Evaluation of the Implementation of

Lean six sigma

The case of Shama plc

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Declaration

I, the undersigned, declare that this project paper is my work and that all sources of material used for this project have been dully acknowledged.

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Abstract

The prevailing assumption is that most private businesses in Ethiopia are being run with the use of few, if any, measurement and assessment tools. Therefore, it is almost impossible for any business to measure its effectiveness, since there are no benchmarks for comparison. Creating mechanisms for measurements and analysis is becoming necessary to improve the performance of an organization. The objective of this project is to evaluate the impact of the application of Lean Six Sigma principles to Shama Plc, thereby proving that Six Sigma is actually applicable and, indeed, necessary for the growth of private businesses in Ethiopia.

The paper evaluated the implementation of Lean six sigma (LSS) with regard to the company's processes by analyzing the company's activities using **DMAIC** (Define, Measure, Analyze, improve and Control) tools of Lean Six Sigma. It mainly focused on the processes related to products and customers. The questionnaire responses and the documents of the company were analyzed to see the impacts of LSS application. Questionnaires, Data analysis tools like figures, tables, Ratios and percentages have been used to arrive at the standardized sigma level of the company.

Analysis of the results show that Shama's Sigma level is "2" Six Sigma with a yield of 70% performance level. The result of the report suggests that there is room for Shama to improve and reach "3" or "4" Six Sigma Level, which is the level of most of internationally standardized companies.

If Shama undertakes market research to asses its market share & segments of customers, and brings books as per the specification of customer demand it can increase its Sigma Level since not knowing its market Share and target market is one of the drawbacks of the company. To increase its performance Shama should also have proper follow up of its policies and procedures, which were used in the application of LSS. Employee related issues has not yet been addressed properly which has also resulted in the low level of Six Sigma.

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List of Acronyms

LSS - Lean six sigma.

Plc - Private Limited Company.

DMAIC - It is a Six Sigma method to Define , Measure, Analyze, Improve and Control a Business Process.

DFSS - Design for Six sigma.

TQM - Total Quality Management.

PPM - A Six sigma Metrics to gauge deficiencies per Million. (Defect Rate of Parts per Million.)

ISO - International Organization for Standardization.

ISO 9000 - Certification for consistent application of Business Processes.

CEOs - Chief Executive Officers.

GE's - General Electronics.

BBs - Black Belts.

MBBs - Master Black Belts.

Chapter One

1. Introduction

1.1. Background of the study

The low level development of education is confronting politicians, planners, curriculum developers, teachers and the public in enacting innovations in the education and training systems of a variety of developing countries. From case studies that have been produced by different institutions over the last twenty years, the contributions drawn from these researches, inspired Shama Plc to enter in to the book industry.

This study is a Project paper, which evaluates "Implementation of Lean Six Sigma-the case of Shama Plc ". It tries to show the value added in the implementation of Lean Six Sigma regarding Shama Plc. The analysis focuses on the Qualitative aspects of Products and customer service including organizational structures which reflects the Business Processes as well as the Income generation capacity of the organization.

The Researcher intends to analyze the implementation of the process and reflect on the practical application of Lean Six Sigma. It evaluates Lean Six Sigma implementation of Shama Plc during last two years (2005/2006 and 2006/2007 GC).

1.2. Objectives of the study

The need to assess and evaluate the Impact of the practical application of Lean Six Sigma in the private industry of the Ethiopian Market and to transform and develop organizational processes to the International standard initiated this project.

Based on different theories and applications of Six Sigma, this project evaluates the Values added to the company through the application of this new theory. It focuses on the main activities of the company, which is sales of Books. It specifically evaluates the Value of Lean Six Sigma in terms of:

- Cost Saving.
- Shortening of Service and Cycle Time.
- Improvement of Quality of the product.
- Increment of Customer Satisfaction.

1.3. Research Methodology

1.3.1. The subjects:

Six of the Senior Management members who were involved in the designing and implementation of Lean Six sigma were included in this study. Staff members who implement LSS were also included. Two hundred twelve randomly selected customers were also subjects of this study.

1.3.2. Data Collection Tools:

The Questionnaire incorporated standard questions which depict quantitative and qualitative aspects of the organization. Interviews and Minutes of the meetings of the organization were also used.

Five questionnaires were used in total. The purpose of each type of questionnaire is as follows:

Questionnaire No. 1 used to gather the level of defined processes by the senior management before and after application of LSS. Review of the Minutes of the meetings of the management and the

retail shops (Outlets) and performance reports of the company were also used as a secondary data source.

Questionnaire No. 2 & 3 used to measure the level of implementation of the defined processes before and after application of LSS.

Questionnaire No 4 used to assess the defining and measurement of employee related processes. Administration Department reports, Minutes of the meetings of the management, staff manual & financial manual were also used to obtain secondary data related to employees.

Questionnaire No. 5 used to determine customer satisfaction and investigate the issues related to customer satisfaction.

1.3.3. Data analysis Method:

The following procedures were used to analyze the data gathered:

- Responses collected based on the questionnaire were summarized on a table and analyzed to arrive at the yield of the responses and calculate the level of Six sigma.

- The financial information of the company was analyzed to compare the results before and after the implementation of Lean Six Sigma.

- Yearly Sales and cost report were compared with the new process sales report of the same period (Month) after the implementation of lean Six Sigma.

- The effect of implementation of Lean six sigma on the resources, like staff, customer relation ship, Supplier's Chain and IT, were analyzed to analyze and determine impact of LSS.

- Six sigma bench marking and sigma calculator were used to logically organize the data.

1.4. Significance of the study

- The finding of this study may serve Shama to look in to causes of its problems and be able to use the results of this study for further implementation of LSS.
- It may help companies to achieve better standards by solving their existing problems of employee and resource allocation using the standardization mechanism of Lean Six sigma.
- It indicates implementation caveats and preconditions in the context of Ethiopia.
- It poses areas for further research and investigation in relation to LSS and its implementation in the context of developing courtiers such as Ethiopia.

1.5. Delimitation of the study

The project is delimited in terms of both industry and content. Industry wise, it is limited to one company in the book industry. In terms of content, the project would have been complete and representative if it had covered some of the International Standards like Industry Averages, Financial Market analysis which could have been used to assess the impact of the changes in the market.

1.6. Organization of the study

Chapter one presents the introductory part of the study. Chapter two reviews literature about Lean Six Sigma. Chapter three presents and analyzes the steps in the implementation of LSS including DMAIC. Chapter four provides the conclusion and discusses the recommendations made.

Chapter Two

2. Theoretical Aspects of Lean Six Sigma

Six sigma's effect on improving business processes and benefits of all stake holders were analyzed by many Authors (Bhote, 2003, P. 4); (Wheat, Mills, & Carnell, 2003, P.75); (Shere, 2007). Companies (Motorola Company, Motorola University) also carried out similar analysis.

They all agree that Lean Six Sigma is a way of improving processes to make them as near perfect as possible. The term "Six Sigma" relates to the number of mathematical defects in a process. Six Sigma practitioners focus on systematically eliminating the defects so they can get as close to "zero defects" as possible. **Six Sigma** methodology provides the techniques and tools to improve the capability and reduce the defects in any process. It is a system which focuses on the improvement of processes on both a strategic and tactical level. It has enabled clients to achieve extraordinary, ongoing benefits of tens and hundreds of millions of dollars per

annum. These financial benefits are achieved by eliminating waste, improving cycle times , reducing variation, increasing quality, encouraging innovation, deepening customer relationships, and strengthening corporate cultures. It focuses on the real-life application of process improvement tools.

2.1. The starting Point of Lean six sigma (LSS)

Six Sigma stands for Six Standard Deviations (Sigma is the Greek letter used to represent standard deviation in statistics) from mean. *It is a registered trademark and service mark of Motorola, Inc.* It was started in its manufacturing division, where millions of parts are made using the same process repeatedly. Eventually Six Sigma evolved and applied to other non manufacturing processes. Today Six Sigma is applied to many fields such as Services, call centers, Medical and Insurance Procedures.

Lean Six sigma is the result of lean and six sigma. As six sigma focuses on defect clearance, Lean focuses on avoiding of non value adding activities (reducing total Cycle time). Both have been developed and successfully deployed first by Motorola then by many

Multi national companies. LSS methodology improves any existing business process by constantly reviewing and re-tuning the process. To achieve this, Six Sigma uses a methodology known as **DMAIC** (**D**efine opportunities, **M**easure performance, **A**nalyze opportunity, **I**mprove performance, **C**ontrol performance).

Six Sigma methodology can also be used to create a brand new business process from ground up using **DFSS** (*Design For Six Sigma*) principles. Six Sigma Strives for perfection. It allows for only **3.4** defects per million opportunities for each product or service transaction. Six Sigma relies heavily on statistical techniques to reduce defects and measure quality.

Six Sigma experts (Green Belts and Black Belts) evaluate a business process and determine ways to improve upon the existing process. Six Sigma experts can also design a brand new business process using *DFSS* (*Design For Six Sigma*) principles. Typically it is easier to define a new process with DFSS principles than refining an existing process to reduce the defects. LSS incorporates the basic principles and techniques used in Business, Statistics, and Engineering. These three form the core elements of Six Sigma. Six

Sigma improves the process performance, decreases variation and maintains **consistent quality** of the process output. This leads to defect reduction and improvement in profits, product quality and customer satisfaction. (Shere , 2007)

In his research, Dr. Kenneth D. Shere, (Shere, 2007) analyzed LSS and the following are exerpts from his research:

> "Lean Six Sigma (LSS) is the culmination of a variety of process improvement methods. These methods began in the 1920s with the development of time and motion studies, and the principles of statistical quality control. Thirty years later in the early 1950s, W. Edwards Deming and Bonnie Small developed the foundations of modern process improvement methods. Deming developed Total Quality Management (TQM). Small made the analyses of statistical quality control accessible to people who were not professional statisticians and mathematicians through her publication of "The Western Electric Rules".

Prior to the development of LSS, process improvement methods were narrowly focused. They did not address the bottom line in terms of *what is critical to the customer and the cost of poor quality*.

