2004

Using The Six Sigma Policy Deployment Cycle To Mitigate Project Failur

Archana Magadi
University of Central Florida

USING THE SIX SIGMA POLICY DEPLOYMENT CYCLE TO MITIGATE PROJECT FAILURES

by

ARCHANA MAGADI
B.E., Visvesvaraya Technological University (VTU), Karnataka, India, 2002

A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Science
in the Department of Industrial Engineering and Management Systems
in the College of Engineering and Computer Sciences
at the University of Central Florida
Orlando, Florida

Fall Term
2004

Major Professors: Dr. Ahmad K. Elshennawy
Dr. Sandra L. Furterer

ABSTRACT

Many organizations are struggling to improve customer-focused quality in today's highly competitive domestic and global markets. At the same time, these organizations have failed to implement the Six Sigma methodology into their daily control and strategic planning processes.

Six Sigma deployment failures have been categorized as coming from many sources, both management related and person related. Some of the key management related Six Sigma project failures have been identified and discussed in this research work. For continuous improvement to truly take root, organizations must realize that just successfully applying quality tools on any process will not necessarily provide dramatic results, unless the concepts of policy management and deployment are institutionalized.

A model called "Six Sigma Policy Deployment" was developed and has been proposed which may help mitigate Six Sigma project failures that are presently attributed to management and organizational issues. By integrating Policy Deployment, the Six Sigma DMAIC (Define-Measure-Analyze-Improve-Control) problem solving approach, and the classic PDCA (Plan-Do-Check-Act) Cycle, the potential for breakthrough improvements in any organization can be enhanced. The model was contrasted against a list of 30 sources of failure in typical Six Sigma projects in order to validate its applicability to mitigate these failures. Furthermore these failures were matched with the work of recent quality theorists in order to validate their occurrence and relevance. A case study section is presented to illustrate FPL's Quality Improvement Program and the

Six Sigma Lifecycle, which are bases for the new model. This section also highlights how the use of the proposed Six Sigma Policy Deployment model could help to mitigate potential Six Sigma project failures.

To my parents & my husband who have taught me the value of hard work and discipline

ACKNOWLEDGEMENTS

I would like to thank Dr. Elshennawy, the chair and Dr. Furterer, the co-chair of my thesis committee for their valued time through the course of this research.

I would like to thank Dr.Thompson for agreeing to serve on my committee and for providing me with the valuable feedback, support and guidance.

I would like to express the deepest appreciation to my committee member, Dr. Frank Voehl, who has the attitude and the substance of a genius: he continually and convincingly conveyed a spirit of adventure in regard to research and an excitement in regard to mentoring. Without his guidance and persistent help this thesis would not have been possible. I would like to deeply thank him for his time, support and guidance.

In addition, a thank you to Dr. Lesia Crumpton-Young, the Department Chair and Dr. José A. Sepúlveda, the Department Graduate Coordinator of Industrial Engineering and Management Systems for their encouragement and support.

I thank 1509 ASQ Orlando section and the Harrington Group for sponsoring the community good works Six Sigma projects and allowing me to take part in their community good works project.

I want to thank my parents, my husband Santhosh and friends Meera, Isa, Roberto and Ana whose blessings, love, and affection helped me stay calm and focused during my research work.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ASQ-American Society for Quality
BB-Black Belt
CTQ-Critical To Quality
CTR-Cycle Time Reduction
DFSS-Design for Six Sigma
DMAIC-Define Measure Analyze Improve Control
DMADV- Define Measure Analyze Design Validate
FEEDS- Florida Engineering Education Delivery System
FMEA-Failure Mode and Effect Analysis
FPL-Florida Power and Light
GB-Green Belt
HR-Human Resources
JUSE-Union of Japanese Scientists and Engineers
MBB-Master Black Belt
OFI- Opportunities For Improvement
OSU-Oregon State University
PDCA-Plan Do Check Act
QIP-Quality Improvement Program
TQC-Total Quality Control
TQM-Total Quality Management
UCF-University of Central Florida

CHAPTER ONE: INTRODUCTION

Today many organizations are struggling to improve customer-focused quality in highly competitive domestic and global markets. At the same time, these organizations have failed to implement the Six Sigma methodology into their daily control and strategic planning processes. It has been mentioned by Harry and Schroeder (2000) that Six Sigma initiative should be interwoven up and down the organization to gain velocity and strength. They identify the key to institutionalizing Six Sigma in any organization as having the right people in place at the business, operations and process levels of an organization in order to implement and deploy the breakthrough strategy. For continuous improvement to truly take root, organizations must realize that just successfully applying quality tools on any process will not necessarily provide dramatic results, unless the concepts of policy management and deployment are institutionalized.

1.1 Introduction

Many organizations have reported significant benefits as a result of implementing Six Sigma. For example, General Electric is known as one of the most successful companies in implementing Six Sigma projects. However, not all companies can claim success or have had the similar benefits from Six Sigma implementation. According to recent studies, less than 10 percent of companies are adopting a Six Sigma program to the point where it is going to make any sort of significant difference in any meaningful period of time (Coronado and Antony, 2002).

There are several reasons why a Six Sigma initiative can fail and may be categorized as complete or partial failures of Six Sigma projects. Six Sigma deployment failures have been categorized as coming from many sources, both management related and people related. This work focuses on the management related issues and discusses some of the key management related failures that have been identified in the literature.

Of the Six Sigma failures documented in the literature review attributed to management, thirty (30) failures can be mitigated by using the newly developed model called “Six Sigma Policy Deployment”. This new model aims at mitigating Six Sigma project failures attributable to management issues. This model is an important breakthrough in the field since these failures, while prevalent, should not be considered inevitable. It is believed that while the approach and rationale of this research work is simple, its result is powerful. By integrating Policy Deployment, the Six Sigma DMAIC (Define-Measure-Analyze-Improve-Control) problem solving approach, and the classic PDCA (Plan-Do-Check-Act) Cycle, the potential for breakthrough improvements in any organization can be achieved. This thesis offers a model that may help reduce management related Six Sigma failures.

1.2 Rationale for Thesis

Many of the Six Sigma projects ignore the need for Policy Deployment to achieve breakthrough improvements. Many organizations have also failed to implement the Six Sigma methodology into their daily control and strategic planning processes. The reason for failure may be management related or person related or both. It has been observed

that less than 10 percent of companies are adopting a Six Sigma program to the point where it is going to make any sort of significant difference in any meaningful period of time (Coronado and Antony, 2002).

Thirty (30) Six Sigma failures documented in the literature related to management have been identified and mapped to the teachings of quality theorists whose philosophies are widely known and accepted.

The Six Sigma concept of defect elimination and variation reduction should be incorporated into the daily processes as an organization philosophy. For continuous improvement to truly take root, organizations must understand and realize the benefits of applying Six Sigma tools and techniques on their processes along with two other planning and problem solving methodologies: Policy Deployment and Deming's PDCA (Plan-Do-Check-Act) cycle.

The adoption of Policy Deployment entails the involvement of all employees who will have an influence on the achievement of targets in the planning process. Policy Deployment also known as Hoshin Kanri, are interchangeably used in the various sections of this research work. Plan-Do-Check-Act assists in developing hypotheses and implementing changes to continually improve the processes. Deming's PDCA cycle has been widely used to improve the quality standards of organizations. Hence integration of Six Sigma DMAIC with Policy Deployment and Deming's PDCA cycle would facilitate breakthrough improvement within the organization. Dr. Joseph Juran, who first introduced the idea of breakthrough improvement, explains it as the process of quality

improvement that leads to unprecedented levels of performance (Evans and Lindsay, 2002).

The proposed Six Sigma Policy Deployment model integrates the three problem solving methodologies and is discussed in chapter 3. A case study is presented in chapter 4 which discusses how the use of the Six Sigma Policy Deployment model could help mitigate the potential for Six Sigma project failures. The model proposed in this work presents the highest stage of the evolution of the Six Sigma change methodology shown in figure 1.1. This figure represents when each of the change methodologies were most popularly used in the US. This will be thoroughly described in chapter 3.

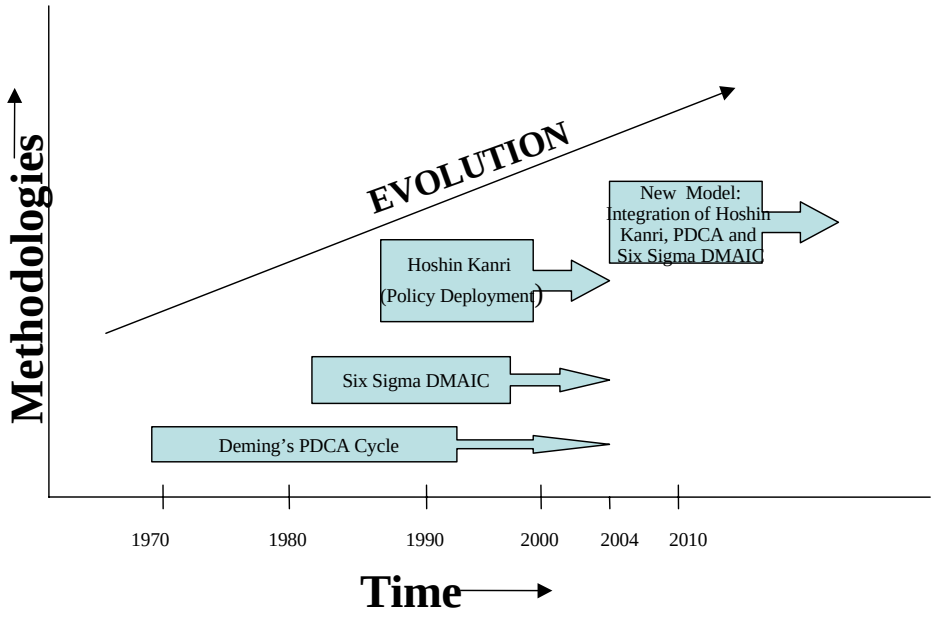

Figure1.1: Evolution of the Six Sigma Change methodology

The model, which represents the highest level of evolution shown in figure 1.1, is an 18-step process represented by a progressive circulatory system of improvement and breakthrough. In the series of concentric circles in the model, the outermost circle as shown in the figure 3.2 represents the Policy Deployment cycle. The Six Sigma DMAIC problem solving approach with the PDCA cycle represents the daily control cycle, and is represented by the middle two circles. The innermost PDCA cycle exists as the core problem solving component and thus leads to continuous improvement. The proposed model sets the stage for the catch-ball activity, thus involving various levels of management. The Catch-ball activity within the organization refers to the back and forth deploying of new goals and objectives to operation areas and the negotiation (catch-ball) with current process capabilities that allow for new levels of achievement (Voehl, 2000). The model and its 18 steps will be discussed in detail in chapter 3.

CHAPTER TWO: LITERATURE REVIEW

This chapter describes existing literature in the areas of Six Sigma, Deming's PDCA cycle and Policy Deployment (Hoshin Kanri). In the first section, an introduction to Six Sigma is discussed. The following section discusses the Policy Deployment planning process, its evolution, deployment model, and its applications in various organizations. The subsequent sections discuss the key aspects of Six Sigma DMAIC methodology and the famous Deming's PDCA cycle. The last section discusses some of Six Sigma success stories and also management related Six Sigma project failures. The new model is proposed in the next chapter that could mitigate these management related project failures.

2.1 Introduction to Six Sigma

In the 1980's, Motorola coined the name Six Sigma. It has become one of the most advanced quality initiatives applied in the United States. Sigma is a Greek letter that denotes standard deviation and is a measure of variation from a specification within a process. The definition of Six Sigma in statistical terms refers to 3.4 defects per million opportunities. It is said that most organizations design or produce parts or products, or provide customer's services, at the 3 Sigma levels, which translates to 66,000 defects per million opportunities (Antony and Banuelas, 2001). Six Sigma has become the stretch goal for improving various products and also some service operations. In business terms, Six Sigma is defined as: "a business improvement strategy used to improve business

profitability, to drive out waste, to reduce costs of poor quality and to improve the effectiveness and efficiency of all operations so as to meet or even exceed customers' needs and expectations" (Antony and Banuelas, 2001). Many organizations have reported significant benefits as a result of Six Sigma project implementation. Among the successful Six Sigma implementers are GE, Motorola, AlliedSignal, Citibank and Sony. (Antony and Banuelas, 2001)

2.2 Policy Deployment (Hoshin Kanri)

The concept of Policy Deployment (Hoshin Kanri) first originated in Japan during the 1960s. In Japanese, Hoshin means "methodology for strategic direction setting". Akao, the guru of Hoshin Kanri describes it as "Hoshin Kanri provides a step-by-step planning, implementation, and review process for managed change. Furthermore, he describes Hoshin Kanri as 'The means by which both the overall control system and TQM are deployed' (Akao, 1991).

Hoshin Kanri, Policy Deployment, Management by Policy, and Policy Control all are interchangeably used in today's business environment to describe Policy Deployment. Policy Deployment builds on some of the strengths of Management by Objectives (MBO) a western performance management strategy, but shifts the emphasis from individual to team oriented targets. The main thrust of the philosophy of Policy Deployment is that the process for the achievement of objectives is discussed and agreed upon before plans are implemented.

Policy Deployment involves a complete methodology with a way to develop and deploy strategy. Planning and development are critical elements of Hoshin Kanri, which imply that the process of developing targets, the development of means to achieve the targets and the deployment of both are crucial to the successful adoption of Hoshin Kanri (Costin, 1999).

