Cost Improvement Tracking System to Promote a Stream Lined Program

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Summary - *This project presents the development of a process supported by a technology mechanism to facilitate the tracking and management of programs implemented by organizations to lower the cost base and/or promote efficiencies. As organizations grows, the complexity to identify and accurately track the success of a cost improvement initiative can be extremely challenging, in many instances, losing evidence of the actual outcome of a given cost improvement project. This project is based on similar applications implemented and led by the author in former jobs but has been developed with a simpler and pragmatic approach in a cost-effective platform.*

Key Terms – *Cost Improvement, Cycle Time, Efficiency, and Lean Six Sigma.*

THEME PRESENTATION

The Cost Improvement Program (CIP) is a critical process to ensure organizations are continuously looking for opportunities to improve their business processes and to find synergies with direct or indirect impact to their business bottom line. A cost improvement program should be structured in a way that top management is fully engaged, departmental management is accountable for cascading the program downstream, project managers perform timely updates of the project activities and all supportive functions, such as Accounting, who provide support to ensure committed savings are in the right track. Organizations with a structured CIP Process are in a solid position to maintain their spending budget in control and find productivities that will either benefit their overall cost base (hard savings) or might improve the capacity availability of resources (soft savings). Even though a cost improvement program relies, to a great extent, in the business process defined to deploy the activities required by the program, including, but not limited to the roles and responsibilities of the participant, no specialized technology solutions are built to support this process that could have significant process variations when comparing organizations sizes and complexities. This aspect triggers the substance and intention of this project of developing a low-cost and pragmatic solution to support and facilitate the creation, forecasting and tracking of a Cost Improvement Project.

LITERATURE REVISION

An organization can be viewed as a living entity moved by many co-dependent and integrated processes. It can be concluded that an organization performance is the reflection or sum of all its parts or processes individual performance. From this perspective, organizations across the globe invest in finding ways to review, maximize, and optimize individual process to benefit the overall performance of their entity, engaging in methodologies designed to achieve this objective [1]. The most utilized methodologies are the following:

1. <u>Six Sigma</u> – Methodology focused on reducing process variations and, consequently, defects in processes. While less defects exists, better process performance is achieved. Originally implemented by Motorola, it became the angular stone of General Electric's overall strategy and since then it is being used across the globe to improve and optimize manufacturing and business processes. The main goal of the six-sigma methodology is to measure defects through a statistical and systematic approach to correct these, implement improved and sustainable processes, and deliver perfect products and services. Six Sigma provides two sub-methodologies, DMAIC for improving existing processes and DMADV for creating new processes. DMAIC stands for Define, Measure, Analyze, Improve and Control while DMADV is the

acronym for Define, Measure, Analyze, Design and Verify. DMAIC, the most used one, follows the following steps:

1.1. DMAIC:

1.1.1. *Define* – The problem statement or project goal is clearly defined. This phase focus in identifying the problem, defining requirements for the project, and setting goals for success [2].

1.1.2. *Measure* – Focused in understanding the current state of the process and collect data on the process speed, quality, and costs that can be used to determine the underlying causes of the problem.

1.1.3. *Analyze* – During this phase, theories of root causes are formulated, these theories are confirmed by means of analyzing data, and the root cause(s) of the problem is identified. The identified and verified cause(s) will form the basis for the solutions in the next phase, Improve.

1.1.4. *Improve* – Possible solutions are evaluated, best solution selected, and an implementation plan is designed. The goal of this phase is to demonstrate with facts and data that proposed solutions will solve the problem by addressing the root causes found.

1.1.5. *Control* – The Control phase will deliver a monitoring plan, standardized process, documented procedures, and response plan. The improved process or Future State is deployed and transferred to the process owner. After this stage, the organization will be achieving sustainable and high-quality production of goods and services based on the improved deployed process.

1.2. DMADV:

1.2.1. Define, Measure and Analyze phases are essentially the same as the DMAIC process previously explained.

1.2.2. *Design* [2] - This phase is where DMADV projects differs from DMAIC projects. At this phase a new process is designed based on a set of solutions tested for the new process. It involves some of the solutions prototyped and tested above, process mapping, workflow principles, and building new infrastructures to support the process to be deployed. This infrastructure includes equipment, software, tools, and human resources.

