KEY SUCCESS FACTOR OF LEAN SIX SIGMA IMPLEMENTATION IN OIL AND GAS INDUSTRY: CASE STUDY IN MBU, STRATEGIC BUSINESS UNIT OF XYZ

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Abstract

Merdeka Business Unit (MBU) is subsidiary of XYZ, Inc in Indonesia. As a global oil and gas company, XYZ, Inc had been implementing Lean Six Sigma since 1990s and cascaded down to its business units gradually. Since its first deployment in 2000, MBU Lean Sigma experienced steady if not unsatisfactory performance looking at the acrrued financial benefit (AFB) only. But with new leadership and governance, it's AFB rose to MM $ 46 (6 times) compared to average AFB in the past eleven years in 2011, MM $ 206 (30 times) in 2012, and MM $ 392 (57 times) in 2013. Within three years, MBU successfully occupying the top position among other business unit in XYZ,inc on its AFB achievement. This paper presents the strategy in reinventing MBU Lean Six Sigma, its governance, best practices. XYZ's five component model, will be tested with existing Critical Success Factor developed by Jeyaraman,K. and Teo, L.K (2010) based on manufacturing company practices LSS in Malaysia with more than 80% corresponding factors. Five component model will then be used to analyze MBU LSS implementation and its performance during the period of 2000-2010 and find the root causes. In addition, this paper will outline best practices to revamp LSS implementation in MBU and its Lean Six Sigma Success implementation Model

Key words: Lean Six Sigma implementation, five component model, critical success factor, Lean Six Sigma Success Implementation Model

1. Introduction

Lean Manufacturing and Six Sigma have been marketed as new organizational change and improvement method, particularly as a cost reduction mechanism (Achanga et al., 2006; Hoerl et al., 2004; Edward and John, 2005). XYZ, inc, as one of the biggests oil and gas company in the world with subsidiaries around the globe is one of many companies that started to recognize the power of the application of Lean and Six Sigma.

XYZ, inc history in implementing Lean Six Sigma (LSS) was started in 1999 when a technical support group international upstream business unit heard about LSS and conducted a projects on their own with accrued financial benefit over $ 15,87 million dollars. LSS was then laterally deployed in 2007 becoming a tools, strategy and framework for continues improvement in its global upstream organization with full support from the management. Until now, XYZ, inc able to achieve accured financial benefit totalling $ 1,1 billion dollars from hundred of LSS projects across its business units.

Merdeka Business Unit (MBU) is one of XYZ, inc's subsidiaries in Indonesia as part of its upstream business, a business involving the activities of exploration and production of a crude oil. MBU was chosen as a pilot for LSS deployment in Asia Pacifid Region on 2000 because of its vast operation and its production profile. MBU was one of the biggest oil contributor in Indonesia with operating area covers 12,000 square kilometers, and a production reaching almost 4 billion barell of oil at that time.

When it was first deployed, LSS in MBU had a steady if not slow performance. Started with only 5 green belts MBU reached an Accrued Financial Benefit (AFB) over $ 2,12 million US Dollar in 2000. MBU'S AFB was then decreasing to only US$ 0,21 million in 2004 (about -90% decrease compared to 2000's AFB), reached it's peak in eight years on US$ 22 million in 2007, and decreased to US$ 4 million in 2010. But since 2011 onward, MBU LSS's AFB significantly increasing years by years, and on 2013, MBU is Business Unit with the highest achiever of AFB among other Business Unit in XYZ, inc. This can be seen in figure 1 below.

When comparing MBU with Gulf Mexico Business Unit (GMBU), we can see that in only takes 4 years for GMBU to break free and sits on the top of the chart, with increasing AFB year by year since its initial deployment in 2006. Meanwhile, it takes eleven years for MBU to take off.
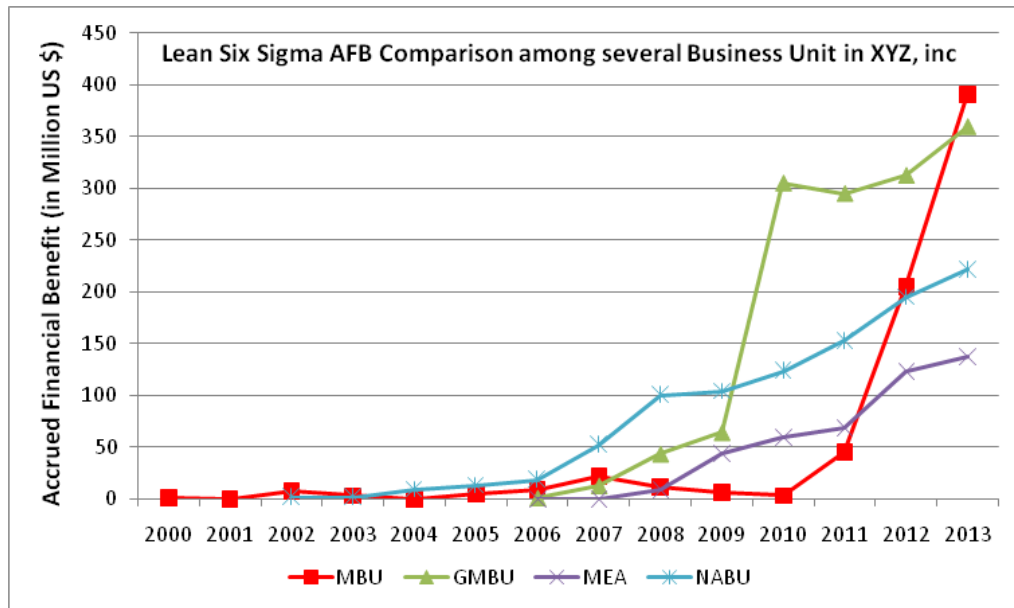
Figure 1. The Lean Six Sigma AFB Comparison among several business unit in XYZ, inc.

1.1 Problem Statement

The fact that it took eleven years for MBU to reach its peak performance, proves that some organization face difficulties in implementing LSS. The implementation of Lean Manufacturing and Six Sigma initiatives is criticized that it harbors enormous difficulties (Denton and Hodgson, 1997). Hayes (2000) has stated that successful corporate initiatives like Lean Manufacturing should be properly planned prior to its implementation.

This research seeks to identify what actually happened in MBU during its eleven years of implementing LSS, and to answer question as to what strategies had been put in place to revive its performance since 2011, and introduce governance model it applies to the organization.

This scope of this paper is limited to the strategy, deployment and implementation of LSS in MBU, although the best practices can be applied to other business units in XYZ, inc, another Oil and Gas Company, or any companies trying to deploy LSS methodology.

1.2 Research Methodology

This paper focus on the study in Merdeka Business Unit (MBU), one of XYZ inc. Subsidiaries of Upstream Organization. Data is collected from MBU LSS scorecard, past study about MBU LSS deployment in 2009, and past researches on LSS deployment and implementation strategies, as well as critical success factors in LSS deployment.

XYZ's five component model, contains critical success factors will be studied side by side with Critical succss factors developed by Jeyaraman,K. and Teo, L.K (2010) that based on their study in manufacturing. This is to gauge and test whether the five component model developed by XYZ is sufficient to analyze MBU LSS implementation and its performance.

Five component model, data review and analysis will be performed to find the root causes of underperformance by MBU LSS implementation from 2000 – 2010. Then this paper will explain what efforts had been done to revamp the performance and bring MBU Success to the top among other Business unit in XYZ.

2. XYZ Inc.'s LSS Deployment and Implementation Strategy

2.1 Lean Six Sigma

George, Rowlands, and Kastle (2004) define "lean six sigma" as a combination of two improvement trends, namely, making work better using Six Sigma, and making work faster using Lean principles. "In a system that combines the two philosophies, Lean creates the standard and Six Sigma investigates and resolves any variation from the standard" (Breyfogle, 2001). Beside those two definitions, there are many definitions of Lean Six Sigma, and "because of these differences in their practice and adaptation, Lean Six Sigma is not having a universally common meaning or implementation procedure" (Gershon & Rajashekharaiah, 2011).

According to XYZ, Lean Six Sigma is the **structured application** of both quality and statistical tools with the purpose of gaining process knowledge to make the output metrics safer, better, safer, and lower cost. Lean Six Sigma also **a methodology** to realize tangible business value by systematically improving existing process. This definitions are documented in XYZ Lean Six Sigma training material.

2.2 XYZ Operational Excellence Culture and LSS

To drive XYZ, inc business success, it designed Operational Excellence strategy. XYZ, inc Handbook (2010) states that Operational Excellence (OE) is a critical driver for business success and a key part of their enterprise execution strategy; OE is defined as "The systematic management of process safety, personal safety and health, environment, reliability, and efficiency to achieve world-class performance." To ensure OE becomes a culture throughout the XYZ Inc. Worldwide operation, it designs OEMS (Operational Excellence Management Systems.

OEMS has consists of three main parts, they are leadership accountability, Management System Process, and OE Expectations. Leadership accountability, is the largest factor for success in OE, they direct the implementation of management system processes, setting priorities, and monitoring progress on plans that focus on the highest-impact items. Management System Process, is a systematic approach used to drive progress towards world-class performance. It is linked to the business planning process and begins with defining a vision of success and setting objectives. OE expectations are thirteen sets of expectation that are met through processes and standards put in place by local management.

One of these thirteen OE expectations is reliability and efficiency. In its handbook, it is clearly outline, that the expectation for reliability and efficiency, is that a process is in place to identify, and resolve the significant few facility and business unit-wide equipment, work process and human reliability opportunities that cause significant incidents or performance gaps. Thus, lean six sigma, is one of the methodology in XYZ to support its operational excellence. In addition to that, Lean Six Sigma is also a methodology to support and improve organizational capability, cost reduction, capital stewardship, which in turn brings profitable growth both for XYZ, inc and its business units across the globe.
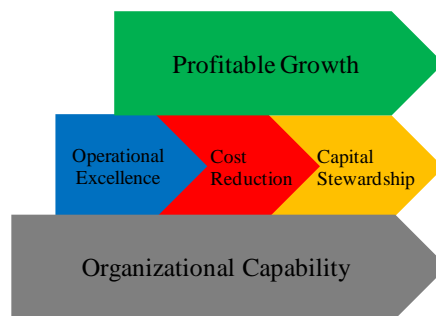

Figure 2. A 4+1 Concept of XYZ, inc. (Source: XYZ)

2.3 XYZ Upstream and MBU LSS Deployment Strategies and governance

XYZ business is devided into three main operation, they are upstream (exploration and production), downstream operation (Manufacturing, product, and transportation), and other business (technology companies, power generation businesses, petrochemicals manufacturing and mining operations). MBU is part of XYZ's Upstream strategic business Unit. Figure 3 depicts organization structure of upstream organization.