Yoshio Kondo described the essential steps of Hoshin Kanri, or policy management, in Japanese companies. Some of the essential points of Policy Deployment are annual policy, the establishment of quality policy, converting methodological policy into objective policy (which is composed of aims, targets and priority strategies) and the top-down and bottom-up deployment. This leads to the Catch-ball effect, which is widely used during the deployment stage. Catch-ball within the organization involves the back and forth deploying of new goals and objectives to operating areas and negotiating (catchball) with current process capabilities to allow for new levels of achievement. (Voehl, 2000). Quality improvements affected by creative methods results in lower cost and higher productivity. (Kondo, 1998)

Policy Deployment is labeled as Hoshin planning at Hewlett-Packard and Procter & Gamble, managing for results at Xerox Corporation and at Unilever it's "management into action" (Witcher, 2003). Alignment is necessary to bring plans (and other associated activities, notably budgets) into line, so that corporate strategy and unit objectives are consistent and agreed upon. Strategic objectives must be integrated into daily operations in a way that ensures that the teams and individuals are able to manage their work. (Witcher, 2003)

Tennant and Roberts have explained that planning and deployment, which are often cited as a reason for failure, are critical elements of Hoshi Kanri. According to them, planning and development would imply that the process of developing targets, the assessment of the means to achieve the targets, and the deployment of both are fundamental to successful implementation. Once the strategic vision and main policies have been identified, a model for implementation must be determined. This model can be deployed as a technique for managing the business as shown in figure 2.1 below.

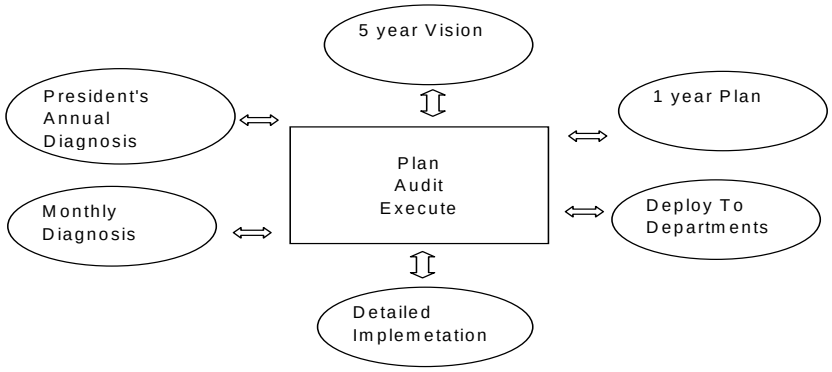

Figure 2.1: Strategic Vision and Policies Implementation Model

Tennant and Roberts have not mentioned linking Policy Deployment with the Six Sigma problem solving methodology in their work.

Policy Deployment applies the Plan-Do Check-Act (PDCA) cycle to strategic planning and business operations and requires effective management leadership, communication, control and checking skills. Akao's (1991) Hoshin model shows the

general Policy Deployment movement from senior management to middle management to implementation teams, where the two-way arrows represent the catch-ball used to attain agreement on goals, measures and review whether the goal was achieved. Policy Deployment can be viewed in the form of a wheel with business results at the hub, targets and means as the spokes and catch-ball as the rim as shown in figure 2.2. The PDCA cycle has to be effectively applied through out this Policy Deployment wheel.

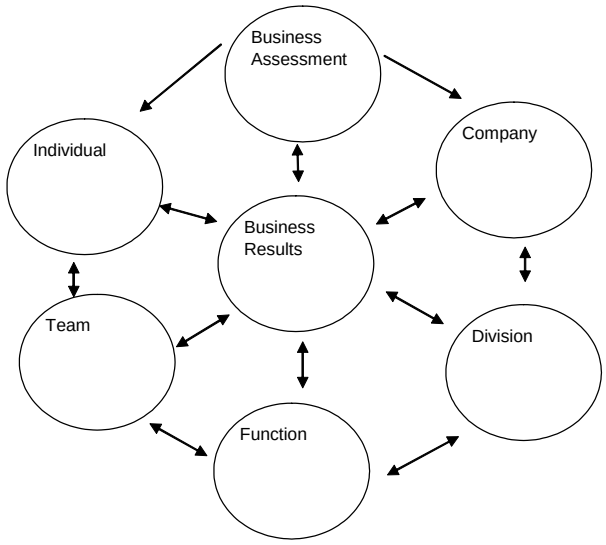

Figure 2.2: Policy Deployment wheel (Lee and Dale, 2000)

Lee and Dale have mentioned that to ensure that the Policy Deployment process is effective, everyone in an organization needs to have proactive involvement in the cascade and catchball process and this should be led by the senior management team. For example, within the PDCA cycle of Policy Deployment, managers should focus on the ‘check’ rather than the ‘act’ which employees should be empowered to do. Policy

Deployment is simply PDCA applied to the planning and execution of a few critical strategic organizational objectives. (Lee and Dale, 2000)

The missing part in Lee and Dale's work is the linking of Six Sigma DMAIC to Policy Deployment at the strategic level and PDCA at the daily control of activities. This became the basis of this research work and the development of the Six Sigma Policy Deployment model.

DeFeo and Janssen talked about Six Sigma and Strategic deployment. Lack of a structured approach for integrating programs into one plan is the major cause of strategic planning process deficiencies. Six Sigma has been used to remain competitive not only in the design and production of products, but also in the functions and customer services that will become more efficient and productive while improving quality and profitability. Including initiatives such as Six Sigma in the strategic plan guarantees the proper management support and resources necessary to achieve its financial results. The following important points are part of strategic deployment (DeFeo and Janssen, 2001):

- Strategic deployment focuses resources on activities that are essential to achieving the organization's business plans resulting in an increase of customer satisfaction
- Creates a planning and implementation system that is responsive, flexible and disciplined.
- Eliminates the existence of potentially conflicting plans in finance, marketing, technology and operations
- It focuses the resources required for financial plans to be achieved

Even though DeFeo and Janssen talked about bringing strategic deployment and Six Sigma together, their work did not provide a specific framework or model on the subject.

2.3 Policy Deployment Application

Among the successful implementers of Policy Deployment are FPL and OSU. During the 1970s, Florida Power and Light (FPL) were forced to increase utility rates repeatedly because of increasing costs, slower sales growth, and stricter federal and state regulations. Marshall McDonald, then chairman of the board, realized that the company had been concentrating on keeping defects under control rather than on improving quality as seen through the eyes of the customer. In 1983, while in Japan, McDonald met the president of Kansai Electric Power Company, a Deming prizewinner, and learned about their Total Quality efforts. FPL began its quality improvement program (QIP) in 1983 and in 1987, Policy Deployment and PDCA became the driving force behind the QIP. Due to the influence of the QIP, the average length of service interruptions dropped, the numbers of customer complaints were drastically reduced, safety had improved, and also the price of electricity stabilized. In 1989, FPL won the Deming Prize. (Evans and Lindsay, 2002). The case study section discusses the Quality Improvement Program (QIP) of FPL in detail.

Oregon State University (OSU) was the first educational institution to start implementation activities on core functions of process management during the 1990s. Implementation of Total Quality Management at OSU was based on an extensive review

of approaches like Policy Deployment and PDCA. Some of the steps followed in implementing process management included:

- Identification of the core processes, which includes goal identification, process analysis, and problem analysis.
- Searching for solutions, implementation and evaluation.

Their model was associated with the Policy Deployment model used by Hewlett-Packard, Ford Motor Company, and others. Using this model their processes improved, employees learned team building and problem solving skills. Job satisfaction and employee morale increased. Customers were often delighted by the improvements. Among many American higher educational institutions, OSU has become a benchmark for Policy Deployment planning of goal setting. Later other educational institutions like Delaware County Community College also applied the Policy Deployment methodology in their institution for the planning process. (Lewis and Smith, 1994)

So far it has been seen that the aim of Policy Deployment is to have the employees of the organization focus on achieving the company's goals. Some of the literature discussed linking Policy Deployment and PDCA. The approach of this research work is to extend the usefulness of Policy Deployment by deploying policies and plans to achieve organizational goals and then bonding them together with Six Sigma projects using DMAIC problem solving approach along with PDCA in daily work activities.

2.4 Six Sigma DMAIC

The most commonly used Six Sigma approach for accomplishing the goal of increased customer satisfaction through improving the processes is DMAIC. DMAIC stands for Define –Measure - Analyze –Improve – Control.

The Six Sigma DMAIC process is defined as (Hammer and Goding, 2001):

- Define: Defining the problem (in terms of customer critical demands).

  Organizations first need to identify the various states of their business before they can be measured.

- Measure: Quantifying the problems by gaining information.

  For example: The three important things to know during this phase is to know what to measure, how to measure and gaining executive commitment to go after the right measure. (Harry and Schroeder, 2000)

- Analyze: Performing root cause analysis using statistical tools.

  After gathering information in the measure phase, it is the time to analyze the capability of the processes and performance gaps using statistical tools.

- Improve: Identifying the actions and implementing the selected actions.

  After the gap analysis, actions for improvement are taken and are implemented. Results are checked to verify and validate the improvements.

- Control: Controlling the process to ensure the improvements are maintained. Standards are established and consistently met. “Bringing about improvement is one thing; sustaining it is often more difficult and requires greater diligence”. (Harry and Schroeder, 2000)

Six Sigma methodology has been extensively applied in manufacturing industries. It has also been adopted by service industries to improve customer satisfaction and achieve breakthrough improvements. Six Sigma focuses on the needs of the market, assists in achieving higher levels of performance, develops measures of achievement, helps organizations become competitive, assists in developing team approaches and improves critical thinking abilities/skills.

Harry and Schroeder have discussed that Six Sigma projects should focus on resolving operational issues, since these issues directly impact the profitability. They have explained the operations perspective of the breakthrough strategy in 8 steps which includes the DMAIC steps as follows (Harry and Schroeder, 2000):

- **Recognize** operational issues that link to key business systems
- **Define** Six Sigma projects to resolve operational issues
- **Measure** performance of the Six Sigma projects
- **Analyze** project performance in relation to operational goals
- **Improve** Six Sigma project management system
- **Control** inputs to project management system
- **Standardize** best-in-class management system practices
- **Integrate** standardized Six Sigma practices into policies and procedures

THE SIX SIGMA ROAD MAP			
BREAKTHROUGH STRATEGY	STAGE	BREAKTHROUGH STRATEGY PHASE	OBJECTIVE
	Identification	Recognize Define	Identify key business issues
	Characterization	Measure Analyze	Understand current performance levels
	Optimization	Improve Control	Achieve breakthrough improvement
	Institutionalization	Standardize Integrate	Transfer day-to-day business conducted

Figure 2.3: Integrated view of the Breakthrough Strategy (Harry and Schroeder, 2000)

Harry and Schroeder discuss the integrated view of the breakthrough strategy as shown in the figure 2.3. The figure represents the eight primary components of the breakthrough strategy, which fall into four major categories. The “Recognize and Define” phases fall under the category of identification, where companies begin to understand the fundamental concept of Six Sigma problem solving methodology. In the “Define” phase specific projects are identified based on process and product benchmarking. The “Measure and Analyze” phase falls under the category of characterization, where critical to quality (CTQ) characteristics in the process are measured and described. The “Improve and Control” phase falls under optimization, which maximizes and maintains the enhanced process capability. Finally, the “Standardize and Integrate” phase is part of institutionalization. The purpose of institutionalization is to make sure that the breakthrough strategies are woven into the organization’s culture. (Harry and Schroeder, 2000)

Though the concept of breakthrough strategy was explained in 8 steps, the authors failed to provide a detailed model to achieve these strategies. The model proposed in this thesis gives a breakdown of each step involved in breakthrough strategy in a simple way and is easy to understand. Also, in their work, there was no mention of using Policy Deployment (Hoshin Kanri) at the executive level, and the famous Deming's PDCA cycle at the daily work control level

2.5 Deming's PDCA Cycle

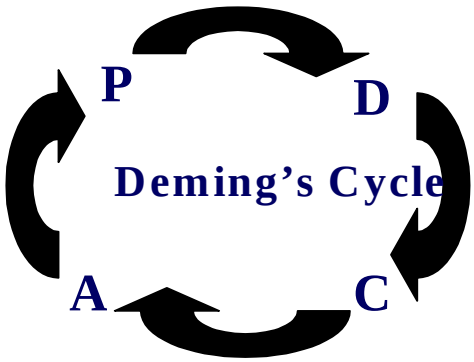

Figure 2.4: Deming's Plan-Do-Check-Act cycle

No one ever gets far into any introduction to quality management without learning about Plan-Do-Check-Act, the never ending cycle of experimentation that provides the underlying structures for all quality improvement efforts. Deming called it the Shewhart cycle (Plan-Do-Study-Act) when he introduced it to the Japanese in 1950, in honor of his mentor Walter Shewhart of Bell Labs. Eventually, it became known as the Deming

wheel, which is composed of four stages: Plan, do, check, and act (PDCA) as shown in figure 2.4. The focus of the Deming wheel is on implementation and learning. The plan stage consists of studying the current situation and describing the process. In the do stage, the plan is implemented on a trial basis. The check stage determines whether the trial plan is working correctly by evaluating the results, recording the learning and determining whether any further issues or opportunities need to be addressed. In the last stage act, the improvements become standardized and the final plan is implemented. The Deming wheel is based on the premise that improvement comes from the application of knowledge (knowledge of engineering, management, or how a process operates, which can make a job easier, more accurate, faster, less costly, safer or better able to meet customer needs)(Deming, 1986,1994).

