2015

Assessing Climate for Systems Improvement Initiatives in Healthcare

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ASSESSING CLIMATE FOR SYSTEMS IMPROVEMENT INITIATIVES IN HEALTHCARE

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN

INDUSTRIAL AND SYSTEMS ENGINEERING

UNIVERSITY OF RHODE ISLAND

2015

DOCTOR OF PHILOSOPHY DISSERTATION

OF

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UNIVERSITY OF RHODE ISLAND
2015

ABSTRACT

Increasing medical costs have made healthcare organizations look at reducing their operating costs while meeting their demands, which made them move towards adopting systems improvement methodologies that have been successful in other business sectors, especially from manufacturing industries. The success of these improvement methodologies is contingent on employees of the organization being ready to adopt and embrace them which necessitates behavior change of employees. This study aimed to develop measures based on the Transtheoretical Model (TTM) to assess employees' attitudes and readiness to adopt improvement methodologies and the effects of employees' demographics like supervisory level, length of service, work group and age on the adoption process. The study was conducted at the Providence VA Medical Center (PVAMC) which is trying to implement improvement methodologies. All employees were surveyed five times over a period of two and half years using TTM measures. Exploratory factor analysis indicated an 8-item single factor structure for self-efficacy and a 2-factor 16 item structure for decisional balance. An additional set of survey questions related to processes of change scale did not produce a reliable factor structure to be used for hypothesis testing. The results indicated that self-efficacy, which is the confidence to adopt improvement methodologies, did predict the stage of change with low confidence in pre-contemplation compared to maintenance. The study did not find support that decisional balance, which is the perception of pros and cons, influences the stage of change. Employees' length of service, supervisory level and work group influenced

the stage of change, and length of service and supervisory level influenced self-efficacy measure while age of employee affected self-efficacy.

ACKNOWLEDGMENTS

I would like to thank my major professor, Valerie Maier-Speredelozzi for her mentorship, support, and guidance throughout the program. She has continuously provided me with guidance in all areas of the program, but more importantly, has supported me during many of my personal life experiences. I feel extremely fortunate to have had the opportunity to work with her. I would also like to extend my sincerest gratitude to my entire dissertation committee for their support, and guidance. I also want to thank my husband, and my parents who have provided me with unconditional, amazing moral support throughout this journey. I would like to acknowledge Robert Harris from Providence VA Medical Center who helped us in partnering with the hospital and providing guidance and flexibility in working with them. Finally, I want to thank all employees of the medical center, without which the research would not have been a success.

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CHAPTER 1

INTRODUCTION

Though healthcare is one of the most important sectors of the United States economy, it falls short in providing effective and efficient patient centered care. Over the past decade, healthcare costs have increased at a disturbing and unwarranted rate (Gawande, 2009; Zhang et al., 2009; Wellman, 2011). As the external environment becomes more volatile, pressure has increased for healthcare organizations to provide effective care with fewer resources. This has led the healthcare organizations to focus on reducing their operating costs while still providing high quality care to patients and satisfying their employees. In order to meet these demands, healthcare is adapting systems improvement initiatives that have been successful in other business sectors, especially from manufacturing industries.

Systems improvement initiatives are important for any healthcare organization to provide high quality, reliable products and services in the present economy with less cost. The industrial engineering principles which were made popular in automotive manufacturing industries are now being embraced by healthcare. Systems improvement initiatives have taken different forms over the years, such as PDCA (plan, do, check, act) cycles, TQM (total quality management) methods, Six-sigma, Lean Manufacturing, Quality Circles, TPS (Toyota Production System) and other variations specific to individual companies or industries. In the past decade especially, many practitioners have been transferring methods developed in traditional manufacturing industries to office, service, and healthcare settings. Adopting process

improvement initiatives provides a systematic framework for organizations to work on both simple and complex problems. Healthcare organizations present many unique features given that the 'product' is patient care, and it is humans as patients who 'flow' through the system during 'production'. Adapting process improvement principles will be unsuccessful unless organizations focus on continuous improvement and develop a culture of continuous improvement. In order to develop a culture of continuous improvement, the organizations' focus should not be limited to introducing new tools or techniques but should concentrate on developing consistent behavior patterns across the organization (Rother, 2010). Organizations' success on adopting the improvement methodologies depends on many factors such as management commitment and involvement, employee involvement, and resource allocation.

Most attempts to change an organizations' culture fail as the principles of psychology of change are ignored (Winum, Ryterband and Stephensen, 1997). Though high level management initiates new methodologies or changes for improvement, these types of top-down initiatives will not help change the culture of the organization. Attempts to change culture with any new initiatives must match the readiness of the targets of change i.e., all employees of the organization. Individual behavior change is needed for the organization to change its culture. If most of the employees are not willing to adopt the new initiatives that were introduced by the management there will be chaos created which ultimately results in wasted resources and animosity developed against management. So, it is important to measure the adoption rate of employees in the process of implementing new systems improvement initiatives.