Upstream capability Lean Six Sigma Group provides the following

1) Governance, such as white belt, green belt and black belt certification, its criteria, and training. It also provide 5 component model for successful LSS implementation, and conduct annual SBU Facilitated Self Assessment based on 5 component model criteria
2) Support the deployment of LSS, they will provide consultation, method, as well as alignment in managerial level if required
3) All training material for White Belt, Green Belt and Black belt are developed together between XYZ Corporate with appointed consultant. This training material has been customized to meet the minimum requirement as per business or project nature. The consultant has local office in each SBU. In MBU, the LSS white belt training, is delivered by branch consultant. For Green Belt Training, it is also facilitated by local consultant with standardized material from XYZ. This is also applied for black belt training, except that black belt training is usually facilitated by Black belt or master black belt from XYZ
4) Another assistance given by upstream is program alignment and any consultation required.

Upstream operation are divided into several Strategic Business Units (SBU) and MBU is one of them. MBU with guideline from upstream group own the LSS deployment and implementation process, and keep communication and update with the upstream group.
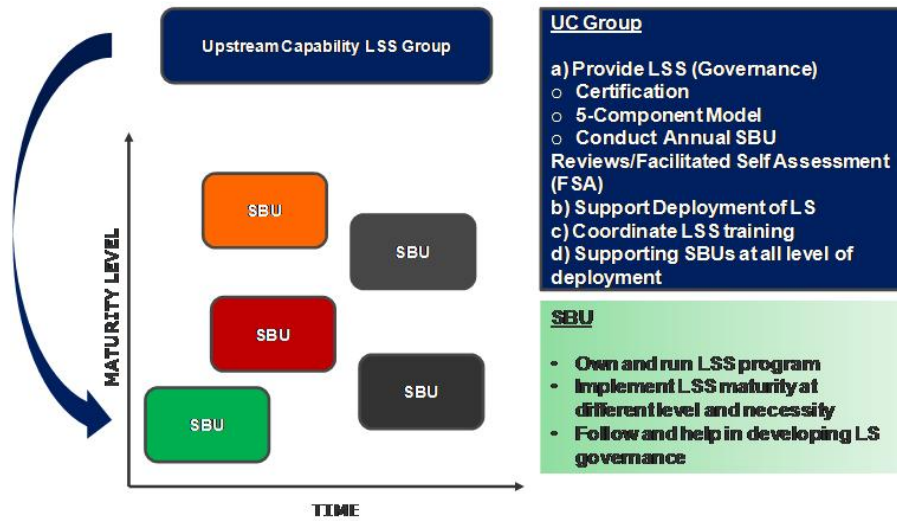
Figure 3. Global XYZ Lean Six Sigma Deployment strategy

If the previous illustration shown the governance of LS deployment from Upstream Group to MBU. The following illustration as shown in Figure 4 depicts MBU organization chart and how LSS implementation will be sub-cascaded and further deployed in an organization-wise, and this is unique in every Strategic Business Unit (SBU)
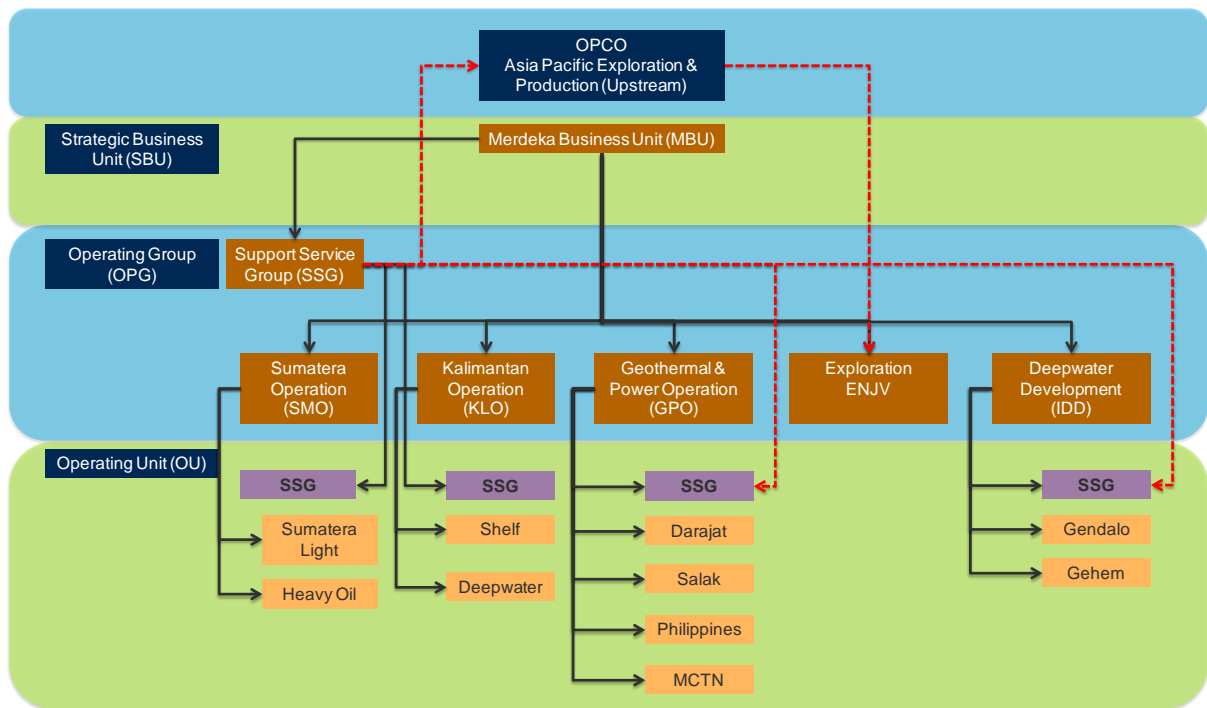

Figure 4. MBU LSS Organization Chart and Deployment Scheme

While the organization-wise deployment structure is unique for every SBU, the strategic framework for the deployment is uniform and design by XYZ corporate headquarter (Figure 5.) The pyramid shows three main relationship between LSS Process Advisor, green belt and belt black, champion, as well as LSS Sponsors. At the bottom of the pyramid is the Process Advisor and Belts, and on the top of it is Sponsor. Champion fill the gap between the sponsor and the bottom of the pyramid.

LSS is following top-down approach, thus the strategic guidance comes from Sponsor. It is cascaded to the next level. The tactical deployment begins with the expertise of the LSS Process Advisor on the technical field and the ability of the champion to progress the implementation and remove barrier. Green belts and Black belts as the spearhead of the implementation, with technical support from process advisor and champion as barrier remover is hoped to deliver an LSS project effectively. Meanwhile the sponsor will continue support and being updated the result of the implementation.
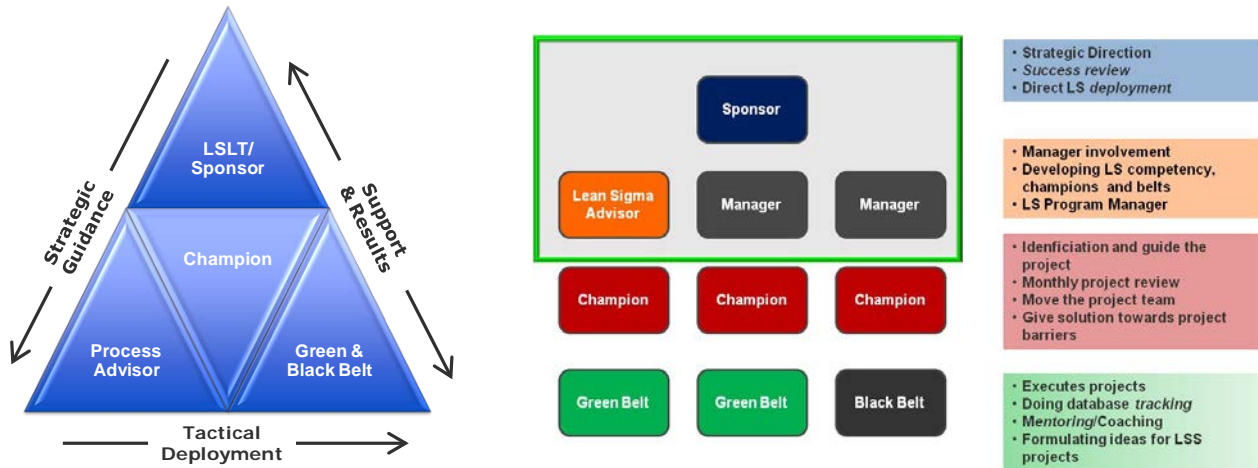
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Figure 5. MBU LSS strategic framework Deployment

Merging the strategic framework into MBU organization chart is different for MBU's operating groups and operating units.

3. Key Success Factors (Investigative Framework)

There are not many reference on specific Key Success Factor in Implementing LSS in Oil and Gas Industry. This paper will refer to those developed based on implementation on Manufacturing Company, considering the underlying framework is no different. Jeyaraman,K. and Teo, L.K (2010) introduces a conceptual framework for critical success factors of lean Six Sigma in electronic manufacturing service industry. In their writings, 25 Critical Success Factors (CSFs) were collected through literature review. These were then shared to 25 LSS practitioners in Electronic Manufacturing Services (EMS) companies for them to select the top ten. The top 10 CSFs were then selected resulted from the pareto. This study also examines the relationship between the CSFs of LSS as the independent variables and the LSS implementation success as a dependent variable with the effect of an organizational belief, and culture is considered as a moderating variable (figure 6.)
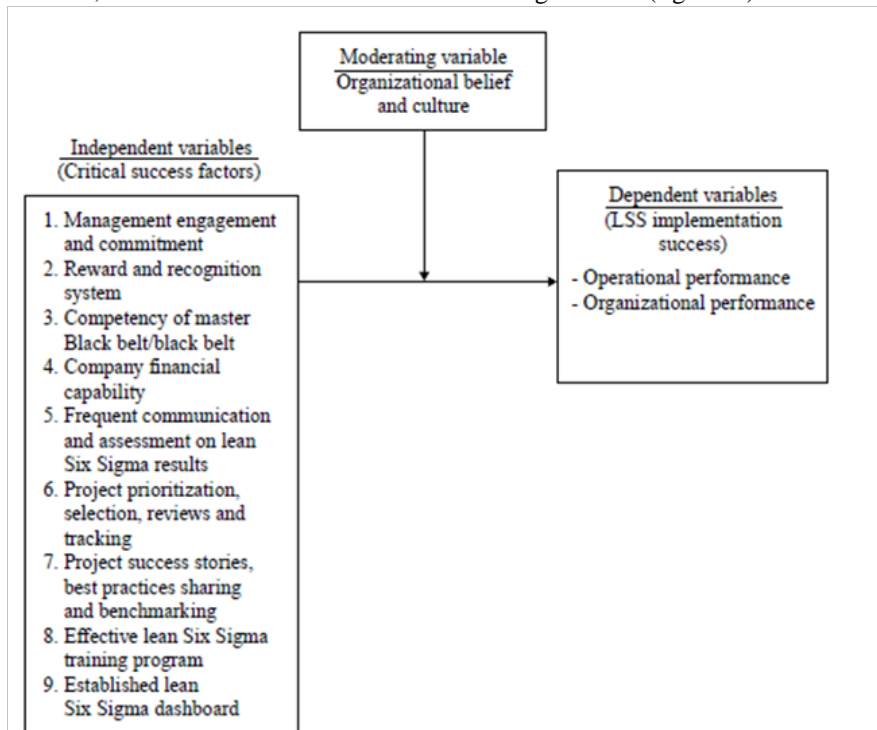