Later in the 1990s, Akao used the PDCA cycle as the most important point of control in Policy Deployment. So when companies like Florida Power and Light (FPL) and universities like Oregon State University (OSU) started adopting Policy Deployment as their strategy planning methodology, the PDCA cycle was also used as part of daily control. It will be discussed in more detail in the coming chapter.

Even though there was some evidence of using Policy Deployment and PDCA together, there was no literature found which discussed integrating the three problem solving methodologies: Six Sigma DMAIC, PDCA and Policy Deployment. Hence the focus of this work is to bring these three methodologies together in a model.

2.6 Six Sigma Successes and Failures

During the 1980s, GE had sought improvement in business-performance and profitability through various programs. These programs resulted in a reduction in GE's total work force from 400,000 to 300,000 and an increase in net profit from US $3 billion to US $4 billion annually. And, at this time, GE had an operating margin of just under 10 percent. However, in 1995, Welch decided that those programs were not enough and directed the company to undertake Six Sigma as a corporate initiative. GE invested US$380 million in Six Sigma, mostly for training. The GE concept of Six Sigma deals with measuring and improving how close the company came in delivering on what it planned to do. It has been noted that when Six Sigma was first launched at GE Aircraft Engines, a four-step methodology (MAIC) was followed. Later the Define phase was added to recognize the importance of having a well-scoped project. Chairman Welch's goal was for the corporation to be operating at Six Sigma levels by the year 2000. However, there was payback in the same year and GE received about US $700 million in documented benefits from increased productivity. (Henderson and Evans, 2000)

Ford Motor Co.'s initial Six Sigma projects revisited lessons the company learned in the 1980's, notably the importance of working closely with suppliers on design and manufacturing and the need to avoid even slight variations in a design or production process. Ford's hope was that Six Sigma would create a uniform approach to solving quality problems that could be replicated. In 1981, Ford recruited Deming to help jump-start their movement towards quality. Deming believed if a company worked systematically at improving processes, profits would follow. He also preached the need to

anticipate what customers wanted. The vast majority of Ford projects concentrated on "how to reduce things gone wrong". (Gabor, 2001). Advocates of Six Sigma at Ford had argued that the disciplined nature of Six Sigma would ensure its long-term success (Gabor, 2001).

Contrary to popular belief, Six Sigma implementation is not restricted purely to manufacturing organizations. In the case of Citibank, a service providing company, the Six Sigma methodology was applied to identify and eliminate the defects in operations and to reduce cycle times. Citibank hired Motorola University Consulting and Training Services in 1997 to teach Six Sigma defect reduction and Cycle Time Reduction (CTR) to its employees. Citibank was aiming to reduce defects and cycle time to one tenth of the previous cycle time by the end of 1997. Every two years after that, it wanted defects and cycle time reduced by the same amount. Citibank established its Cross-Functional Performance Challenge by using Six Sigma methodology. One problem identified using Six Sigma occurred within Citibank's Private Bank. A complicated system of manual funds transfers resulted in many customer complaints, especially regarding the time it took to complete the process. Once again the obstacles to customer satisfaction were identified, the staff was able to correct them with the Six Sigma program. The cycle times of all steps were improved, from order placing to product delivery, including opening new accounts. Citibank is absolutely convinced of the success of the initiatives introduced using techniques learned from Motorola (Rucker, 2000).

In another organization, Six Sigma was deployed in a Human Resources (HR) central function that provides service to 1400 employees in four business divisions. HR is

an integral element of the main corporate business improvement strategy. The HR team deployed Six Sigma to drive the improvement of HR processes. Their goal was to achieve the strategic objective of "Right people in the right place at the right time at the right cost" (Wyper and Harrison, 2000). The primary team objectives were to develop and implement HR processes and measures of performance with embedded continuous improvement. These processes were owned by HR process participants that would deliver defined strategy, with the focus on complete internal customer satisfaction. The secondary objectives were to increase job security and survival of HR central within the company, increase employability of HR staff, promote Six Sigma and promote the success of empowered, high-performance teams. They adopted the DMAIC model with fact-based decision-making as the process improvement methodology. Some of the benefits that were achieved by having applied Six Sigma were reduced costs of the HR function per employee by 34% in 18 months, with the same or better service provided, and an overhead cost reduction of $250,000 was achieved. Overall outcomes of improvement activities were better, faster and more cost-effective HR services to the business. (Wyper and Harrison, 2000)

All of the above discussed Six Sigma projects were successful. Even though these projects were successful they had their share of failures too. Based on the literature review, there is no evidence that they used Policy Deployment or PDCA along with Six Sigma DMAIC.

Instead of targeting the Six Sigma projects for process and product improvements that have a direct impact on both financial and operations goals, organizations only use

DMAIC on a project basis. Even if the first efforts focus on fairly narrow problems, their impact on the whole business should be clear. It needs to be explicit how projects and other activities link to customers, core processes and competitiveness. After implementation of Six Sigma projects, the results must be published. However, these results should not be restricted to success stories but also share lessons learned and communicate setbacks. Thus, it will help other projects to avoid the same mistakes and learn from failures. (Coronado and Antony, 2002)

Carnell's research work listed some of the Six Sigma project failures. He categorizes these failures as:

- Management and Company Failures
- Master Black Belt (MBB), Black Belt (BB) Failures

He has listed thirty-three Six Sigma failures related to "Management and Company" which includes a few duplicates and redundancies. Many of these failures have also been addressed by the quality theorists in one form or the other. Some of these common failures were short listed and can be summarized as: no vision related to customer expectations, lack of alignment (horizontal or vertical), no visible leadership at the executive level, business executives not showing up for report-outs (conveys a lack of priority), deploying Six Sigma without a goal (reason for deployment), deploying Six Sigma with a goal but no plan on how to reach the goal. These Six Sigma failures are addressed using the Six Sigma Policy Deployment model in the next chapter (Carnell, 2004).

DeFeo states that before implementing a Six Sigma process, management must have a basic strategy in place that establishes three things:

- A vision of where the company is going, clearly stated and communicated to every employee at all levels in language they will understand
- Clear definitions of a small number of key objectives that must be achieved if the company is to realize its vision, and
- Communication of these objectives throughout the entire organization so that each person knows how his or her performance helps achieve those objectives; this alignment is critical.

Some critical success factors of Six Sigma are that it must start at the top, Six Sigma's targets must be defined and knowing how to deploy versus delegating quality management activities are important. (DeFeo, 1999)

Some of the management failures are caused due to the lack of concept of customer expectations, no follow up on the annual operating plan, lack of alignment of the improvement projects with the business objectives, no visible leadership at the executive level to deploy the goals and no plan to achieve the goals to list a few. See table 2.1, for a listing of thirty common failure factors attributed to management. These failures have been addressed by using the Six Sigma Policy Deployment model in the next chapter.

Table 2.1 List of thirty documented Six Sigma failures attributed to management

	30 Documented Six Sigma failures related to management and company
1	No concept of customer expectations
2	No vision related to customer expectations
3	No follow-up on the annual operating plan
4	Lack of alignment(horizontal or vertical)
5	No visible leadership at the executive level
6	Business executives do not show up for report-outs(conveys a lack of priority)
7	Deploying Six Sigma without a goal(reason for deployment)
8	Deploying Six Sigma with a goal but no plan on how to get there
9	Abdicating the deployment plan to a consulting company
10	Trying to change the organization without a detailed change process
11	Not having metrics in place for management participation
12	Absence of a formal change process
13	Champions do not show up for report-outs
14	Having metrics in place but no feedback(or limited feedback annually,semi-annually,quaterly)
15	Not having multiple projects queued up for each MBB,BB or GB(so when they complete a project the next one has already been selected)
16	Not communicating deployment plans effectively through the organization
17	No rewards or recognition program
18	Lack of a detailed cultural change management program
19	No retention program for trained personnel
20	Trying to use contract type agreements to retain MBBs and BBs
21	Project selection process does not identify projects related to business objectives
22	Middle management operates on their own agenda (feel support is optional)
23	No accountability
24	Champions do not break roadblocks
25	No buy-in at the process Owner level
26	Lack of interaction with organizational systems and technology
27	Supply base supplying poor quality material
28	No consequence for suppliers sending bad material(typically because of price)
29	No plan to deploy into the Design and Marketing functions after Operations has launced
30	Believing a single initiative can/will solve all your problems

2.7 Summary

The literature review shows that the existing work does not provide a framework for implementing Six Sigma DMAIC along with Policy Deployment and the PDCA cycle

even though all three methodologies focus on gaining dramatic improvements in the quality of products and services. The integration of the Six Sigma DMAIC methodology with Policy Deployment would facilitate breakthrough improvement in organizations. The adoption of Policy Deployment entails the involvement of all those people who would have an influence on the achievement of targets in the planning process.

The approach of this thesis is to provide an integrated framework which includes Policy Deployment for deploying policies and plans to achieve organizational goals with Six Sigma DMAIC projects and quality in daily work activities through the PDCA cycle. This model is represented in the form of an 18-step circulatory system explained in the following chapter.

CHAPTER THREE: RESEARCH METHODOLOGY

The objective of this work is to develop a model that can be successfully used to help mitigate Six Sigma project failures in any organization. The purpose is to achieve breakthrough improvement by combining Policy Deployment, the Six Sigma DMAIC methodology, and the PDCA cycle. This chapter discusses the model that integrates Policy Deployment, the Six Sigma DMAIC problem solving approach, and the PDCA cycle to help create breakthrough improvement that can be implemented in manufacturing and service industries. Also, a summary is presented at the end of this chapter where the thirty most common Six Sigma management failures are validated against the teachings of quality experts whose teachings are widely known and accepted.

3.1 Introduction

During the 1960s, the Japanese first came up with the concept of Hoshin Kanri (Policy Deployment). In Japanese, Hoshin means “methodology for strategic direction setting”. Akao, the guru of Hoshin Kanri described it as “The means by which both the overall control system and TQM are deployed” (Akao, 1991). The adoption of Policy Deployment entails the involvement of all those people who will have an influence on the achievement of targets in the planning process.

Deming’s cycle, also referred to as the Shewhart cycle (Plan-Do-Study-Act) was introduced in Japan during 1950. Later in the 1980s, the PDCA cycle became the most important point of control in Policy Deployment. So when companies like FPL and OSU

started adopting Policy Deployment as the strategy planning methodology, the PDCA cycle was also used as part of daily control.

In the 1980s, Motorola coined the name Six Sigma. Since then it has become one of the most advanced quality initiatives applied in the United States.

The model presents the highest stage of the evolution of the Six Sigma change methodology (as shown in figure 1.1). This model is designed to bring Policy Deployment, PDCA and Six Sigma DMAIC together in a new and powerful way that helps mitigate Six Sigma project failure. For continuous improvement to truly take root, organizations must understand and realize that applying Six Sigma tools and techniques on any process will not necessarily result in dramatic results, unless the concepts of Policy Deployment are institutionalized. Integration of Six Sigma, PDCA, and Policy Deployment would facilitate the breakthrough improvement that companies try to achieve.

3.2 Achieving Breakthrough

Policy Deployment typically operates on two levels: management of continuous improvement-breakthrough and daily management control. It is argued that to be successful, the third level of application is in the Six Sigma DMAIC problem solving strategy (as shown in the Figure 3.1). Both Policy Deployment and Six Sigma focus on dramatic improvements or opportunities in the quality of products and services. The missing ingredient in many situations is the ability to correctly understand the customers'

needs and wants and to listen to the voice of the customer, which is one of the major strengths of Six Sigma.

Policy Deployment focuses on the targets while Six Sigma should focus on both the processes and the targets (as shown in Figure 3.1). Policy Deployment provides a structure for linking the core objectives into the current competitive situation, which results in breakthrough improvement (DeFeo and Janssen, 2001). The Six Sigma DMAIC methodology maximizes individual and departmental performance every day by focusing on daily control using PDCA, and on the key breakthrough areas that enable superior performance.

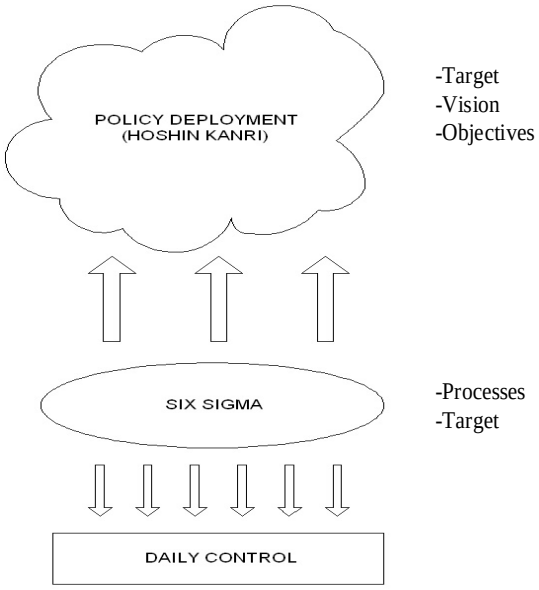

Figure 3.1: Two-way flow of Six Sigma activities

3.3 Policy Deployment and PDCA

Many organizations have been using Deming's Plan-Do-Check-Act (PDCA) to improve the quality standards. PDCA assists in developing hypotheses, implementing

changes, and helps to continually improve the processes. A plan is made which is based on the policy of the organization (Plan). Accordingly, actions are taken by focusing on the processes, which are being done (Do). Results are checked (Check), and the plan is implemented, standardized and acted upon (ACT).