Lean manufacturing focuses on eliminating *non value-added* and *unnecessary* tasks. Tasks are value-added when the customer is willing to pay for them. Some tasks like invoicing are non value-added, but are necessary for business operations. The lean methodology is bottom-line focused but does not address quality *per se*. Motorola developed Six Sigma to drive defects to zero, but did not explicitly address the elimination of unnecessary tasks.

LSS is an approach that combines lean manufacturing and Six Sigma from a global perspective that takes both suppliers and customers into account. This approach tells us how to improve our processes in a way that considers both the costs of poor quality and issues critical to customer requirements. In addition to

manufacturing processes, LSS has been very successfully used in transactional and service industries. It also directly applies to software processes, but few organizations have applied it.

The companies that are the strongest proponents of LSS include General Electric Co., Sony Corporation, Honeywell, TRW Inc., Bombardier, Johnson and Johnson, The Dow Chemical Company, Exxon Mobil Corp., J.P. Morgan Chase & Co., Citibank, GMAC Mortgage Corporation, and John Deere. In annual meetings and letters to shareholders, these companies have credited LSS with saving billions of dollars in operational expenses."

2.2. Six Sigma and other improvement systems

The primary goal of Six Sigma is to improve customer satisfaction, and thereby profitability, by reducing and eliminating defects. Defects may be related to any aspect of customer satisfaction: high product quality, schedule adherence, cost minimization. Underlying

this goal shows that increasing defects leads to increased customer dissatisfaction and financial loss. Common Six Sigma metrics include defect rate (parts per million or ppm), sigma level, process capability indices, defects per unit, and yield. Many Six Sigma metrics can be mathematically related to the others.

Satisfaction is based on the "statistical thinking" paradigm that:

- Everything is a process
- All processes have inherent variability
- Data is used to understand the variability and drive process improvement decisions

2.3. Six Sigma and Total Performance Excellence

In the context of Total Performance Excellence (TPE), Six Sigma focuses more on quality and problem-solving - while Process Management focuses on basic process definition, Lean focuses on time and flow, and Design for Six Sigma focuses on designing new processes or products. Thomas Pyzdek (Pyzdek, 2007) defined Six

Sigma in everyday terms for both business quality professionals and top managers alike. He says that Six sigma can be explained as a new management tool which has customer focus, Data driven and Robust Methodology.

2.3.1. Customer Focus

Ensuring all outputs meet customer specifications is the primary objective of Lean six sigma. This is very intuitive for manufacturing and industrial businesses; potentially a new concept for transactional businesses. Customer needs must be understood down to the tolerance level. In addition, new products and services should be conceived to meet the needs of customers not currently serviced.

2.3.2. Data Driven

Data is necessary to identify input, process and output areas for improvement. Quality improvements are not haphazardly implemented. Instead, resources are assigned to projects when it

can be shown through data analysis that a difference will be felt by the customer.

2.3.3. Robust Methodology

Data alone cannot solve all your customer or business issues. A methodology for defect definition, measurement, analysis, improvement and control must be utilized to standardize improvement processes and maximize business productivity. Business processes should be structured around the customer's ideal experience.

2.4. Why Six Sigma is not TQM

Pyzdek (2007) argues that there is a difference between the applications of Six Sigma and TQM though there are similarities. He stated that " Six Sigma employs some of the same tried-and-true tools and techniques of TQM". Both Six Sigma and TQM emphasize the importance of top-down support and leadership. Both approaches make it clear that continuous improvement of quality is critical to long-term business success. But there are differences. The difference, in a word, is *management*. TQM provided only very

broad guidelines for management to follow. Guidelines so abstract and general that only the most gifted leaders were able to knit together a successful deployment strategy for TQM. Business magazines and newspapers reported widespread failure of TQM efforts. True, solid research showed that organizations which succeeded in successfully implementing TQM reaped substantial rewards. But the low probability of success deterred many organizations from trying TQM. Instead, many organizations opted for ISO 9000. ISO 9000 promises not world-class performance levels, but "standard" performance. But it provides clear criteria and a guarantee that meeting these criteria will result in recognition. In contrast, TQM offered a mushy set of philosophical guidelines and no way to prove that one had accomplished their quality goals.

Unlike TQM, Six Sigma was not developed by techies who only dabbled in management. Six Sigma was created by some of America's most gifted CEOs. People like Motorola's Bob Galvin, AlliedSignal's Larry Bossidy, and GE's Jack Welch. These people

had a single goal in mind: to make their businesses as successful as possible. Once they were convinced that the tools and techniques of the quality profession could help them do this, they developed a framework to make it happen. Six Sigma.

The downside of Six Sigma is that there are currently no standards, nor an official certifying institution, to make sure that everyone walks the talk. Generally, Six Sigma criteria are less comparable to the ISO 9000 criteria than to that of the Malcolm Baldrige National Quality Award. Companies that have won the Baldrige Award have already learned that successful quality management encompasses many business management tools, including leadership, strategic planning, customer and market focus, information and analysis, human resource focus, process management, and results orientation.

2.5. Steps in Designing Six sigma

Pyzdek (2007) emphasized on the steps to be followed for the success of six sigma deployment. Six Sigma also describes a proven box of powerful tools and strict guidelines for the implementation of it in one company. The difficulty lies in implanting this concept into an organization's culture. Most companies pursuing Six Sigma must go through **four phases of implementation**.

In phase one, the company's leadership team decides to go for Six Sigma and is caught between dreams of increasing its net income with huge savings (and continuing to live up to its image of an outstanding company while increasing customer satisfaction and loyalty) and doubts of whether these concepts will actually work. A Six Sigma implementation normally begins with leadership-awareness training and a few improvement projects. When the first projects are chosen, the company either demonstrates its Six Sigma competence by assigning business-related projects within the leadership team or demonstrates the old-fashioned quality way

by delegating the tasks to their Black Belts or a quality team. If the projects only focus on manufacturing, the company will limit itself to traditional quality improvement initiatives. Instead, it makes sense to think cross-functionally and recognize improvement opportunities in *all* key business processes.

As phase two begins, it's critical for the leadership team to pass the first tollgate: Are they tracking results from their first projects or are they losing interest? Successful Six Sigma companies set up a steering committee--often called a "quality council"--to make decisions about projects, especially about tying their selection to business strategy and customer needs, implementing improvements, and reward and recognition. Results also need to be communicated to the entire company. It's critical to sell Six Sigma internally and convince the skeptics. Otherwise, the company won't be ready for the next phase.

In phase three, measures are implemented to track results from initial projects and ensure that the improvement lasts. Successful companies add these measures to their internal dashboard and customer loyalty tracking system. Some companies even share

those results with their customers, which builds trust. Customer satisfaction measures are key for project selection. Unfortunately, they're not always available or used.

Scorecards (comparable to balanced scorecards and containing deployment and result measures) should be implemented to tie Six Sigma implementation to the reward-and-recognition system and the bonus system to drive process improvement, customer satisfaction, employee satisfaction and net income.

To facilitate phase four, building Six Sigma into the "business as usual," all departments must be involved. Six Sigma includes a powerful tool set that can be used to improve all key business processes--including administrative processes--throughout the company. Additionally, there are a few key departments that must support the Six Sigma initiative. Finance should track costs and benefits; marketing and sales should gather voice- of-the-customer data and track customer satisfaction levels; and human resources must support communication, Black Belt and Green Belt selection and development, reward and recognition, and employee satisfaction tracking and analysis.

At this stage, project selection is no longer driven by the quality leader or business leader but by individual process owners, who are using Six Sigma to achieve their own business goals, dedicate resources to the effort and gain the results.

At this stage it will be understood that Six Sigma is finally part of the organization's bloodstream when you no longer need to talk incessantly about it. It will simply be part of the culture.

2.6. Role of CEO's and Leaders

Leadership's role is critical--especially at the outset--because leaders communicate and reinforce the power that Six Sigma has to achieve business objectives. Without buy-in from leadership, Six Sigma simply won't work. It must be reinforced from above and adopted by each internal level and process area. When implemented well, Six Sigma has the ability to create a truly customer-focused workforce and organization. The CEOs were able to see what the problems were, and to create an approach that fixed them. Six Sigma addresses all of the following:

- Six Sigma extends the use of the improvement tools to cost, cycle time, and other business issues.
- Six Sigma discards the majority of the quality toolkit. It keeps a subset of tools that range from the basic to the advanced. Six Sigma discards esoteric statistical tools and completely ignores such staples of the quality professional as ISO 9000 and the Malcolm Baldrige criteria. Training focuses on using the tools to achieve tangible business results, not on theory.
- Six Sigma integrates the goals of the organization as a whole into the improvement effort. Sure, quality is good. But not independent of other business goals. Six Sigma creates top-level oversight to assure that the interests of the entire organization are considered.
- Six Sigma strives for world-class performance. The Six Sigma standard is 3.4 PPM failures per million opportunities. It goes beyond looking at errors. The best of the Six Sigma firms try to meet or exceed their customer's expectations 999,996.6 times out of every million encounters.
- Six Sigma creates an infrastructure of change agents who are not employed in the quality department. These people work

full and part-time on projects in their areas or in other areas. Six Sigma Black Belts do not make careers in Six Sigma. Instead, they focus on Six Sigma for two years and then continue their careers elsewhere. Green Belts work on Six Sigma projects while holding down other jobs. These subject matter experts are provided with training to give the skills they need to improve processes. Six Sigma "belts" are not certified unless they can demonstrate that they have effectively used the approach to benefit customers, shareholders, and employees.

Senior Leadership is responsible for the strategic plan, and selecting potential six sigma plus project areas. Once a six sigma plus project is understood using total quality management (TQM) tools, total quality management (TQM) techniques generate alternatives. Improvements are then implemented. Six sigma plus projects maintain improvements using control tools of total quality management (TQM). This is the define, measure, analyze, improve and control sequence (DMAIC) of six sigma.