Figure 6. Theoritical Framework on Key Success Factor (Jeyaraman and Teo, 2010)

Based on above framework and literature review, the following hypotheses were derived :

- H1. The better the management engagement and commitment, the higher the LSS implementation success.
- H2. The better the reward and recognition system, the higher the LSS implementation success.
- H3. The better the competencies of MBB/BB, the higher the LSS implementation success.
- H4. The better the company financial capability, the higher the LSS implementation success.
- H5. The better the communication and assessment on LSS result, the higher the LSS implementation success.
- H6. The better the project selection, prioritization, project status and tracking, the higher the LSS implementation success.
- H7. The better the project success stories and best practices sharing, the higher the LSS implementation success.
- H8. The better the LSS training program, the higher the LSS implementation success.
- H9. The better the established LSS dashboards, the higher the LSS implementation success.
- H10. The organizational belief and culture mediates the relationship between the independent variables and the dependent variable.

This framework is also detailed into list of items on CSFs for LSS implementation in Table 1.

Table 1. list of items on CSFs for LSS implementation (Jeyaraman and Teo, 2010)

NO	CSFs	Explanation	Items
1	Management engagement and commitment (Domain 1)	Management team should act as key driver in driving continuous improvements, communicate to employees about organizational goals and highly engage and lead by example and commit to drive into LSS culture	1. Top management assumes responsibilities for LSS performance
			3. Top management supports long-term LSS improvement process
			4. Importance attached to LSS by the top management in relation to cost and schedule objectives
			5. Degree to which the top management considers LSS improvement as a way to increase profits
			6. Degree of comprehensiveness of the LSS plan within the company
			7. Commitment of the top management to employee training
2	Reward and recognition system (Domain 2)	Reward and recognition system is essential to promote employee involvement and recognize their contribution will make the LSS program more effective	1. Effectiveness of performance measurement
			2. Fairness of individual or team-based performance measurement
			3. Reward and recognition for actual performance improvement
3	Competency of MBB and BB (Domain 3)	Experienced and highly skilled BB and MBB will drive LSS program more effective and deliver result accordingly	1. Visibility of the MBB/BB in driving LSS program
			2. MBB/BB accesses to top management
			3. Autonomy of the MBB/BB
			4. Utilization of MBB/BB professionalism as a consulting resource
			5. Effectiveness of the MBB/BB in improving company performance
4	Company financial capability (Domain 4)	Implementing LSS program needs some investment. Company that having positive financial performance will implement a well-defined LSS program with all the LSS necessities being developed (Minitab software, sophisticated training materials, BB, etc.); to ensure LSS program a success	1. Adequate budgeting or funding to support LSS projects
			2. Adequate budgeting or funding to set up IT infrastructure for data analysis using minitab
			3. Adequate budgeting or funding to set up classroom training with computer facility
			4. Adequate budgeting or funding to reward success project *(Continued)*

Table 1. list of items on CSFs for LSS implementation (Jeyaraman and Teo, 2010)

NO	CSFs	Explanation	Items
5	Frequent communication and assessment on LSS result (Domain 5)	Regular communication and assessment is important to convey the LSS status to the team as to come out strategy to achieve the goals that will help to sustain the aggressiveness of LSS program	1. Use of LSS problem-solving tools/techniques to solve problems
			2. Good communications between different departments
			3. Effective top-down and bottom-up communication
			4. Clear, consistent communication of mission statement and objectives
6	Project selection, prioritization, reviews and tracking (Domain 6)	A well-defined project selection, prioritization, review and project status tracking should be designed to capture all the LSS projects and activities in order to monitor the status and measuring the gain of the LSS projects	1. Having project selection and prioritization on projects that improve company competitive advantage, business profitability, process cycle time, throughput yield, etc.
			2. Periodic project review to ensure projects are proceeded according to schedule
			3. Project tracking system to track the project status
7	Project success stories and best practices sharing (Domain 7)	Success LSS projects should be published to promote motivation and involvement for new projects as well as to share problem-solving methodology; will drive LSS program into success	1. Extent to which LSS data (cost of quality, defects, errors, scrap, etc.) are used as tools to manage LSS performance
			2. Extent to which LSS project success stories and best practices are available to employees
			3. Extent to which LSS project success stories and best practices are available to managers and supervisors
			4. Extent to which LSS project success stories and best practices are displayed at employee work stations
8	Effective LSS training program (Domain 8)	A well-defined training program and appropriate training duration will equip the employees with quality-related knowledge and problem-solving skills that will develop a success LSS program	1. Specific LSS training (yellow/green/BB training) given to employees throughout the company
			2. LSS awareness training among employees is ongoing
			3. Training in problem identification and solving skills, quality improvement skills and waste identification skills
			4. Training in statistical techniques (such as histograms, control chart, design of experiments and regression analysis)
			5. Availability of resources for employee training in the company
			6. Training in interactive skills (such as communication skills, effective meeting skills and leadership skills)
9	Established LSS dashboard (Domain 9)	Clear and specific LSS goals should be specified to align the LSS team towards achieving mutual goals	1. Extent to which LSS results (yield improvement, cost reduction, scrap reduction, etc.) are used as tools to manage performance
			2. Extent to which LSS dashboard is available to employees
			3. Extent to which LSS dashboard is available to managers and supervisors
			4. Specificity of LSS goals within the company
10	Organizational belief and culture (Domain 10)	A successful introduction and implementation of LSS requires adjustments to the culture of the organization and a change in the attitudes of its employees (Antony and Banuelas, 2002).	1. A comprehensive culture exists to support and enhance effective people and team processes
			2. A process is in place to help workers expand their role to become team players, highly skilled, knowledge resources, customer advocates, trainers, problem solvers and decision makers. This process includes training and follow-up support
			3. A process is in place to help supervisors, managers and technical and support professionals modify and expand their roles to become coaches, facilitators, customer advocates, barrier busters, motivators and leaders. This process includes training and follow-up support
			4. Major achievements stemming from the continuous improvement and empowerment efforts are formally celebrated

XYZ also developed 5 component model as a framework and guideline for a successful LSS implementation. This model is also used during yearly Facilitated Self Assessment in each SBU to determine its maturity level, closing the gap for a better LSS performance. This 5-component model is also broken down into several list of items that are believed to be the key activities or factors that influence a successfull LSS. Each of these items are given weight (1 to 5) that associated with SBU's LSS maturity level.

Top 10 of Key Success Factor by Jeyaraman and Teo will be cross-checked with XYZ's 5 component model and to see, if XYZ's oil and industry own-generated Critical success factor similar or already aligned with other company especially those in manufacturing. The result is seen in Exhibit 1.

From table 2, we can say that XYZ's five component model that contain critical success factor in successful LSS implementation has 23 out of 44 items by which in line with CSF's framework by Jeyaraman and Teo. There are 6 items in which can be adopted by 5 component model, while the rest of the 15 items are either already included altogether in 23 items with stringent factors, or not applicable in XYZ. Thus, XYZ's five component model can be used to assessed the MBU's LSS implementation performance during period 2000 – 2010 to investigate whether it has a critical success factors are met or not, and the gap.

The actual assessment during the Facilitated Self Assessment (FSA) session by the end of 2010 were attended by LSS advisor, several appointed champion, green belt facilitators, and sponsor with over 19 participants. They requested to independently filling out the form with scale 1 to 5, and then score from each individual is calculated by average to get the result (figure 7).
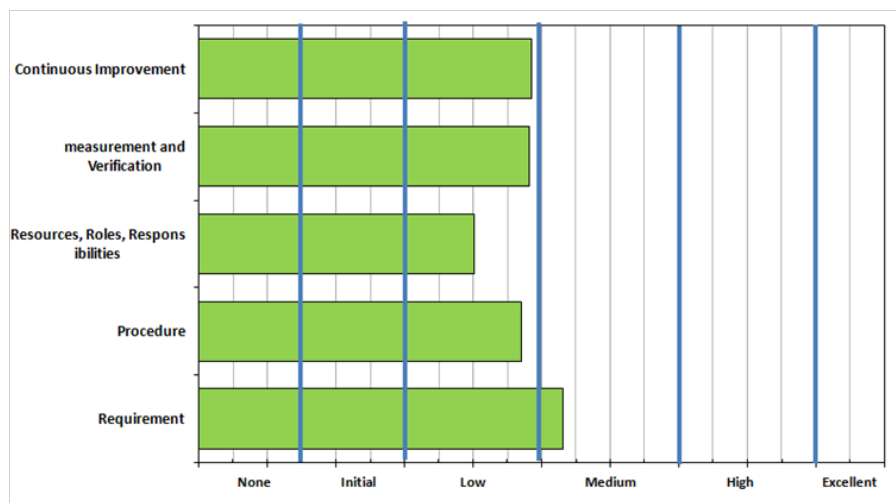

Figure 7. MBU FSA result based on XYZ's five component model

The result was fall on the "Low", near to initial performer, while MBU itself has almost eleven years in implementing LSS back then, including several effort in 2008 to revamp the performance that failed again.

4. Root Causes for MBU underperformance Implementation

During the 2011's FSA, 19 participants including active sponsors, some of them parts of Lean Sigma Advisory Team (LSAT), Process Advisor and several green belt facilitators conducted brainstorming session, as well as interview session by the Upstream Process Advisor to revamp the MBU LSS performance. This is part of the FSA session, after reviewing the result.