The purpose of this study is to develop a tool to measure the organizational change or culture change due to process improvement initiatives using a theoretical model called the Transtheoretical Model of change (TTM). The Transtheoretical Model was developed on the core concept that organizational and individual behavior change occurs in stages and over time. The model defined four theoretical concepts that are needed for change. These are Stages of change – readiness to take action; Decisional Balance –pros and cons of changing; Self-efficacy – confidence to make and sustain changes; and Processes of change – ten cognitive, affective, and behavioral activities that facilitate change. In this study the TTM is associated with the involvement of employees in process improvement trainings, participation in process improvement projects and incorporating continuous improvement in everyday work. The TTM is used to measure employees on their stage of readiness to adopt continuous improvement and to provide strategies to help them move from one stage to the next based on their responses to the decisional balance, efficacy and processes of change questions.

In order to develop the tool to measure organizational culture and to identify the factors that affect the adoption of improvement methodologies in healthcare organizations, an 81 question survey was developed using the constructs of the Transtheoretical Model. All of the questions in the survey require responses on a Likert scale format except for two open ended questions at the end. The survey was sent to all employees of the Providence VA Medical Center five times between spring 2011 and spring 2013. The Providence VA Medical Center is a mid-sized facility providing inpatient and outpatient services and it has started to adopt industrial

engineering techniques such as lean and six-sigma to improve their processes. The medical center also received a three year grant from FY 10 to FY 12 from a national VA systems redesign office to work on systems improvement initiatives and to develop a culture of continuous improvement. The current study focused on measuring change in organizational culture relative to demographic factors of employee supervisory level, age, length of service, work environment and exposure to trainings.

The survey, along with the disclosure form, was approved by the Institutional Review Board (IRB) at the University of Rhode Island and the Providence VA Medical Center. The survey was administered through Survey Monkey, which is a private company that enables users to create their own Web-based surveys. The identity of the respondents was protected by making changes to the survey monkey settings so that responses collected from the surveys are completely anonymous. The web link of the survey was sent through the work email addresses of all employees. Paper copies of the survey were also made available to workgroups with less access to computers or for employees who prefer paper format. The research team worked with the Office of the Director at the Providence VA Medical Center to send survey links and reminder e-mails to all employees.

After each survey, results were collected from Survey Monkey and multivariate data analysis was done using SAS and SPSS statistical analysis software. The same data analyses were done after each of the surveys to determine reliability and validity of the instrument. Missing value analysis was performed to find out the percent of missing values and to analyze the missing patterns in the responses which

helped to identify the appropriate imputation method to use to fill in missing values. Descriptive statistical analysis was done to check for any outliers and to find out if the data was normal or not. Correlations between the items were looked at to identify any predictive relationships and the directionality of relationships between items in the survey. Principal Component Analysis (PCA) was done to determine the number of factors to retain and to find the correlation between the factors. PCA was conducted after each survey for all of the sub-scales to check if the validity of the scales changed over time. Cronbach's alpha was looked at to measure the internal consistency of the scales, where the closer the coefficient is to 1, the more reliable the scale. Multivariate analysis of variance (MANOVA) was used to find out whether there were mean differences among groups (work groups, supervisory level, age…) due to a combination of factors. The hypotheses framed in the survey were analyzed to see if they vary over time, and the analysis results were also used to see how specific workgroups progressed over time through stages of change. All of the survey results were compared to the medical center records of systems improvement initiatives that have occurred in those workgroups, such as improvement methodology trainings, improvement projects or other major initiatives.

The survey results were reported to the medical center management and employees at various events after each survey completion. The research team, as members of the medical center Systems Redesign Advisory Council, helped the systems redesign department to develop the optimal conditions for change in the organization by providing stage-matched interventions that reduced resistance and increased participation in process improvement activities.

CHAPTER 2

REVIEW OF LITERATURE

There are several process improvement methodologies defined in the literature to improve products, processes and services by using a set of tools and techniques (Ozcan, 2009) and ultimately develop a culture of continuous improvement. Some commonly used improvement methodologies are Lean, Six-sigma, Lean Six-sigma, PDCA or PDSA (Plan, Do, Check/Study, Act) cycles, Quality Circles, Total Quality Management (TQM), Business Process Re-Engineering (BPR) and Management Engineering. These improvement methodologies help understand processes and align them with customer needs with the ultimate aims of improving quality or reducing costs. Many businesses across various industries have significantly improved through the use of one or more improvement methodologies. The efforts put forth by industries improvement techniques goes to waste unless the initiatives are recognized and adopted by all levels of employees, thus creating a change in the organizational culture. There is a need to measure the cultural change that is happening in the organization to reassess the efforts put on implementing improvement methodologies.