2.7. The Six Sigma Method–DMAIC

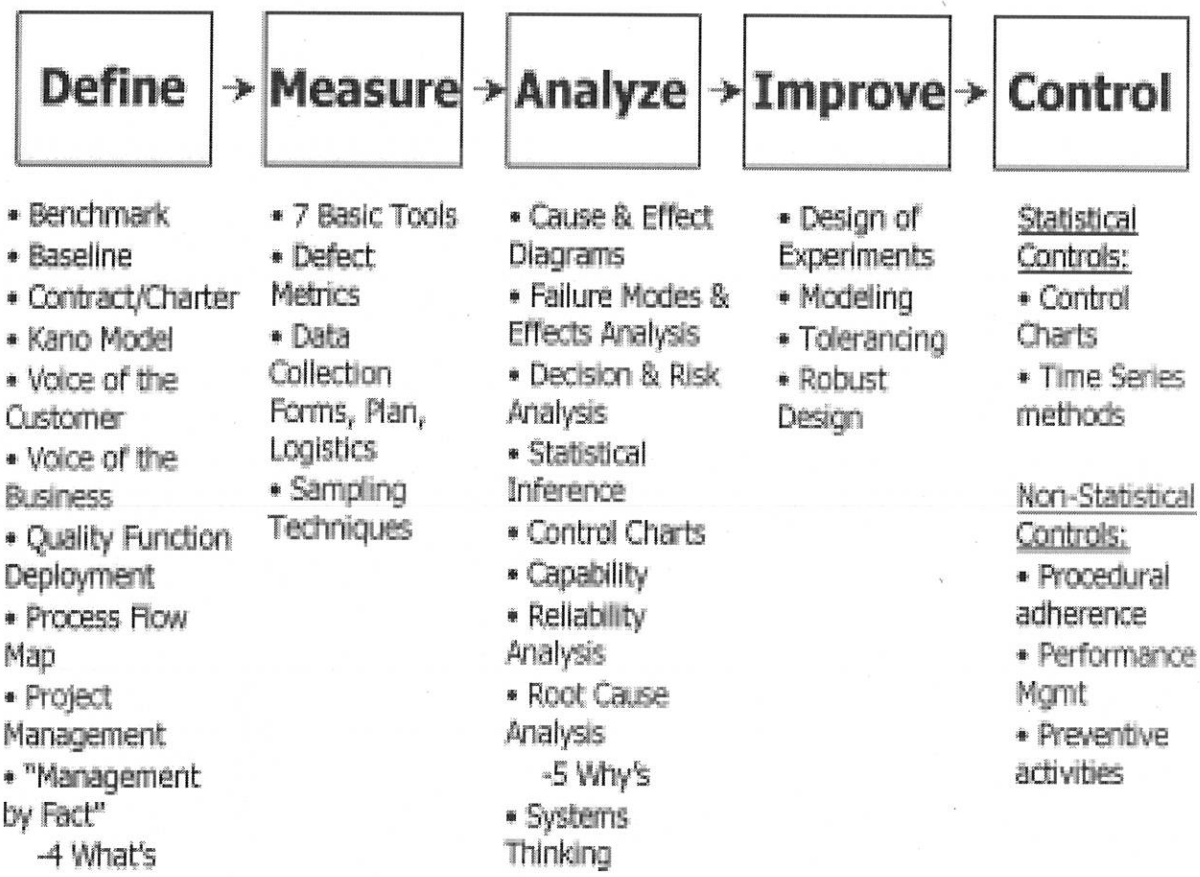
While Six Sigma follows the DMAIC methodology at the project level, it follows a well established deployment methodology at the business level. As the roadmap for actualizing the statistical thinking paradigm, the key steps in the Six Sigma improvement framework are Define - Measure - Analyze - Improve – Control. Six Sigma distinguishes itself from other quality improvement programs immediately in the "Define" step. When a specific Six Sigma project is launched, the customer satisfaction goals have likely been established and decomposed into sub goals such as cycle time reduction, cost reduction, or defect reduction. (This may have been done using the Six Sigma methodology at a business/organizational level.)

Once an effort or project is defined, the team methodically proceeds through Measurement, Analysis, Improvement, and Control steps.

Jeannine Siviy, (Siviy, 2007) stresses that Six Sigma improvement team is responsible for identifying relevant metrics based on engineering principles and models. With data/information in hand,

the team then proceeds to evaluate the data/information for trends, patterns, causal relationships and "root cause," etc. If needed, special experiments and modeling may be done to confirm hypothesized relationships or to understand the extent of leverage of factors; but many improvement projects may be accomplished with the most basic statistical and non-statistical tools. It is often necessary to iterate through the Measure-Analyze-Improve steps. When the target level of performance is achieved, control measures are then established to sustain performance. A partial list of specific tools to support each of these steps is shown in the Figure and Table 2.1 .

Figure & Table 2.1. DMAIC Process flow chart[1]



2.8. Approaches used by Six Sigma

The approach, used for process improvement, is called the *define-measure-analyze-improve-control* approach, which represents five

[1] Taken from www.sci. **cmu.edu**

phases. Some organizations use six phases. The difference between these representations is that the second approach divides the define phase into vision and define. These six phases of LSS are described below. (Shere, 2007)

- **Vision.** This phase is used to identify critical-to-customer factors, teams, and key stakeholders; to describe the business impact; and to plan the process improvement project.
- **Define.** This phase focuses on defining the as-is process. Frequently, processes are understood by experienced personnel but are not actually written down. Simply gathering a group of key people in a room and asking them to define a process often improves it. Sometimes the improvements are significant, and the team decides that it is good enough - no further work is necessary.
- **Measure.** The purpose of this phase is to measure the existing process. Without these measurements, it is impossible to determine how much a process is improved or to validate savings. This phase is critical to future analyses and suggested process improvements.

- **Analyze.** During this phase, the causes of poor quality are determined and analyzed. Each step of the process is assessed to determine waste from a lean perspective. Problems are determined from historical data and employee knowledge. Fishbone charts, also called cause-and-effect charts, are used to identify the most likely causes of the defects. The process is usually simulated to determine bottlenecks and resource utilization, and the cost of defects. These analyses form the basis for design of experiments, regression analysis, and other techniques used to evaluate potential improvements in the next phase.
- **Improve.** The focus of this phase is to determine process improvements. Processes are assessed from the perspectives of whether (1) each task adds value to the product or service, (2) there is a more cost-effective way of performing the process, and (3) the process meets or accounts for requirements critical to the customer. Typically, the process is modeled and simulated. New ideas are tried out in simulation before they are implemented. Sometimes it is necessary to perform a design-of-experiments analysis to determine ways to improve a process. This allows the analyst to determine the

value of adding people or resources to a given task or taking them away from another task. It also allows the analyst to look at fundamental changes to the process. These analyses are conducted from a bottom- line perspective.

- **Control.** During this phase, the improved process is implemented in a controlled manner. Data are taken to verify that the proposed improvement (previously validated through simulations) is real. The financial member of the team serves as an independent auditor and validates the savings. Frequently, the process is initially implemented as a prototype before full implementation.

2.9. What Makes The Difference?

2.9.1. Management Commitment

Management commitment is certainly a key success factor. Commitment is time, funding, priorities and interest from the CEO. Six Sigma requires as much from top management as it does from line workers, perhaps even more.

Coaching, encouragement and support from all levels of management is necessary. This is often the most difficult part of Six Sigma. It requires all managers to discover, for themselves, the new paradigm. Some never do. Sometimes a single well-placed and shrewd holdout can destroy a major Six Sigma or TQM effort.

2.9.2. Training

Training is an issue. Only knowledgeable and experienced people can create effective adult training. Training also requires coaching and follow-up. The most difficult and critical step is transferring "book-learning" to the daily job.

Traditional organizations work against TQM programs. Hierarchy and privilege inhibit those who often have critical information. Functional work structures promote managerial tunnel vision. Six Sigma and TQM threaten each individual's interest in the current power structure. Even those with little power often take comfort from their familiar place.

2.9.3. The Socio-Technical System

The social system includes people and their habitual attitudes, values, behavioral styles and relationships. It includes the reward system. It is the formal power structure as depicted on organization charts and the informal power structure deriving from knowledge and personal influence.

The technical system includes machinery, processes, procedures and a physical arrangement. We usually think of a factory in terms of its technical system.

To be effective, the social and technical systems must integrate and assist one another. A manufacturing work cell that requires high teamwork will not produce in an environment of suspicion, individual rewards and command-control. Businesses where people have isolated workstations, large inventory buffers and few sequential processes have difficulty with teamwork.

a) Social System

- There is no optimum organization.
- As the environment, culture, people and technology change, so should the organization.
- When selecting people for a workgroup, strive for homogeneity in their backgrounds and work attitudes.
- Reduce wide variations in knowledge levels and variety through cross training.
- Achieve High performance through commitment rather than minimal compliance. Use more carrot than stick.
- Build commitment by involving people in the shaping of their future.
- Provide opportunities to satisfy unfulfilled higher order needs. Use the intrinsic motivators.
- Adult learning occurs primarily through experience. Integrate learning on the job through advisors, facilitators, and guided application.

b) Technical System

- Ensure that the detection of a variance and the source of that variance occur in the same work group.
- Control variances at their source.
- Maintain quality by detecting variances in the process rather than in the final product.
- Monitor inputs as carefully as outputs.
- Size work buffers large enough to allow problem solving but small enough to prevent problem avoidance.
- Match technological flexibility with the product mix.
- Match technology scale with production volume of the work groups.

c) Integration

- Design the Socio and Technical systems simultaneously and jointly.
- Give workers larger and more varied tasks and increase cycle time.
- Integrate support functions within work groups to the largest possible extent.
- Optimize the system rather than the system's components.

- Begin and end a work group's technical boundary at a discontinuity in the material transformation process.

d) Managing The System

- Allow teams to manage the daily work.
- Coach and facilitate rather than supervise. Coaches should manage the team boundaries.
- Upper management should set goals, supply resources and manages the culture.

2.10. Failure of Six sigma application

A recent Six Sigma Discussion Forum thread posed the following question: "Have there been any Six Sigma deployments that have failed?" From the discussion it was summarized that Six Sigma consultants typically define successful deployments in the following way: A successful Six Sigma deployment is one that provides an acceptable ROI and leaves a stand-alone program (not requiring further assistance from outside resources). A Six Sigma

deployment is no different than any other program or business initiative. You make plans and develop metrics to evaluate the progress. When the deployment is not going as expected, you make adjustments. The following lists are some of the ways Six Sigma deployments have failed to meet expectations.