In Policy Deployment, the PDCA cycle helps in the deployment of policies and it is a most important item of control. Using the PDCA cycle in Policy Deployment, helps the organization in strategic planning and business process management, and leads to effective management leadership, communication, and control/checking skills (Greenall, 1997).

Policy Deployment draws information from the on-going data collection and analysis activities of the process to identify broad system problems in which breakthrough is needed. PDCA then becomes part of the system of the Policy Deployment planning cycle (as shown in Figure 3.1).

3.4 Policy Deployment and Six Sigma

Six Sigma is a data-driven approach that provides a proactive approach to eliminate and prevent problems. Yet, it cannot be treated as a stand-alone tool. This is the most important point that organizations must be careful about: They must link Six Sigma DMAIC projects with the policies and management systems. Policy Deployment requires five basic tasks as far as Six Sigma is concerned (Voehl, 2000):

- Understanding the Customer: involves the logistical focus of strategic planning, analyzing customer needs, competitor's position, and environmental forces.

- Goal setting: reviewing past performances on objectives, critical success factors and targets, while changing work processes to close the gaps between targets and desired performance.
- Catch-ball within the organization: involves the back and forth deploying of new goals and objectives to operating areas and negotiating (catchball) with current process capabilities to allow for new levels of achievement.
- Monthly and daily management activities: in order to measure and track how much of the year's objectives are being accomplished.
- Checking, inspecting and problem-solving: the analysis and solutions involved in both daily and monthly management.

3.5 Integration of the Policy Deployment, Six Sigma DMAIC and PDCA

Six Sigma DMAIC can be effectively used along with Policy Deployment to operationalize the concept of breakthrough. To create a breakthrough and mitigate the Six Sigma project failures, this work proposes a unique model which integrates Policy Deployment (based on Akao's mutual movement of daily control and improvement activity) with the Six Sigma DMAIC problem-solving approach, along with the PDCA cycle.

In the model shown in Figure 3.2, the innermost PDCA cycle exists as the core problem solving steps. The Six Sigma DMAIC problem solving approach along with the PDCA cycle become the daily control cycle, represented by the middle two circles in the figure. The outer circle represents the Policy Deployment cycle. The top level

management policies and strategies are shown in the outer circle of Policy Deployment, these include steps one through eleven, to be performed by the Master Black Belts (MBBs), the Black Belts (BBs), Champions and other members of the top management team. Once this team finishes with step nine, the Six Sigma project team, mostly the Green Belts (GBs), would embark on the Six Sigma DMAIC, steps twelve through eighteen. After step seventeen is complete, the project team would then start the Check-Act-Plan-Do (CAP-Do, the PDCA cycle started at check phase) cycle to implement the changes and continually improve the process. The innermost cycle, which is the CAP-Do cycle, is repeated within each of the DMAIC phases. PDCA (CAP-Do cycle) is often referred as “Wheel within a Wheel”, as these steps are continuously repeated, thus leading to the daily control.

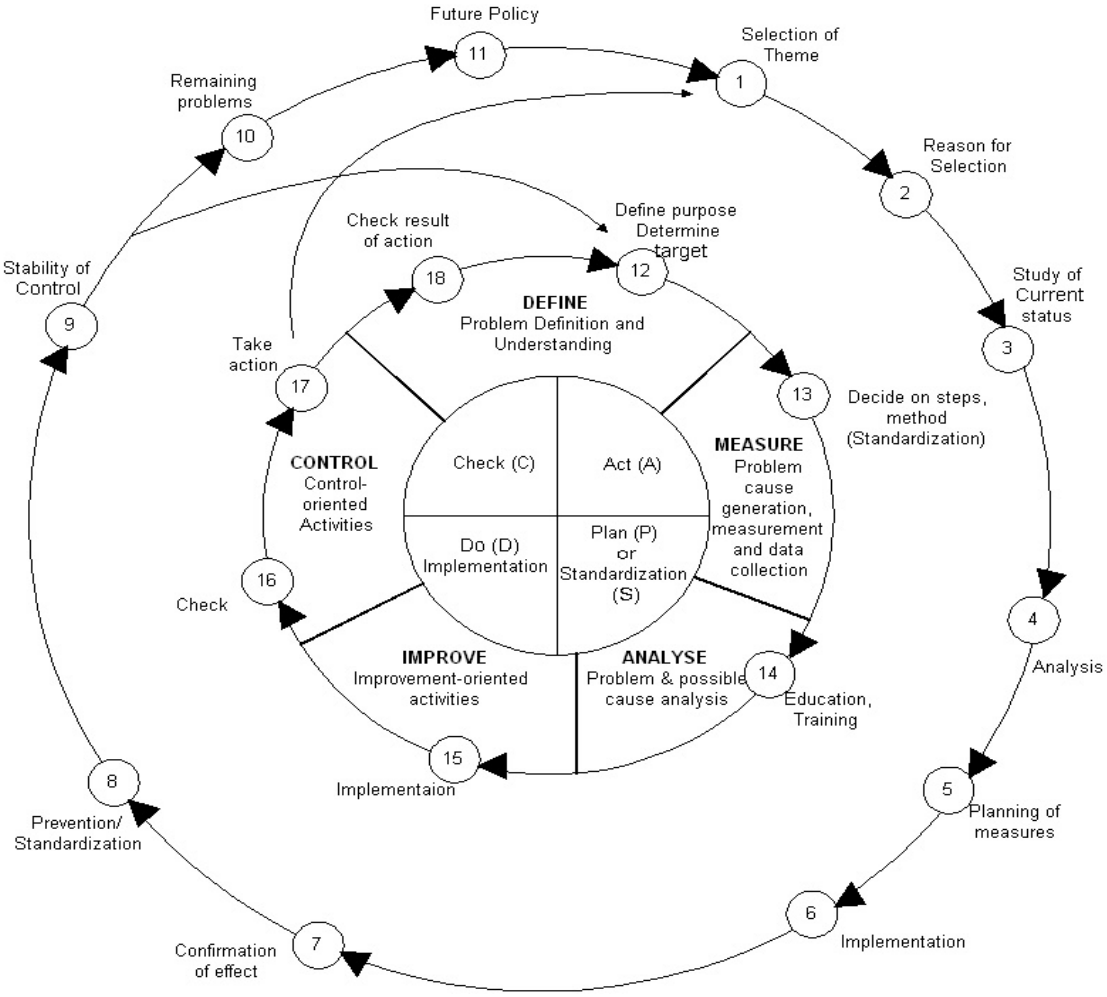

Figure 3.2: Integrated Six Sigma Policy Deployment Cycle

3.6 Explanation of Integrated Six Sigma Policy Deployment Model

This proposed model is an 18-step process of a progressive circulatory system of improvement and breakthrough based upon an integrated Six Sigma Policy Deployment cycle, as shown in figure 3.2.

Table 3.1 presents a summary of the integrated Six Sigma Policy Deployment steps that can be taken for improving many processes. The Integrated Six Sigma Policy

Deployment model is a combination of Akao's Policy Deployment steps 1-11 and PDCA steps 17-18 and Six Sigma DMAIC steps 12-16.

Table 3.1: Integrated Six Sigma Policy Deployment Steps

Steps	Objectives
1.Selection of theme	high customer satisfaction, improving effectiveness and efficiency
2.Reason for Selection	gap analysis, identification of critical process, analyze and prioritize opportunities for improvements
3.Study of current status	acquire adequate knowledge, interview with stakeholders,Champions
4.Analysis	feedback from Champions
5.Planning of measures	development of master plan
6.Implementation	development of charter, approvals
7.Confirmation of effect	confirmation from MBBs,BBs, Champions and other top management
8.Prevention/Standardization	choose a standard model (e.g.DMAIC for process improvement)
9.Stability of control	stabilize the current system
10.Remaining Problem	indentify,analyze,prioritize OFIs
11.Future Policy	continuous improvement
12.Define	purpose, determine target
13.Measure	steps, method (Standardization)
14.Analyze	cause and effect hypotheses, root cause analysis
15.Improve	implement improvements, train and execute
16.Control (includes PDCA)	meaure results, develop control methods, manage change
17.Take action	confirm to implemetation plan
18.Check result of action	review results, whether goals of institution have been met

Step 1: **Selection of theme.** The theme is a result of the senior management review to identify short and long term problems. Champions (members of senior management) would be concerned with the improvement of the effectiveness and efficiency of the

system and customer satisfaction. They would team up with the Master Black Belts (MBBs) and the Black Belts (BBs) to prioritize the problems and would concentrate on the core processes that need improvements.

Step 2: **Reason for selection.** In the second step this team would provide reasons why this improvement project is important for the organization. A high-level performance gap analysis may be performed to determine the gap between the desired and actual delivered quality of service. The gap analysis would include identification of critical processes that fulfills the mission and achieves the vision of the organization. Documenting the existing processes and the infrastructure, identifying critical processes, and analyzing and prioritizing opportunities for improvement occurs at both departmental and organizational levels.

At the end of these two steps, the reason for seeking improvements is defined.

Step 3: **Study current status.** The MBBs and the BBs along with team leaders would gain a good understanding of the current status of the processes and systems by senior management reviews. The following objectives are met during this step:

- Study existing processes, infrastructure, and technology used in the system
- Acquire adequate knowledge concerning the critical processes
- Identify and brainstorm with the Champions to understand existing problems
- Interview all stakeholders to understand their expectations

Step 4: **Analysis.** Once the business systems are measured and capabilities are determined, a detailed gap analysis is performed by the MBBs and BBs along with team leaders and Champions. The objective will be to improve the system elements that limit

overall system performance. Champions would provide all the information that describes past performance.

Step 5: **Planning of measures.** During this step, critical success factors (CSF) are measured. It is important to know what needs to be measured, how to measure and gaining executive commitment to right measurements. (Harry and Schroeder, 2000) The MBBs along with the BBs, team leaders and Champions would put a master project plan together. The outcome of this step would be a master plan, which addresses the critical issues.

Step 6: **Implementation of the master plan.** A charter is developed by making use of the master plan developed in the previous step. The charter, which is used on a project team level, is then reviewed by all the stakeholders of the project that leads to the next step.

Step 7: **Confirmation of effect.** Critical success factors that were found in the planning of measures become the basis for the master project plan. While the master plan is used at the executive level, the teams develop their individual project charters. Team Leaders would get the charter confirmed from MBBs, BBs, and Champions and then the team members (GBs) would also approve to be sure that there is "buy-in" at all levels.

Step 8: **Prevention /Standardization.** By this time, it becomes obvious that the organization's next step should be to improve the system elements that limit overall system performance. Standardization of a system that proves to be best in class is performed at the executive level. At the team level, a model is chosen as the standard approach for problem solving. If the need were to improve the existing process within the

organization, then the team would choose the DMAIC (Define, Measure, Analyze, Improve, and Control) model as shown in figure 3.2. If the need were to redesign the key processes, then the team would choose DMADV (Define, Measure, Analyze, Design, and Validate) model. Also team briefing/team awareness should be performed to ensure all the members of the team are comfortable using the standard model.

Step 9: **Stability of Control.** Stability of control is brought into the current system by integrating the best-in-class systems into the strategic planning framework. Brainstorming sessions with the MBBs, BBs and Champions are conducted during this step.

Step 10: **Remaining Problem.** During this step, recognizing other operational issues that link to key business systems is performed. At the team level, remaining problems are identified, analyzed and prioritized. Opportunities for improvement are also identified on a continuous basis.

Step 11: **Future Policy.** The future policy is determined to continually improve the processes both at the departmental level and the organizational level.

From this point onward Six Sigma Green Belts (GBs) team level discussions are performed using the five steps of the DMAIC model (steps 12 through 16 below). During the control phase of the DMAIC model, the PDCA cycle is introduced to implement the changes and verify the results.

Step 12: **Define.** In addition to defining the purpose and determining targets, the team leader also

1. Selects sub teams (Six Sigma Green Belts and assign tasks /accountabilities)

2. Sets goals for sub teams

Step 13: **Measure.** The Six Sigma Green Belt team under the supervision of the team leader performs the following steps:

- Defining the current process at project team level
- Focusing on high leverage opportunities for improvement and confirmation of key customer requirements
- Gathering of initial data and determining the current performance
- Stratifying and analyzing the data
- Performing an analysis to identify high-impact areas within the organization
- Developing opportunity/problem statement and project scorecard

Step 14: **Analyze.** The Six Sigma Green Belts along with the team leader:

- Develops cause and effect hypotheses for the project
- Determines and validates root causes

Step 15: **Improve.** The Six Sigma Green Belts – team leader:

- Identifies breakthroughs and selects practical approaches
- Designs future state
- Establishes performance targets and project scorecards
- Gains approval from the strategy management team to implement improvements
- Implement improvements
- Trains and executes

Step 16: **Control.** The project team:

- Measures results, develops control methods and manages change
- Reports scorecard data and creates a process control plan
- To continually improve the process, the PDCA cycle is repeated

Step 17: **Take action.** This is the final step in the PDCA cycle. In this step, the following activities are performed by the project team:

- Gain commitment to implementation efforts
- Conform to the implementation plan
- Standardize the methods that produce best-in-class process performance

Step 18: **Check results of action.** This review process is the last step in the model, where actions are checked for results. The purpose of the review is to check whether goals and objectives of the organization have been met. The team members along with other MBBs, the BBs would make a presentation to the champions. Finally, a report is handed out to the champions.

