Independent Learning Pursuit
FX Competency

The following essay was written by a student in the School for New Learning, in support of an Independent Learning Pursuit (ILP). The student has agreed to share this with SNL writing and the Writing Center. Names and identifying details have been removed. December, 2011.

Learning Six Sigma Theory

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Introduction and Background

The use of Six Sigma methodology has a valuable connection to my current field of performance improvement, advancing my current skill set to a higher level of function. I currently employed as the manager of Performance Improvement at a major Medical Center, an environment challenged by the need to continuously improve performance in order to meet regulatory standards. The main point of this independent learning pursuit will qualify the knowledge I gained through formal education on the theory of the Six Sigma improvement process so I could apply it to the high level strategic improvement opportunities I facilitate in healthcare. This paper targets my ability to demonstrate knowledge and understanding of the Six Sigma process improvement methodology.

Rationale for Experience

As a quality improvement professional, the use of continuous quality improvement (CQI) tools and methods are at the core of my accountabilities when preparing to facilitate a team through an improvement project. These skills are basic requirements for a quality improvement professional to effectively provide the structure needed for teams to plan and implement their actions for improvement, how they will be accomplished, and most importantly, how they will be measured to demonstrate effectiveness. The knowledge gained through my formal Six Sigma Green Belt training allowed me to add new learning which advanced my skill and ability to facilitate strategic, high level improvement project teams far beyond my previous level of function.

Development of the Experience

In January 2006, I was fortunate to be offered an invitation from my employer to participate in formal training on the Six Sigma process improvement methodology, with the intention that the outcome of my training would result in achieving the status of Green Belt. The experience was gained through formal learning provided by 3 Six Sigma Master Black Belts at the G.E. Healthcare Institute in Pewaukee, Wisconsin. The experience provided didactic learning of the methodology as well as the use of tools and facilitation skills required to successfully lead a Six Sigma team. I was one of a six member delegation chosen by our corporation for this learning experience. Class exercises focused on the daily lecture topics covered in class and involved both individual as well as team activities.

The learning environment involved an intense 3 week classroom experience staggered over a 3 month period. The period between classes required me to implement a guided, step by step application of the knowledge gained by applying it to an actual healthcare project, sponsored by executive leadership. This actual experience was also guided and evaluated by a Master Black Belt, both on site as well as by way of conference call, dependent on the level of planned activity.

The Learning Cycle & Methodology

First and foremost, learning addressed a basic introduction to Six Sigma as a measure of quality, a process for continuous improvement and enabler of change

empowering organizations to make sound, data driven decisions. (Hoisington). The statistical sigma level measures how close a targeted service comes to its quality goal. Statistically speaking, reaching a level of six sigma demonstrates that a process performs at a nearly flawless level of execution by meeting specifications 99.9997% of the time falling in the range of having only 3.4 defects per million opportunities. (G.E. Healthcare Design)

Six Sigma is supported by the five step problem solving methodology of Define-Measure-Analyze-Improve-Control, more commonly referred to as the DMAIC method. Classroom knowledge focused intensely on each step of the process, with an entire book dedicated to each step of the process. The *Define* step initiated our learning, focusing on who the process customers are and their priorities in order to set the objectives for the improvement project. The define phase sets the expectations of the improvement project and articulates the Six Sigma strategy based on the customer's requirements. Facilitation of the team generates what process requirements are critical to quality (CTQs) from those who have best knowledge of the process. This assessment was obtained through voice of the customer (VOC) interviews focusing on what works well or poorly in the current process and their ideas on change within the process. This data was used to gather information to better define the problem and what was of importance to the customer. A problem statement is crafted to reveal: the problem, under what conditions it occurs, where it occurs, the extent of the problem and the impact of the problem. (G.E. Healthcare Design). Once identified, the team develops a charter which serves to recognize what success would look like. A process map is generally constructed to

visually display major steps in the process, and a stakeholder analysis to identify who has a significant influence on the success or failure of the process.

The *measure* phase is the second step of the process. This phase is important as it specifically defines the defect the team is going to measure and how it will be measured. A data collection plan is developed and includes an assessment of the measurement system to assure it is accurate prior to actually measuring the process. This phase establishes customer specifications and determines the system of measuring the defects in order to gather appropriate and meaningful data for the project. (G.E. Healthcare Measure). Data collection goals and operational definitions are identified and a sampling plan strategy put into play. The measure phase is important to establish process capability which compares the current to improved state of the process and all sources of possible variation. Learning during the measurement phase was enhanced through use of Minitab statistical software, a high powered tool which enhanced data analysis through use of different functions falling under basic and descriptive statistics. This phase identifies the project X's and Y's for measurement as well as a Z score to determine the probability of a defect in the process, the number of times the process falls outside the limit. The Xs represent the inputs, factors, or pieces that are needed to produce the outcome, and the Ys are representative of the desired result. (G.E. Healthcare Measure) Understanding these measures set the foundation for analysis, the third phase of the methodology.