2.10.1. Failure of Black and Green Belts:

- Not severing themselves from their old job, at least through training
- Treating it as an academic exercise
- Failing to appreciate the complexity of dealing with people
- Failing to recognize Control as the most difficult phase to implement effectively
- Not transferring ownership of the solution to the team as the project progresses (the solution becomes personality dependent)
- Spending too much time on the computer and not enough time in the process
- Not communicating effectively with management - they speak the language of money

- Presenting results as if it were a science project - using things such as ANOVA tables to convey results (graphical representations convey more information faster - you are communicating an idea)
- Avoiding resistance - when you know it is present you have to deal with it
- Creating a exclusive club attitude around the program
- Not sharing the credit for the solution with the team
- Taking credit for work accomplished by another initiative or an ongoing project.
- Focusing on certification rather than the team project and the company's results
- Not providing the team the opportunity to share the spotlight (have them attend a management presentation or better yet use them in the presentation)
- Generating false data
- Not getting at least a basic understanding of the tools required to do an analysis
- Including special effects in the presentation to cover a lack of content

- Using a large number of slides to cover a lack of content in project reviews
- Running to the Champion to break a roadblock before they try themselves
- Not taking a roadblock to the Champion after they have tried themselves

2.10.2. Management And Company Failures:

- No concept of Customer expectations
- No vision related to Customer expectations
- No follow-up on the annual operating plan
- Lack of alignment (horizontal or vertical)
- No visible leadership at the executive level
- Business executives do not show up for report-outs (conveys a lack of priority)
- Deploying Six Sigma without a goal (reason for deployment)
- Deploying Six Sigma with a goal but no plan on how to get there
- Abdicating the deployment plan to a consulting company
- Trying to change the organization without a detailed change process

- Not having metrics in place for management participation
- No metrics for Champions
- Champions do not show up for report-outs
- Having metrics in place but no feedback (or limited feedback annually, semi-annually, quarterly)
- Not having multiple projects queued up for each MBB, BB or GB (so when they complete a project the next one has already been selected)
- Not communicating deployment plans effectively through the organization
- No rewards or recognition program
- A rewards or recognition program that does not recognize teams
- No retention program for trained personnel
- Trying to use contract type agreements to retain MBBs (Master Black Belts) and BBs (Black Belts)
- Project selection process does not identify projects related to business objectives
- Middle management operates on their own agenda (feel support is optional)
- No accountability

- Champions do not break roadblocks
- No buy-in at the Process Owner level
- Process Owner believes they have the option to not buy-in
- Supply base supplying poor quality material
- No consequence for suppliers sending bad material (typically because of price)
- No plan to deploy into the Design and Marketing functions after Operations has launched
- Believing a single initiative can/will solve all your problems
- Using BBs for fire-fighting
- Buying cheap software to save money on the deployment
- Training BBs without providing a computer

Chapter Three

3. The Application of Lean Six Sigma

The Case of Shama Plc

3.1. Why do Shama wanted to apply Six Sigma?

Shama in its history has undergone lots of strategic processes. To begin with this company is the result of Vertical Integration of three companies. It went through the process of Backward and forward integration. All the three companies deal with the book industry. Shama Mac Millan (Book Publisher), Bookworld (Book distributor) and TRANCO (Trans African Commercial and Commission Agency – Book importer) were merged with the intended objective of the following:

- Increasing Market Share
- Expected Cost saving synergy
- Enhance financial strength
- Sustainability of the type of business i.e., Book Industry
- Serve the public in a better way by reducing price of the books,

- Less intermediary cost less Selling price

- Utilization of the slack variables
  - Shama Publishing – Excess capital & Fixed Assets
  - Bookworld - Retail space and competent marketing personnel
  - TRANCO – Highly qualified professional for management of book business, and
- Generate a higher return on investment

As the objective of the company is maximizing profit by serving the public, it tried to implement better ways to achieve the objective of the company by implementing Lean Six sigma.

3.2. The process of Six Sigma application

As a starting point Shama started improving its processes in the areas of Data Integrity process and product selection thereby tackling the issues related to delivering quality service to customers. The company organized a three day retreat outside Addis Ababa to Senior managers and Team leaders (Sales

Representatives) to discuss the Vision of the Company in relation to its products and customers. The discussion was documented to be used for further improvements. The team evaluated the company's operational processes which are critical to stake holders. They divided them in to the following three Categories:

Issues related to Management:

- Vision and Mission of Shama Plc
- Value Chain Analysis and Logistics flow.
- Structural Adjustment.
- IT development and Usage.
- Expected Growth.
- Standardization of Quality.
- Performance Parameters.

Issues Related to Employees:

- Employee's Objective.
- Logistics Flow.
- IT development and Usage.
- Standardization of Product Quality.

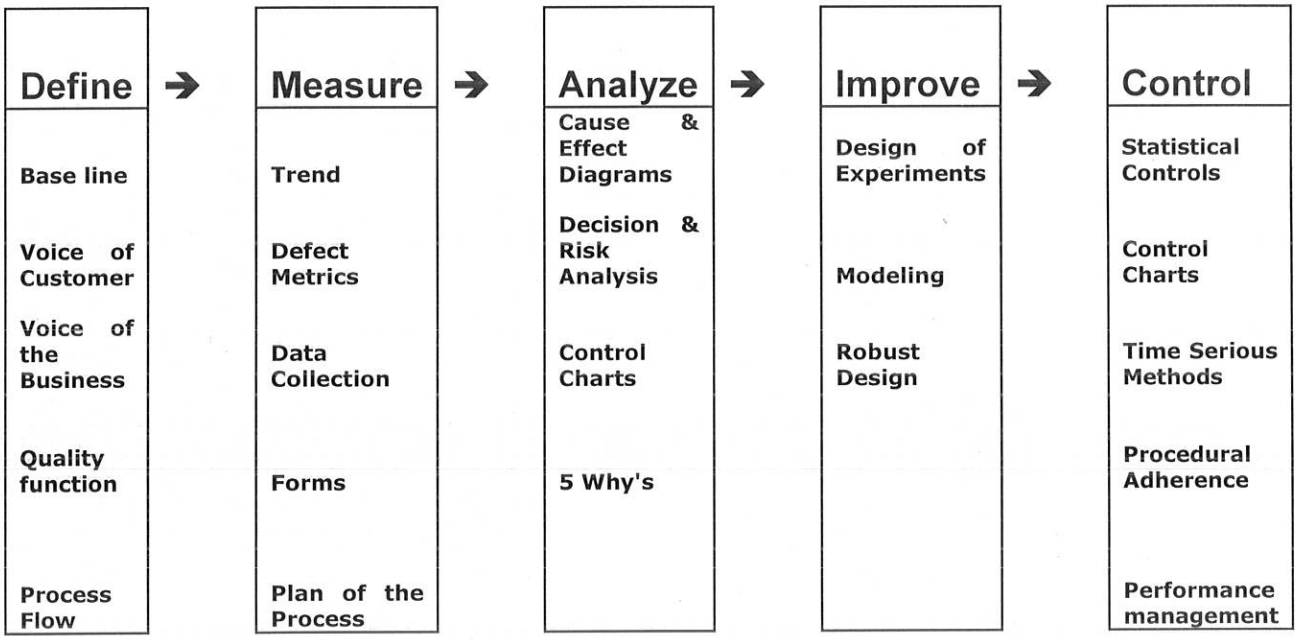
- Implementation of Process.

Issues Related to Customers:

- Customer's Objectives.
- Target Market.
- Size of Market.
- Knowledge of Company and Product.

Based on the discussion they came up with the vision and mission statement of the company. The team concluded that Priority must be given to define and improve the process related to Products and customer services since customers are the main factors for the company's growth and expansion. Therefore it is important to analyze first the product of the company and the market the company is going to serve. The activities under the DMAIC were applied by the company. This study has gone through the phases of Six sigma application as shown in Figure 3.1 on the next page.

Figure 3.1. Flow chart of DMAIC used by Shama Plc



3.2.1. Defining the Company processes

The Define stage, which is the **first phase** in the application of six sigma, was conducted for base lining and benchmarking of the process and sub Processes to be improved with specific goals and business process infrastructures to accomplish the goals including the cultural and organizational changes .

Questionnaire was distributed to the concerned bodies to assess that the Lean six sigma application helped in achieving the intended

improvement. The questionnaire also examined if the management has begun inculcating new values – Customer focus, Team work, Personal Responsibility, and profitability. **Table 3.1** shows the defined activities or issues regarded as processes by the company. The processes have been defined by the management in relation to its importance for the smooth flow of operations to attain the company's objective.

Table 3.1. Activities and Issueds regarded as procecess by the company.

Description of Defined Processes and Sub Processes	**This process shows if the company:**
Performance Parameters.	• defined and designed a system to evaluate and bench mark the performance of the Employees, Outlet Shops, Cost and Profit Centers.
Expected Growth.	• planned its yearly anticipated growth in Relation to Over all sales, Sales per outlet, Number of shops to be opened and their Location.
Product Quality	• knows the criteria for Quality of the product specifically Books. This includes International Book Standard Number, Best Seller's Notification by Publishers and International Media, Country of Origin etc..
Logistics Flow.	• Designed a system to map the operational flows of the over all activities of the company to have smooth flow of operation and timely process of the activities.
Implementation of Process.	• uses the designed and mapped operational system for the overall activities of the processes.
Vision and Mission of the Company	• has promoted its vision and mission and created awareness with in the company.
Organizational Structure	• designed the organi-gram versus its operational process.
Employee knowledge	• assigns employees based on their knowledge, capacity and competence.
Value Chain Analysis and Logistics flow.	• designed the inbound and out bound logistics systematically with the operational and financial activities.
Outbound Logistics-Supplier	• has reliable, known and permanent suppliers for its products.
Operations-Products	• has selected and defined the products to be sold in the company like Books, CDs, Traditional Gift Items and segmented its market to Supplies of Books and Hotel shop products.
Product Knowledge	• designed a system to train the management and sales force to understand what they are selling. (As they are selling books they must have the knowledge to help and advise their customers.)
Product Selection	• designed a system for the selection of books to be ordered or restocked.