3.7 Application of the model to mitigate Six Sigma project failures

The literature review identified some of the Six Sigma failures attributable to management (see table 2.1). Many quality theorists in one form or another have discussed these management failures. In order to validate these failures, the works of quality theorists were studied and a matrix was created (shown in table 3.2) based on their philosophies. The works of quality theorists and related sources that were referred to gather information have been listed in the reference section. The quality theorists that were studied related to management failures are:

1. *Deming:* The impact of Deming's teachings on manufacturing and service organizations has been profound. Dr. Deming's famous 14 Points serve as management guidelines. In the study shown in table 3.2, Deming has covered about 19 factors out of these 30 listed failures related to management (Deming, 1986, 1994).

2. *Juran/DeFeo*: Juran and DeFeo have made many contributions to the field of quality management. These two quality theorists have discussed about 21 points out of 30 listed failures.

3. *Crosby:* Crosby popularized the idea of the "Cost of poor quality" and “Zero defects”. Some of his books like "Quality without Tears" and "Quality is Free" were referred in order to validate the thirty documented failures. Out of these 30 failures, 8 of them were discussed in his work and are shown in the table 3.2.

4. *Feigenbaum:* Armand V. Feigenbaum coined the term "Total Quality Control". He laid out the precepts of total quality control. His focus was on customer satisfaction.
Of the 30 failure factors he has covered 14 of them in his work related to TQC.

Table 3.2 shows the views of the quality theorists with respect to the thirty-documented project failures related to management. Among these 30 failures, failure points 12, 18, 26 were identified and verified by the author’s research and experience. The remaining 27 were confirmed by Carnell’s work and verified according to the writings of the quality theorists by research. (Carnell, 2004). Table 3.3 describes the impact of the Six Sigma Policy Deployment model on the thirty documented failures. Table 3.4 gives a breakdown of the model showing which steps in the model can prevent these failures or mistakes.

Table 3.2: Documented Failures according to the quality theorists

	30 Documented Six Sigma failures (related to management and company)	Edward Deming	Juran & DeFeo	Philip Crosby	Armand Feigenbaum
1	No concept of customer expectations	*	*		*
2	No vision related to customer expectations	*	*		*
3	No follow-up on the annual operating plan	*	*		
4	Lack of alignment(horizontal or vertical)		*	*	
5	No visible leadership at the executive level	*		*	*
6	Business executives do not show up for report-outs(conveys a lack of priority)	*		*	
7	Deploying Six Sigma without a goal(reason for deployment)		*		
8	Deploying Six Sigma with a goal but no plan on how to get there	*	*		*
9	Abdicating the deployment plan to a consulting company		*	*	
10	Trying to change the organization without a detailed change process	*	*		*
11	Not having metrics in place for management participation	*	*		
12	Absence of a formal change process	*	*		
13	Champions do not show up for report-outs			*	
14	Having metrics in place but no feedback(or limited feedback annually,semi-annually,quarterly)	*			
15	Not having multiple projects queued up for each MBB,BB or GB(so when they complete a project the next one has already been selected)		*		
16	Not communicating deployment plans effectively through the organization	*	*		*
17	No rewards or recognition program	*	*		*
18	Lack of a detailed cultural change management program	*	*	*	
19	No retention program for trained personnel	*			*
20	Trying to use contract type agreements to retain MBBs and BBs		*		
21	Project selection process does not identify projects related to business objectives	*	*		*
22	Middle management operates on their own agenda (feel support is optional)		*		
23	No accountability	*	*		*
24	Champions do not break roadblocks		*		
25	No buy-in at the process owner level			*	*
26	Lack of interaction with organizational systems and technology			*	*
27	Supply base supplying poor quality material	*	*		*
28	No consequence for suppliers sending bad material(typically because of price)	*	*		*
29	No plan to deploy into the Design and Marketing functions after operations has launched				*
30	Believing a single initiative can/will solve all your problems	*			

Table 3.3: Impact of Six Sigma Policy Deployment Model on Project Failures

		Six Sigma Policy Deployment			
	30 Documented Six Sigma failures related to management and company	**HEAVY IMPACT**	**MEDIUM IMPACT**	**LIGHT IMPACT**	**NO IMPACT**
1	No concept of customer expectations	*			
2	No vision related to customer expectations		*		
3	No follow-up on the annual operating plan	*			
4	Lack of alignment(horizontal or vertical)	*			
5	No visible leadership at the executive level	*			
6	Business executives do not show up for report-outs(conveys a lack of priority)		*		
7	Deploying Six Sigma without a goal(reason for deployment)	*			
8	Deploying Six Sigma with a goal but no plan on how to get there	*			
9	Abdicating the deployment plan to a consulting company		*		
10	Trying to change the organization without a detailed change process			*	
11	Not having metrics in place for management participation		*		
12	Absence of a formal change process	*			
13	Champions do not show up for report-outs		*		
14	Having metrics in place but no feedback(or limited feedback annually,semi-annually,quarterly)			*	
15	Not having multiple projects queued up for each MBB,BB or GB(so when they complete a project the next one has already been selected)	*			
16	Not communicating deployment plans effectively through the organization	*			
17	No rewards or recognition program			*	
18	Lack of a detailed cultural change management program	*			
19	No retention program for trained personnel		*		
20	Trying to use contract type agreements to retain MBBs and BBs				*
21	Project selection process does not identify projects related to business objectives	*			
22	Middle management operates on their own agenda (feel support is optional)			*	
23	No accountability	*			
24	Champions do not break roadblocks			*	
25	No buy-in at the process owner level		*		
26	Lack of interaction with organizational systems and technology		*		
27	Supply base supplying poor quality material			*	
28	No consequence for suppliers sending bad material(typically because of price)			*	
29	No plan to deploy into the Design and Marketing functions after operations has launched		*		
30	Believing a single initiative can/will solve all your problems		*		

Table 3.4: Breakdown of Six Sigma Policy Deployment steps- relation to project failures

	30 Documented Six Sigma failures related to management and company	Six Sigma Policy deployment steps																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	No concept of customer expectations	*												*					
2	No vision related to customer expectations		*										*	*					
3	No follow-up on the annual operating plan					*	*						*						
4	Lack of alignment(horizontal or vertical)						*						*						
5	No visible leadership at the executive level	*	*					*											
6	Business executives do not show up for report-outs(conveys a lack of priority)		*			*									*				
7	Deploying Six Sigma without a goal(reason for deployment)	*	*																
8	Deploying Six Sigma with a goal but no plan on how to get there	*	*		*	*		*					*						
9	Abdicating the deployment plan to a consulting company	*		*	*	*			*				*						
10	Trying to change the organization without a detailed change process					*	*	*											
11	Not having metrics in place for management participation													*	*	*			
12	Absence of a formal change process	*				*	*	*						*					
13	Champions do not show up for report-outs							*											
14	Having metrics in place but no feedback(or limited feedback annually,semi-annually,quarterly)				*	*	*	*							*				
15	Not having multiple projects queued up for each MBB,BB or GB(so when they complete a project the next one has already been selected)										*	*							
16	Not communicating deployment plans effectively through the organization					*	*	*					*						
17	No rewards or recognition program																		*
18	Lack of a detailed cultural change management program	*	*			*	*	*											
19	No retention program for trained personnel										*	*							
20	Trying to use contract type agreements to retain MBBs and BBs																		
21	Project selection process does not identify projects related to business objectives	*	*		*			*											
22	Middle management operates on their own agenda (feel support is optional)					*		*					*						
23	No accountability							*					*	*	*				
24	Champions do not break roadblocks			*	*			*											
25	No buy-in at the process owner level			*									*						
26	Lack of interaction with organizational systems and technology			*	*			*	*				*	*	*				
27	Supply base supplying poor quality material													*	*	*	*		
28	No consequence for suppliers sending bad material(typically because of price)													*	*	*	*		
29	No plan to deploy into the Design and Marketing functions after operations has launched													*	*	*	*	*	
30	Believing a single initiative can/will solve all your problems	*	*			*		*	*				*						

3.8 Six Sigma Policy Deployment Measurements

This section discusses the measurements for the Six Sigma Policy Deployment Model. The performance measurement categories used here are based on ISO and Baldrige criteria (Mears and Voehl, 1995). Table 3.5 discusses the Six Sigma Policy Deployment model against the seven performance measurement categories. This table also discusses some of the objectives of measurements.

The seven different performance measurement categories that were used to measure Six Sigma Policy Deployment model are listed below (Mears and Voehl, 1995):

1. Leadership:- Some of the key aspects of leadership are: Getting involved in developing a quality culture, following up with the annual operating plan, practicing quality concepts, clearly communicating quality responsibilities to all employees, coordinating between departments and providing adequate resources for quality improvement.
2. Strategic Planning:- Some of the key aspects that are involved in strategic planning of any organization are: concept of customer expectations, using competitive data from other firms when developing Six Sigma goals, having an operational plan that describes the goals, involving employees in quality planning, having specific methods for monitoring progress toward improving quality, project plans in effect for all departments and having quality plans for suppliers.
3. Information and Analysis:- Information and Analysis criteria concentrates on gathering the data on all important dimensions of customers and services provided to

them, knowing the competitors, analyzing the suppliers' view of quality, data gathering to analyze the performance and identifying causes of poor quality.

4. Human Resource Development and Management:- Some of the key aspects of human resource management are: involving employees in Six Sigma improvement projects, using quality criteria for employee performance evaluation, communicating Six Sigma goals to all employees, training all employees on the Six Sigma Policy Deployment concepts and rewarding employees for their quality improvement efforts.
5. Process Management:- Some of the key aspects covered under process management are: defining customer quality expectations, transferring customer requirements into the planning process for improvement, evaluating processes for improvement, making sure that departments have defined Six Sigma goals, using competitive data for making process improvements and working with suppliers to improve quality.
6. Customer Focus and Satisfaction:- Some of the key aspects that are covered under this category of performance measurement are: gathering customer satisfaction data from customer groups, having vision related to customer expectations, proving higher levels of customer satisfaction than the competitors and using innovative approaches in assessing customer satisfaction.
7. Business Results:- Some of the key business results discuss the improvement of customer satisfaction, leaders getting involved in the report-outs and having the right metrics in place.

Table 3.5: Six Sigma Policy Deployment model against seven performance measurement categories

		Model			Business Excellence-Performance Measurement Category						
	Six Sigma failures related to management and company	HEAVY IMPACT	MEDIUM IMPACT	Objectives	Leadership	Strategic Planning	Information and Analysis	HR Management	Process Management	Customer Focus	Business Results
1	No concept of customer expectations	*		Concept of customer expectations		*	*			*	
2	No vision related to customer expectations		*	Vision related to customer expectations	*	*				*	
3	No follow-up on the annual operating plan	*		Follow-up on the annual operating plan	*	*	*				*
4	Lack of alignment(horizontal or vertical)	*		Alignment of the projects with business objectives		*			*		
5	No visible leadership at the executive level	*		Leadership at the executive level	*						
6	Business executives do not show up for report-outs(conveys a lack of priority)		*	Business executives show up for report-outs	*	*		*	*		
7	Deploying Six Sigma without a goal(reason for deployment)	*		Deploying Six Sigma with a goal		*	*		*		
8	Deploying Six Sigma with a goal but no plan on how to get there	*		Deploying Six Sigma with a goal and plan on how to get there		*	*	*	*		
9	Abdicating the deployment plan to a consulting company		*	Developing deployment plan within the company	*	*					
10	Not having metrics in place for management participation		*	Having metrics in place for management participation		*	*		*		
11	Absence of a formal change process	*		Having a formal change process		*			*		
12	Champions do not show up for report-outs		*	Champions show up for report-outs	*						
13	Not having multiple projects queued up for each MBB,BB or GB(so when they complete a project the next one has already been selected)	*		Having multiple projects queued up for each MBB,BB & GB		*					
14	Not communicating deployment plans effectively through the organization	*		Communicating deployment plans effectively through the organization		*	*		*		
15	Lack of a detailed cultural change management program	*		Having a detailed cultural change management program		*					
16	No retention program for trained personnel		*	Retention program for trained personnel		*		*			
17	Project selection process does not identify projects related to business objectives	*		Project selection process identifies projects related to business objectives		*	*				*
18	Middle management operates on their own agenda (feel support is optional)	*		Middle management supports other operations within the company		*			*		
19	No accountability	*		Having accountability		*			*		
20	No buy-in at the process owner level		*	Buy-in at the process owner level	*				*		
21	Lack of interaction with organizational systems and technology		*	Having interaction with organizational systems and technology			*		*		
22	No plan to deploy into the Design and Marketing functions after operations has launched		*	Plan to deploy into the Design and Marketing functions after operations has launched		*	*				
23	Believing a single initiative can/will solve all your problems		*	Not believing a single initiative can/will solve all the problems		*	*				*

3.9 Summary

Based on the literature review, there is no existing framework or model which integrates the Six Sigma DMAIC problem solving with the PDCA and Policy Deployment (Hoshin Kanri) planning process that can be used by organizations to achieve breakthrough improvements.

The model represents the highest stage of the evolution of the Six Sigma change methodology (shown in figure 3.1) which integrates Policy Deployment, the Six Sigma DMAIC problem solving approach, and the PDCA cycle to achieve breakthrough results. The table 3.1 listed the 18 steps of Six Sigma Policy Deployment cycle. The model was designed to bring Policy Deployment, PDCA and Six Sigma DMAIC together in a new and powerful way that helps mitigate Six Sigma project failures.