2.1 Lean Methodology and Culture of Continuous Improvement

Lean methodology is built on a set of principles and structures which were first demonstrated by Toyota who popularized their Toyota Production System (TPS) (Ohno, 1998). The basic concept of lean is to maximize customer value by minimizing waste in the processes and using fewer resources. Lean tries to reduce

costs, defects, inventory, space, and lead times and also attempts to increase productivity, customer satisfaction, profit, capacity and quality. The five principles of lean, as defined by Womack and Jones (1996) are Value, Value Stream, Flow, Pull, and Perfection. These principles can be put into action through a variety of tools and methods. The principles and tools of lean can be arranged into the "house of lean" or "Toyota house" which is shown in figure 2.2.1, as depicted by Liker (2004). The "roof" of the house represents the goals of the system, which included quality, cost, delivery, safety, and morale. The first principle of lean, value, could also be shown in the roof of the house, and is actually a principle of customer focus, or customer defined value. The house has a "foundation" of corporate philosophy with associated vision and mission, as well as stability and standardization in work processes. The two "pillars of lean" have to do with "flow" and "quality," respectively. Finally, residing inside the house are people or employees in the organization, working in teams towards a culture of continuous improvement and reduction of waste in the system. Lean helps identify the underlying problems in the organization and creates a way for improvement. The success of lean implementation depends on the readiness of the organization which includes support from the high level management and willingness to change among front line employees.

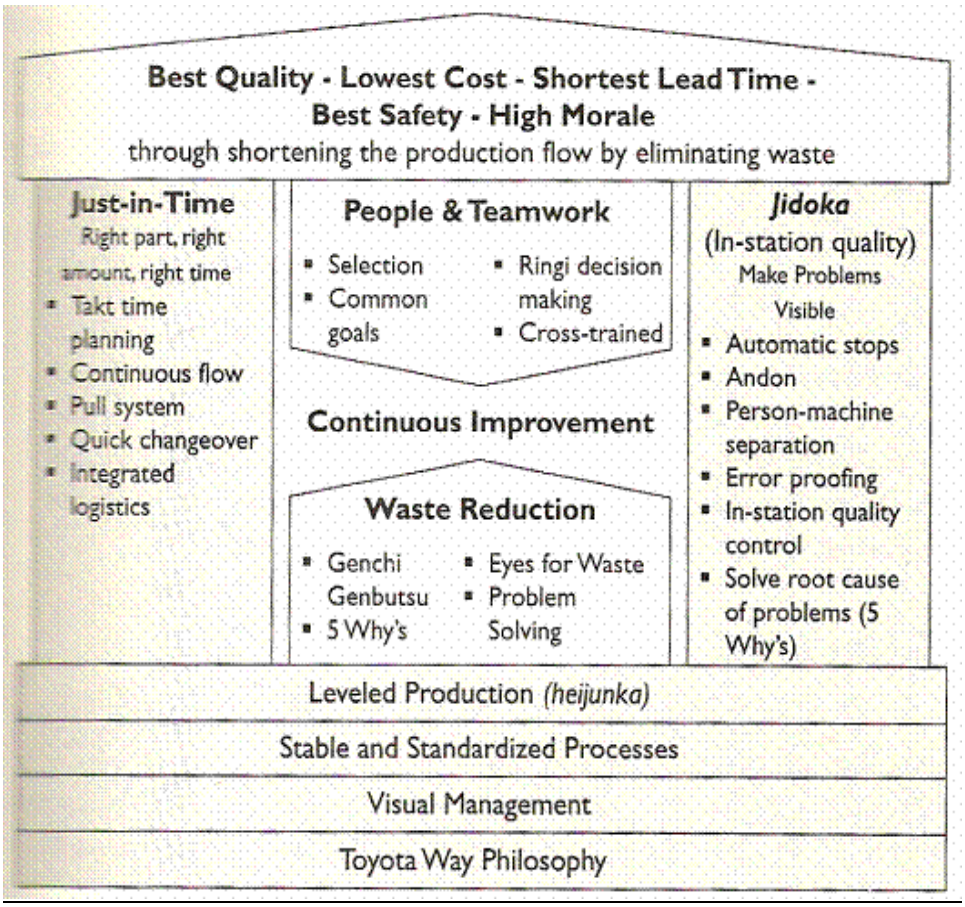

Figure 2.1. The Toyota Production System (from Liker, 2004)

