilitate the correction of errors techniques such as JIT lights which indicate line stoppages, and tally boards which record and analyze causes of production stoppages and slowdowns can be used. Single unit or small lot conveyance – the conveyance of parts between work stations in small quantities can be done with the help of kanban or any other signaling system.

4.6.3 The reasons to implement JIT

The Toyota Motor Company philosophy aim was to manipulate between the ordering cost and the holding cost in order to place an order that will give the minimum holding and ordering costs combine. This order quantity is called the Economic Order Quantity (EOQ). Another reason was to be able to quickly response to demand fluctuation and a constant change of customers' tastes.

Theory of EOQ

Let:

K = cost of placing an order

P = the yearly cost of carrying one unit of inventory

D = the yearly demand in units

Objective – to determine the optimum order quantity (Q), in units

Ideal conditions – assumes demand is constant, no safety stock meaning another order is only placed when stock is zero, and there is no lead time during the placement of orders to suppliers

Therefore average stock held = (Q+0)/2 = Q/2

Yearly order placed = D/Q

Total cost (TC) = carrying (holding) cost (QP/2) + ordering cost (DK/Q),

i.e. TC = QP/2 + DK/Q

By differentiating with respect to Q and equating to zero, we have

d(TC) = P/2 – KD/Q2 = 0

Q2 = 2KD/P

Q = square root (2KD/P)

Where Q is the Economic Order Quantity (EOQ)

4.6.4 Kanban

The Japanese word “Kanban” which is literally translated as “Sign” or Instruction Card” is a philosophy that relates to JIT but the two concepts are not virtually the same. Just as the name implies Kanban uses cards to request for parts or input materials but any other signalling device can be use to trigger the movement of inflow materials in a factory or shop. Kanbans are usually sized to hold just the amount of materials needed for the production of the customer’s demand. When production starts, the operator takes materials from the incoming Kanban, and thus emptying of the incoming Kanban signals the supplier that more material is needed. The fact that Kanban is a reactive system means little is fore-plan hence it can work to the detriment of the company in case of a high volatility environment such as quickly changing customers demands, changing products, extensive and frequent changes in product design.

There are two kinds of Kanban

1. Production Kanban (P-kanban): which request for the production of more parts
2. Conveyance Kanban (C-kanban): This demand for the delivery of more parts to the next workstation. It is also called “move kanban” or “withdrawal kanban”

A kanban system is a pull system, in which the kanban is used to pull parts to the next production stage when they are needed; a material requirement process system (or any schedule based system) is a push system, in which a detailed production schedule for each part is used to push parts to the next production stage when scheduled. The weakness of a push system is that customer demand must be forecast and production lead times must be estimated. Bad guesses (forecasts or estimates) result in either excess or less inventory, while the longer the lead time, the more room for error. Below is a picture of a kanban environment which shows the various activities reigning during a typical kanban operation.

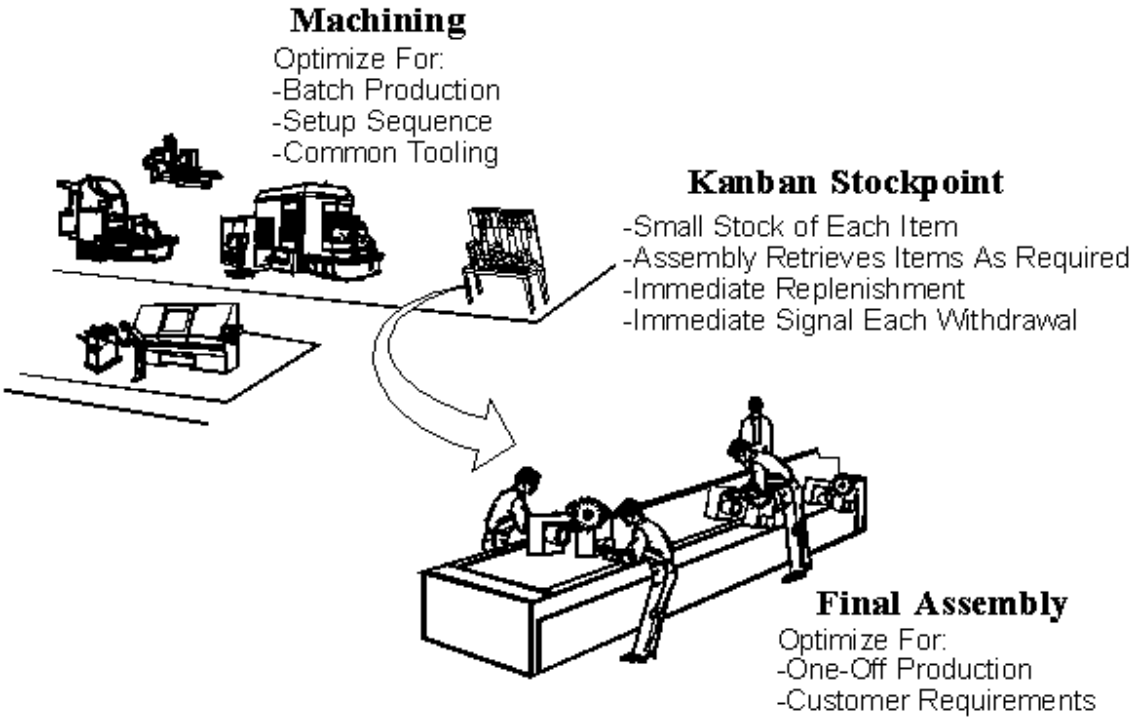


Figure 4-8: Typical Kanban Operation

Kanban has three major policies that must be respected in order to achieve its objective, which are;

1. No part is made except P-kanban authorizes production
2. Exactly one P-kanban and one C-kanban for each container (the number of containers per part number is a management decision)
3. Only standard containers are used, and they are always filled with the prescribed quantity The number of kanban card sets required in a particular location can be calculated as K = (expected demand during lead time + safety stock)/ (size of the container)

4.6.5 How kanban improve productivity

1. The deliberate removal of buffer inventory by removing kanban from the system
2. It observe and record problems occurring in the system such as accidents, machine breakdowns defective products, production process out of control, etc
3. Enable corrective actions to be taken to relegate the cause of a problem.

4.6.6 Poka-yoke

It is simply a method of preventing errors through setting of limits on how a particular operation can be performed in order to force the operation to be done correctly. For example, the inability to remove a car's keys from the ignition switch if the automatic transmission is not first put in the park position to enable drivers to park the car where the wheels are locked against movement

4.6.7 Kaizen

It is a Japanese word that literally is translated as "Continuous Improvement". It goals include the elimination of waste, JIT delivery, the leveling of the amount and types of materials for production, standardization of work, pace moving lines, right size equipment, etc. Kaizen cycle can be define as

Standardize an operation --- measure the standardized operation --- gauge measurement against requirement --- keep on innovating in order to meet requirements and to increase productivity --- standardize any new operations --- continue cycle ad infinitum

4.6.8 Learn-by-doing

The "zen" in kaizen emphasizes the-learn-by doing aspect of improvement programs. This is what makes Lean System different from the awkward mass production system of operation where the "command and control" was the order of the day. Kaizen emphasize on making changes while administering the results and adjusting. Also, large plans and projects are crack down to bits for easy experimentation and implementation when necessary.

