Creation of a Library for a Religious Organization Using the Lean Six Sigma Methodology

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Abstract — *Due to the economic situation during this 21th century, each individual, corporation, industry, service, and any kind of business, is looking for better ideas to improve their day to day jobs. It is not a surprise then that a Church is also exploring new ways of opportunity to facilitate their community services. One of these aspects is the way that the church team leaders prepare themselves to be able to provide the best quality service to the community where they had been established. One important way is the creation of a library that includes relevant information about how to understand the Bible in a way that the quality of their life improves as a result of a better understanding of it. This is what this project is about. It is related to Church that has over 500 books that need to be organized in such a way that they are easy to retrieve and manage. This project was developed using the Lean Six Sigma tool, specifically the DMAIC concept. As a result of this project, a Book Library with it specific data base was created as a community service to this church.*

Key Terms — *DMAIC, Six Sigma, 5S, Lean.*

INTRODUCTION

The actual economic situation has created many opportunities to the whole world. Along with the current challenges that people need to phase, it is a social condition that affect everybody's life around the world. In able to deal with this phenomenon, the human being is looking for motivational and religious help. The churches around the world are changing along with the communities that surround them. This is why a concept like the Lean Six Sigma is applicable for their use as well. Tools from Six Sigma and Lean Manufacturing like DMAIC, Project Charter, Voice of the Customer, and Kaizen event can be implemented in a church library creation.

The primary problem to be solved by this project is to improve how fast a necessary book is find out. Among the primary problems that was hoped to be improved with this design project was the lack of ability to define where the library gaps in terms of area of interest are. By detecting it, the church team leader may know what books need to be purchased according to their needs. The Lean Six Sigma and the Project Management concepts will be applied to implement this project.

RESEARCH DESCRIPTION

The research is about the application of the lean manufacturing and the six sigma concepts in the developing process of a library for the use of a religious organization. Religious and literature books will be selected for the scope of this project.

RESEARCH OBJECTIVES

The indicated church has the need to be able to find the books by different areas or categorization depending on the specific need of the individuals that belong to the organization.

Actually, when a specific book is required, it is really difficult to find it due to the lack of organization and space. Due to the cabinet space limitations, the books will be organized by book size, in order to maximize the cabinet space. As a consequence, the books will be mixed in terms of area of interest, like motivational, faith, literature, etc. In order to be able to identify the books

location, a data base will be developed. The data base will include the books location, author and title. The area of interest will be added to the religious books only. The data base will be developed in the Spanish language, as a customer requirement. By adding the area of interest, even books that are not considered available, may be purchased for the benefit of the organization. As a consequence of this project, a new storage unit will be design and the books will be located using a library system. Customer prefers to have the book organized by size according to the designed cabinet space. The implementation of this project will significantly reduce the necessary time to locate specific books requested by the community, and will identify if there is any specific area of need that it is not covered by the existing inventory of books.

RESEARCH CONTRIBUTION

By applying the lean manufacturing and the statistical and six sigma concepts, as well as the overall knowledge acquired during the Master Degree studies:

- Library Cabinet Design;
- Be able to design and develop the Library Data Base for easy retrievable process;
- Reduce the necessary time searching for specific books.

Concepts like Project Charter, VOC, Stakeholder Diagram, 5 S, Kaizen Event, and SIPOC concepts will be applied to design the new library.

LITERATURE REVIEW

Lean Manufacturing began in the 1950's at Toyota Motors with their manufacturing philosophy [3].

- Toyota Philosophy: "There are no bad people – there are only bad processes. At Toyota, we get brilliant results from average people managing a brilliant process. Others get average results from brilliant people managing a broken process."

Lean was based on Henry Ford's philosophy of low cost, fast lead time and high quality and Deming's 14 Points of Total Quality Management (TQM)

- Henry Ford: "Every Improvement in a process is temporary because there is always a better way."
- W. Edwards Deming: "If you can't describe what you're doing in a process, you don't know what you are doing. It is not enough to do your best; you must know what to do, then do your best. It is not necessary to change. Survival is not mandatory."