Lean is often viewed as a set of tools and procedures, which can cause many organizations to fail in successful implementation of lean methodology. Creating a culture of continuous improvement is essential, apart from implementing tools and processes for making improvements (Detert and Schroeder, 2000). A culture of continuous improvement is defined as the effort to make incremental improvements to processes and services that define an organization and sustain them. According to Latta (2009) change in organizations occurs through different ways like strategic change and process changes. The success of creating a culture of continuous improvement lies in employee motivation and commitment (Womack, Jones and

Roos, 1990). Successful lean implementation can change working habits and the work environment which may influence the belief, values, and working practices of the employees (Chatman and Flynn, 2001). According to Lukas et al. (2007), impetus to transform, leadership commitment to quality, improvement initiatives that actively engage staff, alignment to achieve consistency of organization wide goals with resource allocation and actions at all levels of the organization, and integration to bridge traditional intra-organizational boundaries between individual components are important for an organization's success in moving towards sustained, highly reliable, evidence based improvements.

It is relatively easy to change the way things are done, but sustaining them and integrating it into a culture is more challenging. Behavior change should happen to the individual employee, and those employees contribute to the change at the organizational level (Barker and Barker, 1996). According to Spiker and Lesser (1995), employee resistance is one of the main reasons why many organizations fail to sustain cultural changes. In order to change the culture, organizations need to identify why employees do things in their particular way, and understand how this affects organizational culture, so that new practices can be sustained.

2.2 Process Improvement Methodologies in Healthcare

Over the past decade, medical care costs have increased at a disturbing and unwarranted rate (Gawande, 2009; Zhang et al., 2009; Wellman, 2011). This has led healthcare managers to reduce their operating costs while trying to satisfy their employees and provide quality care to patients. In order to meet these demands,

healthcare has been moving towards adapting process improvement initiatives that have been successful in other business sectors, especially from manufacturing industries. Many healthcare researchers have applied industrial engineering techniques to healthcare settings, including Statistical Quality Control (SQC), simulation, queuing and scheduling, optimization, forecasting, and many others. In hospitals, industrial engineers are often known as Management Engineers. Recently, lean methodologies have become popular for healthcare organizations compared to other improvement methodologies.

Lean application in healthcare organizations started in the early 21st century (Brandao de Souza, 2009). Application of lean methodology in healthcare is distinctive as healthcare settings have many unique features as the product here is patient care, and it is humans that "flow" through the system. Literature suggests that lean is implemented in healthcare organizations in silos as small projects using various tools and techniques (Brandao de Souza, 2009). Adapting the lean methodology is not sufficient unless healthcare organizations focus on creating a culture of continuous improvement (CI). As in every sector, support from leaders is important for successful implementation and creating a culture of CI. In healthcare, customer satisfaction has high priority and improving and streamlining the processes improves quality of services provided to the customer.

2.3 Organizational Culture and review of existing instruments

An organization consists of a variety of people and professions working together for a common goal which is satisfying their end customer. A group's culture

can be defined through a "*wide range of social phenomena such as values, beliefs, assumptions, symbols of status and authority, dress, language, behavior, myths, ceremonies and rituals, and modes of deference and subversion"* (Palmieri, et al., 2010). In order to measure the culture of an organization, we must first define what culture means in this research. Organizational culture has been defined in a number of ways by Siehl and Martin in 1984, Deal and Kennedy in 1982, and Thompson and Luthans in 1990, but the definition of culture from Schein (2004) most closely matches the purposes of this study (Helms-Mills et al., 2008). According to Edgar Schein, the culture of a group can be defined as "*a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems"* (Schein, 2004). Schein also said, an 'organization's culture will also define what actions are taken in reaction to various situations' (Schein, 2004). Organizational change can also be described as numerous individuals undergoing a similar change process during the same period of time. Organizations are an amalgam of various employee demographics such as age, length of service, and education level, with several management levels. Organizations' culture depends on its employees and the success of any new intervention depends on employee readiness to accept the intervention and adopt it (Armstrong, Reyburn and Jones, 1996). According to Armstrong et al. (1996) supervisory and non-supervisory staff members express more negative attitudes towards change than their managers and executives. Studies on employee burnout and their performance show that older

employees and employees who are in their jobs for more time experience less burnout (Brewer and Shapard, 2004) and steer less towards change (Edelwich and Brodsky, 1980).