1.2.3. *Verify* – Very similar to the Control phase of the DMAIC sub-methodology, where the designed process is piloted and verified to ensure it process goals and customer needs. Upon a successful verification, the process is implemented.

2. Lean Manufacturing – Methodology developed by Toyota in the 1950s, based on the work of Frederick Taylor and W. Edwards Deming, both industrial engineers. Even though this approach is widely known as Lean Manufacturing, Toyota refers to it as Toyota Production System. Lean Manufacturing is a systematic process to of improving efficiency by minimizing waste without sacrificing productivity. As the name would suggest, the Lean methodology strives to cut costs by eliminating waste, it is exactly what the name sounds like - it is about "cut to the bone", fat-trimmed, streamlining operation and organizations [3]. Although it is often referred to as Lean manufacturing, it can be applied to every organization and process. Someone using this method would evaluate a process's value stream. The value stream consists of value-added activities (the actions a customer would pay for) or non-value-added activities in the process that either brings a concept to fruition or completes an order. Any action that doesn't add value or isn't required as part of a policy or regulation is *waste*. Waste can include:

2.1. *Transportation*: The movement of products unnecessary for the process.

2.2. *Inventory*: Materials that aren't required to deliver the create and deliver the goods or products.
2.3. *Motion*: Human and other resources that move more than necessary to complete a process.
2.4. *Waiting*: Periods of inactivity or interruptions during a process.
2.5. *Overproduction*: Excessive production of materials ahead of demand.
2.6. *Overprocessing*: Extra work due to redundancies or poor tool or product design.
2.7. *Defects*: Effort involved in checking for and correcting defects that resulted in the process of creating or transforming goods or services.
2.8. *Skills*: The act of underutilizing the knowledge and skills employees have.

These waste sources are the aspects for which a customer is not willing to pay, elements that doesn't add any value to a product or service.

3. Lean Six Sigma – A combination of Lean and Six Sigma methodologies. This methodology pulls the "best of two worlds" with the target of improving efficiency and process capability by reducing waste and variation. Figure 1 provides a high-level perspective of what the Lean Six Sigma methodology is about:

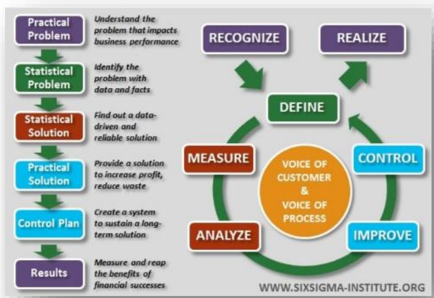

Figure 1

Lean Six Sigma Methodology [4]

4. Total Quality Management (TQM) - An organization-wide effort focused on continuous improvement to improve customer quality. TQM is the management approach of an organization, centered on quality, based on the participation of all its members and aiming a long-term success through customer satisfaction, and benefits to all members of the organization and to society.
5. Just-in-time - Methodology centered around reducing inventory costs, manufacturing products only as they're needed. It is a Japanese management philosophy, which has been applied in practice since the early 1980s in many Japanese manufacturing organizations. It was first developed and perfected within the Toyota manufacturing plants by Taiichi Ohno as a means of meeting consumer demands with minimum delays. Taiichi Ohno is frequently referred to as the father of JIT. Just in Time has the following four key elements [5]:

5.1. *Setup Time*: An effective Just in Time System environment generally requires reduced setup time. Setup time is the preparation period prior to initiate a task to start a process to create or transform a product or service. Reduced setup time offers the capability to react swiftly to customer orders and lower the need of safety stocks inventories.
5.2. *Plant Layout*: The layout of the manufacturing plant should be improved to decrease distances and allow efficient movement of goods and people.
5.3. *Flexible workforce*: JIT promotes a multi-skilled workforce which is often organized into small contexts known as "cells" that contain all the equipment required to carry out many steps in the production process. Workers need to be able to use all the various pieces of equipment in the work cell. Also, workers are typically expected to perform maintenance tasks on their own equipment and to do their own quality inspections.
5.4. *Defect Rates*: JIT offers lower defect rates which are one of the biggest offenders when dealing with high costs and operational inefficiencies. High defects rates mean extra work correcting these and rejecting or even disposing goods manufactured. An establishment must persistently endeavor for reducing defects.