During the literature review, thirty documented Six Sigma failures related to management were identified. These thirty failures were validated against the teachings of quality theorists (as shown in table 3.2) whose philosophies are widely known and accepted. The impact of the integrated Six Sigma Policy Deployment model against these documented failures was studied and shown in table 3.3. In this table, heavy impacts are the points that can be directly and strongly related to the steps in the model, medium impacts are the points that can be directly and moderately related to the steps in the model, light impacts are the points that are not addressed directly but can be derived or implied from the steps of the model and no impact are the points which have not been addressed by any of the steps in the model. It can be seen that the model has twelve instances of heavy impact on the failure points, ten of medium impact, seven of light

impact and one instance of no impact out of these thirty documented failures. This indicates that the Six Sigma Policy Deployment model has:

1. Addressed 97% of the documented failures and
2. Addressed 74% with significant impact (Heavy and Medium)

Further, the thirty failures across all 18 steps of the Six Sigma Policy Deployment model are listed as shown in table 3.4. The 18-step Six Sigma Policy Deployment model covers all 30 failure points, with some steps covering as many as nine failures and others covering one or more. Thus, the model, as shown in table 3.4 covered a total of 102 failure mode interaction points. Later in table 3.5, the Six Sigma Policy Deployment model was measured against the seven performance measurement categories. The objectives of measures were also discussed in table 3.5.

A case study has been presented in the following chapter that discusses the FPL quality improvement program and then discusses the projects that followed the Six Sigma lifecycle steps.

CHAPTER FOUR: CASE STUDY

4.1 Introduction

This section aims at presenting the limitations of previous approaches in quality management and how the new Six Sigma Policy Deployment Model would address those limitations. For this purpose an industry case study is presented as a benchmark for the development of the integrated model. The benchmark chosen was Florida Power and Light (FPL), a key organization in the development of continuous improvement programs and an early leader in the application of policy deployment. The FPL benchmark was chosen for the following reasons:

1. FPL had learned much from the JUSE (Union of Japanese Scientists and Engineers) Counselors, including Dr.Akao, who popularized the policy deployment model.
2. The Shortcoming of the model at the time was that it did not include the Six Sigma DMAIC problem solving process. Instead, FPL used the QC story, which was a robust approach containing some but not all the DMAIC components.
3. The Six Sigma Lifecycle used by the master instructor was derived from the FPL model.

By using the Six Sigma Lifecycle as a benchmark foundation, the new integrated Six Sigma Policy Deployment model had a strong platform to expand upon and helped clarify many of the policy deployment steps.

This case study is used to outline the limitations of that early approach by cross-referencing its components to a present case of a Six Sigma project at the University of

Central Florida (UCF). Later a contrasting view is presented in which the components of the new Six Sigma Policy Deployment Model are used to highlight the areas of possible enhancements in the UCF Project.

The Executive Board of the ASQ Orlando Section 1509 decided to provide educational opportunities to their membership, and provide benefits to local community organizations. The ASQ Board involved the ASQ Student Chapter at UCF to provide an applied learning opportunity to students. ASQ along with cooperation from the Harrington Software Group headquartered in Orlando, Florida, launched three ASQ Community Good Works projects in June, 2003.

The three projects successfully created value through cycle-time reduction, process documentation and improvement, volunteer involvement, and innovative solutions. These three projects were proposed by Frank Voehl, Chief Operating Officer of The Harrington Software Group of Orlando, and Cathi Balboa, Vice Chair of section 1509 (Voehl, 2004)

Two of the three Six Sigma Community improvement projects have been summarized in the section 4.4:

Project #1- Florida Engineering Education Delivery System (FEEDS) deals with UCFs distance education system.

Project #2-Seniors First deals with providing meals to senior citizens population

Frank Voehl has served as General Manager of Florida Power and Light (FPL) Qualtec Quality Services. He led teams as the Six Sigma Master Black Belt (MBB)

instructor. Under his guidance these projects were benchmarked against the FPL quality improvement program which is discussed in the following section in detail.

4.2 FPL Policy Deployment Case Study

The FPL case study is based on the 1988 JUSE (Union of Japanese Scientists and Engineers) Counselor Comments Report as well as the FPL description of Quality Improvement Program (reference #000942, 1989).

During the 1970s, FPL was forced to increase utility rates repeatedly because of increasing costs, slower sales growth, and stricter federal and state regulations. Marshall McDonald, then chairman of the board, realized that the company had been concentrating on keeping defects under control rather than on improving quality, as seen through the eyes of the customer. In 1983, while in Japan, McDonald met the president of Kansai Electric Power Company, a Deming prizewinner, and learned about their total quality efforts.

FPL began its Quality Improvement Program (QIP) in 1981 and in 1987, Policy Deployment became the driving force behind the QIP. Due to the influence of the QIP, the average length of service interruptions dropped, the numbers of customer complaints were drastically reduced, safety had improved, and also the price of electricity stabilized. In 1989, FPL won the Deming Prize, the most prestigious quality award in the world. (Evans and Lindsay, 2002)

FPL's QIP consisted of three major components (shown in figure 4.1):

1. Policy Deployment at the executive level

2. Quality Improvement teams (QC Story) at the project level
3. Quality in Daily (repetitive) Work (QIDW)

Policy Deployment: Policy Deployment integration at FPL was a top-down, bottom-up method to ensure that plans and strategies were successfully implemented within the organization and throughout the value chain. The JUSE counselors taught FPL executives to deploy their strategy through a process called "Hoshin Kanri" which is also known as "Hoshin Planning". The word "Hoshin" refers to policies of management and "kanri" to the aspects of planning. FPL's Hoshin Kanri (Policy Deployment in Western quality literature) became the company-wide planning and implemention method that tied improvement activities, usually requiring breakthrough results, to the long-term strategies of the organization.

Quality Improvement teams (QC Story): Rather than having a continuous improvement methodology for process and product improvements that have a direct impact on both financial and operations goals and the organization, FPL treated each occurrence on a project-by-project basis. Even though the first efforts focused on fairly narrow problems, their impact on the whole business was soon made clear. Quality Improvement teams were developed to provide a structure for the employees to improve the quality of products and services, skills and abilities, communication and teamwork and enhance the quality of work life. This gave equal opportunity to be heard by management and to express their individual creativity.

Quality in Daily (repetitive) Work (QIDW): Quality in daily work (QIDW) provided a decentralized method for controlling and improving daily work processes. The

basic aim was to ensure that routine activities were performed correctly. It provided for maintenance of the gains achieved through improvement activities.

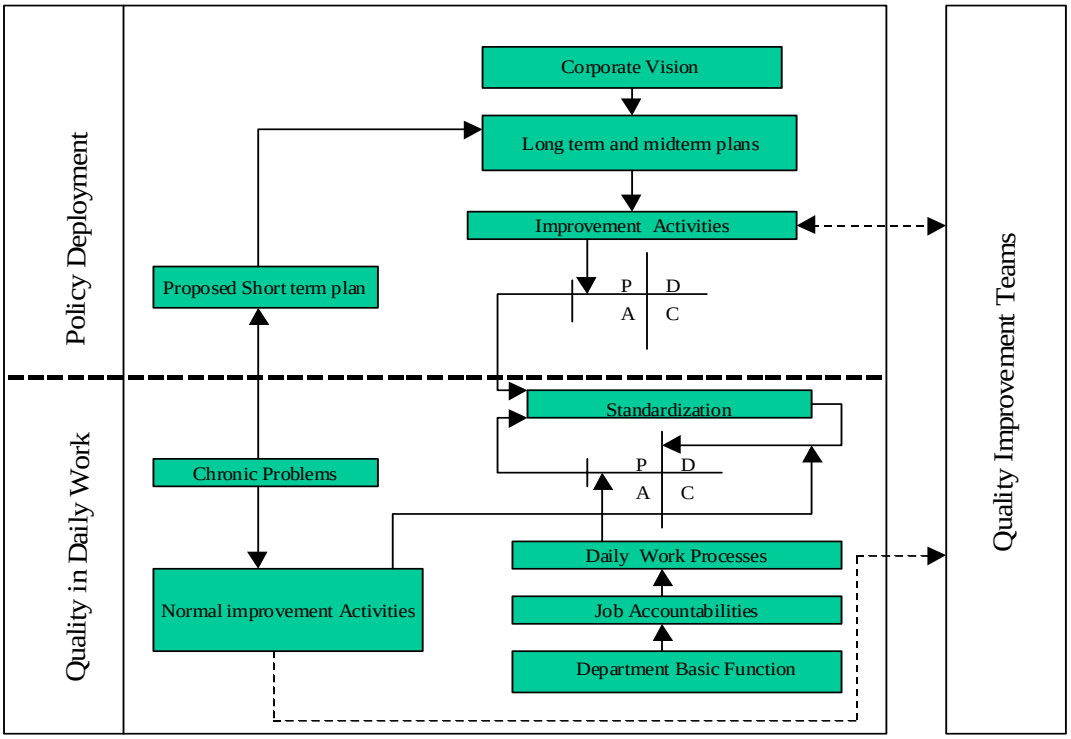

Figure 4.1 Quality Improvement Program (QIP) at FPL

4.2.1 Description of Policy Deployment at FPL

During 1985, Yoshio Kondo, one of the JUSE Counselors working with FPL, described the essential steps of Hoshin Kanri, or Policy Deployment. He recommended differentiating between those indicators that were useful in setting policy and those that help achieve control (JUSE Counselor Comments Report, 1988). Some of the essential points of Hoshin Kanri incorporated by FPL were:

- Annual policy
- Establishment of quality policy
- Converting methodological policy into objective policy that is composed of aims, targets and priority strategies, from top-down and bottom-up deployment.

Starting in 1988, each year's Policy Deployment projects were based upon the results of the previous year's projects, as recommended by the JUSE counselors (JUSE Counselor Comments Report, 1988). Policy Deployment started with the top management team, who was responsible for developing and communicating the FPL vision, mission, and values, as well as building an organization-wide commitment to achievement. The FPL vision was then deployed through the development and catchball execution of annual "Hoshins", or policy statements.

4.2.2 Playing Catchball through Goal Setting at FPL

Through the catch-ball activities, all levels of FPL employees were actively participating in generating strategies and action plans for the attainment of the vision and associated objectives (Evans and Lindsay, 2002). Thus, at each level, progressively more and more detailed action plans were developed to make the strategies and 'hoshins' came alive. Each 'hoshin' contained an objective statement, a goal or target, a strategy, a measure and the person responsible for achievement. As plans cascaded downward, there was a clear link of the vision and common goals. It was this focus on a few critical goals that helped FPL achieve the desired breakthrough, by the alignment of critical resources in a focused and concentrated manner. (JUSE Counselor Comments Report, 1988)

4.2.3 FPL Policy Alignment

The main objective of Policy Deployment is to align the organizational forces of the extended enterprise in the same direction so that everyone within the enterprise knows and understands the overall direction of the organizations involved and how each can play its part to best support that direction. (Voehl, 2000). At FPL, this included the selection of suppliers who shared the vision of the enterprise and were willing to work together to reduce cycle time and prioritize its improvement efforts to tie to the vision.

The need to improve was governed by the levels of customer satisfaction, state of statistical process control, process capability, trends and the overall business environment. Each of the major processes within the FPL supply chain was prioritized in order to focus on the high leverage critical success factors that existed. The use of Critical Success Factors (CSFs) greatly assisted FPL with the prioritization and focusing activities and was viewed by FPL executives as the strategic enabling arm of Policy Deployment. However, Dr. Kano emphasized that Policy Deployment was a strategic subject and should not cover all the operations in a utility business; hence, QIDW (quality in daily work) was introduced (JUSE Counselor Comments Report, 1988).

The missing ingredient at FPL at the time was the ability to correctly understand the customer needs and wants, and to listen to the voice of the customer. FPL needed to have had a better system for surfacing and aligning their CSFs. FPL found such a system called Table of Tables (Quality Function Deployment) which was effectively used to surface CSFs and develop breakthrough strategy thereby creating policy alignment.

At FPL, one of the lessons learned was that if the method of project selection was not correct, then achievement of the project will not result in the achievement of the total objective. If the causes of non-achievement are not investigated at the evaluation step, the tendency is to repeat the same mistakes and lose all chances of improvement. For this reason, FPL instituted Presidential Reviews in order to ensure that champions showed up for report-outs. This also helped insure that the metrics were in place for management participation.

In summary,

- The five fundamental work force tasks of Policy Deployment that were followed in FPL.
    - Understanding the customer
    - Goal setting
    - Catch-ball within the divisions of the organization
    - Monthly and daily management review activities
    - Checking, inspecting and problem-solving
- Policy Deployment was not merely a cascade of objectives, but an integrated approach between strategy, process, projects and logistics both horizontally and vertically. Therefore, it contributed to the likelihood that alignment occurred around key operating principles.
- At the beginning, Policy Deployment was added to older systems of support, thereby adding complexity and slowing things down while focusing and aligning.

They soon became replacements for older systems of MBO management, and they radically simplified the documentation and performance of work.

The table 4.1 summarizes the Policy Deployment steps that were followed by FPL.