The measurement of organizational culture in healthcare remains challenging due to lack of consistency in measurement, ambiguity in developing the constructs, and the broad range of constructs to be measured (Scott et al., 2003). Scott, et al. (2003) reviewed a number of instruments such as the Organizational Culture Inventory (OCI), Hospital Culture Questionnaire, Competing Values Framework, and Organizational Culture surveys that were already tested and applied in healthcare organizations to measure the cultural change. OCI was initially developed by Cooke and Lafferty (1987) and was later modified by others to meet their specific needs. The OCI measures the operating culture of the organization in view of its employees. It measures the strength of twelve behavioral norms associated with three types of cultures such as Constructive, Passive/defensive and Aggressive/defensive. The Constructive culture is the one which promotes balance between people and tasks and which helps organizations attain its goals through development of people. The Passive/defensive culture is the one which provides extreme attention towards people as opposed to tasks which creates a stagnate organization and detracting from overall effectiveness. The Aggressive/defensive culture is the one which provides extreme attention towards tasks without consideration for people which creates a sense of insecurity and impact on performance. This is one of the widely used tools for measuring organizational culture with good internal consistency and validity. The disadvantage of OCI is that it is too long and complex to complete. Also, it is under

copyright and can be expensive to use. The Hospital Culture Questionnaire measures the organizational culture using employee opinions based on eight dimensions – supervision, employer attitudes, role significance, hospital image, competitiveness staff benefits, cohesiveness and workload. This is used in private hospitals in UK and no data is available on validity and it is also under copyright. The Competing Values Framework was developed by Kim Cameron and Robert Quinn. The Competing Values questionnaire was developed to illustrate three dimensions—the future outcome the organization desires to achieve; current organizational practices; and the leadership approach. It classifies the organizational culture into one of the four types of cultures — clan, adhocracy, hierarchy and market culture. This is one of the widely used tools for measuring organizational culture with high face validity. The drawbacks of this tool are the organizational types were classified too narrowly and can effectively provide overall view of the culture but, is not capable of providing the detail required to direct a new intervention (Scott et al., 2003).

2.5 Organizational Change Models

There are a number of organizational change models in the literature-Lewin's Three Stage Change Model, Kotter's 8 Step Change Model, Burke-Litwin Model of Change and McKinsey 7-S Model are widely used by organizations. Organizational change needs individual behavior change (Barker and Barker, 1996) and any new structural changes will only be successful if implemented and recognized by individuals. Except in Lewin's model, the other widely used organizational change models do not directly address individual-level change. Lewin's Change model uses a

physical metaphor to describe the organizational change in three steps. The first step in change is Unfreezing, in which the organization begins to recognize the need for change. Any number of external factors, motivational or psychological may affect the organization's ability to think about change. The external factors will not initiate the unfreezing process automatically. It depends on the organization to choose the path to unfreeze and develop a plan to implement change processes. The second step in Lewin's model is Transition. In this step, the new organization moves through a set of new behaviors and attitudes due to the initiated structural or process changes. Adequate leadership support is necessary in this step to prevent unnecessary confusion that develops as the organization adapts to new behaviors. The third step is Refreeze, in which the changes in behavior that began during the transition stage have become a routine. The organizations may revert back to old behaviors if the refreezing is not reinforced.

Though Lewin's model is relatively simple in structure, it has its own drawbacks. It is often seen as a top-down management driven approach and ignores situations involving bottom-up change. Because creating a culture of continuous improvement requires change in the individual behaviors and creating a bottom-up culture Transtheoretical model (TTM) of change is used for this research. The Transtheoretical model is a model of change developed through research by integrating multiple fragments of individual change theories (Prochaska and Velicer, 1997). TTM has four core constructs of the model – stages of change, decisional balance, self-efficacy and the processes of change. The model is based on the philosophy that individuals move through a series of stages when adopting new

behaviors. Moreover, the major breakthrough of the TTM is the ability to have an impact on all employees by individualized and interactive interventions that have produced exceptional impacts (Levesque, Prochaska and Prochaska, 1999). A brief history of the Transtheoretical model and its core constructs are explained in detail in the next section.

2.6 Transtheoretical Model of Change (TTM)

The Transtheoretical Model of change (TTM) (Prochaska and DiClemente, 1983) is used to measure change in organizations' culture due to continuous improvement initiatives. This model has been used in research from over 20 years to measure the effectiveness of interventions (Levesque, et al., 2001) with its application mostly to behavior change studies (Pendlebury, 1996). The model was originally applied to individuals' health behavior change; it has also been successfully applied to organizational behavior change (Levesque, Prochaska, and Prochaska, 1999; Prochaska, et al., 2006). TTM has even been previously used in healthcare settings to study the readiness of physicians for continuous quality improvement, or CQI (Levesque, et al., 2001). The basic theory behind TTM is that organizational and individual change occurs in stages over time.

The four theoretical concepts that were defined in the model as essential to change are 1) Stage of Change – Intention to take action 2) Decisional Balance – Pros and cons of changing 3) Self-efficacy – Confidence to make and sustain changes 4) Process of Change – ten cognitive, affective, and behavioral activities that facilitate change (Prochaska and DiClemente, 1983).