■ **right number of titles**	• has the ability to decide to bring the right titles to the market.
■ **right quantities**	• has the ability to decide to bring the right quantities to the market.
■ **right time**	• is fulfilling the requirement of the market at the right time.
Inbound Logistics-Shops & Stores	• has designed a system for the arrival and delivery of products to the stores as well as to chain of its shops.
■ **Standardized displays**	• created a system to have proper and standardized displays (Shelves) in all its shops so that any customer who comes to any of the book shops doesn't have any confusion in going to the right shelf to browse the products.
■ **standardized shelving**	• has the same way of shelving in all the book shops based on the type of the books and their category.
■ **standardized uniforms**	• has installed proper uniform for the sales force in all the book shops.
■ **standardized services**	• gives training for the sales force to extend similar service in all its book shops.
■ **standardized customer communication**	• gives training for the sales force to have smooth flow of communication between the Head office, outlet shops, and customers.
■ **Cleaning standards**	• set a system for the shops as to cleaning time, cleaner's responsibility, sales force personal appearance, shops environment etc...
■ **standardized categories**	• has similar categories for similar books in every shop and stores.
Policies and procedures	• prepared financial and operational manuals as well as working procedures.
Order requests from salespeople	• brings books requested by customers and have them in its book shops and have follow up of the requests ordered by customers.
Customer Handling	• gives after sale service to its customers, communicates its regular customers and sends notification for new arrivals and discount periods etc..
Price of Product	• price of the products consider the buying capacity of customers and deals with suppliers to meet this requirement before ordering the products.
Marketing & Sales	• has proper marketing and sales team that can over come the challenges of the market.

Promotion	• uses promotional materials and media to promote its products.
Meeting Customer Specification	• brings product based on customers request and specification.
Target Market.	• studied the customers who come to its shops and designed a system to segment its target market.
Size of Market.	• studied the market to know its share of the market.
Knowledge of Company and Product by Customers	• uses proper advertizing and promotional campaigns to reach its customers to create awareness about its product.
IT development and Usage.	• gives training to its employees to update their knowledge of computer applications and uses proper hardware and software to facilitate the financial and operational activities of the company.

Table 3.2 to 3.8 Show the summarized responses of Questionnaire No 1. to 3 as to the defining and measurement level of the company processes. The respondents were six of the company's management members. (Administration Manager, Outlet (Shop) supervisor, Head of Accounts, Director of Finance and Operations, Head of whole sale and Distribution center, and Purchases Manager).

Table 3.2 . Defining of the Company Processes

Description of Defined Processes and Sub Processes	Before Application			After Application		
	100% Fully Defined	On Process	0% not yet defined	100% Fully Defined	On Process	0% not yet defined
Performance Parameters.			✓	✓		
Expected Growth.			✓		✓	
Product Quality			✓		✓	
Logistics Flow.			✓	✓		
Implementation of Process.			✓		✓	
Vision and Mission of the Company		✓		✓		
Organizational Structure			✓	✓		
Employee knowledge			✓		✓	
Value Chain Analysis and Logistics flow.		✓		✓		
Outbound Logistics-Supplier	✓			✓		
Operations-Products		✓		✓		
Product Knowledge		✓		✓		
Product Selection		✓			✓	
■ **right number of titles**		✓			✓	
■ **right quantities**			✓		✓	
■ **right time**			✓		✓	
Inbound Logistics-Shops & Stores		✓		✓		
■ **Standardized displays**	✓			✓		
■ **standardized shelving**	✓			✓		
■ **standardized uniforms**			✓		✓	
■ **standardized services**		✓			✓	
■ **standardized customer communication**		✓		✓		
■ **Cleaning standards**	✓			✓		
■ **standardized categories**		✓		✓		
Policies and procedures			✓			✓
Order requests from salespeople			✓	✓		
Customer Handling			✓		✓	
Price of Product			✓		✓	
Marketing & Sales			✓		✓	
Promotion			✓		✓	
Meeting Customer Specification			✓	✓		
Target Market.			✓	✓		
Size of Market.			✓			✓
Knowledge of Company and Product by		✓		✓		
IT development and Usage.			✓	✓		

Performance Parameters, Logistics flow and Implementation of the Existing and the Ideal process have been defined by the above mentioned management members including the Managing Director. All the defined processes was discussed by the Sales force and the Top level management body. The ✓ mark indicates the stage of the process already defined. The following are some of the defined process which are worth mentioning since these processes play an important role in the overall management performance of the organization.

1. Vision of Shama Plc

Shama plc will be recognized by its stakeholders as the leading knowledge provider in Ethiopia.

2. Mission Statement of Shama Plc

- *bookseller/publisher that is dedicated to providing the right books, at the right place, at the right time and at a fair price to its customers.*

- *a company of dedicated individuals, who are proficient in the work that they do; who are professional, knowledgeable and courteous.*
- *dedicated to meet all the needs of its customers for knowledge and inspiration.*

3. Value Chain Defining and Logistics flow:

Suppliers- The company has different Local and International Suppliers.

Operation- In the operation side the company has three broad wings, Support staff, Sales force and Publishing Staff. All involve in the process of Production, Purchase, Distribution and Sales of the product of the company.

Chain of Shops- This outbound logistics deals with the Shelving, Displaying, and sale of the company's product, Mainly Books.

Marketing and Sales- Marketing is mostly done by the Support Staff not by assigned marketing personnel. The sales

force is responsible for the sales that are mostly assigned in the Chain of Book shops.

Customer Support & Service- The responsibility of this area is giving On sale and After sale service to customers.

3.2.2. Measuring of the Defined Processes

Measuring of the existing Processes, Which is **Phase Two** of the Application of Six sigma, has been carried out to validate and analyze the existing process and future improvements. Questionnaire has been distributed to the management members to collect data regarding the company's existing process. The Measured processes have been analyzed in the Analysis stage .

Table 3.3. Summary of Measured Processes

		Responses by the Team for the level of defining the details of the Processes		
Application Stage	**Total No. of Processes**	**Yes**	**On Process**	**No**
Before Application	35	4	11	20
After Application	35	19	14	2
%age increment of improvement		375%	27%	-90%

Table 3.4. Summary of Measured Processes by %age

		Responses by the Team for the level of the Processes by %age		
Application Stage	**Total No. of Processes**	**Yes**	**On process**	**No**
Before Application	35	11%	31%	57%
After Application	35	54%	40%	6%

Table 3.5. Summary of the responses by the management members for the Measurement of process Implementation Before the Application of Six Sigma.

Description of Processes and Sub Processes	No of Respondents	100 Fully Implemented	80 Mostly Implemented	60 Partially Implemented	30 Least Implemented	0 Not Yet Implemented	Avarage%age Summary
Performance Parameters.	6				6		30
Expected Growth.	6				6		30
Product Quality	6				6		30
Logistics Flow.	6				6		30
Implementation of Process.	6					6	0
Vision and Mission of the Company	6		1	4	1		58.33
Organizational Structure	6					6	0
Employee knowledge	6					6	0
Value Chain Analysis and Logistics flow.	6		1	4	1		58.33
Outbound Logistics-Supplier	6	1	3	2			76.67
Operations-Products	6		1	4	1		58.33
Product Knowledge	6	1	3	2			76.67
Product Selection	6		1	4	1		58.33
■ **right number of titles**	6		1	4	1		58.33
■ **right quantities**	6		1	4	1		58.33
■ **right time**	6		1	4	1		58.33
Inbound Logistics-Shops & Stores	6		1	4	1		58.33
■ **Standardized displays**	6		1	4	1		58.33
■ **standardized shelving**	6		1	4	1		58.33
■ **standardized uniforms**	6					6	0
■ **standardized services**	6				6		30
■ **standardized customer communication**	6				6		30
■ **Cleaning standards**	6	1	3	2			76.67
■ **standardized categories**	6		1	4	1		58.33
Policies and procedures	6					6	0
Order requests from salespeople	6					6	0
Customer Handling	6					6	0
Price of Product	6				6		30
Marketing & Sales	6					6	0
Promotion	6					6	0
Meeting Customer Specification	6					6	0
Target Market.	6					6	0
Size of Market.	6					6	0
Knowledge of Company and Product by	6				6		30
IT development and Usage.	6					6	0

Table 3.6. Measurementof process Implementation Before the Application of Six Sigma to arrive at Six sigma yield.

Description of Processes and Sub Processes	100 Fully Implemented	80 Mostly Implemented	60 Partially Implemented	30 Least Implemented	0 Not Yet Implemented	%age Summary
Performance Parameters.				✓		30
Expected Growth.				✓		30
Product Quality				✓		30
Logistics Flow.				✓		30
Implementation of Process.					✓	0
Vision and Mission of the Company			✓			60
Organizational Structure					✓	0
Employee knowledge					✓	0
Value Chain Analysis and Logistics flow.			✓			60
Outbound Logistics-Supplier		✓				80
Operations-Products			✓			60
Product Knowledge		✓				80
Product Selection			✓			60
■ **right number of titles**			✓			60
■ **right quantities**			✓			60
■ **right time**			✓			60
Inbound Logistics-Shops & Stores			✓			60
■ **Standardized displays**			✓			60
■ **standardized shelving**			✓			60
■ **standardized uniforms**					✓	0
■ **standardized services**				✓		30
■ **standardized customer communication**				✓		30
■ **Cleaning standards**		✓				80
■ **standardized categories**			✓			60
Policies and procedures					✓	0
Order requests from salespeople					✓	0
Customer Handling					✓	0
Price of Product				✓		30
Marketing & Sales					✓	0
Promotion					✓	0
Meeting Customer Specification					✓	0
Target Market.					✓	0
Size of Market.					✓	0
Knowledge of Company and Product by				✓		30
IT development and Usage.					✓	0
Number of Processes Defined						1140 35
Avarage Ratio						33

Table 3.7. Summary of the responses by management members for the Measurement of process Implementation After the application of Six Sigma.