The following will describe each problem based on each component. The Items in each component that will be shown are those score less than 4 (<4)

4.1 List of problems regarding LSS implementation requirement sets by XYZ

Table 2. Problem and proposed solution for Component 1 - Requirement

Items	Problems	Proposed Solution
Individual of adequate influence is accountable to perform the roles of a Lean Sigma Process Advisor.	Process Advisor's position buried 6 levels down from MD, making it somewhat ineffective on deploying the program	Will review the organization structure
A program financial benefit target is set annually.	No predicted achievement based on queue project.	Develop project queue in advance

Teams on successful projects that produce measurable impact are considered for Recognition according to the corporate program. Local SBU guidelines may supplement the corporate program to provide consistency of application.	No awareness to always submit recognition for a successful project - The requirement is not well communicated	- To communicate the requirement during champion training
Teams are recognized based on the business impact.		
Recognizes project teams for accomplishments.		
All active process improvement projects have a contract and follow a fit-for-purpose DMAIC roadmap.	Requirement is not well communicated and enforced	To include in green belt training the compulsory requirement to have good documentation LSS Project
Benefits from completed projects are verified according to the Guidelines for Lean Sigma Project Financial Verification.	No coordinated effort in each OU to verify the financial document Requirement for Financial verification is not well communicated	- To assign full time facilitators to help coordinate the LSS effort - Include in Green belt training the requirement for a LSS Projects
A queue of proposed process improvement projects are developed in alignment with the business objectives (identify, prioritize, select, and resource meaningful improvement projects).	No populated project queue, scattered opportunity ineach OUs and OPGs	Coordinate project queue by running opportunity generation OU by OU
Active and control phase projects are reviewd by exception monthly by the Leadership Team.	- All effort still centralized on advisor with SBU as the scope - need more resources to drive the LSS forward	- To assign full time facilitators in each OU
Active process improvement projects are updated monthly in the Lean Sigma database. Appropriate documents should be attached.	Green belts are not aware of the requirment of good documentation	To include in green belt training the compulsory requirement to have good documentation LSS Project
Participate in a Global Upstream and SBU Lean Sigma network (community of practice) for best practice sharing and continuous improvement.	- with the small number of project and only one advisor for the entire MBU, the task is challenging	- to assign black belt full time *(Continued)*
A process improvement project Champion (typically the process owner) and a Lean Sigma Facilitator (Green Belt or Black Belt level) are assigned to each active and control phase process improvement project.	No strong driver and link to performance measure that drives the green belt to be actively involved in an LS Project	Include Active Greenbelt in the MBU LSS Scorecard
Sufficient Process Improvement Facilitators are developed / made available to the lead the target number of active projects.	No assigned full time black belt, still small number of green belts	- To develop more rigorous plan on training - To assign full time black belt

Table 3. Problem and proposed solution for Component 2 - Procedures

Items	Problems	Proposed Solution
The project list is prioritized in leadership team meetings	No Leadership team meeting in place for LSS in each OU or OPG	- Develop LSS review meeting in each OU
Teams are recognized based on the business impact.	Requirement for giving the recognition was not communicated well, and it has not been a culture	- To communicate this procedure during championt training
Results are rolled up and reported by the Process Advisor.	No standard reporting format	Develop standard reporting format

		To emphasize the importance to having Active green belt in LSS Project - Provide guidance more actively to GB running a LS Project
The team follows a fit-for-purpose DMAIC process improvement roadmap,	Green belts experience are still modest	
Was (is) cause and effect relationship established between the problem statement and the solution, is it clearly stated	Green belts experience are still modest	To emphasize the importance to having Active green belt in LSS Project - Provide guidance more actively to GB running a LS Project
Financial benefit is verified in a formal look back.	Requirement is not well communicated and enforced	To include in green belt training the compulsory requirement on look back

Table 4. Problem and proposed solution for Component 3 – Resource, Roles, and Responsibilities

Items	Problems	Proposed Solution
Meets formally with the SBU Process Advisor monthly.	- Monthly meeting with the LSS Sponsor as OPG Manager lead the meeting. It needs to be on higher position to lead this	- To request higher endorsement - Develop MBU LSS Shaping plan
Champion Identifies and contributes improvement project opportunities to the project queue.	The opportunities still come from sponsor or process advisor	include LSS metric and achievement in performance management
Champion Removes resource barriers to projects.	Low champion participation in LSS Project	
Reviews SBU projects in the database for completeness, compliance, and accuracy.	- No awareness on pTrac documentation - Need a full time facilitator to help deploying the requirement	- Assign full time facilitators *(Continued)*
Tracks and communicates SBU program metrics and project status.	No meeting or forum available to communicate the achievement and status	- Need a strong force from management to enable Ous active participation
Participates in the Process Advisor Network.	- With decentralization, process advisor can focus on more strategic activities	- Assign full time facilitators
Mentors Process Improvement Facilitators.	No full time facilitators Black belt to implement tactical deployment	
Update the LS database	No awareness to always update the database	To include in green belt training the compulsory requirement to have good documentation LSS Project
Coordinates and/or delivers SBU training.	- lack of black belt resources to coordinate more efficiently	- Hire or contract more black belt
Mentoring	- lack of black belt resources as a center for LSS expertise	

Table 5. Problem and proposed solution for Component 4 – Measurement & Verification

Items	Problems	Proposed Solution
SBU tracks the number of active projects (count).	Metric is monitored but no long term plan actions to closing the gap	To develop plan in monitoring and closing the gap on those metrics
SBU tracks the number of project starts (# per month).		
SBU tracks regular project progress (% of projects updated in the database each month).		

SBU tracks the duration of active and control phase projects (months).	
SBU tracks the count of trained Facilitators and Champions (count) and maintains an active list naming them.	
SBU tracks the number of projects successfully completed (# per month and % successfully completed).	
SBU tracks the lead time for project completion (months).	

Table 6. Problem and proposed solution for Component 5 – Continuous Improvement

Items	Problems	Proposed Solution
An annual Continual Improvement Plan is developed and identifies gaps to be closed or opportunities for improvement, resources required responsible person, and timing and milestones for implementation.	No continual improvement and shaping plan in place for MBU in terms of continual improvement plan, and benchmarking from other SBUs	- Develop MBU Shaping Plan - Enable sharing between OUs and OPG through forum, meeting, etc - Following XYZ Global LSS Forum *(continued)*
Lean Sigma graphical and statistical tools are used to monitor and improve the SBU deployment, including IPO diagrams for the overall program and project management process, a process flow diagram on project execution, a Champion checklist, histograms on process metrics, and run charts on process metrics.	No continual improvement and shaping plan in place for MBU in terms of continual improvement plan, and benchmarking from other SBUs	- Develop MBU Shaping Plan - Enable sharing between OUs and OPG through forum, meeting, etc - Following XYZ Global LSS Forum
SBU Lean Sigma staff work to improve the SBU deployment by networking with other SBU's and quality societies as well as benchmarking with other companies.		

What MBU did to Revamp the LSS implementation can be divided into several effort as follow:

1. **Management Evolution**

   In 2011, the new Managing Director (MD) was appointed and he was the beliefer of Lean Six Sigma, and having taste the success of LSS Implementation in GMBU (Gulf of Mexico Business Unit). GMBU at that time was the top LSS contributor in XYZ. Here's what improvement had been done regarding leadership/ sponsorship factor by MD

   a. Reviewing and restructuring the LSS organization

      Based on the feedback from existing LSAT and FSA, it is necessary to review the organization chart and see where the resource most needed to push the LSS improvement forward.

| NO	Before	After
1	No dedicated Manager assigned for LSS implementation	New manager is appointed, and its served directly to LSAT, Endorsed by Managing director
2	No dedicated green belts/black belts as full-time facilitator in each Operating Units	Sponsors from each OU was asked to select 1 full-time facilitator, individual with high performance. He/she will directly report to sponsors from each OU and responsible for LSS progress in each OU, and has dotted line connection with Manager of Business Improvement, LSAT, and Process Advisor.
3	No dedicated black belt as center for LSS expertise	With the limited number of Black belt inside the organization, MBU hired Black belt from outside company, and developing contract with consultant for providing black belts to help with LSS Project
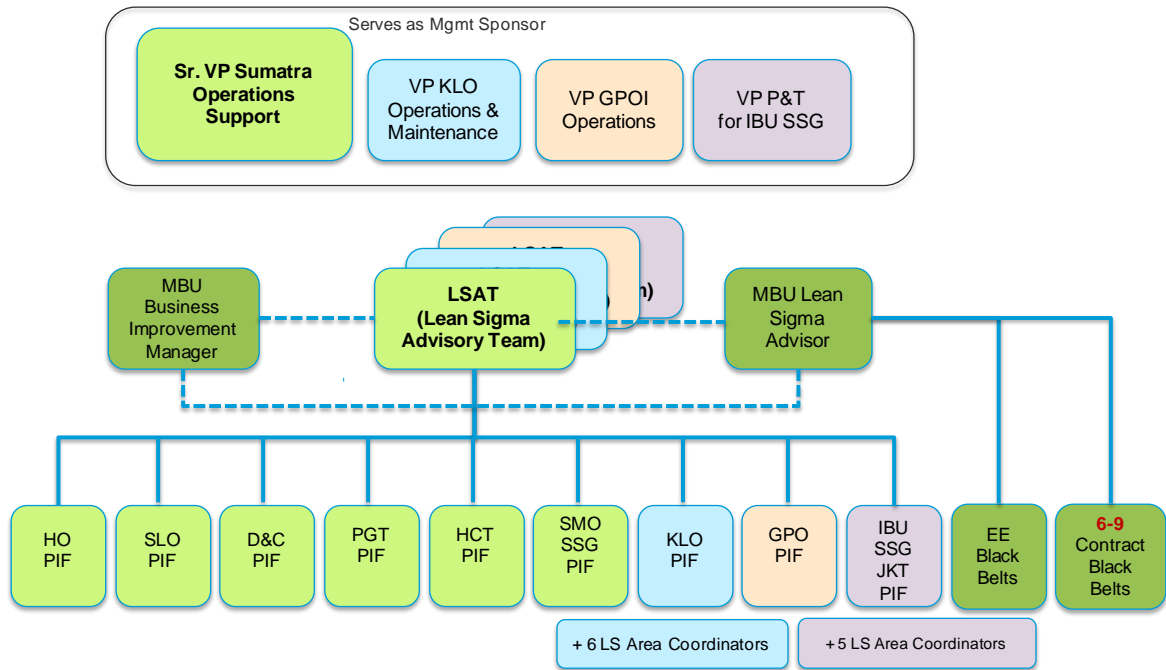
Figure 8. MBU New Organization Chart (2011- now)

b. Selecting LSAT members
    MD directly select members of LSAT, those with strong leadership ability and it's able to expand its influence towards their peers and subordinate

c. Develop LSAT key behavior and champion Behavior
    LSAT Key behavior involves Visibly support LSS, provide reinforcement and recognition, and dedicate the right resource and develop them. Champion behavior involves: (1) identify improvement opportunity and start at least one project a year, (2) Review LS projects progress with the facilitator monthly, (3) Catalyst / Engage with LS project team, and (4) Talk about LS and share best practices and successes in meetings. These behaviors are enfored and observed by LSAT members and any team manager promotion includes LSS behavior as consideration. These are included also in Champion training for their awareness

d. LSAT Meet and Greet
    In this occassion, LSAT member from various OU gathered face to face in designated place, usually followed by luncheon and reward & recognition to green belts, whose project has been completed. This event usually held quarterly.