6. Theory of Constraints [6] - A systematic process, originally conceived by Dr. Eliyahu Goldratt and is his bestselling 1984 novel, "The Goal", focused on finding and eliminating constraints. The Theory of Constraints is a methodology for identifying the most important limiting factor, known as constraint, that stands in the way of achieving a goal and then systematically improving that constraint until it is no longer the limiting factor. In manufacturing, the constraint is often referred to as a bottleneck. The Theory of Constraints takes a scientific approach to improvement. It hypothesizes that every complex system, including manufacturing processes, consists of multiple linked activities, one of which acts as a constraint upon the entire system. This constraint activity is the weakest link in the chain, for instances, the constraint is the limiting factor for the entire system. The Theory of Constraints provides a powerful set of tools for helping to achieve that goal, including:
   6.1. The Five Focusing Steps: A methodology for identifying and eliminating constraints.
   6.2. The Thinking Processes: Tools for analyzing and resolving problems.
   6.3. Throughput Accounting: A method for measuring performance and guiding management decisions.

This project is built under the assumption of a *Process Improvement* project type as defined in the Lean Six Sigma methodology [7]. Such project type is intended to reduce process defects, cycle time, or cost as depicted in Figure 2.

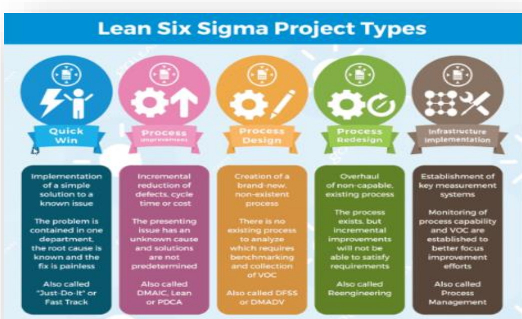

Figure 2

Lean Six Sigma Project Types [1]

The Lean Six Sigma philosophy states that all processes can be Defined, Measured, Analyzed, Improved and Controlled (DMAIC) and looks for the reduction of any process variability within a range of acceptance to promote the process repeatability. This philosophy further states that processes require inputs that generates outputs thus as long inputs are controlled, the outputs will be controlled as well [8]. Six Sigma is a term utilized to portrait how well a process is controlled when visualizing such process in a control chart and expecting it to fall withing +/- 3 Standard Deviations from the center of the chart. The center of the chart represents the mean of the population sample measured for a given process.

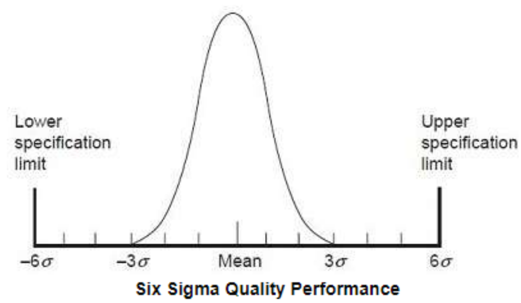

Figure 3

Control Chart

By "blending" Lean and Six Sigma, the result is a methodology that focuses on waste and variation reduction with the goal to provide the end customer with the best quality and cost of the product, it is a methodology for pursuing continuous improvement that will result in higher customer satisfaction and profit that goes beyond defect reduction and emphasizes business process improvement in general. One of its ultimate goals is to deliver processes that produces 3.4 defects per million opportunities or less. While the purpose of this project is not intended to provide an extended description of the Lean Six Sigma Philosophy, its core components: Define, Measure, Analyze, Improve and Control, are going to be further debriefed as follows [9]:

Define – First phase of the Lean Methodology that focus on depicting the problem that needs to be fixed. During this stage a Project Charter is drafted, high-level process flow defined, and customer needs outlined. Clear alignment within the project scope and organizational goals should be gotten prior to move to the measure stage.