4.6.9 5S

One of the important areas to facilitate the philosophy of keep on improving is "5S", the five Japanese words are as translated below

- Seiri – tidiness
- Seiton – orderliness
- Seiso – standards
- Seiketsu – cleanliness
- Shatsuke – discipline
- Jidoka

In the perspective of the Lean System Jidoka means "Automation with human touch". It applies to the following

- Detect the abnormality
- Stop
- Fix the immediate condition
- investigate the root cause and install a countermeasure

4.7 LEAN SIX SIGMA (LSS)

Lean Six Sigma is a methodology that maximizes shareholders' value by achieving the fastest rate of improvement in customer satisfaction, cost, quality, process speed and invested capital. (George, 2002) Lean helps to reduce the waste, but cannot reduce variation alone. Six Sigma can help to reduce variation, but alone does not reduce waste or reduce cycle time. Lean Six Sigma can be used on any process to eliminate waste and attain statistical control and reduce variation. (George, 2002)

After a thorough literature review, we found out that the combine usage of Lean and Six Sigma is becoming the most successful methodology nowadays and it is continuously dominating all other improvement methodologies. With the aforementioned toolkits of TQM, the methodology of Six Sigma and Lean, companies can easily chose the methodology and toolkits that will best suit the business problem and environment for implementation.

4.8 CHAPTER SUMMARY

The chapter begins with an overview of the Malcolm Baldrige Quality Award (MBQA) criteria. The criteria outline the basis for implementing improvement programs which is then followed by a review of Six Sigma, Lean, and Lean Six Sigma. A roadmap for implementing improvement program is developed. The roadmap is divided into two sections; the selection phase which outlines the basic factors to take into consideration when selecting an improvement program. The key point to select improvement program should be based on maximising shareholders value since. The next phase after selection is implementing the improvement program. A guideline have been developed on implementing improvement programs, above all, the most important point for implementation is the Critical Chain Project Management (CCPM) approach which is still to gain popularity. The approach focuses on minimizing multitasking on project critical resources and reduces task padding.

CHAPTER FIVE

5 RESULT AND ANALYSIS

5.1 INTRODUCTION

This chapter will begin with a brief introduction of the various companies that responded to the questionnaire followed by demography of their responses. The questionnaire is a 32 structured questions consisting of close and open end questions. The companies are as below;

5.2 ABB

It is a Swedish/Swiss based company that is both a service and a manufacturing company. It is the merging of Asea AB of Västerås, Sweden and BBC Brown Boveri Ltd of Baden, Switzerland in 1988 with headquarters in Zurich, Switzerland, and in 1996 the two merged companies changed their names to ABB (Asea Brown Boveri). The company has integrated 850 subsidiaries, has 180,000 employees and operating in 140 countries worldwide. The company operates two basic divisions;
The Power Technology division which provides the power supply industry with equipment and services for transmission, distribution and automation, and
The Automation Technology unit which offers equipment use for monitor and control processes in plants and utilities.

5.3 BOMBARDIER

It is a manufacturing/service company that was founded by Joseph Armand Bombardier as L'Auto-Neige Bombardier Limitée in Quebec, Canada in the year 1942, with an objective to be producing snowmobiles. In 1969, the name was change to Bombardier Limited. In 2001 the company was considered the second largest if not the largest manufacturer of railway rolling stock in the world. The company was involved in Aerospace technology, Railway technology, and later in 2003, it sprung as Bombardier Recreational Products. Today, the subsidiary in Sweden involves in manufacturing, development and maintenance of railway vehicles.

5.4 SWEDBANK AB

It is a bank that was formed in 1992 by the merging of many small local saving banks in Sweden to create Sparbanken Sverige which later merged with Föreningsbanken in 1997 to give FöreningsSparbanken. In September 2006, the name was changed to Swedbank. The bank

has close cooperation with 80 different local independent banks and exists presently in 14 different countries across the globe. It has 8.8 million retail customers and 441,000 corporate customers in Sweden, Latvia, Estonia and Lithuania. It currently has 16,000 employees across its operation in Sweden and abroad.

5.5 DEVA MECANEYES

It is a consulting firm that operates within research and development activities, production development, quality assurance and a host of other activities. The company started in 1995, and from 1999 it has become a member of Deva group with offices in Västerås, Stockholm and Malmo. The business objective is to perform and rationalize machine technique jobs in the entire production chain through workshops.

5.6 FACTORS FOR ANALYSIS

The analysis of this research will be presented under the following guidelines;

- ISO 9001 certification
- Availability of control system to maintain ISO standard
- Availability of documented work instructions
- Employees involvement in the selection of areas for improvement
- Employees involvement in the selection of tools for improvement
- Employees training
- Management commitment
- Individual contribution
- Cooperation of team members
- Problems encountered by team members
- Feedback received from management regarding progress of process
- Availability of root cause corrective action plan
- Availability of internal quality audit system
- The end result of the program
- Contributors of the program if it was a success
- Barriers of the program if it didn't succeed
- The effect of the training program
- The kind of organizational structure preferred
- Support needed from management for subsequent implementation

- Support needed from team members for subsequent implementation
- The idea of an external implementer
- Problems faced on a daily basis for delivering quality product to customers
- The one change to make if individuals were opportune to be the president for one day.

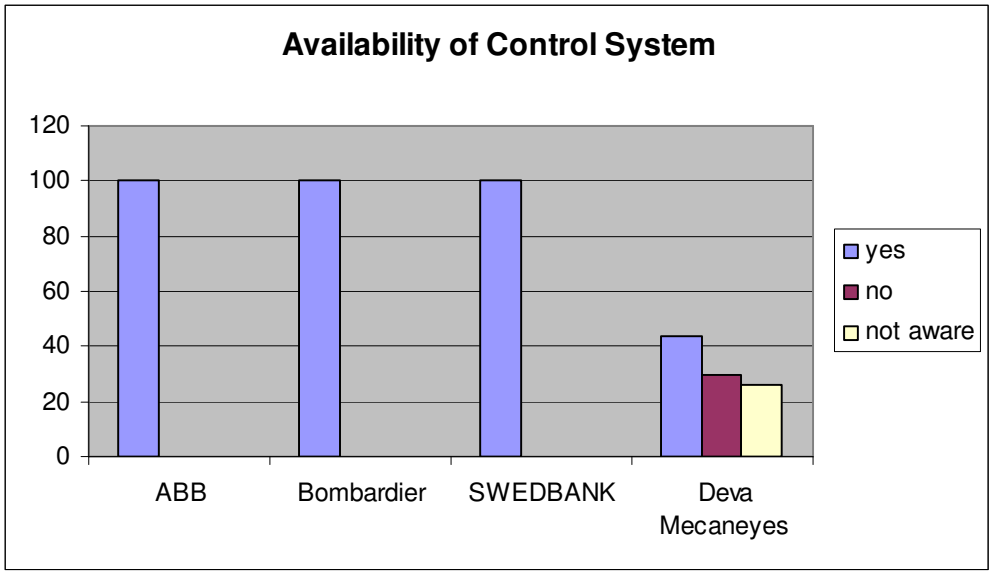
5.7 ANALYSIS

5.7.1 ISO 9001 certification

ABB – a total of 23 responses were received and every respondents acknowledged that the company is ISO 9001 certified.
Bombardier – a total of 21 responses were received and all the respondents acknowledged that the company is ISO 9001 certified.
SWEDBANK – a total of 17 responses were received and they said the company is ISO 14001 environmentally certified.
Deva Mecaneyes – respondents unanimously are aware that the company is ISO 9001 certified.
From the responses it can be notice that all the companies are ISO 9001 certified.