2. **MBU LSS Shaping Plan and its implementation**
    With the new team onboard, resources are directed to do the following:
    - Developing the MBU LSS Shaping plan from 2012 until 2015
    - Starting that year, opportunities list are developed from each OU from value stream mapping session, brainstorming, assited by process advisors, MBU Black belt new hire and black belt consultant.
    - LSS target was put by MD on his Performance Management, and its cascaded down to each department. AFB target and numbers of project initiated was available in each leader's performance management. This way, each operating units are motivated to initiate Lean Sigma projects and trained their employee for white or green belts.
    - Conducted MBU LSS Forum (yearly) for the first time, where all LSS project was competed either for presentation or poster. The selected winner by LSAT will advance to LSS Global forum.
    - Each year, new green belts are trained, and it's project is cascaded down from OU's target and strategic objective
    - With more resources aside from MBU LS Advisor (full-time facilitator, green belts and black belts consultant), project facilitation runs more smoothly, XYZ's LSS requirement are become common awareness to all greenbelts, champions and sponsors.

As a result of this dramatic change, in only 2 years MBU soon become LSS Top contributor in XYZ, and become a role model in LSS Implementation. MBU Successful Implementation Framework can be illustrated in figure 9 below.
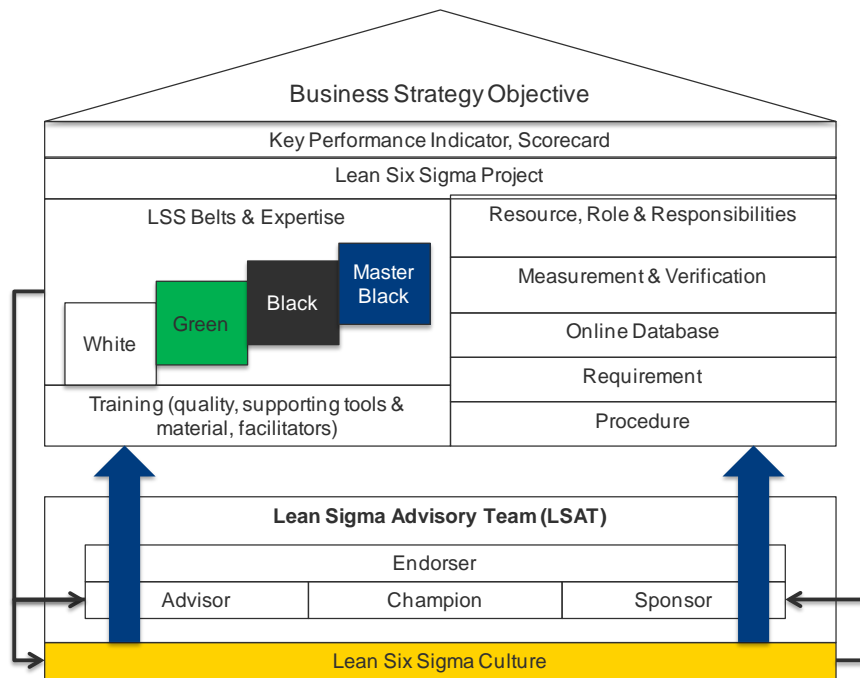
Figure 9. MBU LSS Key Sucess Factor Framework with five component Models

Leadership will help the make of LSS culture. The LSS culture will help the LSS project progressing. These LSS projects was a complete package contributed by belts, and 5 supporting component (Except continuous improvement) and online database. LSS Project will eventually contributed to KPI and scorecard and help MBU reach its Business strategy. This relationship is two directions, in a way that a source of LSS opportunity may come or cascased down from business objective.

5. Conclusion

For a lean six sigma to be successfully implemented, organization has to be aware of what success factors are crucial for its implementation. XYZ as a leading oil and gas company in the world developed 5 component model as a guideline for a successfull LSS implementation, a measure of readiness or maturity level of LSS implementation. This five component model are constructed upon several key success factor for a successfull LSS implementation. When compared to CSFs model by Jeyaraman and Teo, that are developed based on survey on Manufacturing companies in Malaysia, XYZ has a similar and corresponding item of almost 80%, while the rest of the items were either not applicable, already captured in 5 component models, or included in XYZ's framework other than LSS.

With 5 component model, we can investigate the root causes of the LSS performance during the period of 2000 – 2010. The main root causes are:

- No short and long term LSS shaping plan as a vision
- No full-time facilitators in such a complex organization with multiple layers and teams
- Unavailability of strong leadership to push forward and inspire the LSS implementation
- Scattered effort and project porfolio and uncoordinated and unaligned with business unit objective
- Lack of promotion and leadership visibility

To deal with these problems, the proposed solution were implemented as follow:

- Bring in strong leadership with strong LSS background as Managing Director
- Appointed dedicated or full-time facilitator as a catalyst for LSS program in each operating units
- Employee more black belts (new hire and contracts) to help speed up with leveraging knowledge and project progress
- Developing key LSAT and champion behavior, socialize and implemented in all management levels
- Creating forum for sharing
- Align project porfolio with business unit objective
- Align LSS performance with individual performance management and promotion criteria
- Creating rewarding session for those who success deliver business values through LSS Project

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Exhibit 1. CSF Framework by Jevaraman and Teo VS XYZ's Five Component Model

NO	CSFs Framework by (Jeyaraman and Teo, 2010)	Items	XYZ's 5 Component Model	Code	List of Items	Nothing is in place (1)	Partially implemented but not effective (2)	Basic requirement is being met (3)	Beyond basic compliance (4)	Results reflect superior performance (5)
1	Management engagement and commitment (Domain 1)	1. Top management assumes responsibilities for LSS performance	Resources, Roles and Responsibilities (Component 3)	RRR - 4	Meets formally with the SBU Process Advisor monthly.	Hold occasional, informal meetings.	Requests uni-directional updates from Process Advisor monthly.	Holds formal, interactive monthly meetings with SBU Process Advisor covering a wide range of topics related to the program.	Holds formal, interactive monthly meetings with SBU Process Advisor covering a wide range of topics related to the program; formal agenda and scorecards used as a basis for discussion.	Holds formal, interactive monthly meetings with SBU Process Advisor covering a wide range of topics related to the program; formal agenda and scorecards used as a basis for discussion; SBU L/T members are invited to this meeting or the SBU Process Advisor is invited to present at the SBU L/T meeting.
			Resources, Roles and Responsibilities (Component 3)	RRR - 17	Prioritizes, selects, and resources SBU-wide projects.	NO LEADERSHIP TEAM EXISTS	Team meets quarterly. Has little to no involvement in SBU-wide project prioritization, selection, or resourcing.	Team meets monthly. By exception prioritizes, selects, and resources SBU-wide projects.	Team meets monthly. By exception, prioritizes, selects, and resources SBU-wide projects. Prioritization is based on the value stream.	Team meets monthly. Prioritizes, selects, and resources SBU-wide projects. Prioritization is based on the value stream, resources, belts and Champions are aligned to the value stream.
			Resources, Roles and Responsibilities (Component 3)	RRR - 3	Reviews and provides input on program metrics, recommendations, and shaping plan.	No input, guidance, or feedback provided on program metrics, recommendations, and/or shaping plan.	Minimal input provided; generic approval or "rubber stamp" given for program metrics, recommendations, and/or shaping plan.	Program metrics, recommendations, and shaping plan are reviewed for alignment with SBU objectives; timely feedback provided.	Program metrics, recommendations, and shaping plan are reviewed for alignment with SBU objectives; timely feedback provided; stretch goals set and targets challenged. Shaping plan is reviewed and updated yearly.	Program metrics, recommendations, and shaping plan are reviewed for alignment with SBU objectives; timely feedback provided; stretch goals set and targets challenged; future planning goals projected in detail; succession planning discussed with SBU Process Advisor.
			Resources, Roles and Responsibilities (Component 3)	RRR - 2	Advocates appropriate use of Lean Sigma within the SBU.	No effort to encourage use of Lean Sigma.	Commends use of Lean Sigma at project report-outs; reactively supports results. Some members of SBU Leadership team have Champion or Executive overview LS training.	Proactively encourages appropriate use of Lean Sigma methodology and tools throughout SBU. More than 85% of SBU Leadership team have Champion or executive overview training.	Proactively encourages appropriate use of Lean Sigma methodology and tools throughout SBU; seeks new opportunities to apply Lean Sigma. 50% of LT have sponsored a project. Some form of R&A is given by the LT by exception.	Proactively encourages appropriate use of Lean Sigma methodology and tools throughout SBU; seeks new opportunities to apply Lean Sigma; encourages joint efforts between departments, business partners, etc. 85% of LT have sponsored a project. R&A is given by the sponsor on a regular basis for completed projects.
			Resources, Roles and Responsibilities (Component 3)	RRR - 18	Reviews active and control projects by exception.	NO LEADERSHIP TEAM EXISTS	Team meets quarterly. Has little to no involvement in SBU-wide project impact.	Team meets monthly. LS advisor selects the projects to be reviewed., and does the presentation. (Look at the meeting agenda).	Team meets monthly. LS advisor selects the projects to be reviewed., and does the presentation. (Look at the meeting agenda). Feedback from the team is documented, and action items are collected, and reviewed.	Team meets monthly. Project Sponsors select the projects to be reviewed., and does the presentation. (Look at the meeting agenda). Feedback from the team is documented, and action items are collected, and reviewed.