Measure – Describes the process performance quantitively. Lead time and the quality that customers are receiving are focus areas of this stage. This step will provide current performance measures or baseline of the process.

Analyze – This stage is intended to have teams revising the data available including graphs and charts and use these as a source to start putting together or confirming hypothesis and theories. The relation between inputs and outputs of the process are statistically portrayed.

Improve – After the potential root causes of the problem have been identified this stage will deploy pilot process changes and collect data to assess there is a measurable improvement.

Control – This stage will look for mechanisms to sustain improvements deployed by means of monitoring plans and measures.

METHODOLOGY AND FINDINGS

Utilizing the DMAIC methodology the different elements relevant to this project will be depicted as follows:

1. *Define*

1.1. The Critical-To-Quality (CTQ) component for a typical Cost Improvement Process is summarized in Figure 4. It reflects what is the fundamental need of this project which looks for the cycle time reduction on having a cost improvement project status readily available when needed. The factors stakeholders are expecting from the cost improvement program overall process is categorized as cycle time, customer satisfaction, efficiency, and accuracy.

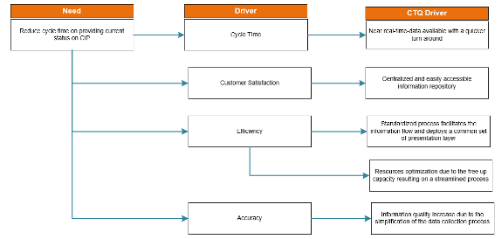

Figure 4

Critical-To-Quality

1.2. Stakeholder Analysis – Even though a CIP Process can be implemented within any organization irrespective to its size or scale, this project targets a process that is typically managed by mid-sized to large organizations with the following group of stakeholders:

1.2.1. Business Unit Leaders – Accountable for the budget of a business unit or segment. This leader would report to a President or Vice-President and has direct reports such as Regional Directors.

1.2.2. Regional Directors – Responsible for regions or specific conglomerate of countries.

1.2.3. Directors – Responsible for divisions beneath the regions.

1.2.4. Senior Managers and Managers – Responsible for departmental budgets.

1.2.5. Project Managers – Responsible to execute and deliver CIP initiatives.

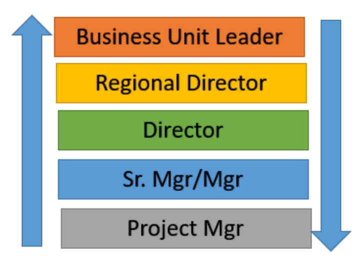

Figure 5

Stakeholder Organizational Chart

1.3. SIPOC stands for Suppliers, Input, Process, Output and Customers. It is intended to provide a high-level depiction of the inputs and outputs of a process along with what are the customers' expectations for each process step:

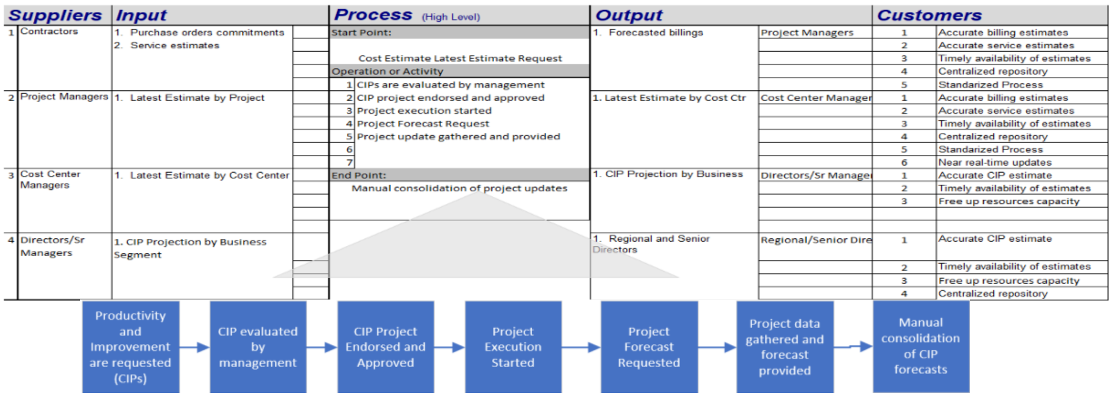

Figure 6

SIPOC Chart

2. *Measure*

2.1. Current State Value Stream Map – Portraits how a current and typical CIP process flows for an organization with such program. Immediately, it can be noticed the estimated non-value-added time totaling 96 hours, resulting from this process primarily because of the significant manual intervention. Non-Value-Added time is seen, for instances, the objective of this project is to reduce the overall cycle time of the process by reducing the total non-value-added time.