Six Sigma

Six Sigma was originally defined as a metric for measuring defects and improving quality to reduce defect levels below 3.4 Defects per Million Opportunities (DPMO). [1]

- Created by Bill Smith and implemented at Motorola in 1986-1987.
- Six Sigma was perfected as a management philosophy with Jack Welch at General Electric in the 1990's.
- Six Sigma is a means to identify and prevent defects in manufacturing processes managing process variations that cause defects: "Variation is evil." - Jack Welch, 1998.

But Six Sigma did not:

- Address the issue of lead time and importance of process speed.
- Have tools associated with lead time reduction.

Lean Six Sigma (LSS) is a business transformation technique that allows an organization to become more customer focused by improving the effectiveness and efficiency of business processes. Assumes that within every business process, there is a perfect business process that is being disguised by non-value added activities/waste. Applies a standard methodology that allows the organization to identify and eliminate waste and variability from its business

processes. This allows us to focus on potentially redesigning, as well as improving the business processes. "Lean Thinking" fostered by training and project implementation will allow business to facilitate the establishment of a continuous improvement culture. LSS deployment is a journey - not an event - focused on improving productivity and inculcating the culture of continuous improvement into the organization. Goal is to optimize resources by increasing productivity without sacrificing quality [4].

DMAIC Method [2]

DMAIC (Figure 1) is a disciplined and systematic approach to business process improvement that includes the following phases:

- Define – Agreement on what the project is to establish the project boundaries.
- Measure – Collect data on the business process that is being reviewed.
- Analyze – Look at the business process (based on the facts you gathered during "Measure") and search for the key factors that have the biggest impact on process performance.
- Improve – Make changes in the process or create new processes that eliminate waste and defects.
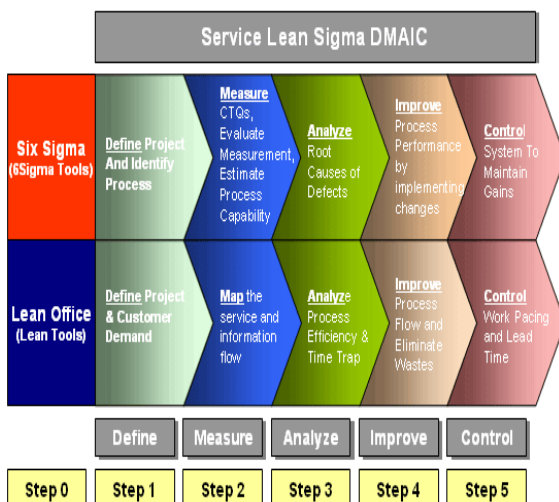- Control – Implement the changes in such a way that they will last.

Figure 1
Service Lean Sigma DMAIC [6]

Lean Manufacturing Basic Components [4]

The Lean Manufacturing basic components are key to a successful project and they are (3):

Specify Value
- Customer Determines Value.

Identify the Value Stream
- Processes Used to Create Value;
- Value Stream Analysis.

Make Value-Creating Steps Flow
- Remove Waste ("Muda"). The Muda's are seven (Figure 2) and will be described as follows:
  - o Over production ahead of demand,
  - o Waiting for the next process step or information,
  - o Transporting materials non necessary,
  - o Over processing,
  - o Inventory that is more than bare minimum,
  - o Motion by employees that is unnecessary,
  - o Producing non-conforming parts.

Customers Pull Products or Services from the Value Stream
- Provide Only What's Needed When It's Needed.

Perfection
- Continuous Improvement.

Figure 2
Types of Muda (Waste) [7]

For each area of waste, examine each process step to determine if waste occurs in the operation and how to remove the waste from the production system.

Kaizen means change (Kai) to become good (zen). It is a philosophy of continuous improvement emphasizing employee participation. Every process is continuously evaluated and improved in terms of time, resources, quality, and other aspects relevant to the process. A Kaizen event is a specific activity where special groups organize to apply kaizen principles to specific areas or subjects.[5]

5 S Methodology

5 S is a methodology for organizing, cleaning, developing and sustaining a productive work environment (Table 1) [4].

Table 1
5 S Methodology

Pillar	Meaning	5 S WORD
1	Organization	Sort
2	Orderliness	Set In order
3	Cleanliness	Shine
4	Standardized Clean UP	Standardize
5	Discipline	Sustain

METHODOLOGY

For the development and to achieve the objectives of this project lean six sigma principles were used. The tool used was the DMAIC methodology.