Description of Processes and Sub Processes	No of Respondents	100 Fully Implemented	80 Mostly Implemented	60 Partially Implemented	30 Least Implemented	0 Not Yet Implemented	Avarage%age Summary
Performance Parameters.	6		1	4	1		58.33
Expected Growth.	6		1	4	1		58.33
Product Quality	6	1	3	2			76.67
Logistics Flow.	6	1	3	2			76.67
Implementation of Process.	6	1	3	2			76.67
Vision and Mission of the Company	6		1	4	1		58.33
Organizational Structure	6	1	3	2			76.67
Employee knowledge	6		1	4	1		58.33
Value Chain Analysis and Logistics	6	1	3	2			76.67
Outbound Logistics-Supplier	6	1	3	2			76.67
Operations-Products	6	1	3	2			76.67
Product Knowledge	6	1	3	2			76.67
Product Selection	6	1	3	2			76.67
■ **right number of titles**	6		1	4	1		58.33
■ **right quantities**	6	1	3	2			76.67
■ **right time**	6	1	3	2			76.67
Inbound Logistics-Shops & Stores	6		1	4	1		58.33
■ **Standardized displays**	6	1	3	2			76.67
■ **standardized shelving**	6	1	3	2			76.67
■ **standardized uniforms**	6		1	4	1		58.33
■ **standardized services**	6		1	4	1		58.33
■ **standardized customer communication**	6		1	4	1		58.33
■ **Cleaning standards**	6	1	3	2			76.67
■ **standardized categories**	6	1	3	2			76.67
Policies and procedures	6		1	4	1		58.33
Order requests from salespeople	6		1	4	1		58.33
Customer Handling	6		1	4	1		58.33
Price of Product	6		1	4	1		58.33
Marketing & Sales	6		1	4	1		58.33
Promotion	6		1	4	1		58.33
Meeting Customer Specification	6		1	4	1		58.33
Target Market.	6		1	4	1		58.33
Size of Market.	6				6		30
Knowledge of Company and Product	6	1	3	2			76.67
IT development and Usage.	6	1	3	2			76.67

Table 3.8. Measurement of process Implementation After the application of Six Sigma to arrive at Six sigma yield.

Description of Processes and Sub Processes	100 Fully Implemented	80 Mostly Implemented	60 Partially Implemented	30 Least Implemented	0 Not Yet Implemented	%age Summary
Performance Parameters.			✓			60
Expected Growth.			✓			60
Product Quality		✓				80
Logistics Flow.		✓				80
Implementation of Process.		✓				80
Vision and Mission of the Company			✓			60
Organizational Structure		✓				80
Employee knowledge			✓			60
Value Chain Analysis and Logistics		✓				80
Outbound Logistics-Supplier		✓				80
Operations-Products		✓				80
Product Knowledge		✓				80
Product Selection		✓				80
■ **right number of titles**			✓			60
■ **right quantities**		✓				80
■ **right time**		✓				80
Inbound Logistics-Shops & Stores			✓			60
■ **Standardized displays**		✓				80
■ **standardized shelving**		✓				80
■ **standardized uniforms**			✓			60
■ **standardized services**			✓			60
■ **standardized customer communication**			✓			60
■ **Cleaning standards**		✓				80
■ **standardized categories**		✓				80
Policies and procedures			✓			60
Order requests from salespeople			✓			60
Customer Handling			✓			60
Price of Product			✓			60
Marketing & Sales			✓			60
Promotion			✓			60
Meeting Customer Specification			✓			60
Target Market.			✓			60
Size of Market.				✓		30
Knowledge of Company and Product			✓			80
IT development and Usage.			✓			80
Number of Processes Defined						2410 35
Average Ratio						69

Table 3.9. Customer Response to the following Parameters from the defined Processes

		Ranking								
Guaging Discription	**No. of Respondents**	**5 Excellent**	**%age Value of Respondents**	**4 Very Good**	**%age Value of Respondents**	**3 Good**	**%age Value of Respondents**	**2 Needs to be improved**	**%age Value of Respondents**	
Product Quality	56	12	21	41	73	2	4	1	2	
Product Selection/Knowledge Product	204	12	6	177	87	8	4	7	3	
Meeting Customer Specification/All Categries of Books	212	6	3	39	18	152	72	15	7	
Price of the Product	81	8	10	36	44	5	6	32	40	
Discharging Social Resposnsibility	17	7	41	4	24	5	29	1	6	
Customer handling	69	11	16	22	32	16	23	20	29	
Promotion	10	2	20	0	0	2	20	6	60	
IT Usage Sales Persons/ Cashiers Knowledge Uniform	No Direct Response was given to this processes. However, the summerized comment shows that there is customer dissatisfaction regarding these processes.									

Table 3.10. Defining of Employee Related Processes

	Before Application			After Application		
Description of Processes and Sub Processes	**Yes**	**on Process**	**No**	**Yes**	**on Process**	**No**
Sharing the vision of the company			✓			✓
Operation Manual			✓	✓		
Level of Education and skill required for the work			✓			✓
Work flow diagram			✓	✓		
Job Descriptions		✓			✓	
performance standards and objective standards			✓	✓		
Perormance evaluation			✓			✓
Meeting Work schedules			✓			✓
periodic appraisal system			✓			✓
Job requirement analysis			✓	✓		
Problem Detection Methods			✓	✓		✓
Training			✓	✓		
Reward System			✓	✓		✓
disciplinary Measure system			✓			✓

Table 3.11. Summary of Employee Related Defined Processes

		Responses by the Team for the level of the Defined Processes		
Application Stage	**Total No. of Processes**	**Yes**	**On process**	**No**
Before Application	14	1	0	13
After Application	14	5	3	6
%age increment of improvement		400%	100%	-54%

Table 3.12. Summary of Employee Related Defined Processes by %age

		Responses by the Team for the level of the Defined Processes		
Application Stage	**Total No. of Processes**	**Yes**	**On Process**	**No**
Before Application	14	7	0	93
After Application	14	36	21	43

Table 3.13. Summary of the responses and the analysis on Measuring of Defined Employee Related Processes.

Description of Processes and Sub Processes	No. Of Respondents	Score					Avarage%age Summary
		100	80	60	30	0	
Sharing the vision of the company	10		3		7		45
Operation Manual	3			1	2		40
Level of Education and skill required for the work	Admin Department Information						From the analyzed job description in relation to Education level, 60% of the staff assessed doesn't meet the requirement.
Work flow diagram	21		2	10	9		49
Job Descriptions	Admin Department Information						20%of the employment letter and job description doesn't have performance and objective standard
performance standards and objective standards	Admin Department Information						Except the Support staff, which is about 20% of the work force, the company prepared performance and objective standards which was not yet implemented properly.
Performance evaluation	Admin Department Information						No performance evaluation has been conducted by the company.
Meeting Work schedules	Minutes of the Meetings of						47% of the minutes assesed show lack of meeting dead lines.
periodic appraisal system	Admin Department Information						No periodic appraisal system has been installed.
Job requirement analysis	Admin Department Information						20% of the staff asses doesn'r have job discription.
Implementation of Problem Detection Methods	Minutes, Admin, Manual						40% of theminutes assed there is no indication of the procedures and manuals for the occurred problems.
Training	Minutes and Admin						From the minutes of administration discussion 40% of the assesed minutes doesn't show any link between the training and the job. Though they conducted training it
Reward System	Admin Department Information						No Reward system has been installed.
disciplinary Measure system	Admin Department Information						No disciplinary actions has been taken by Admin for poor conduct as per the labour law of the country and staff manual.

Table 3.14. Measuring of Defined Employee Related Processes to arrive at Six Sigma Yield

Description of Processes and Sub Processes	Summary of Measurement in %age	No. Of Respondents
Sharing the vision of the company	45	10
Operation Manual	40	3
Level of Education and skill required for the work	60	Admin Department Information
Work flow diagram	49	21
Job Descriptions	85	Admin Department Information
performance standards and objective standards	80	Admin Department Information
Performance evaluation	0	Admin Department Information
Meeting Work schedules	53	Minutes of the Meetings of Management and Sales representatives
periodic appraisal system	0	Admin Department Information
Job requirement analysis	80	Admin Department Information
Implementation of Problem Detection Methods	60	Minutes, Admin, Manual
Training	60	Minutes and Admin
Reward System	0	Admin Department Information
disciplinary Measure system	0	Admin Department Information
Total Score	612	
Number of processes	14	
Weighted Average %age	44	

Table 3.15. Financial Measure of defined processes and performance analysis (See Appendix D)

Defined processes for Financial Measure	2006 Financial year Taken as a Base Year	Performance of 2007	Increase (Decrease)
Balance Sheet Items			
Fixed Assets(Net)	100	57	(43)
Current Assets	100	110	10
Total Assets	100	107	7
Current Liability	100	72	(28)
Long term Liability	100		-
Total Liability	100	72	(28)
Net Current Assets	100	178	78
Capital	100	160	60
Net Assets	100	160	60
Income Statement Items			
Revenue(Excluding Extraordinary Income)	100	115	15
CGS(Excluding Extraordinary CGS)	100	112	12
Expense	100	94	(6)
Net Income Before Tax	100	167	67

Table 3.16. Financial Measure of defined processes and performance analysis

Defined processes for Financial Measure	2006	2006 Financial year Taken as a Base Year	2007	Performance of 2007	Increase (Decrease)
Ratio Analysis					
Return on Equity- NI/Equity	0.41	100	0.42	104	4
Return on Assets - NI/Assets	0.16	100	0.25	156	56
Fixed Assets Turnover - Sales/ FA	17.98	100	36.34	202	102
Debt to Asset Ratio - Liability/Assets	0.60	100	0.40	67	(33)
Debt to Equity Ratio - Liability / Equity	1.50	100	0.67	45	(55)
Working Capital Ratio - CA/CL	0.57	100	1.42	249	149

In the measurement phase the main objective is to measure the performance to arrive at findings that can be analyzed to check the improvement. When the performances are analyzed the causes and effect relation ship of the defined processes can be depicted. The defined processes have been measured in the Tables **(Table 3.2 to 3.16)** above.

3.2.3. Analysis of the Measured Processes

During the Analysis Process the Prevailing process of the company has been analyzed and their causes identified based on the measured processes pertaining to product and customers . Some of the operational activities of the company has also been analyzed from the excerpts of the responses obtained from the Questionaire.

a) Analysis of Measurement of the level of defining the processes (Table3.2, 3.3, 3.4 and 3.5):

- 11% of the processes, which add value to the company's product and customer service, have been defined properly before application of six sigma. This percentage increased to 54% after implementation of Six Sigma.