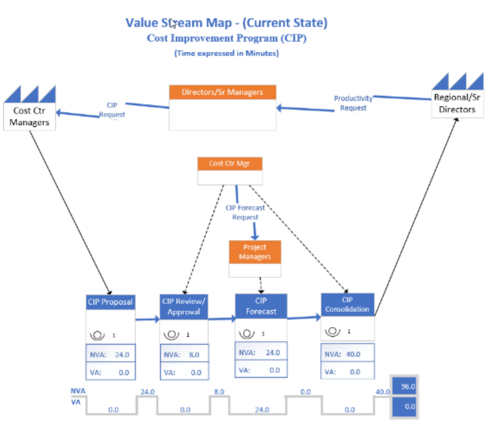

Figure 7

Current State Value Stream Map

3. *Analyze*

3.1. As noted in the previous Measure step, the process relies on a significant time investment of 96 non-value-added hours where the manual consolidation process looks like the primary target to improve the process by 25%. Also, having a way to expedite the CIP Review and Approval could shorten the total cycle time even longer. During the analyze step, a Fishbone Diagram was worked to reflect potential root causes that contributes to the lagging of the Cost Improvement Update. There, it can be noticed that the Technology dimension could be driving most of the inefficiencies of the process specifically, the lack of a technological framework to collect data, automate consolidation and promote standardization.

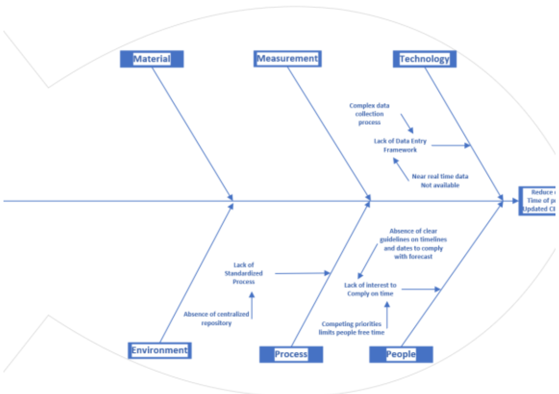

Figure 8

Fishbone (Ishikawa) Diagram

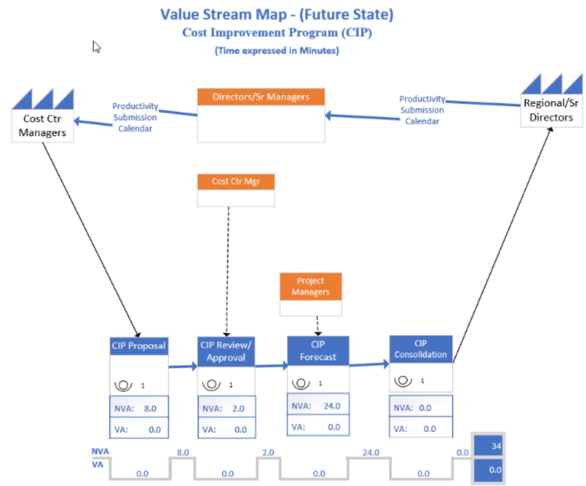

Figure 9

Future State Value Stream Map

4. *Improve*

4.1. After pinpointing the potential root causes during the previous Analyze stage, an obvious element to enhance the current state process points to be a technological solution capable to facilitate the data collection, productivities (projects) submission and approval, as well as the automation of the CIP consolidation process. Such technological component will drive a standardized process including a centralized means of collecting the CIP forecasts, automated way to submit and approve productivities (projects) proposals, as well as automatic consolidation process eliminating the manual intervention. The following Future State Value Stream Map outlines how the process looks after deploying the technological solution.