Define Phase

The Define is the first phase on the DMAIC methodology. The purpose of this phase is *"to have the team and its sponsor reach agreement on the scope, goals, and financial and performance targets for the project"*. Tools used during this phase were: Project Charter, VOC, SIPOC, and Stakeholder Diagram. The project charter was the first step taken for the development of the project and consists of:

- Problem statement – Covers what is occurring, when did this problem start, where it is occurring and the extent of the problem or opportunity.
- Business case – Give reasons why the project is important investment of time and other resources
- Financial Impact – Mentions any financial benefits.
- Goal Statement – Refers to the desired state of the current performance as to meet or exceeds the customer's need.
- Project scope – Explain extend and boundaries of the project.
- Project plan – Shows dates established to complete each phase.
- Team selection – Members of the team who will contribute, participate directly and/or indirectly on the development of the project.
- Deliverables – Project outcomes.

After the Project Charter development, an interview with the customer impacted by the project was performed. The interview was to obtain the VOC, a tool to know and understand what the sponsor and customer really wants in a way to bring them the product/service and results they are expecting. Afterward, a SIPOC diagram was developed. The SIPOC presents a high level map of the process and helped to identify the basic elements of the process. Suppliers include the pastor and the church team members, as well as the cabinet supplier. This map is called SIPOC because it identifies the process Supplier, Input, Process, Output, and Customers. A stakeholder diagram was generated to identify the required resources. The Stakeholder Diagram helps to identify the people impacted by the change due the project and the role each have in the development of the project. The involvement of stakeholders is important *"to the success of the change"*. A before and after process mapping was developed also to identify how the process changes will impact the process flow.

Measure Phase

The measure phase is the step in which data is collected to know and understand the process itself and "current state of the process". For this purpose, a 100 % of the book data will be collected by title, author, location, and area of interest (religious only).[3]

Analyze Phase

The third phase, Analyze Phase, is used to identify root causes of the problem and solutions to solve them to achieve project goals, which in this case is to create a library and it corresponding tracking system. Cause and Effect Diagrams or Fishbone Diagrams is a tool used to identify and arranged by category the possible causes of the problem. These possible causes are identified either by brainstorming or interviews to the people involved and affected by the problem. Categories on the Fishbone Diagram vary depending on the problem to be solved; these can be Materials, Methods, and People, or Others. [3]

Improve Phase

During the Improve Phase, solutions for each root cause are selected and an action plan to implement them is prepared. During this phase, a kaizen event and a 5 S will be performed to organize the books following the design cabinet space and book size, and then a data base will be generated including the book title, author, area of interest (For Religious only), and location. Also, a MUDA (Waste) determination will be performed.[3]

Control Phase

The Control Phase is the last phase of the DMAIC methodology and it is the final step taken for the completion of the Design Project. The purpose of this phase is to achieve and maintain improvements during the process. During this phase the project work is completed project and the improved process is given to Process Owner together with the established control plan and procedures to maintain the improvements made. [3]

RESULTS AND DISCUSSIONS

This section presents and discusses the results obtained during the DMAIC process: Design, Measure, Improve, and Control phases. The main purpose of this project was to generate a library of over five hundreds (500) books for a religious organization using the tools provided by the Lean Six Sigma concepts. Methodology used to address the problem will be explained in detail and how its help to facilitate the project implementation process. As a key step during this phase, a Project Charter (Table 2) was generated to formalize the DFSS (Define for Six Sigma). The basic purpose of the Project Charter is to capture the vision of the project, to convey a feeling of enthusiasm, to set direction of the project team, and to define the parameters of the project.