Table 4.1 Summary of FPL Policy Deployment steps

	Steps	FPL objective
1	Selection of theme	To initiate Quality Improvement Program (QIP) in 1980s
2	Reason for Selection	FPL identified significant external and internal issues that were impacting the survival of the company.Corporate goals needed to be established and achieved using new management techniques.
3	Study of current status	Study revealed that internal and external environments were changing faster than FPL could adapt. Declining customer confidence and satisfaction, uncertainty of the future of nuclear power supply, price of electricity increasing faster than the consumer price index (CPI)
4	Analysis	Further analysis was conducted based on the previously collected data
5	Planning of measures	Goals were set to realize the corporate vision.
6	Implementation	Established policy deploymnet committtee, Established new vision, phased out Management By Objective (MBO)
7	Confirmation of effect	Presidential reviews were conducted,Developed Midterm and short term plans,
8	Prevention/Standardization	Assigned Coordinating executive, integrated policy deployment with budget system, established "Policy Deployment guidelines"
9	Stability of control	Formalized cross-functional management of problems, set midterm targets to reflect "Best Managed".
10	Remaining Problem	Introduced corporate quality/delivery system, introduced department quality systems, confirmed alignment of short-term plans with customer needs
11	Future Policy	Aligned corporate and departmental activities through mini-situation conference, linked project targets drectly to short-term plans

4.3 Application of the FPL QIP to FEEDS and Seniors First project

The two Six Sigma projects were initiated with the guidance of a Master Black Belt instructor, who provided a Six Sigma project life cycle (unpublished manuscript, Voehl 2003) that was originally based on the FPL QIP. This methodology was used as a benchmark by the Six Sigma project teams. The FPL's lessons learned became the basis for the Six Sigma project teams to start off the projects with the right method of project selection process and developing reasons for selection. Each of the steps that were followed in the projects are discussed in the next section.

4.4 Integrated Six Sigma Policy Deployment-FEEDS and Seniors First project

Tables 4.2 and 4.3 gives a Summary of the FEEDS and Seniors First projects that followed the Six Sigma Lifecycle methodology, which is a component of the new Six Sigma Policy Deployment Model, and thus helped to overcome some of the deployment failures that were discussed in the previous chapters. While the Six Sigma Lifecycle methodology followed by the two projects was adequate and contained most of the components of the new Six Sigma Policy Deployment Model, it did not explicitly guide a user through a sequence of steps or provide an orderly path to pursue. This while appearing trivial, is the most valuable component in the new Six Sigma Policy Deployment Model: orderly guidance.

4.5 FEEDS and Seniors First Project Overview

The Florida Engineering Education Delivery System (FEEDS) is a program that provides distance learning and knowledge sharing services. The statewide system supports 121 company partners and 44 delivery and receive locations. An Assistant Dean and full-time staff of four technical experts administer FEEDS through the Engineering College at the University of Central Florida. The FEEDS Six Sigma project had two goals: documenting the current process and identifying the opportunities for improvement. The MBB, BBs, and Champions set the goals for the project. Policy Deployment steps (based on FPL QIP) of the proposed model was followed for initial project planning. The FEEDS Six Sigma Green Belt team along with the team leader performed the Six Sigma DMAIC steps. During the measure step, the team surveyed FEEDS students (who are the customers) to know their expectations. The team listed many of the opportunities for improvement from the survey. In the latter stages of the project, the team developed a Failure Mode and Effects Analysis (FMEA). The steps that were followed in the project fall in line with the 18 steps of the Six Sigma Policy Deployment Model, which is shown in table 4.2.

The Seniors First project goal was to assess the current capability and, to identify and prioritize opportunities for improvement of the Seniors First meals-on-wheels system. The Seniors First Six Sigma Green belt team along with their team leaders interviewed GA Foods and Seniors First, conducted a benchmark survey, and gathered staff reports. Later, based on the interviews they compiled data that was then used to plot control charts and scatter diagrams. The team also conducted a gap analysis to understand

the current state of service. The team then created a desired state service system map. Table 4.3 gives a breakdown of the Seniors First project steps.

Both of the projects were benchmarked against the FPL QIP. The Six Sigma Policy Deployment model uses the Policy Deployment steps of FPL QIP. By following this methodology, most of the deployment failures that were discussed in earlier chapters were prevented during the course of the projects. While both projects did not explicitly follow the new Six Sigma Policy Deployment model described in this work, the components of the proposed model are identifiable among the projects' tasks. A summary of the FEEDS project and Seniors First project and the corresponding model tasks is presented in tables 4.2 and table 4.3 respectively.

While the 18 steps of the new Six Sigma Policy Deployment model are identifiable in the project's tasks, some aspects of the project could have been enhanced, had the projects used the model explicitly. A list of potential enhancements to the projects that could have been achieved is presented next:

- While the *PDCA cycle* was identified in the project tasks, its value for daily control capabilities was not used to its fullest. As such the projects dragged at times because of commitment limitations from volunteer team members.
- While some of the recommendations from the project were implemented, the *future policy* component could have been enhanced. At the end of the projects, the continuous improvement effort may have subsided without the implementation of new policy that enables continuous improvements, such as FEEDS integrating the

student survey as an ongoing policy. The clear integration of projects to the business objectives would have given much better results.

- The last steps of the model *(17-Take Action, 18-Check Results of Action)* could have been enhanced in order to enable the leap to a second project that would take the measurements from the implemented policy or other opportunities for improvement.
- While the components of the new model were among the tasks followed by both projects, they were not organized in a format that allowed the project teams to fully grasp the path to follow (i.e. the teams were not aware that they were following a policy deployment model), thus limiting their planning capabilities.

Table 4.2: Summary of FEEDS Six Sigma Project

Steps	FEEDS Case study
1.Selection of theme	Problems with the existing system,To achieve high Customer(FEEDS Students) satisfaction
2.Reason for Selection	Document the existing processes UCF FEEDS system, Identify, Analyze and Prioritize opportunity for improvement of the FEEDS system, both at UCF and statewide,Provide an applications opportunity to team members for learning and reinforcement of the Six Sigma DMAIC process
3.Study of current status	Study of existing FEEDS processes, Infrastructure, and technology, Brainstorm with FEEDS Champions
4.Analysis	Analysis of feedback from FEEDS Champions, based on past performance
5.Planning of measures	Beginning of planning process and Development of master plan from the MBB
6.Implementation	FEEDS charter was developed and approved
7.Confirmation of effect	Confirmation of master plan from FEEDS Master Black Belt and Champions
8.Prevention/Standardization	DMAIC cycle was chosen as the standard approach for the problem solving
9.Stability of control	Brainstormed with FEEDS Champions and Stability brought in the system
10.Remaining Problem	Identify, Analyze and Prioritize opportunity for improvement of the FEEDS system at statewide
11.Future Policy	To continuously improve the FEEDS system in the state of Florida and throughout the world
12.Define	Goal setting of sub teams,Identifying stakeholders,Select team and assign tasks /accountabilities,started Define phase by listening to the voice of the customer, student survey was designed.
13.Measure	Survey measured perceptions in two categories:satisfaction and usefulness
14.Analyze	A Failure Mode and Effects Analysis (FMEA)and the results of the student survey were analyzed using radar diagram, histograms,correlation,root cause analysis
15.Improve	Opportunities for improvements, breakthroughs were identified and selected practical approaches, Design Future State, Establish Performance Targets, Train and execute
16.Control(Check)	Measured results, developed control methods and managed change, create a process control plan
17.Take action	Create a process Control plan, presentations were given out to the champions
18.Check result of action	Reviewed results,documented the project and final presentation given out to the entire team

Table 4.3: Summary of Seniors First Six Sigma Project

Steps	Seniors First Case study
1.Selection of theme	Lack of compliance of meal delivery for both individual and congregate , Achieve ultimate customer satisfaction (seniors)
2.Reason for Selection	To boost and enhance the current meal delivery process to adhere to State requirements and ensure food safety, Assess the current capability of the system (meals on wheels), Identify, analyze and prioritize opportunity of improvement of the Seniors-First meals-on-wheels system Provide an opportunity to apply six sigma tools in a real life project, and demonstrate the power of the DMAIC process
3.Study of current status	Interviews with stakeholders and site visits to both GA Foods and Seniors First facilities
4.Analysis	Analysis of various stakeholders input, and setting up for performance measures
5.Planning of measures	Beginning of the project planning process Setting project targets
6.Implementation	Seniors First charter was developed and approved
7.Confirmation of effect	Confirmation of plan with master black belt and champions
8.Prevention/Standardization	DMAIC was chosen as the method of choice to address the issues with the meals-on-wheels delivery process
9.Stability of control	Brainstormed with Seniors First champions and assessing stability of current process
10.Remaining Problem	Standardization and provisioning processes, and streamlining the food delivery operation
11.Future Policy	To continuously provide the right meals, at the right time, to the right person, at the right temperature
12.Define	Interviewed GA Foods and Seniors First Executives and Operations Staff Toured Plant Facility Visited Congregate Meal Sites Interviewed Site Managers Obtained Process Flow From GA Foods
13.Measure	Compiled Observation Data Plots on Control Charts,Plots on Scatter Diagrams,Conducted Gap Analysis on Current State Service System Map and Root Cause Analysis
14.Analyze	Conducted Benchmark Survey, Riding Exercises,Gathered Staff Reports and SRA Reports
15.Improve	Created “Desired State” Service System Map Reviewed Recommendations With Staff to Determine Feasibility,Agreed on Implementation of Improvements with Seniors First Staff,Need Concurrence From GA Foods and SRA
16.Control(Check)	GA Foods and SRA agreed with recommendations and also implement them
17.Take action	Seniors First will implement the recommendations
18.Check result of action	Six Sigma Team will follow up in 6 months to review implementation results Monthly reviews will track and control compliance

4.6 Description of the heavy impact areas

1. No concept of customer expectations:

By following the Six Sigma Lifecycle, the FEEDS Six Sigma project team performed customer needs analysis and FEEDS students (customers) were surveyed to know their expectations. Survey measured perception in two categories: satisfaction and usefulness. Project team interviewed and brainstormed with the Feeds Champions and stakeholders.

On the other hand, the Six Sigma Seniors First team went on a site visit to GA Foods and toured Seniors First facilities in order to directly observe the customer interactions. The team observed congregate meal sites and reviewed the existing documentation. They interviewed GA Foods and Seniors First executives and operations staff concerning customer needs and wants. They also obtained process flow from GA Foods and drafted “Current State” flow With Seniors First. While successfully mitigating this failure factor, the projects could have been further strengthened by explicitly following the step 1 and step 2 of the Integrated Six Sigma Policy Deployment model.

2. No follow-up on the annual operating plan

Each of the Six Sigma project teams developed project charters (FEEDS charter and Seniors First charter respectively), which were approved by all project stakeholders. Project objectives were then aligned to the organizations annual business objectives. Six Sigma MBB, BBs, Champions, team leaders and GBs met frequently to discuss the progress of the projects. Discussions were based on the Charter that was developed at the

beginning of the projects. Team results could have been further strengthened by using the clear linkages to the operating plans provided through the Integrated Six Sigma Policy Deployment model. For example, at the end of each quarter, the Senior Leadership teams of the client organizations would perform a management review of the impacts of each project against the budget and business objectives.

3. Lack of alignment (Horizontal or vertical)

In addition to the alignment mentioned in item # 2 above, both projects used a focused process to align stakeholder and Champions objectives with project objectives. The use of the Integrated Six Sigma Policy Deployment model, had it been available at the projects inception, would have provided a direct line of sight from the project objectives throughout the entire organization, and would have provided a clearer vertical integration with the organizational visions and missions.

4. No visible leadership at the executive level

Champions were involved through out the course of the projects. Although their involvement was less at the start of the projects, the Champions co-operated in providing the right data and resources supporting the projects after the initial Champions training provided by the MBB. Each of the Six Sigma project teams were led by the team leaders who had a thorough understanding of the Six Sigma tools and techniques. Tollgate revisions were held periodically with the client management. The Integrated Six Sigma Policy Deployment model would have called in for heavy Champions involvement from the project beginning till the end by using Catchball technique.

5. Deploying Six Sigma without a goal (reason for deployment)

Apart from providing an opportunity to apply six sigma tools in a real life project, and demonstrate the power of the DMAIC process, specific project goals were set. The Integrated Six Sigma Policy Deployment model, had it been available, would have provided a much clearer goal-alignment to the clients policies and the catch-ball technique would have added substantial value beyond what was already achieved.

The two goals that were set for the FEEDS Six Sigma project was:

1. Document the existing process of the UCF FEEDS system.

2. Identify, analyze and prioritize opportunities for improvement within the system.

Goals of the Seniors First Six Sigma project were:

1. To boost and enhance the current meal delivery process to adhere to State requirements and ensure food safety, assess the current capability of the system (meals on wheels).

2. Identify, analyze and prioritize opportunity of improvement of the Seniors-First meals-on-wheels system.

6. Deploying Six Sigma with a goal but no plan on how to get there

Each project had a detailed master plan that accompanied the project charter. Six Sigma MBB, BBs and team leaders decided to follow the DMAIC cycle, which was chosen as the standard approach for problem solving. Six Sigma project teams were trained on using the Six Sigma tools based on the DMAIC cycle, and the plans that were developed were more than adequate to ensure a successful project. At the end of the

projects, the continuous improvement effort may have subsided without the implementation of new policy. The Six Sigma Policy Deployment model ensures continuous improvement by using the PDCA cycle.

7. Absence of a formal change process

The Six Sigma Lifecycle model provided a well-designed and structured change management process. Team members were trained on this approach. The Integrated Six Sigma Policy Deployment model would have provided a clearer structure for the culture changes required in order to standardize the recommended changes and the PDCA aspects of daily work control that were left up to the client to consider and implement without any formal training in this area.

8. Not having multiple projects queued up for each MBB, BB or GB the step (so when they complete a project the next one has already been selected)

During the course of the projects, a number of mini projects and improvement ideas were developed, which were based on the concept of continuous improvement as follows:

FEEDS project: To continuously improve the FEEDS system in the state of Florida and throughout the world. A total of 7 points were listed as the opportunities for improvement.