5.7.2 Availability of control system to maintain ISO 9001 standard

ABB/two – all the respondents accepted that their companies has a control system to maintain the ISO standard
SWEDBANK – 44% of respondents says the company has a control system to maintain ISO standard, 30% says they don't know while 26% says the company doesn't have.
Deva Mecaneyes – respondents could testify if there exists a control system to maintain ISO standard



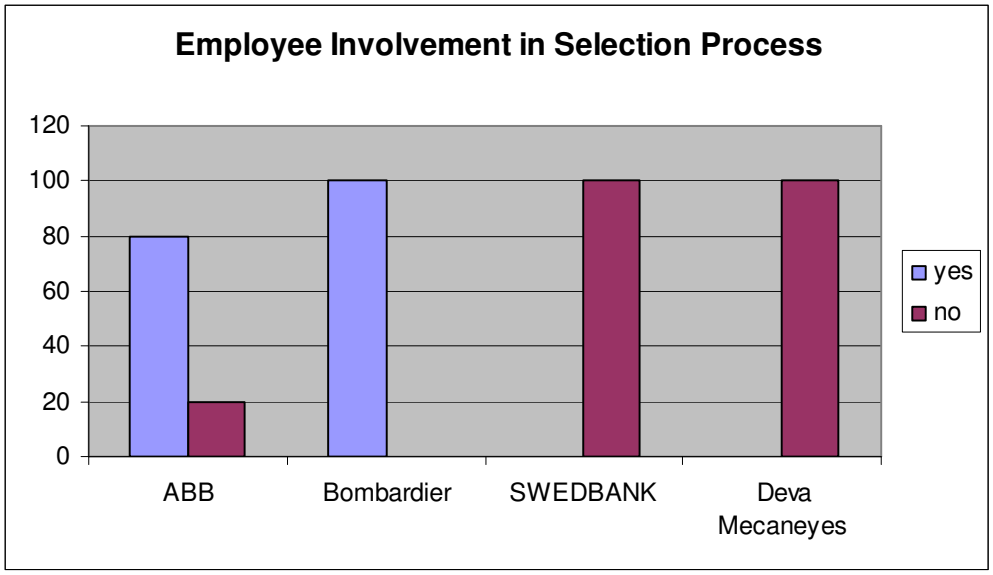
From the graph, all the companies under study have a control system to maintain ISO 9001 standard with an exception of the Deva Mecaneyes of which some of its respondents confided that the company has, another portion says they don't and some says they aren't aware if a control system do exist.

5.7.3 Employees' involvement in the selection of areas for improvement

ABB – among the responses received 80% of the respondents confided that they are been engaged in the identification and selection of possible windows of for improvement while 20% says they are not involved.

Bombardier – all respondents say they are being involved in the identification and selection of areas for improvement.

SWEDBANK/Deva Mecaneyes – the respondents here says that management only bring improvement programs and then give instruction from above on what to be done.



From the histogram, it is seen that not all the companies involve employees during the selection of possible areas for improvement with the exception of Bombardier that always involve its employees. SWEDBANK and Deva Mecaneyes never involve employees while ABB involve some employees.

5.7.4 Employees training

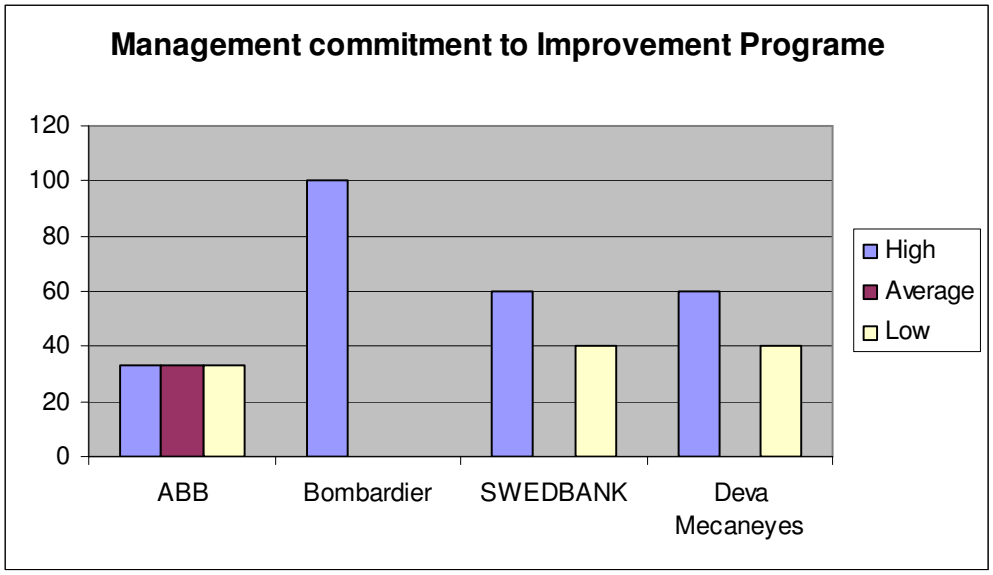
ABB/Bombardier/Swedbank/Deva Mecaneyes – here everybody that has once been involved in an improvement program says they were trained prior to the implementation process, and while those who have not been involve in an improvement program said contrary.

5.7.5 Management commitment

ABB – among the responses received; 1/3 of the respondents confided management commitment was high, 1/3 said it was average and 1/3 says it was low.

Bombardier – 100% of the respondents confided management commitment was average.

SWEDBANK/Deva Mecaneyes – 60% of the respondents say management commitment was high and the other 40% says it was low.



From the graph, at least the management of all the companies were committed to a certain degree and that of Bombardier was exceptional where the management was fully committed to the program.

5.7.6 Individual contribution

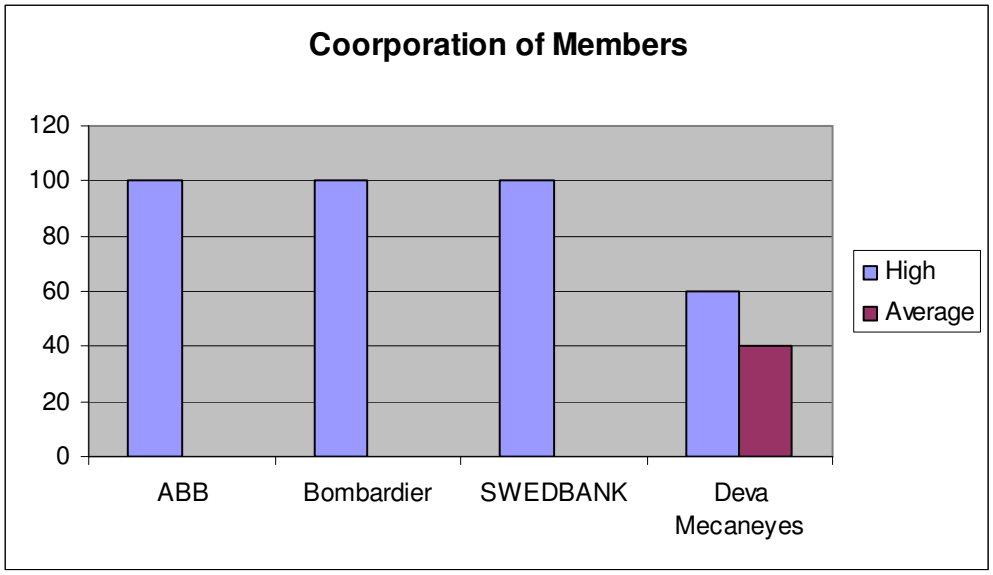
ABB/Bombardier/Swedbank/Deva Mecaneyes – the respondents from all the companies claimed to support in one way or the other during the implementation of the program.