Table 2
Project Charter

Problem Statement:	For years, a significant quantity of books used by a religious organization had been stored in boxes with any kind of definition or traceability process. Actually, for the benefit of both, a better organization is required because they need that the books are easy retrievable.
Business Case:	Resources on this are required because there is a specific need to be able to find the books whenever they are required.
Financial Impact:	Project will improve service level to the religious organization. No direct impact to financials.
Goal Statement:	Provide to the religious organization, a formal library for their use according to the required needs of the community. This project is considered a community service.
Project Scope:	Project includes over 500 religious and literature books.
Team Selection:	Team Leader, Pastor, 2 Helpers, and Cabinet Supplier.
Deliverable 1:	Storage Cabinet
Deliverable 2:	Data Base including the book information classified by location, Title, Author, and Area of Interest.
Risk:	Lack of space in the designed cabinet. en the team

When the team has identified all the customers of the project processes, it was found out the customer's need and expectation using the Voice of the Customer tool (VOC; Table 3). It was developed to identify the critical requirement of the customer. A SIPOC Diagram and a Stakeholder diagram were developed to continue the team activities (Figure 3 and 4, respectively).
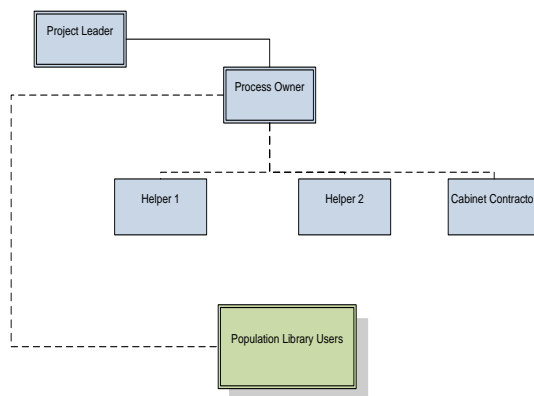
Table 3
Voice of the Customer (VOC)

Customer	Customer Needs	Critical to Satisfaction (Delivery CTD)
Process Leader and Process Owner	Creation of a Library with its corresponding tracking system.	Easy retrievable of specific Books either by area of interest, title, or author.

Figure 3
SIPOC Diagram

Figure 4
Stake Holder Diagram

Several Process MUDA (Waste) had been identified as follows (Table 4):

Table 4
Process MUDA (Waste)

Muda	Activity
Over Production Ahead of Demand	When an urgent book is required, over check of several boxes ahead of demand is required
Waiting for the Next Process Step of Information	During the over check process, several boxes are waiting to try to find the required book.
Transporting materials unnecessarily	Boxes that are not needed are moved unnecessarily.
Over processing	When a specific is overlook during the process, over processing is the only option to find the book.
Motion by employees that is unnecessarily	Persons need to move boxes that are not necessary during the searching process.

After the Define phase, the team had a project charter, an overview of the process to be improved, information the customer consider critical to quality, a statement of the problem, A SIPOC, and a Stakeholder diagram. Afterward, a Data Collection Plan was developed to implement the Measure Phase of the methodology. It was established to determine when the data will be collected and how.

By measuring the process, the extension of the problem will be established. In addition during the measure process, a Pareto chart was developed to determine where are the areas of opportunities for specific books that may be required and are not available in the current book inventory. For the Project Metric, due to the high variability of the current process, (from one day to several days), it was determined to measure only the process after remediation process. For this phase, the following data collection was established: Design of the Book Cabinet (Figure 5).

A small portion of the Book Data Base Library was included for reference purposes (Table 5). A Pareto Chart to identify the areas of opportunities was evaluated (Figure 6).

Analyze Phase

In the Analyze phase we will start breaking the problem into its vital few factors. The Analyze phase is the portion of the project where the black