Seniors First: To continuously provide the right meals, at the right time, to the right person, at the right temperature. A total of 4 points were listed as the opportunities for improvement. This step made the MBB, BBs, team leaders and GBs to get involved in projects all the time.

The Integrated Policy Deployment model would have assisted the client organizations with integrating and implementing these improvements.

9. Not communicating deployment plans effectively through the organization

Each project's deployment was first communicated via a project charter. The deployment plans continued via the use of tollgates at key points in the project. The communication planning aspects of the Integrated Six Sigma Policy Deployment model would have helped ensure the success of the communication plans in a more robust manner by closely mapping into step # 1 of the Six Sigma Policy Deployment Model: Selection of theme, than was done by the Six Sigma Lifecycle.

10. Lack of a detailed cultural change management program

As mentioned in item #7 above, the Integrated Policy Deployment model would have provided a clearer structure for the culture changes required in order to standardize the recommended changes as the PDCA aspects of daily work control were left up to the client to consider and implement without any formal training in this area. All team members were trained on the basics of cultural change management through simulation and hands on experience during the course of the project.

11. Project selection process does not identify projects related to business objectives

As mentioned in items #2 and #3 above, the business objectives were aligned during the project. The MBB, BBs and Champions met for project selection. During the process of project selection, reasons for selection were listed for both of the projects, which were based on the business objectives. The use of the Integrated Policy Deployment model, had it been available at the projects inception, would have provided a

direct line of sight from each project to the business objectives and would have provided a clearer integration with the organizational vision.

12. No accountability

The Six Sigma Policy Deployment model would have called for heavy Champion involvement from the project beginning until the end on both projects. Although during the projects, all team members and Champions were closely aligned with project tasks using a roles and responsibilities matrix. Finally, steps 3, 5, 6, 7, 12, 15 and 17 of the Six Sigma Policy Deployment model would have provided for direct accountability of key team members and organizational Champions.

4.7 Summary

The preceding section discussed two of the three Six Sigma projects that were conducted by ASQ Orlando section 1509 in cooperation with the Harrington Software Group, Orlando. Table 4.2 discussed the steps performed in the FEEDS Six Sigma project and table 4.3 discussed the steps performed in the Seniors First Six Sigma project. The projects were benchmarked against the FPL QIP. The project teams were trained with using the Six Sigma DMAIC lifecycle, tools and techniques during the projects. The Six Sigma DMAIC lifecycle was based on FPL QIP provided the framework, which subsequently resulted in the formulation of the integrated Six Sigma Policy Deployment model, which was used as a final project completion checklist to ensure that all essential items for project success had been covered using the Six Sigma Lifecycle.

Even though the elements in the model previously existed under different components of Six Sigma problem solving, they had never been incorporated into one integrated and united framework. Most of the failures discussed during the course of this work were preemptively covered by following the 18 steps of the model, thus avoiding project failures. The various areas where the Integrated Policy Deployment model would have created added value are described in Section 4.6, items #1 through 12. Some of the instances where the Six Sigma Policy Deployment model had a heavy and medium impact on the 30 documented failures like customer expectations, vision related to customer expectations, follow-up on the operating plan, and project alignment with the business needs and accountability were discussed in the same section. These factors were given the most importance during the course of the projects. Even though these two projects created value through cycle-time reduction, process documentation and improvement, volunteer involvement, and innovative solutions, they would have even been more successful had the Integrated Policy Deployment model been available for use at the project inception phase, instead of at the project conclusion phase. The volunteer aspect of FEEDS and Seniors First projects makes the need to follow a rigid step by step procedure which is the most important component of the new Six Sigma Policy Deployment model.

CHAPTER FIVE: CONCLUSIONS

5.1 Summary

Most of the Six Sigma projects ignore the need for a Policy Deployment in order to achieve breakthrough improvements. Many organizations have also failed to implement the Six Sigma methodology into their daily control and strategic planning processes. These failures may involve a complete failure or partial failure of the Six Sigma projects. Six Sigma deployment failures have been categorized as coming from many sources, both management and person related. Some of the key management related failures were identified and validated against the teachings of quality experts whose teachings are widely known and accepted. A model that reduces the potential for Six Sigma project failures was developed and described in chapter 3. This model presents the fourth stage of the evolution of the Six Sigma change methodology. The proposed Six Sigma Policy Deployment model integrates the three problem solving methodologies by setting the stage for the catch-ball activity, thus involving various levels of management. The model is an 18 step process of a progressive circulatory system of improvement and breakthrough by integrating Policy Deployment, the Six Sigma DMAIC problem solving approach, and the PDCA cycle.

5.2 Conclusions

It is encouraged that all organizations consider the incorporation of the Six Sigma Policy Deployment Model, along with concepts of defect elimination and variation

reduction into their processes as an organizational philosophy to help mitigate project failures.

For continuous improvement to truly take root, organizations must understand and realize that applying Six Sigma tools and techniques on any process will not necessarily result in dramatic results, unless the concepts of Policy Deployment and PDCA cycle are also institutionalized. From the literature review, it was clear that there is no such operational framework or model that ties the three problem solving methodologies together and proposes one single model that organizations can adopt to achieve breakthrough improvement and prevent project failures.

The proposed model is an eighteen-step process applying a progressive circulatory system of improvement and breakthrough based upon an integrated Six Sigma Policy Deployment cycle that can be adopted to mitigate project failures in an organization and achieve breakthrough improvements. Involvement of all levels of management is very important for a Six Sigma project to be successful. This integrated Six Sigma Policy Deployment model sets the stage for the catch-ball activity, thus involving various levels of management.

5.3 Limitations of the Research

- There are several reasons why a Six Sigma initiative can fail. Six Sigma deployment failures related to people while important in its own right, were not discussed in this research work. The focus in this research work was on management related failures.
- Many but not all failures related to management were addressed in this work.

- Since the need in both of the projects (FEEDS and Senior's First) discussed as case studies was to improve the existing process, the DMAIC cycle was followed.
- Design for Six Sigma (DFSS) might be considered as an alternative model, if the system needs to be redesigned. In that case, the middle circle in the integrated Six Sigma Policy Deployment cycle could be replaced by the steps involved in DFSS.
- The integrated Six Sigma Policy Deployment cycle will have limitations at the department level within an organization. This is because this level of the organization is mostly concerned with tactics rather than long-term formal strategies.
- Knowledge of Policy Deployment is still very limited among organizations that seek improvement strategies.

5.4 Recommendations for Future Research

- The Integrated Six Sigma Policy Deployment model should be applied to additional projects to understand the impact of the model to achieving breakthrough improvement in organizations.
- Six Sigma should not be treated as a stand-alone project instead future research should be conducted on the benefits of an integrated Six Sigma Policy Deployment model to enhance the critical thinking.
- Involving of all levels of management is a key assumption for a Six Sigma project to be successful, and needs further validation. This model integrates Six Sigma and Policy Deployment ensuring that the catch-ball effect successfully involves all levels of management.

- Six Sigma Policy Deployment needs a wider implementation platform among service organizations and not for profit organizations.

REFERENCES

Akao, Y., “Hoshin Kanri Policy Deployment for successful TQM”, Productivity Press, Oregon, 1991

Antony, J. and Banuelas, R., "A strategy for survival", Manufacturing Engineer, Vol. 80 No. 3, pp. 119-21, 2001

Benneyan, J. C., “SPC, Process Improvement, and the Deming PDCA circle in Freight Administration”, Production & Inventory Management Journal; 1993, Vol. 34 Issue

Bisognano, M., "Can the guru's concepts cure health care?", Quality Progress, Sept 2004

Carnell, M., "Understanding Six Sigma Deployment Failures", The iSixSigma, 2004. August 22, 2004, <http://www.isixsigma.com/library/content/c020916a.asp>.

Cheney, A. B., “Teams and TQM”, Business Horizons; Sep/Oct94, Vol. 37 Issue 5, p16, 10p, 1

Coronado, R .B., Antony, J., ”Critical success factors for the successful implementation of six sigma projects in organizations”, The TQM Magazine, Bedford, 2002

Crosby, P, B., "Quality is free: the art of making quality certain", McGraw-Hill, New York, 1979

Crosby, P, B., "Quality without tears: the art of hassle-free management", McGraw-Hill, New York, 1984.

Costin, H., “Strategies for Quality Improvement”, The Dryden Press, Orlando, FL, 1999

DeFeo, J., and Janssen, A., “Why Strategic Deployment? ”, Measuring Business Excellence 5,3 2001

DeFeo, J., “Six Sigma: a new approach to quality management”, Directorship; Dec99, Vol. 25 Issue 11, p8, 4p

Deming, W. E.," Out of the Crisis", MIT press, Cambridge, Massachusetts, 1986

Deming, W. E.," The New Economics for Industry, Government, Education", 2nd edition, MIT press, Massachusetts, 1994

Evans, J., and Lindsay, W., “The Management and Control of Quality”, 5th edition, Thomson Learning, Ohio, 2002

Feigenbaum, A.V., "Total quality control", 3rd Edition, McGraw-Hill, New York, 1991

Feigenbaum, A.V., "Total quality control: Engineering and Management", McGraw-Hill, New York, 1961

FPL-Description of Quality Improvement Program, An Internal document, Reference #000942, 1989

Gabor, A., “Quality Revival, Part 2: Ford Embraces Six Sigma”, New York Times New York, Jun 13, 2001

Greenall, R., “Policy Deployment –The missing link”, Manufacturing Engineer, Oct 1997

Hammer, M., and Goding, J., “Putting six sigma in perspective”, Quality Troy, Oct 2001. Vol. 40, Iss. 10, p. 58-62 (5 pp.)

Harry, M., and Schroeder, R., “Six Sigma: The Breakthrough Management Strategy Revolutionizing the World’s Top Corporations”, 1st edition, Doubleday, New York, 2000

Henderson, K. M., and Evans, J. R., “Successful implementation of Six Sigma: benchmarking General Electric Company “, Benchmarking, Bradford, 2000, Vol. 7, Iss. 4, p. 260-281

Hyde, A. C., “Six Sigma black belt: Bruce Lee as a quality management consultant?”, Public Manager Potomac, 1999/2000, Vol. 28, Iss. 4, p. 57-59

Juran, J. M., and Godfrey, A. B., "Juran's Quality Handbook", 5th edition, McGraw-Hill, New York, 1999

Juran, J. M., and Godfrey, A. B., "The quality control process ", McGraw-Hill, New York, 1999

JUSE Counselor Summary Report, FPL, August 1998

Kondo, Y., “Hoshin Kanri-a participative way of quality management in Japan”, the TQM Magazine, Bedford: 1998, Vol.10, Iss. 6, pg 425

Lee, R. G., and Dale, B. G., “Policy Deployment: modeling the CRISP process, IMechE, Vol 214 Part B, 2000

Lewis, R., and Smith, D., “Total Quality in Higher Education”, St.Lucie Press, Delray Beach, FL, 1994

Lucas, J. M., “The essential Six Sigma”, Quality Progress Milwaukee: Jan 2002. Vol. 35, Iss. 1, p. 27-31

Madu, C. N., “Strategic total quality management--transformation process overview”, Total Quality Management; Sep94, Vol. 5 Issue 5, p255

Marsden, N., “The use of hoshin planning and deployment systems in the service sector: An exploration”, Total Quality Management, 1998, Vol 9

Mears, P., and Voehl, F., “The executive guide to implementing quality systems”, St. Lucie Press, Delray Beach, FL, 1995

Robinson, R., “Goal deployment: Getting everyone aiming at the same target”, Tapping the network journal, 1995, Vol. 5, Iss. 3, pg. 8

Rucker, R., “Citibank's cycle ride to satisfaction”, Human Resource Management International, Bradford, May/Jun 2000. Vol. 8

Tennant, C., and Roberts, P., “ Hoshin Kanri: A tool for Strategic Policy Deployment”, Knowledge and Process Management, Vol. 8, number 4, 2001

Voehl, F., “Playing Catchball with Policy Deployment And QFD”, Research paper no.103, 2000

Voehl, F., “Six Sigma Community Improvement Projects”, 58th Annual Quality Congress, 2004, Vol. 58, p. 351-363

Voehl, F., "Deming: The Way We Knew Him", St. Lucie Press, Delray Beach, FL, 1994

Voehl, F., and Harrington, R., "Crosby: The Way We Knew Him", Paton Press, Chico, CA, 2005

Voehl, F., "The Quality Theorists: In Pursuit of Total Quality", Strategy Publications Center, Strategy Associates, Coral Springs Fl, 1998

Voehl, F., "The Six Sigma Lifecycle”, Unpublished Manuscript, The Harrington Group, March 2003.

Walton, M., "The Deming Management Method", The Berkley Publishing group, New York, 1986

Walton, M., " Deming Management at work", G. P. Putnam's, New York, 1990

Wheat, B., Mills, C., and Carnell, M., "Leaning into Six Sigma: a parable of the journey to Six Sigma and a lean enterprise", McGraw-Hill, New York, 2003

Witcher, B., "Policy Management of Strategy (Hoshin Kanri)", Wiley interscience, Jan 2003

Witcher, B., " Hoshin Kanri: A study of practice in the UK", Managerial Auditing Journal, Bradford, 2002, Vol. 17, Iss. 7, pg. 390

Wyper, B., and Harrison, A., "Deployment of Six Sigma methodology in Human Resource function: A case study", Total Quality Management, Jul 2000. Vol. 11

Zahn, D., Watson, G., Voelkel, J., and Patterson, A., "What influence is the Six Sigma movement having in Universities? What influence should it be having?", ASQ Six Sigma Forum Magazine, Nov 2003