2. Acceptance of responsibilities for LSS by department heads	Requirement (Component 1)	Req - 1	A member of the Leadership Team Acts as the Sponsor for the Lean Sigma program.	Sponsor is not a member of any L/T; no sponsor exists.	Sponsor is a member of a local or area level L/T.	Sponsor is a member of the Base Business L/T; Sponsor is a member of the Operations L/T	Sponsor is a member of the SBU L/T. This does not take into account any other XYZ companies outside base business	Sponsor is VP or GM level in the SBU.
	Procedure (Component-2)	Proc - 2	The list is prioritized in leadership team meetings	No opportunity list has been generated	A list has been generated and is held by the process advisor	The opportunity list is visited by the LT, and added too, min 2 times per year	The opportunity list is prioritized by the LT, purged, and added too at least 4 times per year	The opportunity list is prioritized by the LT, purged, and added too at least 4 times per year. The active list is used to build the future year's BP.
	Resources, Roles and Responsibilities (Component 3)	RRR - 13	Identifies and contributes improvement project opportunities to the project queue.	< 25% of Champions actively identify and scope projects aligned with SBU objectives.	26% - 79% of Champions actively identify and scope projects aligned with SBU objectives.	80% - 90% of Champions actively identify and scope projects aligned with SBU objectives.	91% - 95% of Champions actively identify and scope projects aligned with SBU objectives.	> 95% of Champions actively identify and scope projects aligned with SBU objectives.
	Resources, Roles and Responsibilities (Component 3)	RRR - 15	Removes resource barriers to projects.	< 50% of project starts are completed within 6 months	> 75% of project starts are completed within 6 months	> 90% of project starts are completed within 6 months.	> 90% of project starts are completed within 6 months. Unloads work for part time facilitators (15%) .	> 90% of project starts are completed within 6 months. Unloads work for part time facilitators (15%) . Champion's resources are given to scale projects to other areas.
3. Top management supports long-term LSS improvement process	Requirement (Component 1)	Req - 2	Individual of adequate influence is accountable to perform the roles of a Lean Sigma Process Advisor.	No individual serving in the role of Lean Sigma Advisor.	Individual in place as Lean Sigma Advisor but has very little LS training	Individual is in place as Advisor and is a certified BB reporting to BB Manager	Individual is in place as Advisor and is a certified BB reporting to GM or VP	Individual is in place as Advisor and is a certified BB reporting to GM or VP. Have experience teaching Lean Sigma training classes
	Resources, Roles and Responsibilities (Component 3)	RRR - 1	Provides a clear vision and strategic direction for program in alignment with SBU objectives.	No vision for program established or communicated; no clear tie between program direction and SBU objectives.	Vision stated informally; program direction understood, but alignment to SBU objectives minimal.	Clearly articulated vision and strategic direction for the program are recorded, communicated, and endorsed. A formal shaping curve is in place and endorsed by SBU LS Sponsor	Clearly articulated vision and strategic direction for the program are recorded, communicated, and endorsed; program vision shared with SBU L/T; snaking sessions held with SBU L/T to ensure alignment with SBU objectives. A formal shaping curve is in place and endorsed by SBU LS Sponsor. LS objectives are strategically placed in some PMP's.	Clearly articulated vision and strategic direction for the program are recorded, communicated, and endorsed; program vision shared with SBU L/T; snaking sessions held with SBU L/T to ensure alignment with SBU objectives; entire SBU L/T can clearly articulate program vision and how program will contribute to meeting objectives.
4. Importance attached to LSS by the top management in relation to cost and schedule objectives	Requirement (Component 1)	Req - 9	A program financial benefit target is set annually.	No target set.	Unofficial target or SBU L/T unaware of target.	Target established; visible on shaping plan; endorsed by SBU L/T.	Target established; visible on shaping plan; endorsed by SBU L/T; stretch target publicized	Target established; visible on shaping plan; endorsed by SBU L/T; stretch target publicized; current and predicted performance to target is measured monthly and publicized.
5. Degree to which the top management considers LSS improvement as a way to increase profits	Already available: in Five component model, this has been accomodated in the role and responsibilities of the Leadership (Champion and Sponsors), thus, when the drive from management high, this indicates his belief on LSS as a way to increase profits, or other financial measures							

| | | 6. Degree of comprehensiveness of the LSS plan within the company | Already available: This item is captured in item requirement, where : the Project queue containing aligned proposed projects exists; queue is populated from multiple sources; shared on a drive by the process advisor, proposed projects are prioritized against one another; queue is reviewed purged and refreshed monthly; SBU can estimate impact to objectives based on projects in queue. The Queue is aligned and optimized through the value stream. |
| | | 7. Commitment of the top management to employee training | Although training is regularly conducted, management commitment on the training is not included in 5 component model. What included in here, is that management commitment to ensure the green/black belt is active doing a LSS Project after the training. This is part of roles and responsibilities of Green belt and champion, thus included in items : Resources, Roles and Responsibilities |

NO	CSFs Framework by (Jeyaraman and Teo, 2010)	Items	XYZ's 5 Component Model	Code	List of Items	Nothing is in place (1)	Partially implemented but not effective (2)	Basic requirement is being met (3)	Beyond basic compliance (4)	Results reflect superior performance (5)
2	Reward and recognition system (Domain 2)	1. Effectiveness of performance measurement	Since performance measurement of LSS in XYZ standard and it's aligned across the globe, this point is not available, thus the existing measurement is considered effective in alarming and driving the performance forward							
		2. Fairness of individual or team-based performance measurement	Room for improvement for the 5 component model, is to include or relate the performance individual and their contribution in LSS Program.							
		3. Reward and recognition for actual performance improvement	Requirement (Component 1)	Req - 8	Teams on successful projects that produce measurable impact are considered for Recognition according to the corporate program. Local SBU guidelines may supplement the corporate program to provide consistency of application.	No Recognition given to any team members for any Lean Sigma projects.	> 25% of completed Lean Sigma projects received some type of Recognition, nothing was recorded in the Data Base	> 50% of completed Lean Sigma projects received some form of Recognition and have it recorded in the Data Base.	> 75% of completed Lean Sigma projects received some form of Recognition, 75% of projects have it recorded in the Data Base. Exceptional teams recognized publically.	All completed Lean Sigma projects received some form of Recognition, All projects have it recorded in the Data Base. Exceptional teams recognized publically; successful projects publicized within the SBU.
			Procedure (Component-2)	Proc - 10	Teams are recognized based on the business impact.	No Recognition was given to any team members for any Lean Sigma projects.	> 25% of completed Lean Sigma projects received some type of Recognition, nothing was recorded in the Data Base	> 50% of completed Lean Sigma projects received some form of Recognition, 50% of projects have it recorded in the Data Base	> 75% of completed Lean Sigma projects received some form of Recognition, 75% of projects have it recorded in the Data Base. Exceptional teams recognized publically.	All completed Lean Sigma projects received some form of Recognition, all projects have it recorded in the Data Base. Exceptional teams recognized publically; successful projects publicized within the SBU.
			Resources, Roles and Responsibilities (Component 3)	RRR - 16	Recognizes project teams for accomplishments.	No Recognition was given to any team members for any Lean Sigma projects.	> 25% of completed Lean Sigma projects received some type of Recognition, nothing was recorded in the Data Base.	> 50% of completedLean Sigma projects received some form of Recognition, 50% of projects have it recorded in the Data Base.	> 75% of completed Lean Sigma projects received some form of Recognition, 75% of projects have it recorded in the Data Base. Exceptional teams recognized publically.	All completed Lean Sigma projects received some form of Recognition, All projects have it recorded in the Data Base Exceptional teams recognized publically; successful projects publicized within the SBU.

NO	CSFs Framework by (Jeyaraman and Teo, 2010)	Items	XYZ's 5 Component Model	Code	List of Items	Nothing is in place (1)	Partially implemented but not effective (2)	Basic requirement is being met (3)	Beyond basic compliance (4)	Results reflect superior performance (5)
3	Competency of MBB and BB (Domain 3)	1. Visibility of the MBB/BB in driving LSS program	Resources, Roles and Responsibilities (Component 3)	RRR - 9	Reviews SBU projects in the database for completeness, compliance, and accuracy.	Does not use database; project documentation reviews conducted informally.	Greater than 50% of active projects are in the pTrack DB.	Reviews SBU projects on a monthly basis for completeness, compliance, and accuracy. Greater than 80% of active projects are in the pTrack DB.	Reviews SBU projects with the facilitator on a bi-weekly basis for completeness, compliance, and accuracy; develops action plans for projects by exception.	Reviews SBU projects with the facilitator dynamically for completeness, compliance, and accuracy; develops action plans for projects by exception; conducts root cause analysis for repeat issues.
		2. MBB/BB accesses to top management	Procedure (Component-2)	Proc - 11	Results are rolled up and reported by the Process Advisor.	Results are not tracked	Results are tracked by the LS advisor, but not published	Results are tracked by the LS advisor, published, but not acted upon by the LT.	Results are tracked by the LS advisor, published, reviewed by the LT at least 4 times a year.	Results are tracked by the LS advisor, published, reviewed by the LT every other month, and used by the LT to do forward planning.
		3. Autonomy of the MBB/BB	Resources, Roles and Responsibilities (Component 3)	RRR - 7	Tracks and communicates SBU program metrics and project status.	No real metric or project tracking is evident.	SBU program metrics and projects are tracked; reviews are conducted within the Lean Sigma team.	SBU program metrics and projects are tracked and communicated monthly throughout the SBU.	SBU program metrics and projects are tracked and communicated monthly throughout the SBU; summary scorecards are used to share progress and gaps with the effected champions and belts	SBU program metrics and projects are tracked and communicated throughout the SBU; summary scorecards are used to share progress and gaps with the SBU L/T; success stories are compiled and shared; projects and/or belts are profiled within the SBU.
			Resources, Roles and Responsibilities (Component 3)	RRR - 11	Participates in the Process Advisor Network.	Does not participate in Process Advisor Network.	Calls in occasionally to Process Advisor Network > 25%; contributes or comments minimally.	Participates in the Process Advisor Network, including calls >50% and face-to-face meetings as scheduled.	Participates in the Process Advisor Network, including calls >90% and face-to-face meetings as scheduled; occasionally facilitates or hosts a Network call, participates on the governance or training committee	Participates in the Process Advisor Network, including all calls and face-to-face meetings as scheduled; occasionally facilitates or hosts a Network call; arranges guest presentations and/or business partner project shares. Volunteers for action items,
		4. Utilization of MBB/BB professionalism as a consulting resource	Resources, Roles and Responsibilities (Component 3)	RRR - 8	Mentors Process Improvement Facilitators.	No mentoring is provided for Process Improvement Facilitators.	Mentoring is provided for Process Improvement Facilitators on an as-needed basis when requested, from an outside source.	Mentoring is provided for Process Improvement Facilitators on a regularly scheduled basis. from an outside source,	Mentoring is provided for Process Improvement Facilitators on a regularly scheduled basis with formal documentation; Mentoring is done by a qualified internal XYZ's Blackbelt,	Mentoring is provided for Process Improvement Facilitators by an assigned qualified XYZ's Blackbelt on a regularly scheduled basis with formal documentation; projects are reviewed and discussed; career development and succession plans are discussed.
		5. Effectiveness of the MBB/BB in improving company performance	Room for improvement for the 5 component model, where currently, the company performance is only measured by financial measure, or specific metric resulting from an LSS project, but no assessment has been made regarding the connection between the result and the effectiveness in doing a LSS Project								
4	Company financial capability	1. Adequate budgeting or funding to support LSS projects	This is not applicable, since 5 component model is made under the assumption all the cost required to support/ deploy LSS including training already covered by XYZ							