- From 57% of undefined processes there only remains 6% after the application. The 6% undefined ones are :
  - Right Number of Title
  - Defining and implementation of Policy and Procedures, and
  - size of Market

b) Analysis of the implementation of defined processes:

Referring to **Table 3.2, 3.3, 3.4 and 3.5**, the overall performance of Defining the processes increased by 375% while the undefined processes decreased by 90%. This doesn't mean that the ones defined are totally implemented and incorporated in the operation of the business. At least the processes that add value are known and can be gauged and bench marked.

Table 3.6 shows that on the average only 33% of the defined processes were implemented while this percentage increased to 69% after implementation**(Table 3.8).** Proper Six sigma application require the company to fall between 93 to 99% performance allowing the company to be between 3 to 4 sigma level. The improvement of 69% performance level depicts that more or less 70% yield which is two sigma level.

c) Analysis of customer responses for Critical processes:

The process which has direct impact and critical to customers have been measured and analyzed. Questionnaire was distributed to customers to gauge the performance of the processes. **Table 3.9** depicts the analysis of customer responses to the major critical Items in the process.

Product quality and knowledge: 73% of the respondents agree that the product quality is very good. 87% of the customers responded that the company knows what it sales.

Meeting Customer specification: 72% of the respondents state that the company is in a good position to meet their specification which is about 60% yield.

Price of Products: This process shows that the company is more or less serving two segments of the market. The higher level income group who can afford the existing price of the books (44%), and the lower level income group who have the desire to buy the

product but can not afford the existing price. 32% (This group is represented by customers who are customers of the company but can't afford to buy all the books they wanted) of the respondents wanted the company to improve its existing price.

Discharging Social Responsibility: 41%(Excellent work) of the respondents agree that the company is a socially responsible organization. And 24 % responded Very good which is followed by 29% Good. Only one respondent disagrees with the others.

Customer Handling: 32% of the respondents assigned very Good to handling Customers which has 80% yield followed by 23 % with a yield of 60% and 16% with a yield of 100%.

Promotion: 60 % of the respondents agree that there is a need for the company to properly promote itself.

There is customer dissatisfaction in the following areas:

- IT usage
- Sales persons/Cashiers knowledge of the product
- Uniform

In General there is no response level beyond 87% with a yield of 80% which is knowledge of the product, which is followed by 73% response for product quality. All the other responses are below 44%. No excellence (81 to 100% yield) has been reached by the company in all other processes believed to add value to the company.

d) Analysis of Employee Related Issues:

Referring to **Table 3.10 to Table 3.14**, in the measurement of Employee Related processes, except for Job description no process was defined before the application. After the application 13 more processes were defined from which only 5 processes were properly defined. 3 Processes were partially defined and there remains following processes to be defined:

- Sharing Vision of the company
- Meeting the required level of Skill and Education
- Evaluation of the performance of the employees
- Follow up of meeting schedules
- Periodic appraisal of work done
- Failure to take disciplinary actions when necessary

e) Analysis of Finance Related Activities:

The scope of this study is to look in to the six sigma application related to Product quality and customer service processes. As six sigma requires the integration of the overall activities of the company, it is necessary at least to measure and analyze some of the finance related processes.

Analysis of Financial Performance:

During the last two years the company was on the process of expansion which created instability in resource management. This led to high consumption of cash for covering Expenses mainly Salaries and Rent. From the Ratio Analysis it is observed that:

- The Return on Equity, which shows the efficiency of the company, and with which the company employs the share holder's capital earning per Birr, had increased from 0.41 to 0.42 (increment of 4%).

- The Return on assets, which is the allocated resource of the company in the process of generating Income, increased from

0.16 to 0.25.

- The Working Capital Turn over increased from 0.57 to 1.42.

Operationally, during 2007 there was an increase in terms of sales turn over. But, more attention was given only to the expansion rather than devising a system to control the expansion and the related costs. It is during this period the company moved to a new head office. It also opened 4 outlets and one distribution center making the total number of outlets to 12.

Analysis of Data Integrity Process:

From the Financial and operational manual it can be seen that all the finance and operation related activities has been designed in a way that it can depict every process. When it comes to implementation, no action is taken based on the manual except for those which is required by Inland Revenue Authority and External Auditors. Some of the problems are the following:

- Lack of proper data entry in to the Accounting system software.
- Lack of following up Monitoring Results.

- Delay in making Reports to management for major and critical decisions.
- Lack of Adherence to policy and procedures.

3.2.4. Improvement of the analyzed processes:

This stage leads to the determination of processes to have improvement or not. Processes are assessed with the perspective of value and benefit. In this study it is at this stage that the root causes for the low level of performance has been analyzed. The company tried to use systematic thinking of analyzing the cause and effect of the low level performance. The analysis phase indicates the following problems:

1) From 35 Processes -19 (above 50%)processes were partially implemented with a yield of 69%. See **Table 3.8.**
2) Customer's response show that Meeting customer specification, Pricing of products, customer handling and promotion are below 80% approval rate of customers.

3) IT Usage, Knowledge of Sales representatives &Cashiers, are not yet to the acceptance level of customers.
4) Employee related processes not yet fully defined and implemented.

The following are the causes for low level of performance:

Management Obstacle:

- Poor workflow design
    - Lack of harmony for the implementation of the defined processes between departments.
- Weak implementation of Policies and Procedures
    - No Adherence and commitment to follow up the designed processes, policies and procedures.
- Poor training
    - Not seriously taking in to consideration to apply the training in to practice.
- Lack of conducting performance appraisal
- Not Considering Incentives and Motivations
- Not maintaining proper Reward system
- Sloppy performers not properly disciplined

- Focusing on the strategic activities by disregarding the functional activities.

Employees Obstacle:

- The negative Feeling of employees to work in a new way
- Low motivation level of employees in undertaking the improvement process.
- Lack of proper knowledge in using new system .
- Lack of understanding what is going to be the outcome from the new system.
- Absence of Accountability and responsibility (Sloppy behavior, job Description)
- little institutionalized buy-in to the Shama vision

3.2.5. Control of the Improved Processes

In this last phase of six sigma application, the long processes of a project will come to its end point. At this stage the processes were Dfined, **M**easured, **A**nalyzed, and **I**mproved. They will be assessed either to continue as they are or not. There is a need to control and validate the analysis. From the analysis of the Minutes of the meetings of company it was decided to change

the course for the failed processes. Management and the employees discussed to arrive at a better solution. Based on the suggestion, Plan of action to improve the existing problem was formulated.

a) Management Solution:

- Designing of Proper Human Resource Policy
  - Proper Job Description
  - Incorporate Accountability & Responsibility
  - Proper Reward system
  - Implementing Performance evaluation
  - Incorporate work flow designs in the routing activities
  - Creating harmony between departments to carry out the defined processes.

- Intensive Training of staff for the application of new system
  - Understanding of sequence of Tasks
  - Proper communication system

- Understanding of problem solving mechanisms

- Organize proper Marketing and promotion policy
- Design a system for standards and bench marks

b) Actions already taken :

- One Training was given to the key staff on Neuro Linguistic programming.
- Mind mapping process software was installed to be used by senior mangers to define and map the processes in a new form that is be better than the already existing defined processes. Training was given to the concerned employees.
- Management is in the process of assessing the existing data process system to arrive at a better solution.
- Due attention started to be given to the functional departments and activities.
- Pilot program is under way to improve data integrity process.
- Standardized Job description was prepared to Finance and sales staff.

c) Problems not yet addressed

Product Related:

- Defining and implementing policies and procedures for ordering the product.
    - Right Number of titles.
    - Size of Market.
    - Product Selection criteria.
    - Improvement of price of products.

Customer Related:

- Meeting Customer specification.
- Customer handling Mechanisms.
- Promotion.

Employee Related:

- Proper IT usage.
- Uniform.
- Creation of shared vision.
- Evaluation of performances.
- Periodic appraisals.

- Standardized Job description for all employees including Reward and Disciplinary Actions.

Finance and Operation related:

- No major action to increase sales turnover and decrease cost.
- No Periodic Reporting for management.
- No follow up or adherence to already existing policies and procedures.

Part Four

4. Conclusion and Recommendation

4.1. Conclusion

After the application of Six Sigma, Shama Plc gained the following improvements:

1. It helped the company define its processes, which were taken previously for granted. In this regard the company reached the level of 94% yield to define its processes. Only 6% of the processes were not yet defined. From the 94%, 54% of the processes were properly defined and documented. 40% of them are on the process of identification and documentation.

2. When we compare the Implementation of the defined business processes it has reached 69% yield. This yield was 33% before the application of LSS. This shows that the company increased its sigma to 2 Sigma Level from that of less than 1.5 Sigma Level.

3. The analysis of customer response depicts that the highest percentage response is 87% with a yield of 80%. No excellence has been reached by the company. The weighted average of the Very Good performance is 70% which is 2 Sigma level (87%*80%).

4. When it comes to employee related processes the Average yield is 44% which is 1.6 sigma levels.

5. From the financial performance we can see improvements in the working capital, discharging of debts, Return on Investment and Return on Assets. Though there is increase in Sales Turnover it is not satisfactory to compensate the increase in Expenses.

During the application of the Six Sigma theory the following weaknesses of the Shama were identified:

- No proper data management and reporting systems were installed.
- No proper follow up for the improvement and maintenance of the system was installed..

- No Adherence to policy and procedures was seen.

The project also indicated that Lean Six sigma has contributed the following to Shama Plc.

- It forced the management to make processes simple and routine.
- It prohibited the company from using shortcuts without analyzing each and every process.
- It motivated employees to use simple tools to gauge their performance, design follow up mechanisms, and start to nurture good employee management relationship. (Though this stage has not yet been finalized).
- It helped Shama Plc to become result oriented and pin point the deficiency of the business processes.
- It allowed Shama to easily transfer knowledge as a result of the defined and well documented processes.
- Existing Communication gap has been improved.