The *analyze* phase of the process uses the data generated in the measurement phase to determine what is actually driving the process so improvements can be put in place to achieve the desired outcome. The phase examines the Y data in order to generate

a prioritized list of the sources of variation (the Xs). The analyze phase focuses improvement efforts to recognize the vital few variables most likely responsible for the variation, from the trivial many and least likely to have an impact on the process. This phase is crucial as it utilizes the data to identify the most important causes of defects in the process and tools facilitators can use with the team to understand the cause and effect relationships in the process. Various graphs such as histograms, run charts, and dot plots are used to visualize the data and further identify trends and variation. Additional analysis could include the use of value stream mapping to identify waste or Muda from defects, overproduction, motion, and underutilization to name a few. Hypothesis testing is also a part of the analyze phase, a step used to determine if our observed differences are statistically significant or due to chance. (G.E. Healthcare Analyze). Additional tests and tools utilized during this phase can include benchmarking, regression analysis and failure mode and affect analysis.

The *improve* phase is the fourth phase of the DMAIC methodology. This phase confirms that the proposed solutions will meet or exceed the quality improvement goals for the project. Improve identifies the resources which are required for a successful full scale implementation, allowing them to be brought forward as proposed solutions. (G.E. Healthcare Improve). This phase ensures that the analysis and solutions will fix the causes of variation and that proposed solutions will work. These two steps take the guess work out of the equation, as changes are driven by the use of data and how it is analyzed and optimized. Improve allows for the implementation of actions that lead to improvement in the process. This phase can include the design of experiment (DOE), a process which is used to test out what is believed to be valid and relevant conclusions

about a process. Additional tools included the use of a benchmarking, use of a design matrix, replication, and nominal group technique to narrow and prioritize choices. These are tools I was familiar with and have used in facilitating teams, but my experience in using them with a Six Sigma team both refreshed and sharpened effective use. One of the newest tools was the use of the Pugh Matrix. This tool allowed the comparison of different concepts or criteria, visualizing and sorting the weaker components from those considered stronger. (G.E. Healthcare Improve). Use of the matrix was simple and effective in identifying potential solutions, however care needed to be taken in defining the meaning of each component to weight it accurately.

The improve phase also includes steps to test the operating tolerance of proposed solutions in order to diminish the likelihood of failure upon implementation. Tools used in this step include failure mode and effect analysis (FMEA), cost-benefit analysis, and piloting proposed solutions to assess their effects prior to full scale implementation. While these are additional steps in project implementation, and may be perceived to slow progress down, these tools and processes save time and resources by identifying what could go wrong, how it could go wrong and why prior to full implementation. They are steps and time well spent in evaluating if new processes are capable of transition to full scale implementation. These steps are a proven formula for results, recognizing that the effectiveness (E) of the result is equal to the quality (Q) of the solution times the acceptance (A) of the idea. (G.E. Healthcare Improve)

Q X A = E

The fifth and final phase of the DMAIC methodology is the *control* phase. The control phase follows the implemented solution, ensuring that it is sustained. Once

accomplished, lessons learned can be shared with others who can benefit from the project and reproduce it. It is an important phase to assure improvements are sustained over time, and are strong in not allowing the process to revert to its previous state. (G.E. Healthcare Control). Measurement is also a very important component of this phase for its ability to determine process capability and control. It allows the process owner to trust the improvements put in place, recognize that goals of the project have been accomplished, and that improvement is statistically valid. This confirms performance and business requirements have been met for the project and the value of the improvement can be substantiated.

The tools used in this phase include the design of a control plan with clear specifications to ensure each component of the process stays in conformance. All those involved in the process must understand the actions and procedures which are involved in the new process and the importance of following implementation specifications. The control plan can include flow charts, standard operating procedures (SOP) and agreed upon operating tolerances which can be monitored to identify process breakdowns and fix them, a step critical to supporting and sustaining project results. A well designed control plan describes and documents the X and Y variables that are critical to quality and the type of data measured. Data can be visualized using graphics to include control charts and dashboards at a predetermined frequency with alert flags to recognize if a change in the process has occurred and it has the potential for getting out of control. The statistical controls set by the team will allow them to not over react to the data through an understanding of expected variation, called common cause, or unexpected variation noted as special cause. In summary, the DMAIC methodology is embedded in the control phase

in the *design* of the control plan, *measurement* of process control, *analysis* to determine the meaning of variation in the process, evaluation of *improvement* efforts and lastly, the ability to ensure *controls* are in place to maintain improvements. (DeCarlo)

Conclusion

As noted in the paper, my formal learning of Six Sigma methodology included the basis of the DMAIC methodology and knowledge and experience in statistical and change acceleration process (CAP) tools. These experiences challenged my use of sophisticated facilitation tools to best structure and guide the team through accomplishing individual meeting as well as overall project goals.

The training I received allowed me to recognize the value of the Six Sigma methodology, a process widely used in the manufacturing industry and its relevance and importance when applied to opportunities in healthcare. I have vast experience in use of the CQI model and the tools used to facilitate the model, but by comparison, Six Sigma is like CQI on steroids! Healthcare is very much a science, and practitioners the scientists. Our physician and nursing leaders relate to the use of measurement and statistics in the practice of medicine. As such, they relate and engage in the use of statistics to analyze and recognize change in processes. My experience so far has demonstrated the process to be a good fit for healthcare for high level process change.

In summary, learning experiences were gained through both formal classroom training as well as through application in the leading Six Sigma teams. Participants engaging in Six Sigma project teams have a need to understand the basic process and have an appreciation for the methodology used in order to enrich their participation. My

knowledge has led to the development of an educational component, now used to initiate each Six Sigma team. My learning and ability to apply it resulted in the achievement of Green Belt status, as deemed by the Master Black Belt instructor. The Certificate of Achievement recognizes accomplishment of the required professional and leadership skills for implementing DMAIC Six Sigma tools.

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