It is indispensable that the best is gotten out from the employees since they are the people doing the job hence they are in a better position to make suggestions for improvement, thus it is the responsibility of management to create environment fertile for suggestions. Management can do this through brainstorming, quality circle, etc.

5.7.7 Cooperation of team members

ABB/Bombardier/Swedbank – 100% of the respondents acknowledged that the cooperation of team members was very high.

Deva Mecaneyes – 60% of the respondents says the cooperation of team members was fair and 40% says it was very high.



We can depict from the graph that the team members of ABB, Bombardier and SWEDBANK all were highly cooperative and in Deva Mecaneyes a portion (60%) were cooperative and another portion (40%) were not cooperative.

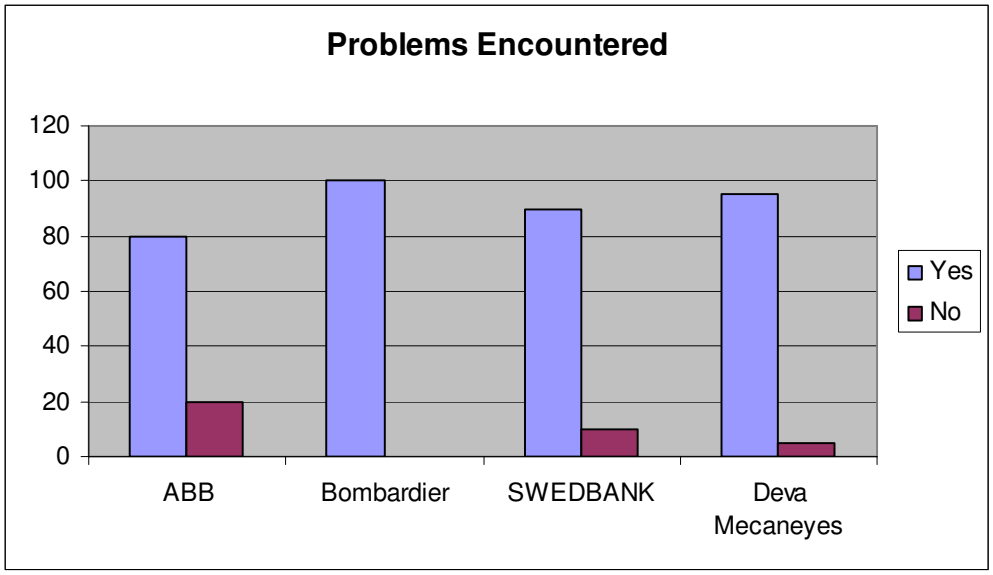
5.7.8 Problems encountered by team members

ABB – 80%of the respondents faced problems during the implementation but as the program progresses with a deeper understanding the barriers became a major source of knowledge and 20% did not face any problem during the implementation.

Bombardier – every respondent faced one problem or another during the implementation process.

Swedbank – 90% of the responded were baffled by problems during the process while 20% didn't encounter any problem.

Deva Mecaneyes – here 95% of the respondents had problem during the implementation process while 5% didn't.



From the graph at least 80% of the team members in all the companies experienced problems Below is a list of the common problems faced by all the respondents,

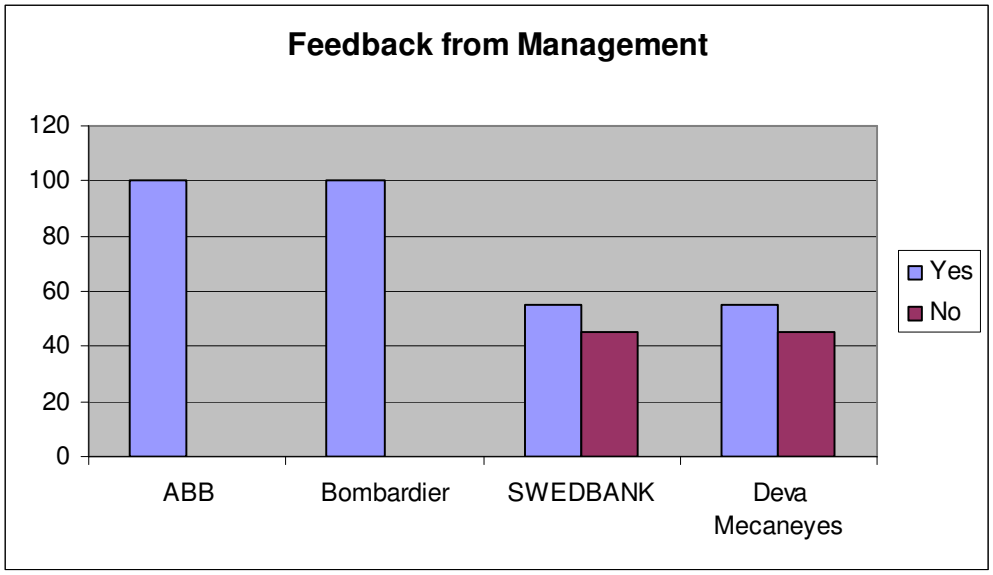
- having common or clear goals
- how to compromise individuals' goal with project goal
- prioritizing the goals
- getting everybody on board in time from the first day of the project to the last day
- how to commit to the functional department as well as the project
- who (the project manager or the functional manager) to answer to when the project activities conflict with the functional activities
- which goal to prioritize higher; the functional goal or the project goal
- how to share resources between other concurrent projects
- how to make project members treat colleagues and customers with respect and trust

5.7.9 Feedback received from management regarding progress of process

From the survey and as shown in the histogram below;

ABB /Bombardier– 100% of the respondents says management constantly give them feedback regarding the progress of the process.

Swedbank/Deva Mecaneyes – 55%% of respondents says management give feedback regarding the progress of the programs and 45% says management didn't give feedback of process.



From the graph, it is seen that ABB and Bombardier always let all the employees of their company to know the progress of the program while in SWEDBANK and Deva Mecaneyes just a proportion of the employees are aware about the progress of the program.

Employees will be more stimulated to work more if they are always made to know where they have been through, where they are and where they are going especially if there is some progress in the process. The progress is a self motivating factor which will inspire project team members to work more.