belt will work closely with the team to review the data that has been collected.
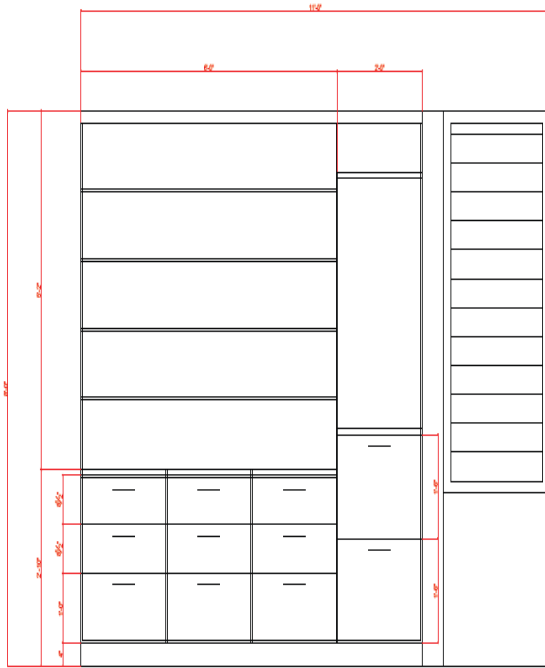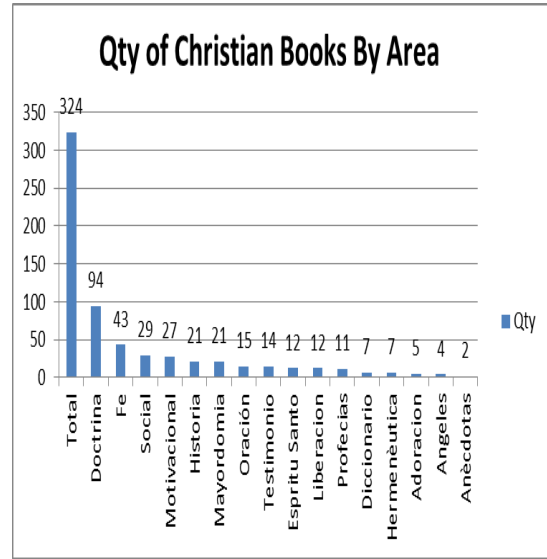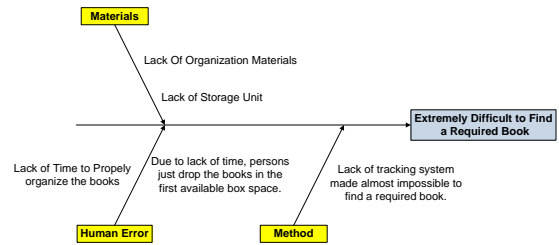

Figure 5
Book Cabinet Design

Table 5
Example of Data Base Library

Loc.	Título	Area	Autor
8-1	Adoremos	Adoración	Marcos Witt
8-73	Desde la Perspectiva de Dios	Adoración	Tommy Tenney
8-77	Generación de Adoradores	Adoración	Emmanuel Lucas
9-64	Mas cerca de la Llama	Adoración	Charles R. Swindoll
10-1	La Alabanza es Dinamita	Adoración	Don Gossett
8-2	Frases y Anécdotas de Hombres Celebres	Anècdotas	J. A Del Castillo

A Cause and Effect Diagram was generated to determine the main root cause of the problem (Figure 7).

Figure 6
Pareto Chart By Categories

Figure 7 Cause and Effect Diagram
Improve Phase

This phase is usually initiated by selecting those products or process performance characteristics that must be improved to achieved the goal. For this specific project, the process performance was the library generation with its corresponding data base for book location.

For this phase, a 5 S and a kaizen event had been implemented, as follows:

Using the 5 S concepts and a kaizen event, 100% of the entire books inventory was organized by assigned Book Location, Book Area of Interest (Religious Only), and Book Author.

For purpose of this report, only a small section of the data base was as part of this written report and a hard copy of the full data base will be provided to the project sponsor and the project final customer.

A Spanish SOP (Standard Operating Procedure) was created for the maintenance of the system, and pertinent persons from the church will be train accordingly to ensure the consistency and follow up of the established library system. This SOP will be provided to the project sponsor also.

CONCLUSIONS AND RECOMMENDATIONS

Lean Six Sigma is an extremely successful tool to solve and improve processes. Specially, the DMAIC concept is a well-designed tool to organize, implement, improve and maintain a new concept or improved an existing one. During the experience, it was proved that techniques like the 5S were especially helpful. The 5 S processes were very intensive due to the quantity of books necessary to complete the project. The project gave to the owner the expertise to know what the best areas of opportunity to improve the current state of the process. For example, Books from the area of Adoration, Angels, and Christian stories are necessary to reinforce the necessary religious library. Now, the library is fully prepared to reach the desired book from a specific area of interest in a matter of minutes. This project allowed me to implement the Master Degree knowledge and as a consequence to be able to help others to learn the DMAIC concept and be able to implement it on other projects. A recommendation is that no matter what the area for improvement is, these improvement concepts may be apply, like my project demonstrated. Places like the industry, the banks, the hospitals, the schools, our own homes, may be an excellent target for improvement.

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