Stage of change

The TTM understands change as progress over time, and that people, or organizations, move through a series of five stages when adapting new behaviors. The change process is not linear, but is fluid, and individuals can revert back to earlier stages before attaining permanent behavior change (Prochaska and DiClemente, 1986). The stages of change are defined as:

1) Pre-contemplation stage - not intending to take action within the next 6 months

2) Contemplation stage - intending to take action within the next 6 months

3) Preparation stage - ready to take action

4) Action stage - explicitly engaged in new behavior

5) Maintenance stage - sustaining the changes for at least 6 months.

Decisional Balance

Change requires the consideration of associated pros and cons. Studies have shown that a decisional balance inventory with two scales relating to the Pros and Cons of change is the best available predictor of future change (Velicer, et al., 1985). In the change process the balance of pros and cons systematically relates to stages of change (Prochaska, et al., 1994).

Self-efficacy

There are two components in this concept of behavior change - confidence to make and sustain changes and temptation to revert back to earlier stages. Levels of self-efficacy change when people, or organizations, move through various stages of change. People or organizations experience greater confidence to change in the later stages.

Processes of change

Prochaska et al. (1982) derived a set of 10 fundamental processes by which people change using a comparative study of 24 major systems of psychotherapy. The set was refined following further theoretical analyses and empirical studies (Prochaska and DiClemente, 1983). The 10 processes are consciousness raising, dramatic relief, self-reevaluation, environmental reevaluation, social liberation, self-liberation, helping relationships, reinforcement management, stimulus control and counter conditioning. These 10 processes were originally defined for individuals, but were adapted for assessment of organizational-level processes of change in the adoption of continuous quality improvement in healthcare (Levesque, et al., 2001). The definitions of the organizational-level processes of change for culture of continuous improvement shown in Table 2.6.1 seek to link together the original Transtheoretical model with principles and theory from literature on systems improvement, culture of continuous improvement, and lean systems. For instance, dramatic relief in the current study is defined as "generating positive attitudes for change and dissatisfaction with the current state." Pawley and Flinchbaugh (2006) describe the basis behind the important lean tool of process mapping, otherwise known as value stream mapping. They state that if an organization does not know its current state, then the organization cannot successfully journey towards the ideal future state. More importantly, it does not work to "throw out" the current state and start from a blank slate, as some might suggest. The organization has existing procedures and systems in place, some of which are doing things right and some of which do represent core competencies that are valued by current customers.

Organizational level Processes of Change	Definition
Consciousness raising	Increasing awareness and information about the benefits and goals of systems improvement
Dramatic relief	Generating positive attitudes for change and dissatisfaction with the current state
Self-Reevaluation	Helping employees clarify their values, goals and involvement related to systems improvement initiatives
Environmental Reevaluation	Helping employees understand how improving the systems has an impact on the facility's success and climate
Social Liberation	Displaying strong commitment to systems redesign and the success of the change effort by facility leadership
Self-Liberation	Empowering employees, encouraging involvement, and providing feedback
Helping relationships	Providing support and assistance to employees for adopting change
Reinforcement management	Aligning direct or indirect incentives or disincentives
Stimulus Control	Aligning resources to support change
Counter conditioning	Providing training to encourage the transition to new climate and roles

Table 2.1. Organizational-level Processes of Change for measuring culture change from improvement initiatives

Stage matched interventions

Change initiatives are best successful when the interventions match the stage the individual is progressing through instead of a one common intervention (Levesque, Prochaska and Prochaska, 1999). This can be achieved by applying the processes of

change best suited for moving the individuals from current stage to the next. Consciousness raising, dramatic relief, environmental reevaluation, social liberation, and self-reevaluation are called experiential processes and are most effective in the stages of pre-contemplation, contemplation, and preparation. These processes stimulus control, helping relationships, counter conditioning, reinforcement management, and self-liberation are called behavioral processes and are effective when used in action and maintenance stages (Prochaska et al., 1994; Prochaska and Velicer, 1997). The table below shows the process of change by stage of change that is best suited to help move between stages.