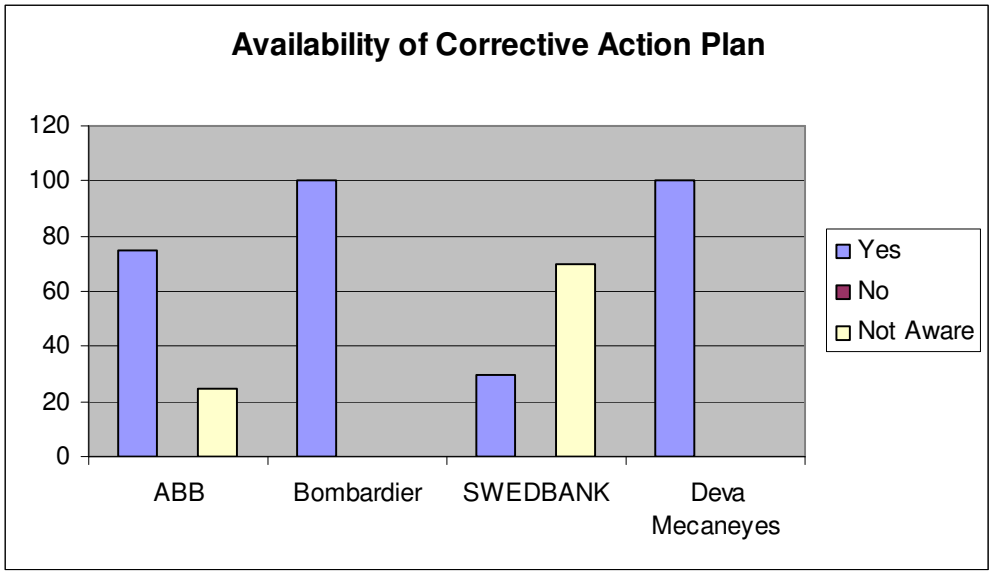
5.7.10 Availability of root cause corrective action plan

As depicted in the graph below;

ABB – 75% of respondents confided that the company has a root cause corrective action plan while 25% don't know whether the company has a plan for it.

Bombardier/Deva Mecaneyes – all the responded confided that the company has a root cause corrective action plan.

SWEDBANK – 30% of the employees says the company has and 70% says they don't know whether the company has such a plan.



The graph also shows that none of the respondent in any of the company could tell that the company doesn't have a corrective action plan, rather they will either respond that tha company has or they aren't aware if it does exist. All the respondents in Bombardier and Aeva Mecaneyes testified that the companies have a root cause corrective action plan. It is inevitable for any company to have a root cause corrective action plan. This will enable recording of fault and their corrective actions for future review in case there occur similar fault thus saving time for through put.

5.7.11 Availability of internal quality audit system

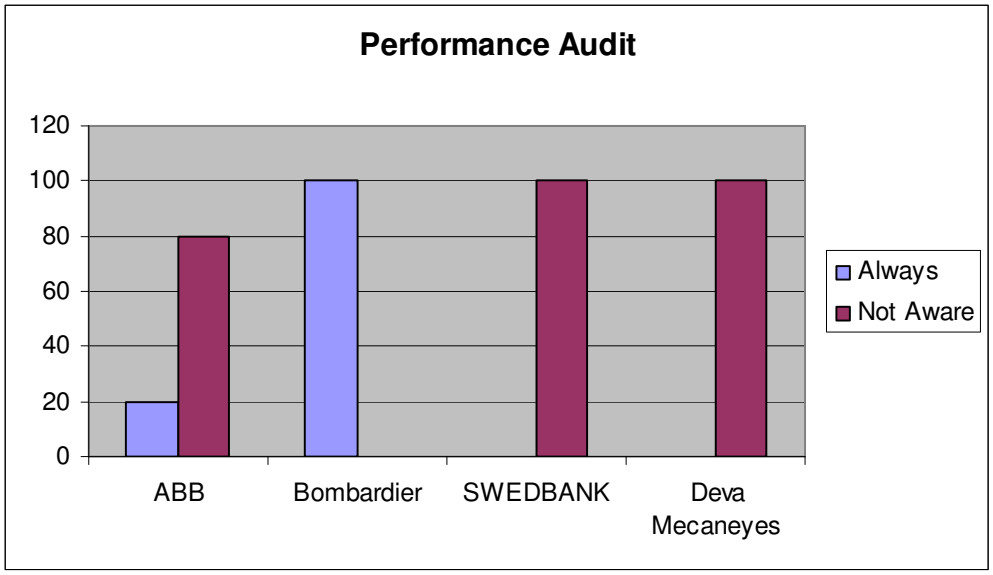
The graph below stipulates that;

ABB – 20% of the respondents says that the company perform internal audit always while the rest of the respondents says not always.

Bombardier – all respondents says the company perform internal audit always

SWEDBANK – none of the respondents know if the company perform internal audit or not.

Deva Mecaneyes – the respondents confided that it is not necessary since the company is too small and everything operation of the firm can be gotten at just a glance.



As seen in the graph, only Bombardier has 100% responses that acknowledged that the company performs internal audit, and just a portion of the respondents in ABB could acknowledge the performance of internal audit while all the respondents in SWEDBANK and Deva Mecaneyes are not aware if the companies perform internal audit. Internal audit is as vital as having improvement programs because it let the management identify little errors that can't be notice so easily, and correcting it when at its initial stage rather than when it has grown to large and more cost entailing.

5.7.12 The end result of the program

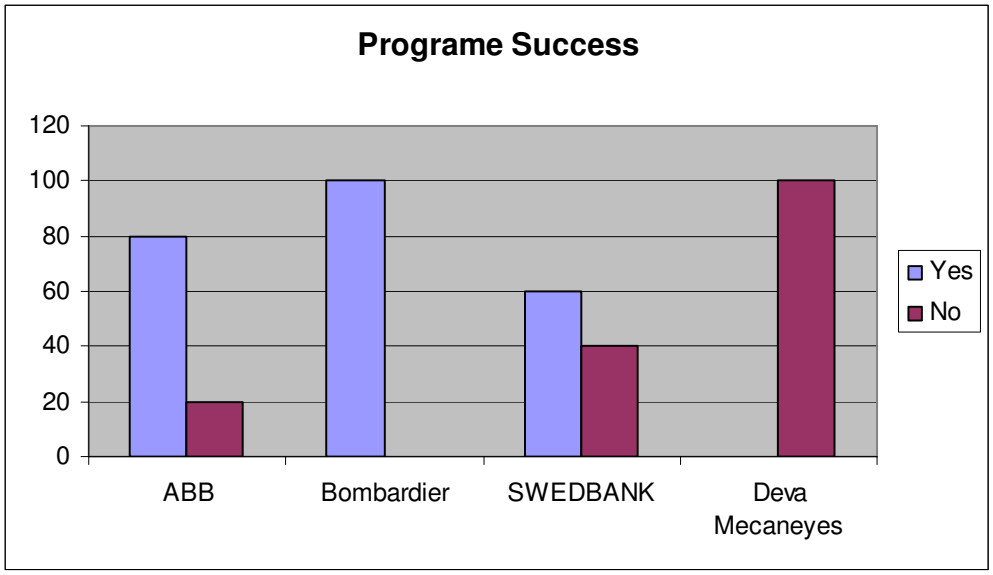
From the histogram below, it can be noticed that;

ABB – 80% of respondents says the program was a success and 20% says they don't know if it was a success

Bombardier – all the respondents says the program was a success

SWEDBANK – 60% of the respondents says the program did succeed while the others don't know if the program did succeed.