4.2. Recommendation

To increase its Sigma level to 3 or 4 Shama shall perform the following:

1. From the 35 defined processes only 19 processes were implemented. This was due to lack of poor work flow design, weak implementation of policies and procedures and lack of on job training to work based on the defined processes. The management as well as the employees should adhere to the existing financial and operational policies &procedures of the company. The management and the employees, who participated in the implementation of LSS, need to properly follow and document the impact of the implementation of LSS process to use it for the next stage of **DMAIC**.
2. Customer response show that Meeting customer specification, price of the product, customer handling, and promotion are below 80% approval rate of customers. The company must make a market research to know the customers demand. From the responses, it was observed that the company has two

segments of customers. The higher income group who can afford to buy the books (44%) and the low level income group (32%) who wanted the company to revise its prices. Therefore, the management should target each segment differently and also consider decreasing the price of the books (Quality books at a reasonable price) so as not to loose specially the low income segment of customers.

3. From the implementation of the defined business processes not bringing the right titles (60% yield); not knowing the size of market (30% yield); not segmenting the target market (60% yield) contributed to the low level performance of Shama. The company must make a market research to properly document and identify these processes as they contribute to the increment of the market share of the company. Such will also improve the capital and reserve of the company for further expansion and growth.

Finally Shama Plc didn't properly document the implementation, monitoring and evaluation of the business processes. This created much problem in the processes of studying the documents for this project and such made Shama Plc to score less grade for this

section of the evaluation. Having proper documentation is one of the preconditions in applying LSS. Companies who consider applying LSS shall, therefore, give due attention to documentation before embarking on LSS implementation.

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Appendix A

Addis Ababa University

Faculty of Business and Economics

Department of Accounting and Finance (Postgraduate Program)

(Questionnaire to be filled by Shama Plc Staff & cutomers)

Dear Respondent,

I am undertaking a project paper entitled "**Evaluation of the Implementation of lean Six Sigma: The Case of Shama Plc**" for MSc degree in Accounting and Finance at Addis Ababa University.

The questionnaire is designed to gather information relating to the topic of the study. You are therefore kindly requested to take your precious time to fill and return the questionnaire.

I convey my special thanks for your concern, objectivity and diligence while responding to the questions.

I thank you again,

Neima Abduljelil

Questionaire No. 1

Please make a ✓mark on the level of the defined activities before and after the application of Lean six sigma.

	Before Application			After Application		
Description of Defined Processes and Sub Processes	**100% Fully Defined**	**On Process**	**0% not yet defined**	**100% Fully Defined**	**On Process**	**0% not yet defined**
Performance Parameters.						
Expected Growth.						
Product Quality						
Logistics Flow.						
Implementation of Process.						
Company						
Organizational Structure						
Employee knowledge						
Logistics flow.						
Outbound Logistics-Supplier						
Operations-Products						
Product Knowledge						
Product Selection						
■ **right number of titles**						
■ **right quantities**						
■ **right time**						
Stores						
■ **Standardized displays**						
■ **standardized shelving**						
■ **standardized uniforms**						
■ **standardized services**						
communication						
■ **Cleaning standards**						
■ **standardized categories**						
Policies and procedures						
Order requests from salespeople						
Customer Handling						
Price of Product						
Marketing & Sales						
Promotion						
Meeting Customer Specification						
Target Market.						
Size of Market.						
Product by Customers						
IT development and Usage.						

Questionaire No. 2

Please make a ✓mark on the level of measurement of the defined activities before the application of Lean six sigma.

Description of Defined Processes and Sub Processes	Before Application					
	100 Fully Implemented	80 Mostly Implemented	60 Partially Implemented	30 Least Implemented	0 Not Yet Implemented	Avarage% age Summary
Performance Parameters.						
Expected Growth.						
Product Quality						
Logistics Flow.						
Implementation of Process.						
Company						
Organizational Structure						
Employee knowledge						
Logistics flow.						
Outbound Logistics-Supplier						
Operations-Products						
Product Knowledge						
Product Selection						
■ **right number of titles**						
■ **right quantities**						
■ **right time**						
Stores						
■ **Standardized displays**						
■ **standardized shelving**						
■ **standardized uniforms**						
■ **standardized services**						
communication						
■ **Cleaning standards**						
■ **standardized categories**						
Policies and procedures						
Order requests from salespeople						
Customer Handling						
Price of Product						
Marketing & Sales						
Promotion						
Meeting Customer Specification						
Target Market.						
Size of Market.						
Product by Customers						
IT development and Usage.						

Questionaire No. 3

Please make a ✓mark on the level of measurement of the defined activities after the application of Lean six sigma.

	Before Application					
Description of Defined Processes and Sub Processes	**100 Fully Implemented**	**80 Mostly Implemented**	**60 Partially Implemented**	**30 Least Implemented**	**0 Not Yet Implemented**	**Avarage% age Summary**
Performance Parameters.						
Expected Growth.						
Product Quality						
Logistics Flow.						
Implementation of Process.						
Company						
Organizational Structure						
Employee knowledge						
Logistics flow.						
Outbound Logistics-Supplier						
Operations-Products						
Product Knowledge						
Product Selection						
■ **right number of titles**						
■ **right quantities**						
■ **right time**						
Stores						
■ **Standardized displays**						
■ **standardized shelving**						
■ **standardized uniforms**						
■ **standardized services**						
communication						
■ **Cleaning standards**						
■ **standardized categories**						
Policies and procedures						
Order requests from salespeople						
Customer Handling						
Price of Product						
Marketing & Sales						
Promotion						
Meeting Customer Specification						
Target Market.						
Size of Market.						
Product by Customers						
IT development and Usage.						

Questionaire No. 4

Please make a ✓mark on the level of understanding of the defined activities related b to Employees.

	Score			
	100	**80**	**60**	**30**
Do you understand the Vision of Shama Plc?	Yes Fully aware of it	Mostly understand it	HAVE Good knowledge of it	Do not know the impact
Have you implemented the operation manual in your area?	Fully implemented	Mostly implemented	Partially implemented	Fairly implemented
Do you know the over all operation of the company?	Yes Fully aware of it	Mostly work based on schedules	Some times I work with the other departments	Do not want to get involved since it takes my time

Questionaire No. 5

Please make a ✓mark on the level of the activities related to cutomer service for the following processes.

	Ranking			
Guaging Discription	**5 Excellent**	**4 Very Good**	**3 Good**	**2 Needs to be improved**
Product Quality				
Product Selection/Knowledge Product				
Meeting Customer Specification/All Categries of Books				
Price of the Product				
Discharging Social Resposnsibility				
Customer handling				
Promotion				
Other Remarks				

Appendix B

The following documents have been used to assess employee related issues.

1. Job description Vis-à-vis Education level of the staff has been studied to assess whether the employees fulfill the requirement or not.
2. The employment letter and job description of the staff has been analyzed to assess whether the letter includes performance and objective standard.
3. The minutes of the company have been studied to see the issues related to the defined processes.

Appendix C

Six Sigma Level Calculator
Taken from www. Isix

Yield	Long - Term Sigma	Short - Term Sigma	Defects per Million	Defect per 100
100.00000%		Over 6	0	0
99.99966%	4.5	6	3.4	0.00034
99.99946%	4.4	5.9	5.4	0.0005
99.99915%	4.3	5.8	8.5	0.008
99.99866%	4.2	5.7	13	0.001
99.99790%	4.1	5.6	21	0.002
99.99680%	4	5.5	32	0.003
99.99520%	3.9	5.4	48	0.004
99.99280%	3.8	5.3	72	0.007
99.98920%	3.7	5.2	108	0.01
99.98400%	3.6	5.1	159	0.015
99.97700%	3.5	5	233	0.023
99.96600%	3.4	4.9	337	0.033
99.95200%	3.3	4.8	483	0.048
99.93100%	3.2	4.7	687	0.068
99.90000%	3.1	4.6	968	0.096
99.87000%	3	4.5	1,350	0.135
99.81000%	2.9	4.4	1,866	0.186
99.74000%	2.8	4.3	2,555	0.255
99.65000%	2.7	4.2	3,467	0.346
99.53000%	2.6	4.1	4,661	0.466
99.38000%	2.5	4	6,210	0.621
99.18000%	2.4	3.9	8,198	0.819
98.90000%	2.3	3.8	10,724	1.07
98.60000%	2.2	3.7	13,903	1.39
98.20000%	2.1	3.6	17,864	1.78
97.70000%	2	3.5	22,750	2.27
97.10000%	1.9	3.4	28,716	2.87
96.40000%	1.8	3.3	35,930	3.59
95.50000%	1.7	3.2	44,565	4.46
94.50000%	1.6	3.1	54,799	5.48
93.30000%	1.5	3	66,807	6.68
91.90000%	1.4	2.9	80,757	8.08
90.30000%	1.3	2.8	96,801	9.68
88.50000%	1.2	2.7	115,070	11.5
86.40000%	1.1	2.6	135,666	13.5
84.10000%	1	2.5	158,655	15.8
81.60000%	0.9	2.4	184,060	18.4
78.80000%	0.8	2.3	211,855	21.2
75.80000%	0.7	2.2	241,964	24.2
72.60000%	0.6	2.1	274,253	27.4
69.10000%	0.5	2	308,538	30.8
65.50000%	0.4	1.9	344,578	34.4
61.80000%	0.3	1.8	382,089	38.2
57.90000%	0.2	1.7	420,740	42
54.00000%	0.1	1.6	460,172	46
		1.5	480,000	

Appendix D

Shama Plc
Balance Sheet & Income Statement
Extracted from the Financial Report of 2006 & 2007

Defined processes for Financial Measure	2006	2006 Finacial year Taken as a Base Year	2007	Performance of 2007	Increase (Decrease)
Fixed Assets(Net)	657,840.73	100	374,197	57	(43)
Current Assets	10,391,623.50	100	11,472,723	110	10
Total Assets	11,049,464.23	100	11,846,920	107	7
Current Liability	6,620,858.46	100	4,746,453	72	(28)
Longterm Liability	-	100	-		-
Total Liability	6,620,858.46	100	4,746,453	72	(28)
Net Current Assets	3,770,765.04	100	6,726,270	178	78
Capital	4,428,605.77	100	7,100,467	160	60
Net Assets	4,428,605.77	100	7,100,467	160	60
Revenue(Excluding Extrordinary Income)	11,824,736.90	100	13,597,569	115	15
CGS(Excluding Extrordinary CGS)	6,468,472.60	100	7,253,623	112	12
Expense	3,558,549.63	100	3,339,588	94	(6)
Net Income Befor Tax	1,797,714.67	100	3,004,357	167	67