Pre-contemplation	Contemplation	Preparation	Action	Maintenance
Consciousness raising				
Dramatic relief				
Environmental reevaluation				
Social Liberation				
	Self-reevaluation			
		Self-liberation		
		Helping relationships		
		Counter conditioning		
			Reinforcement management	
			Stimulus control	
Pros of changing increasing				
	Cons of changing decreasing			
		Self-efficacy increasing		

Table 2.2. Processes of change, decisional balance and self-efficacy effective in each stage

CHAPTER 3

METHODOLOGY

The goal of this study is study the rate of adoption of systems improvement initiatives and study the change in the organizational climate occurred due to systems improvement initiatives. The study is done at the Providence VA medical center, Providence, RI in association with their Systems Redesign office. Providence VA medical center is a mid-size hospital providing inpatient and outpatient services with 73 operating beds. The medical center has approximately 1200 employees, which includes professional, technical, administrative, and support personnel. The Systems Redesign office received a grant called an Improvement Capability Grant with the goal of "Developing a Culture of Continuous Improvement" and has the following stated aim, "The Medical Center will clarify and communicate a deep commitment to continuous improvement, expand improvement capabilities, apply the most effective methods available and make improvement an integral part of everyday work for all staff within three years."(Appendix B). As part of creating a culture of continuous improvement, the systems redesign office offered various improvement methodology trainings in lean, six-sigma, facilitation, etc. The systems redesign office also provides technical support for teams that want to work on process improvement initiatives.

3.1 Study Hypothesis

It is expected that the rate of adoption and implementation rates of new methods for systems improvement will vary between different groups. This could include different departments or workgroups, different demographic groups, different healthcare settings, and different industries, as described below.

1) Different departments or workgroups within a hospital or specific healthcare settings (laboratory testing, primary care, inpatient, outpatient, mental health, emergency, foodservice, housekeeping, etc.). The training of personnel in various departments or workgroups can differ significantly, as can the day-to-day process and environment, so it is expected that departments would respond differently to change initiatives.

2) Different demographics of employees including age, length of service, and supervisory level. For example, employees who have been with an organization longer or who are older or who have different responsibilities in the system will respond differently to change initiatives.

3) Different types of healthcare settings such as large or small hospitals, publicly or privately funded hospitals, or hospitals versus medical clinics, physician offices, independent labs, same day surgery centers, urgent care centers, etc.

4) Different types of work settings, such as healthcare versus manufacturing or service or transportation companies.

In the present study, levels 1 and 2 are studied at Providence VA Medical Center. Levels 3 and 4 described above cannot be studied at a single facility, but contributes to

longer-term research involving multiple facilities and settings. The specific hypotheses that were tested in this research are given below.

Hypothesis 1

Null hypothesis (H_0): The supervisory role of the employee does not impact the adoption rate of process improvement initiatives.

Alternate hypothesis (H_1): The supervisory role of the employee impacts the adoption rate of process improvement initiatives.

Hypothesis 2

Null hypothesis (H_0): The length of service of the employee at an organization does not impact the adoption rate of process improvement initiatives.

Alternate hypothesis (H_1): The length of service of the employee at an organization impacts the adoption rate of process improvement initiatives.

Hypothesis 3

Null hypothesis (H_0): The age of the employee does not impact the adoption rate of process improvement initiatives.

Alternate hypothesis (H_1): The age of the employee impacts the adoption rate of process improvement initiatives.

Hypothesis 4:

Null hypothesis (H_0): Employee work group does not impact the adoption rate of process improvement initiatives.

Alternate hypothesis (H_1): Employee work group impacts the adoption rate of process improvement initiatives.

Hypothesis 5:

Null hypothesis (H_0): Employees who have greater exposure to training will not be more positive about the culture of CI compared to employees who do not have training.

Alternate hypothesis (H_1): Employees who have greater exposure to training will be more positive about the culture of CI compared to employees who do not training.

3.2 Instrument Development

A survey was developed to measure the involvement of employees in process improvement methodology trainings and their participation in process improvement projects, the employee perception of their stage, pros and cons constructs and self-efficacy of employees in being involved in process improvement and processes of change. Levesque, Prochaska and Prochaska (1999) reviewed the existing studies that have used the Transtheoretical Model and found that most researchers have focused on stages, decisional balance and their interrelationships. They noted that most of the researchers did not use processes of change in their studies. In this study too, the instrument was developed with focus on stages, decisional balance and self-efficacy. Though much emphasis has not been placed on processes of change the questions have been developed and were included in all of the surveys and analysis. The stage of change measures the readiness to change behavior and is a temporal dimension measured in terms of time period. According to Prochaska et al. (2001), the time dimension defined in the stage of change should fit the target behavior that is studied. In the studies (smoking cessation, alcohol cessation, exercise studies, physician quality

improvement study) that used TTM in healthcare a six month time period was selected to classify each stage.