Deva Mecaneyes – none of the respondents knows if the program succeeded.



Also, the graph shows that only Bombardier has 100% responses from respondents that the program was a success. ABB and SWEDBANK had just a portion of their respondents to acknowledge if the program did succeed while the other portions don't know if the program succeeded or not. Deva Mecaneyes was the only company that none of the respondents knew the result at the end of the program. That notwithstanding, employees will be much happier and willing to be involved in subsequent program if the previous one was a success, therefore its management responsibility to let employees know the end result of a program they implemented. If the program wasn't a success management shouldn't shoulder blame to a particular employee or any team, rather they should find out why the program didn't succeed and then publish the reasons behind the failure so that caution will be taken in subsequent implementation.

5.7.13 Contributors of the program if it was a success

The success of improvement programs depends on so many factors, below are the factors given by respondents;

- common and well defined goal
- availability of resources during the implementation process
- effective training prior to the program which nurture the culture necessary to breed the program
- committed employees
- full support of top management
- continuous follow up as project progresses

- constant feedback which serve as a source of inspiration to team members
- a scheme for rewarding teams with exemplary performance. Rewarding teams instead of individual motivate individual to contribute for the benefit of the team. On the other hand if management reward individual, this will initiate hatred hence individual will refrain from giving information at the detriment of the group

5.7.14 The effect of the training program

All the respondents in all the companies acknowledged the contribution of the training toward the success of the program and comment that for the training to play a foremost role, it must be equipped with the right resources such as intelligent trainers, good training tools, etc.

The organizational structure preferred

The graph beneath indicates that;

ABB - 65% of the respondents says they prefer flat organizational structure where the number of managers is reduced to the barest minimum while 35% prefer a hierarchical structure. Those that preferred a flat structure gave reasons to backup their option. Their reasons are outlined below;

- it encourages personal development and display of knowledge
- possibly greater responsiveness to unforeseen contingencies
- easy flow of information to and fro management

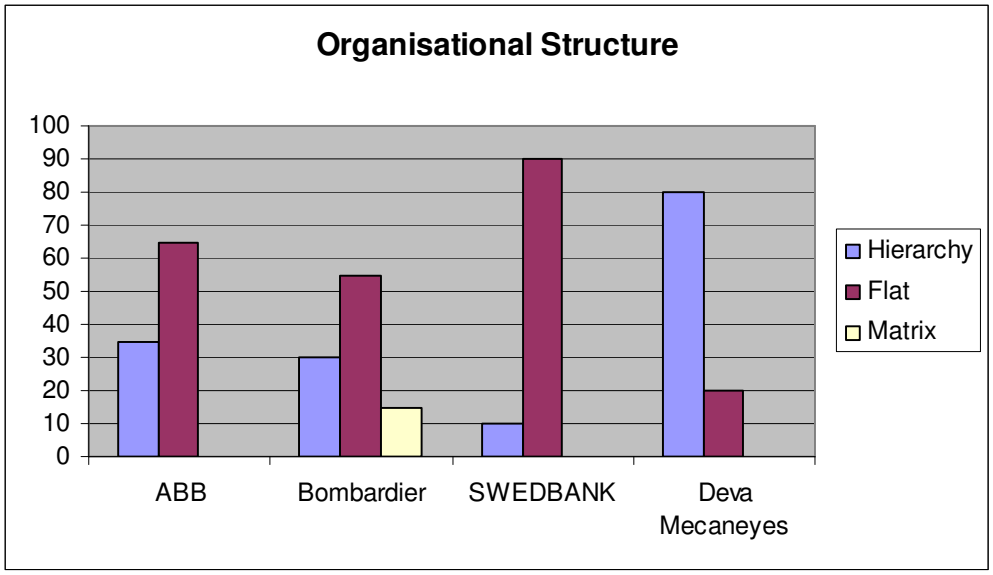
Those that preferred hierarchical gave reasons to support their choice as below;

- easier definition of roles and responsibility
- greater scope of developing expertise
- more frequent opportunities for promotion

Bombardier – 55% preferred a flat structure, 30% a hierarchical and 15% a matrix structure.

SWEDBANK – 90% of the respondents preferred a flat structure while just 10% preferred hierarchical.

Deva Mecaneyes – 80% of respondents preferred hierarchical structure and 20% preferred a flat structure.



From the graph, a majority of the respondents in ABB, Bombardier and SWEDBANDK prefers a flat structure while majority of the respondents in Deva Mecaneyes prefers hierarchical structure. A matrix structure could only be seen in Bombardier. Despite the overwhelming desire for a flat structure, none of the structure is free from disadvantages of implementing it. So management should choose the one that will best fit the program. As noticed in the aforementioned reasons given by respondents in ABB and individual responses, most managers will prefer a hierarchy in order to keep their recognition by their subordinates as their boss, while most shop floor workers will prefer flat structure in order to gain more control over what they do. Current researches have shown that organizational structure is becoming more flat in order to quickly response to the precarious business environment.

5.7.15 Support needed from management for subsequent implementation

Management support is one of those major factors that are capable of driving the program to success. All the respondents from all the companies have given similar support that they will like to get from management to enable them meet their tasks. These factors are;

- continuous commitment from top management from start to finish of the project
- carve out a clear goal and a good strategy to achieve the goal
- receiving feedback from management as the project progresses
- provide the teams with all the necessary qualified tools
- delegate the project manager's responsibility to a competent individual worthy to be recognize by team members as the leader
- provide a motivational scheme that will keep the flame of inspiration glowing

- minimize bureaucracy to facilitate quick response to changes in due course of project
- make available the necessary labor hour for the project
- avoid pressurizing team members to meet their various functional department goals because it may force them to reduce the labor hour needed for the project to meet up with functional demands
- hire external implementer if and only if a competent staff can't be found to delegate the responsibility of a project leader since people will understand and appreciate better the things they implemented
- recognize the contribution of each employee no matter how small the contribution seem to appear

5.7.16 Support needed from team members for subsequent implementation

Support from team members to each other is inevitable. The respondents gave a series of support they will expect from members that will enable them meet their tasks, these are;

- team members should be able to respect each other as colleagues
- be able to commit their interest to the project from the start to the end
- be able to be open by giving your contribution and acknowledging others contribution
- create and initiate new ideas for the benefit of the team and the project as a whole
- team members should try to prioritize the project goal above the individual interest