(Domain 4)	2. Adequate budgeting or funding to set up IT infrastructure for data analysis using minitab							
	3. Adequate budgeting or funding to set up classroom training with computer facility							
	4. Adequate budgeting or funding to reward success project							

NO	CSFs Framework by (Jeyaraman and Teo, 2010)	Items	XYZ's 5 Component Model	Code	List of Items	Nothing is in place (1)	Partially implemented but not effective (2)	Basic requirement is being met (3)	Beyond basic compliance (4)	Results reflect superior performance (5)
5	Frequent communication and assessment on LSS result (Domain 5)	1. Use of LSS problem-solving tools/techniques to solve problems	Procedure (Component-2)	Proc - 5	The team follows a fit-for-purpose DMAIC process improvement roadmap,	Review of SBU control and completed project list indicates 25% or less of the projects are entered into the project data base with documentation containing a charter, IPO, show cause and effect, and a control mechanism	Review of SBU control and completed project list indicates > 25% of projects are entered into the database with documentation containing a charter, IPO, cause and effect, and a control mechanism .	Review of SBU control and completed project list indicates > 80% of the projects have a charter, IPO, show cause and effect, and have a control mechanism	Review of SBU control and completed project list indicates > 90% of the projects were entered into the database with documentation showing a charter, IPO, cause and effect, and have a control mechanism.	Review of SBU control and completed project list indicates more than 95% of projects were entered into the database with documentation showing a charter, IPO, cause and effect, and have a control mechanism.
			Procedure (Component-2)	Proc - 6	Were the appropriate tools used correctly?	1 or less	2 or 3 used, not documented in a final report	3 tools used, documented in final report	3 + tools used, documented in final report, acted upon	3 + tools used, documented in final report, acted upon, found systemic solutions
		2. Good communications between different departments	Beside LSS framework, XYZ already using operational excellence and other framework that address this, so this is excluded in five-component model							
		3. Effective top-down and bottom-up communication	This item is already captured in requirement component, where regular meeting between LSS green belt/facilitator shall conduct a regular meeting with management							
		4. Clear, consistent communication of mission statement and objectives	Procedure (Component-2)	Proc - 7	Was (is) cause and effect relationship established between the problem statement and the solution, is it clearly stated	no	Looked for it, but did not find it	Cause and effect was shown	Cause and effect was shown, and clearly stated	Cause and effect was shown, clearly stated and analyzed at a systemic level
			Requirement (Component 1)	Req - 5	All active process improvement projects have a contract and follow a fit-for-purpose DMAIC roadmap.	Less than 25% of control and completed projects have a project contract in the database, and are following the DMAIC methodology.	Review of SBU control and completed project list indicates > 25% of the projects have both a completed project contract in the database, and are following the DMAIC methodology,	Review of SBU control and completed project list indicates > 80% of the projects have both a completed project contract in the database, and are following the DMAIC methodology	Review of SBU control and completed project list indicates > 90% of the projects have both a completed project contract with the Champions signiture in the database, and are following the DMAIC methodology.	Review of SBU control and completed project list indicates more than 95% of the projects have both a completed project contract with the Champions signiture in the database, and are following the DMAIC methodology.,

					Nothing is in place (1)	Partially implemented but not effective (2)	Basic requirement is being met (3)	Beyond basic compliance (4)	Results reflect superior performance (5)
		Requirement (Component 1)	Req - 7	Benefits from completed projects are verified according to the Guidelines for Lean Sigma Project Financial Verification.	No financial lookbacks have been completed.	>25% of projects have a financial look-back. Benefits may be recorded; no supporting calculations given; signatures missing.	Benefits verified per guidelines; majority >50% of required signatures are obtained on the financial lookback and is completed on a majority > 50% of projects.	Benefits verified per guidelines; > 90% of all pojects are verified with > 75% of required signatures obtained. >75% have detailed supporting calculations	Benefits verified per guidelines; > 95% of all pojects are verified with > 85% of required signatures obtained. >85% have detailed supporting calculations provided; assumptions clearly stated; financial verifications performed at 3-4 month and 12 month points on >95% of projects.
		Procedure (Component-2)	Proc - 9	Financial benefit is verified in a formal look back.	No Formal look backs are done	25% of projects have a formal project look-back.	75% of projects have a formal project look-back.	85% of projects have a formal project 4 and 12 month look-back.	95% of projects have a formal project 4 and 12 month look-back

NO	CSFs Framework by (Jeyaraman and Teo, 2010)	Items	XYZ's 5 Component Model	Code	List of Items	Nothing is in place (1)	Partially implemented but not effective (2)	Basic requirement is being met (3)	Beyond basic compliance (4)	Results reflect superior performance (5)
6	Project selection, prioritization, reviews and tracking (Domain 6)	1. Having project selection and prioritization on projects that improve company competitive advantage, business profitability, process cycle time, throughput yield, etc.	Requirement (Component 1)	Req - 4	A queue of proposed process improvement projects are developed in alignment with the business objectives (identify, prioritize, select, and resource meaningful improvement projects).	No project queue exists; critical review indicates that projects do not align with SBU objectives; Belts populate a minimal queue.	Small queue exists; queue filled from Champion brainstorming session(s); critical review indicates some proposed projects align with SBU objectives.	Project queue containing aligned proposed projects exists; queue is populated from multiple sources; proposed projects are prioritized against one another.	Project queue containing aligned proposed projects exists; queue is populated from multiple sources; proposed projects are prioritized against one another; queue is reviewed, purged and refreshed quarterly. SBU can estimate impact to objectives based on projects in queue.	Project queue containing aligned proposed projects exists; queue is populated from multiple sources; shared on a drive by the process advisor, proposed projects are prioritized against one another; queue is reviewed purged and refreshed monthly; SBU can estimate impact to objectives based on projects in queue. The Queue is aligned and optimized through the value stream.
		2. Periodic project review to ensure projects are proceeded according to schedule	Requirement (Component 1)	Req - 12	Active and control phase projects are reviewd by exception monthly by the Leadership Team.	Active and control phase projects are not reviewed.	Active and control phase projects are reviewed by the SBU Lean Sigma governing body on a quarterly basis.	Active and control phase projects are reviewed by exception by the SBU Lean Sigma governing body on a monthly basis.	Active and control phase projects are reviewed by exception by the SBU Lean Sigma governing body and SBU LT on a monthly basis; meeting has a standard agenda; performance to target updated.	Active and control phase projects are reviewed by exception by the SBU Lean Sigma governing body and SBU LT on a monthly basis; meeting has a standard agenda, performance to target updated; mitigation plans developed for lagging projects.
		3. Project tracking system to track the project status	Requirement (Component 1)	Req - 6	Active process improvement projects are updated monthly in the Lean Sigma database. Appropriate documents should be attached.	Review of SBU active project list indicates 25% or less of the projects have been updated in the Lean Sigma database over the last year	Review of SBU active project list indicates > 25% of the projects have been updated in the Lean Sigma database over the last year.	Review of SBU active project list indicates > 80% of the projects have been updated in the Lean Sigma database over the last year.	Review of SBU active project list indicates > 90% of the projects have been updated in the Lean Sigma database over the last year.	Review of SBU active project list indicates more than 95% of the projects have been updated in the Lean Sigma database over the last year .
			Resources, Roles and Responsibilities (Component 3)	RRR - 14	Holds project teams accountable for project success. Ensures projects are held in control beyond 12 months	> 50% of project starts are completed within 6 months	>75% of project starts are completed within 6 months	> 90% of project starts are completed within 6 months.	> 90% of project starts are completed within 6 months. 50% of projects with AFB > $!MM have a control plan in place to control the project after 12 months	> 90% of project starts are completed within 6 months. 90% of projects with AFB > $!MM have a control plan in place to control the project after 12 months

		Resources, Roles and Responsibilities (Component 3)	RRR - 19	Update the LS database	Review of LS SBU metrics indicates 25% or less of the projects are entered into the LS database	Review of SBU active and control projects indicates > 25% of projects are entered into the LS database	Review of SBU active and control projects indicates > 80% of the LS projects are entered into the LS database, and updated monthly, have a current project charter and storyboard.	Review of SBU active and control projects indicate >90% of LS projects are entered into the LS database, are updated monthly, have a current and accurate project charter and storyboard.	Review of SBU and control LS projects indicate > 95% are entered into the LS database, are updated monthly, have a current and accurate project charter, financial lookback, and storyboard. Anyone can review and understand the project deliverables, how the AFB was calculated, cause and effect was clearly demonstrated and understood.
		Procedure (Component-2)	Proc - 1	Improvement opportunities are generated by process owners and business unit leadership	No opportunity list has been generated, or belts populate a minimal queue.	A list has been generated and is held by the process advisor, Belts or advisor populate a minimal queue filled from Champion brainstorming session(s)	The opportunity list is held by the advisor or LSAT and populated with projects containing both VOB and VOP, visited and added too, min 2 times per year	The opportunity list is held by the advisor or LSAT and populated from multiple areas with projects containing both VOB and VOP. List added to at least 4 times per year	The opportunity list is shared on a drive by the process advisor or LSAT; is being used and shared by all, and populated from all areas with projects containing both VOB and VOP, purged and added too monthly.
		Procedure (Component-2)	Proc - 8	Progress and results are documented in the Lean Sigma project database	Review of SBU active project list indicates 25% or less of the projects are entered into the database	Review of SBU active control and completed project list indicates > 25% % of projects are entered into the database with documentation containing a project summary, and a completed project financial verification document	Review of SBU control and completed project list indicates > 80% of the projects have a project summary, and a completed project signed financial verification document.	Review of SBU control and completed project list indicates > 90% of projects were entered into the database with documentation showing a project summary, and a completed project signed financial verification document. All of the required signatures are present, 50% of projects < $2MM in AFB and 90% of projects greater than $2 MM have a 4 and 12 month look back	Review of SBU control and completed project list indicates more than 95% of projects were entered into the database with documentation showing a project summary, and a completed project signed financial verification document at both 4 and 12 months All of the required signatures are present. A standard template is used.
7	Project success stories and best practices sharing (Domain 7)	1. Extent to which LSS data (cost of quality, defects, errors, scrap, etc.) are used as tools to manage LSS performance	Room for improvement: this can be included						
		2. Extent to which LSS project success stories and best practices are available to employees	Requirement (Component 1)	Req - 13	Participate in a Global Upstream and SBU Lean Sigma network (community of practice) for best practice sharing and continuous improvement.	No participation or interation with other SBU's or GU.	Process Advisor has occasional touchpoints with GU PA.	Process Advisor or SBU represenative participates >75% in a monthly Advisor Network call	Process Advisor or SBU represenative participates in a monthly Advisor Network call >95%; full time Black Belts interact with peers from other SBU's and/or GU on a routine basis.
		3. Extent to which LSS project success stories and best practices are available to managers and supervisors							Process Advisor or SBU represenative participates in a monthly Advisor Network call > 95%; full time Black Belts interact with peers from other SBU's and/or GU on a routine basis; SBU full time Lean Sigma personnel host CoP and/or learning sessions.
		4. Extent to which LSS project success stories and best practices are displayed at employee work stations	Room for improvement: The current five component model emphasize on the Recognizition and Award (popular by term R&A) , XYZ's standard tools for giving monetary reward, and one of the criteria is to giving the award in public occassion. Outside from R&A, this item can be utilized to promote LSS program.						