4.2. Future State Value Stream Map shows a significant Non-Value-Added reduction from 96 hours to 34 hours when compared to the Current State Value Stream Maps which represents a 65% cycle time reduction. This improvement was primarily achieved by the reduction in time in the CIP Proposal, CIP Review and Approval and CIP Consolidation steps. This, because in these steps the manual intervention is dramatically reduced or eliminated.

Future State Value Stream Map is supported by a technological solution that expedites the overall Cost Improvement Status feedback loops by providing a cost-effective framework that facilitates the Projects Submission, Approval and Real Time consolidation. The macro level flow of this application works as follows:

1. When user access the application, a login screen will show up providing the option to login, in the case of existing users, or request access to the application.
2. For new users, an application administrator will receive a notification to change the new user access profile if required.
3. Users with the appropriate access will have the ability to search, create, submit for approval, and update Cost Improvement Projects. Activities related with the creation and updates of projects are communicated by email to the parties of concern to review, maintain and approve projects.
4. The Ad hoc reporting option provides with the alternative to extract data on multiple filter criteria that can be further consumed in other application to render graphics and other analyses.
5. Once created, a project can be accessed to maintain and update the spending forecasts. In this screen, the user has the option to include complementary attachments, for example, a detailed project plan for reference.

Figure 10

Automated application screenshots

6. There is also a Dashboard available that changes interactively displaying the real-time status of the CIP forecast vs latest estimate.
7. The application has the option to configure parameters to Base Year and Forecast Periods. Base Year refers to the year for which the CIP forecasts are applicable while Forecast Periods defines if the forecast is going to be done by Quarter of Month.

The future state process is also complemented with a structured process or governance which is driven by clear roles and responsibilities as to who works and publishes the yearly CIP Updates Calendar. With this element, project and cost center managers are aware ahead of time about the key dates to submit the CIP latest estimates. The governance also establishes who are the system owners and administrators to perform the different tasks required in the application, tasks such as new user maintenances, project approvals and application parameters setup. The end state of this new enhanced process deploys a standard means of working and providing CIP forecasts, with clear roles and responsibilities and automated data compilation, availability, and consolidation.

5. *Control*
   5.1. Utilizing the Ad Hoc reporting capability, management can get a clear perspective of active project that haven't been updated based on its last update date and follow up on the downstream team to get feedback and rationale on why a given CIP initiative has not been updated.
   5.1.roject managers are required to enter to CIP projects under their responsibility and save the given project even when the forecast remains the same. This activity will update the modified date of the project so that management knows that the project has been looked and reviewed by its project manager.

CONCLUSIONS

Based on the problem statement utilized in the content of this work, it can be concluded that utilizing the appropriate analytical tools it is possible to dissect a problem in its potential root causes, identify ways to determine the major offender of these causes, and figure out improved ways to diminish or eliminate the root causes.

As organizations of all types and sizes are constantly facing the challenge to continuously improve their processes to promote efficiencies and lower their cost base, it is imperative to create a Cost Improvement culture so that everyone in an organization would be able to have the right training, programs, tools, and empowerment to collaborate and actively participate in searching for ways to provide initiatives to improve the organizational spending and cost base. A well-structured Cost Improvement Program is the right mechanism to provide with the right framework that can be holistically deployed and adopted at all levels as the primary provider of cost improvement initiatives. The blending of technology and business process standardizations portrayed in this work are a showcase of the potential analytical tools could benefit any process looking for improvement and cost effectiveness.

RECOMMENDATIONS

To ensure the sustainability of the Future State Process designed in this work, which relies in the technological solution designed, it is important to define clear role and responsibilities. Also, the following process elements are highly recommended:

- Training Materials – A proforma training material that could be provided to new users to the application.

- Yearly CIP submission schedule – Responsible to define dates where the CIP Latest Estimate (Forecast) needs to be submitted.
- Application Administrator(s) – Responsible to update application users access profiles.
- Trainers – Responsible to train new application users.
- Forecast Compliance Reviewer – Responsible to verify that all projects' managers submitted forecast updates for all CIP projects under his responsibility.

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