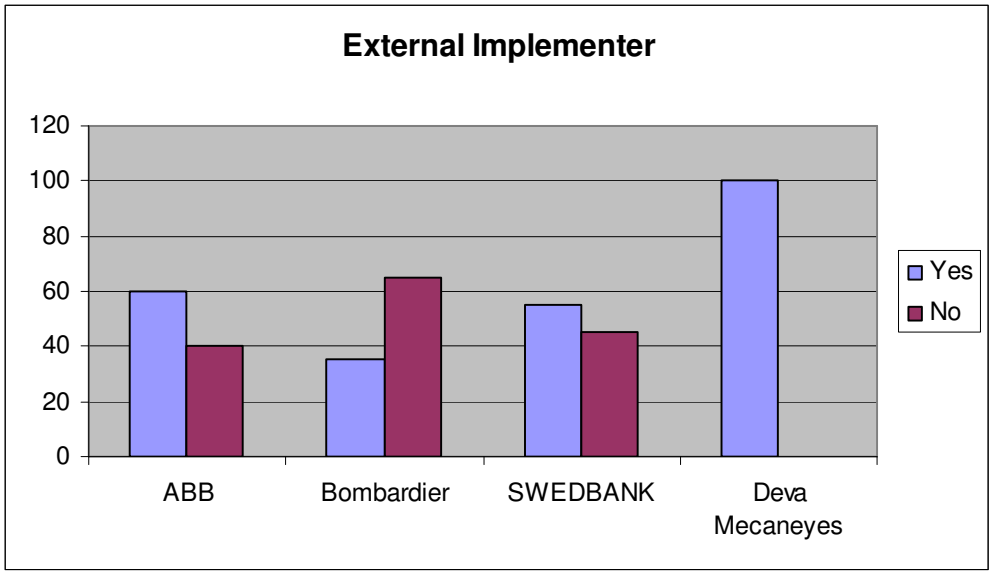
5.7.17 The idea of an external implementer

The role of an external implementer is argumentative; while some respondents favored and disfavored it, others took a stand either for it or against it. Unfortunately, this question was answered just by a handful of respondents in all the companies. The reasons for those that favored it have been summarized below;

- sometimes it is necessary to gain initiative from people that have done project in other companies,
- an external implementer can be respected more compared to a colleague who was just the delegated the responsibility of a leader, like the saying goes " a prophet is never acknowledged in his/her own home"
- external implementer brings in new idea and tackle the problem in a different point of view
- an external implementer in most cases is an expert in that field thus could easily identify the problem and propose solution necessary for the problem

On the contrary the reasons for those that didn't support inviting an external implementer are summarized below;

- the team members are mostly those working day to day with the process therefore they are in a better position to make suggestion to improve the process
- An external implementer can catalyze the team in identifying the problem, but the implementation should be done by those working with the process because people will better understand and appreciate what they have implemented.



From the graph above it can be notice that;

ABB – 60% of the respondents would an external implement to come and facilitate the implementation while 40% would prefer the implementation to be done by the internal employees.

Bombardier – 35% of the respondents admit that they would prefer an external implementer while 65% prefer no external implementer.

SWEDBANK – 55% of the respondents would prefer the service of an external implementer while 45% wants only an internal implementer.

Deva Mecaneyes – all the respondents confided that they would prefer an external implementer. Also depicted from the above, no particular view about an external implementer dominated in all the companies. The respondents in ABB and SWEDBANK have almost the same views regarding this factor, and Bombardier stands out as the only company that most of the respondents prefer internal implementer. Whatever the case may be inviting an external implementer will depend on the density of problem, culture reigning in the organization, the level of competent staff available for the project. So if the problem is too technical and

difficult, it will be wise to invite external implementer after team members must have surrendered. If the organizational culture is one that has been admitting third parties previously without problem, then management can think of bringing some in case the problem persist diagnoses otherwise it won't be advisable to bring in third parties.

5.7.18 The one change to make if individuals were opportune to be the president for one day

Like the previous sub headings just few respondents responded to this question. The responses of the few that responded are the same and are outlined below;

- create an incentive system for all employees that are involved in the project
- take pro-active quality measures instead of taking action in response to a problem
- systematically define a clear goal corresponding to the project

5.8 CHAPTER SUMMARY

The chapter gave a brief introduction of the companies that are used for the analysis of the research, the companies include; ABB, Bombardier, Swedbank and Deva Mecaneyes. The various guidelines which were used to analyze each company pending the responses gotten from the respondents were also presented. Among the companies, the number of responses varies and the highest number was gotten from ABB followed by Bombardier, Swedbank and Deva Mecaneyes respectively.

CHAPTER SIX

6 CONCLUSION AND RECOMMENDATIONS

The implementation and sustainability of improvement programs has been the necessary evils of most companies. Even the companies that succeed maneuvered through a string of failures and had to persist to overcome the huddles to realize what made them popular. As mentioned in the problem statement, there are three reasons why improvement programs get to a stop, which are; some companies intended to use it temporary hence stop the program when the objective is met, some lost interest hence abandon the program, while some have the interest but couldn't continue because they lack the know how, but our research is focused on the last two. In the preceding chapters, precisely the literature review we were able to pinpoint why some companies fail in sustaining improvement programs and what the successful ones did, this bulk of literature has been supported by the result we got through the responses of the questionnaire we sent to some companies. It can be seen from the analysis that, Bombardier was the only company where we received 100% respondents acknowledging that the program was successful followed by 80% in ABB and 60% in SWEDBANK, while none of the respondents at Deva Mecaneyes was able to confirm success of the program. We can also see that there are conflicting views among companies with respect to each factor. Despite these, most programs didn't get the necessary management support required, companies lack an effective audit system, and respondents placed least value to external implementers. On the other hand, employees' involvement in selection process, availability of control system, cooperation of team members and the growing concern of flat organizational structure in most companies nowadays has contributed to the success of the program. We noticed that some improvement programs tend to worsen the performance of the implementing company if they fail to properly implement it. This paradox is caused by a series of factors that were identified in the bulk of literature and in the cases, which include;

- management inability to define the problem to be solve and the method of measurement,
- implementers chooses wrong parameters for improvement,
- implementers sub-optimize or may not involve everyone that will be affected by the program,

- top management gives little or no attention to improvement programs and at times they may even loose focus,
- so many concurrent improvement programs are executed which will result to resource overloading,
- teams members most often lack data integrity, and teams members are often scared to try new ideas hence prohibiting the chances of innovation

In chapter three, we have discussed the steps necessary for the selection and implementations of improvement programs which will enable implementers minimize these cankerworms to the barest minimum. The factors for selection of improvement programs include;

- defined the program and communicate it across the organization,
- focus project on improving shareholders' value,
- select project that will be supported by the entire organization so that functional areas will not be sub-optimized

The selection process is accompanied by the implementation process which include;

- execute project in a manner that will continuously receive top management support by aligning the goal of the project to that of the organization and letting an executive stirring committee to oversee the deployment of the project,
- prioritize project according to their demand of the strategic resources while weighing the input of each project against the output and then choose the one with the most output,
- use CCPM to plan and execute project which demands that the assignment of critical activities to critical resources should be minimize as much as possible,
- minimize the number of concurrent project because concurrent project result to the spreading of resources thinly across the numerous projects hence ineffective performance of the resources,
- run a companywide data quality initiative by incorporating it into a corporate data administration program so that data integrity is achieved,
- implementers should identify and spend time on value adding activities,
- create a culture of continuous improvement by adopting a formal structure of project management that recognizes mistakes so that they won't be repeated hence enabling team members to take the risk to try new ideas to create an innovative environment

The empirical data of this research work has been gotten through questionnaire because direct access to companies' data bank has not been possible. The analysis has been drawn from the

responses gotten thus making the research qualitative. We hope that the readers of this thesis could conduct a quantitative research where analysis will be based on quantitative data from many companies so that the result could more reflect a general view. Also, almost half of our questions were open ended that requires more thought and time from the respondents hence some companies returned the questionnaire without responding to it, so we hope that future researchers in this area should provide respondents with more simplified and close end questions. Lastly, future researchers in this area could use our analysis, framework and some of the methodologies that we have mentioned as a base for their research work.