		1. Specific LSS training (yellow/green/BB training) given to employees throughout the company	Room for improvement: Although number of trained employee is included in the LSS scorecard, it is not included in five component model assessment. One of the reason is that the scorecard for measuring training is already standard for all SBU, and only those facilitate, and or becoming an LSS member are trained white/green/black belt LSS						
		2. LSS awareness training among employees is ongoing	Room for improvement: This can be included to assess whether the employee are aware about the LSS and if there's training available for them upon endorsement from their leader						
		3. Training in problem identification and solving skills, quality improvement skills and waste identification skills	Although this types of training maybe beneficial for the facilitator to improve their soft skills, the training outside LSS is not included in LSS framework						
		4. Training in statistical techniques (such as histograms, control chart, design of experiments and regression analysis)	The standard training packages from XYZ already included this tools, and therefore is not included in the 5 component model, since it's considered given and standard by XYZ corporate level						
8	Effective LSS training program (Domain 8)	5. Availability of resources for employee training in the company	Resources, Roles and Responsibilities (Component 3)	RRR - 10	Coordinates and/or delivers SBU training.	Has little to no involvement in SBU training activities.	Arranges training schedule; monitors budget.	Coordinates training schedule and budget; delivers SBU training as required (White Belt and Champion training). Coordinates and ensures the participants are correctly entered into LMS. Mentors Champions / Sponsors on selection of candidates	Coordinates training schedule and budget; delivers SBU training as required (White Belt and Champion training); kicks off SBU training classes; directly solicits feedback. Coordinates and ensures the participants are correctly entered into LMS. Mentors Champions / Sponsors on selection of candidates	Coordinates training schedule and budget; delivers SBU training as required (White Belt and Champion training); kicks off SBU training classes; directly solicits feedback; arranges for SBU leadership to kick off classes; co-delivers key concept modules. Coordinates and ensures the participants are correctly entered into LMS. Mentors Champions / Sponsors on selection of candidates
			Resources, Roles and Responsibilities (Component 3)	RRR - 22	Mentoring	none have mentors	Mentoring is provided for Process Improvement Facilitators on an as-needed basis when requested, mentor is an outside resource.	Mentoring is provided for Process Improvement Facilitators on a regularly scheduled basis. from an outside source,	Mentoring is provided for Process Improvement Facilitators on a regularly scheduled basis with formal documentation; Mentoring is done by a qualified internal XYZ Blackbelt, projects are reviewed and discussed; Facilitator's needs and concerns are documented on an action plan	Mentoring is provided for Process Improvement Facilitators on a regularly scheduled basis with formal documentation; Mentoring is done by a qualified internal XYZ Blackbelt, Facilitator needs and concerns are documented on an action plan. Belts are shared to help mentor areas outside the BU
		6. Training in interactive skills (such as communication skills, effective meeting skills and leadership skills)	Although this types of training maybe beneficial for the facilitator to improve their soft skills, the training outside LSS is not included in LSS framework						

			Requirement (Component 1)	Req - 3	A process improvement project Champion (typically the process owner) and a Lean Sigma Facilitator (Green Belt or Black Belt level) are assigned to each active and control phase process improvement project.	Review of SBU active and control project list indicates 25% or less of the projects have both an assigned Champion and Facilitator.	Review of SBU active and control project list indicates between 26% and 90% of the projects have both an assigned Champion and Facilitator.	Review of SBU active and control project list indicates between 90% and 95% of the projects have both an assigned Champion and Facilitator.	Review of SBU active and control project list indicates between 95% and 99% of the projects have both an assigned Champion and Facilitator.	Review of SBU active and control project list indicates every project has both an assigned Champion and Facilitator.
			Requirement (Component 1)	Req - 11	Sufficient Process Improvement Facilitators are developed / made available to the lead the target number of active projects.	Insufficient facilitators available; projects lingering in queue until resources can be made available.	Sufficient number of facilitators available; projects sometimes delayed due to waiting on available resources.	Sufficient number of facilitators available; projects resourced per prioritized plan.	Sufficient number of facilitators available; projects resourced per prioritized plan; Black Belts are available to mentor Green Belts and the majority provide standard white belt traing on a regular basis.	Sufficient number of facilitators available; projects resourced per prioritized plan; Black Belts are available to mentor Green Belts, and the majority provide standard white belt traing on a regular basis; future workload monitored proactively to anticipate resource requirements.
9	Established LSS dashboard (Domain 9)	1. Extent to which LSS results (yield improvement, cost reduction, scrap reduction, etc.) are used as tools to manage performance	Measurement & Verification (Component 4)	MV - 8	SBU tracks the estimated COPQ	Metric not tracked.	Metric is tracked; reporting is sporadic or infrequent.	Metric is tracked, recorded, and reported monthly to SBU L/T.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance; actions plans developed and executed in response to changes in performance.
			Measurement & Verification (Component 4)	MV - 9	SBU tracks project accrued financial benefit ($ and % revenue).	Metric not tracked.	Metric is tracked; reporting is sporadic or infrequent.	Metric is tracked, recorded, and reported monthly to SBU L/T.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance; actions plans developed and executed in response to changes in performance.
		2. Extent to which LSS dashboard is available to employees			Room for improvment: the visibility of LSS dashboard shall be tracked and implemented to spread the word of successfull LSS Projects and implementation					
		3. Extent to which LSS dashboard is available to managers and supervisors								
		4. Specificity of LSS goals within the company	Requirement (Component 1)	Req - 9	A program financial benefit target is set annually.	No target set.	Unofficial target or SBU L/T unaware of target.	Target established; visible on shaping plan; endorsed by SBU L/T.	Target established; visible on shaping plan; endorsed by SBU L/T; stretch target publicized	Target established; visible on shaping plan; endorsed by SBU L/T; stretch target publicized; current and predicted performance to target is measured monthly and publicized.
			Requirement (Component 1)	Req - 10	A minimum number of active projects are conducted to reach the minimum plan financial benefit.	Insufficient number of active projects to support target; no connection between active projects and financial target.	Expected benefit from active projects is enough to meet planned target.	Expected benefit from active projects is enough to marginally (0% - 10%) exceed planned target.	Expected benefit from active projects is enough to comfortably (11% - 25%) exceed planned target.	Expected benefit from active projects is enough to significantly (>25%) exceed planned target. Number of projects and projections to plan are published monthly

			Measurement & Verification (Component 4)	MV - 1	SBU tracks the number of active projects (count).	Metric not tracked.	Metric is tracked; reporting is sporadic or infrequent.	Metric is tracked, recorded, and reported monthly to SBU L/T.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance; actions plans developed and executed in response to changes in performance.
			Measurement & Verification (Component 4)	MV - 2	SBU tracks the number of project starts (# per month).	Metric not tracked.	Metric is tracked; reporting is sporadic or infrequent.	Metric is tracked, recorded, and reported monthly to SBU L/T.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance; actions plans developed and executed in response to changes in performance.
			Measurement & Verification (Component 4)	MV - 3	SBU tracks regular project progress (% of projects updated in the database each month).	Metric not tracked.	Metric is tracked; reporting is sporadic or infrequent.	Metric is tracked, recorded, and reported monthly to SBU L/T.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance; actions plans developed and executed in response to changes in performance.
			Measurement & Verification (Component 4)	MV - 4	SBU tracks the duration of active and control phase projects (months).	Metric not tracked.	Metric is tracked; reporting is sporadic or infrequent.	Metric is tracked, recorded, and reported monthly to SBU L/T.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance; actions plans developed and executed in response to changes in performance.
			Measurement & Verification (Component 4)	MV - 5	SBU tracks the count of trained Facilitators and Champions (count) and maintains an active list naming them.	Metric not tracked.	Metric is tracked; reporting is sporadic or infrequent.	Metric is tracked, recorded, and reported monthly to SBU L/T.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance; actions plans developed and executed in response to changes in performance.
			Measurement & Verification (Component 4)	MV - 6	SBU tracks the number of projects successfully completed (# per month and % successfully completed).	Metric not tracked.	Metric is tracked; reporting is sporadic or infrequent.	Metric is tracked, recorded, and reported monthly to SBU L/T.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance; actions plans developed and executed in response to changes in performance.
			Measurement & Verification (Component 4)	MV - 7	SBU tracks the lead time for project completion (months).	Metric not tracked.	Metric is tracked; reporting is sporadic or infrequent.	Metric is tracked, recorded, and reported monthly to SBU L/T.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance.	Metric is tracked, recorded, and reported monthly to SBU L/T; Lean Sigma tools are used to present and monitor performance; actions plans developed and executed in response to changes in performance.
10	Organizational belief and culture (Domain 10)	1. A comprehensive culture exists to support and enhance effective people and team processes	Room for improvement: Current 5 component model does not currently measure the culture progress						

		2. A process is in place to help workers expand their role to become team players, highly skilled, knowledge resources, customer advocates, trainers, problem solvers and decision makers. This process includes training and follow-up support	Procedure (Component-2)	Proc - 3	Cross-functional teams are resourced.	Projects have less than 3 active members	Projects have more than 3 active members	50% of projects have more than 3 members, leadership has a voice in staffing the projects	50% of projects have more than 6 members, leadership has a voice in staffing the projects	50% of projects have more than 6 members, leadership has a voice in staffing the projects, the value stream is used in staffing projects.
		3. A process is in place to help supervisors, managers and technical and support professionals modify and expand their roles to become coaches, facilitators, customer advocates, barrier busters, motivators and leaders. This process includes training and follow-up support	Room for improvement: this items has not yet measured							
		4. Major achievements stemming from the continuous improvement and empowerment efforts are formally celebrated	This already capture in the item Requirement where R&A Shall be given. Normally, this is also considered as form of celebration							