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Volume 19, Number 3, 2005
Development and Implementation of a Quality
Improvement Program for Ryan White Title I Care
Services Using a Stakeholder-Based Model
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ABBREVIATIONS

MBNQ Malcolm Baldrige National Quality
NIST
ISO

APPENDIX

7 APPENDIX A

7.1 QUESTIONNAIRE

7.1.1 Cover Page

We are Tongwa Ivo Atem and Gilbert Ncheh Yella, Production and Logistics Management Masters Degree students at Mälardalens Högskola, Sweden, writing our end of program thesis on "Why Companies fail in Sustaining Improvement Programs". Getting the right improvement program today is usually less of a problem, unfortunately implementing and sustaining it has been the major hell in organizations. With the help of sincere respondents, we will diagnose those factors hindering implementation and sustainability, and then come up with how to breed the culture that will sustain improvement programs. To facilitate responses, we will need the total support from management for the benefit of the accomplishment of the research work and also to provide a worthy pathway for organizations to take when implementing or trying to sustain improvement programs.

We have also noticed that language is a major barrier for respondents to respond to this Questionnaire so each question has been translated from English to Swedish.

Any information given will be highly appreciated, strictly be use for academic purpose, and will be treated as classified and confidential if deem necessary.

NOTE: Please, we will prefer a respondent to respond in English in case he/she is good at both languages.

Respondents can either send responses by post or e-mail

Postal Address
Tongwa Ivo Atem
Humlegatan 14C,
72226 Västerås,
Sweden

E-mail: tam05002@student.mdh.se
Tel: 0735 835 841

7.1.2 QUESTIONS

This questionnaire is design for middle level management and shop floor workers, but it can also be open to top management if they deem it necessary.

The questionnaire is divided into four parts. A supplementary response sheet(s) can be added where necessary and relate any response on the supplementary sheet to the question number. Please tick a box (□) where necessary.

Personal

What is the name of your company and your position?

Is your company a manufacturing or a service company?

What is the product of your company?

Before Implementation

Is your company an ISO 9001 certified? Yes□ or No□

Does your company have a control system to maintain the ISO 9001 standard? Yes□ or No□

Does your company have a documented procedure to control quality program implementation? Yes□ or No□

Does your company have documented/controlled "work instructions"?

Yes□ or No□

Have you been involved in a quality program before? Yes□ or No□

Total Quality Management (TQM) □ , Lean □ , Six Sigma □ , Lean Six Sigma □ , JIT□, Kaizen□, Other(s) □

Did management engage you during the selection of areas that needs improvement, and also in the selection of an appropriate improvement program? Yes □ or No□

During Implementation

How was management commitment to the program? High□, fair□, low □

What was your contribution?

Did you work as a team? Yes□ or No□, how many?

How was the cooperation of team members? High□, fair□, low □

How was the relationship of other team members toward you?

High□, Fair□, Low□

What were the most common problems encountered by team members during implementation?

Did management give you feedback regarding the progress of the quality program? Always □, Sometimes□, Never □

Does your company have a "Root Cause" Corrective Action System?

Yes□ or No□

Does your company perform internal audits of its quality system, and are results documented? Always□ , Sometimes□ , Never □

After Implementation

Was the improvement program successful? Yes □ or No □

If yes to (22), give major contributors

If program didn't succeed what do u think were the barriers?

Did you undergo any training pending the improvement program? Yes □ or No□

Did the training program help you during the implementation process?

Yes □ or No□

What kind of organizational structure will you recommend for your company for such program? Hierarchical□ or Flat□

Will you prefer working as a team or as individual if such program was to be implemented again, and why?

What are the things that you think should be done by management that will motivate you to do your job?

What kind of support will you like to receive from your colleagues that can enable you meet your task?

Do you think an external implementer could be of help? Yes□ or No □

Why?

What is the biggest problem you face on a daily basis in trying to deliver high quality of goods/services to your customers?

If you were president of this company for one day and could make only one change to improve quality, what change would you make?

In your opinion, what are the factors critical to the successful implementation of improvement program?

Others

Thanks

8 APPENDIX B

The Evolution of the Concept of Quality

8.1 LATE 19TH CENTURY

The Taylor System: "scientific management" increasing production without increasing skilled craftsmen by separating the planning of production (by engineers) from the execution by supervisors and workers. Juran (1973), Juran (1995, p. 555).

8.2 EARLY 20TH CENTURY

Independent Inspection Departments: The Taylor System damaged human relations and had a negative impact on craftsmanship and quality. Central inspection departments were created to restore balance. Materials and goods were sampled in process with the results determining whether or not a lot of goods would be used. Finished goods were inspected in detail. Quality came to be seen as the responsibility of the inspection department. Juran (1995, p. 555-556).

8.3 MID-1920S

Early Statistical Quality Control (SQC): Sampling inspection was grounded in probability theory. Juran (1995, pp. 556-557), AT&T (1989).

1940s and 1950s

Second wave of SQC and ASQC: Production needs and delivery deadlines required during World War II brought new interest in SQC. Eventually the American Society for Quality Control was created. New impetus for SQC resulted in quality control engineering and quality control departments to supervise the inspection department. Eventually functions of inspection, testing, quality control and reliability engineering were housed in the "quality department" headed by the "quality manager" usually reporting to the vice president for manufacturing. Juran emphasizes the deficiencies of the system in which quality was the top priority of just the quality department rather than the entire organization. Juran (1995, pp. 558- 562), Working (1945), Grant (1953), AT&T (1989), Grant (1991), Juran (1991), Wareham and Stratton (1991).

8.4 1960S AND 1970S

The big forces for change in the concept of quality Juran (1995, p. 630): "Greater complexity and precision of products," "Threats to human safety and health, and to the

environment." "Government regulation of quality." "The rise of the consumerism movement." "Intensified international competition in quality." In response to the quality crisis brought on by the forces for change, piecemeal strategies emerged, including (Juran, 1995, pp. 583): "Exhortation of the workforce." "Organization and training of quality circles." "Statistical process control." "Awareness training for managers and supervisors." "Computation of the cost of poor quality." "Project-by-project quality improvement." "Preparation of complete manuals of procedure." "Revision of organization structure." "Incentives for quality." "Automation inspection and test." "Automation and robotics." Juran (1995, pp. 562-581, 630-634.)

8.5 1980S

In the face of a major quality crisis, U. S. firms focused primarily on three strategies:

"exhortation, project-by-project quality improvement, and statistical process control." Juran, (1995, pp. 584-586.)

1990s

Poor strategies and poor execution of valid ones caused largely disappointing results for most quality initiatives in the 1980s, but some firms, including the winners of the NQA, "attained quality leadership … and thereby became the role models for the rest of the American economy." Juran (1995, p. 586). The core list of strategies, embodying the lessons learned in the 1980s about what worked and what did not, for successful pursuit of quality are captured by the NQA criteria described above. Juran (1995, pp. 649-650), Reimann and Hertz (1993, p. 46), George (1992), George and Weimerskirch (1994).

The NQA criteria define "a model of integration" that demonstrate "how all of a company's processes and people can be focused on meeting customer requirements and improving operating performance." George and Weimerskirch (1994, p. v.)

Source: See Juran (1995, pp. 553-655).