In this research, the time dimension of six months was selected and the employee is said to have developed a culture of continuous improvement when they have been involved in improvement activities for more than six months without reverting back to old habits. The stage of change dimension has been asked in two different ways, one in a series of statements with a rating scale and the other on a categorical stage scale. The first one is framed to measure the amount of training employees received, usage of improvement tools, and involvement in improvement activities at that particular point in time. The respondents were asked to answer on a 5-point Likert scale of 'not at all' to 'completely'. The next stage of change question asks about employee involvement in improvement initiatives on a series of five statements which includes a time scale. The decisional balance dimension involves 8 pros and 8 cons questions and respondents were asked how important each statement is to the employees on a 5-point Likert scale of 'not at all important' to 'extremely important'. The self-efficacy dimension includes 7 statements and respondents were asked how confident the employee is in doing a particular activity. Responses are collected on a 5-point Likert scale of 'not at all confident' to 'extremely confident'.

While developing the questions for the processes of change dimension various surveys that were used by the Veterans Affairs (VA) were examined to look for any questions that could be adopted. The annual All Employee Survey (AES) and the VA quality improvement survey were examined for sources of questions. The first source of research survey questions is the annual VA All Employee Survey (AES), which has

three segments - Job Satisfaction Index or JSI, Organizational Assessment Inventory or OAI and Cultural index. The JSI scale was developed by Nagy (2002) with the underlying concept that individual and psychological outcomes build up to form organization-level outcomes (Kopelman, Brief, and Guzzo, 1990) like turnover and absenteeism. The following three questions were selected from the job satisfaction index section for inclusion in the instrument development. The first two questions were included in the dramatic relief processes of change as they measure the current working conditions of the job and may create an attitude towards change if unsatisfied. The third question was selected as it helps measure the definition of the environmental reevaluation processes of change.

1. Compared to what do you think it should be, how satisfied are you with the amount of work that you currently do?
2. Compared to what do you think it should be, how satisfied are you with the working conditions in your job?
3. Compared to what do you think it should be, how satisfied do you think the customers of your organization are with the products and services it provides?

The Organizational Assessment Inventory was developed by the Office of Personnel Management at the Federal Human Resource Agency (Gowing and Lancaster, 1996) for use in government agencies, to measure workplace satisfaction and stress. It was originally a survey instrument with more than 100 items, but for reasonable inclusion in the VA AES, was analyzed and reduced to 27 items. The OAI measures constructs such as civility, safety, service, management for achievement,

cooperation, coworker support, engagement, rewards, diversity, leadership, and physiological safety. A total of twelve questions were selected from the OAI section for use in the current instrument and were listed below. The first two questions represent the consciousness raising processes of change definition and measure the awareness about goals and benefits of improvement initiatives. Questions 3 and 4 measure the self- liberation definition of empowering employees and encouraging them to get involved in improvement initiatives. Questions 5 and 6 represent the helping relations processes of change and measure the support that employees provide for each other for adopting new initiatives. Question 7 measures counter conditioning definition of encouraging the transition by providing new skills. The remaining questions are added to measure the lean values and current climate.

1. Managers set challenging and yet attainable performance goals for my work group.
2. Employees in my work group are involved in improving the quality of products, services, and work processes.
3. New practices and ways of doing business are encouraged in my work group.
4. My work group manager reviews and evaluates the progress towards meeting the goals and objectives of the organization.
5. People treat each other with respect in my work group.
6. A spirit of cooperation and teamwork exists in my workgroup.
7. I am given a real opportunity to develop my skills in my work group.

8. Products, services and work group processes are designed to meet customer needs and expectations.
9. Customers of my work group are informed about the process of seeking assistance, commenting, and/or complaining about products and services.
10. Members in my work group are able to bring up problems and tough issues.
11. It is safe to take risk in this work group.
12. I have a lot to say about what happens on my job.

The 14 Culture survey questions used in the AES originated from Zamutto and Krakower (1991) whose work was adapted for the healthcare industry by Shortell, et al. (1995). The following four questions have been selected from the culture section to use in the current survey. The four questions measure the current organizational culture and also measure the lean principles of standard work and clarifying roles and responsibilities.

1. Policies and procedures in my facility are helpful because they clarify roles and responsibilities.
2. Policies and procedures in my facility help save time and effort.
3. Policies and procedures in my facility represent the best way of doing things.
4. Policies and procedures in my facility are revised when they no longer work effectively.

The second source of research survey questions originate from a Quality Improvement Survey developed by the Center for Organization, Leadership and Management Research (COLMR). It was first administered at the VA in January

2010 to a sample of 10% of employees. This survey had 8 questions and 7 of these were included in this research. The first three questions measures the stimulus control definition of resource alignment to support change. Question 4 represents the stimulus control construct, question 5 represents self-reevaluation and question 6 measures the social liberation construct. The last question was selected to measure lean values.

1. In this workgroup, there is time to reflect on how well our processes work for providing patient care.
2. This workgroup actively uses data to support quality improvement activities.
3. My immediate supervisor(s) establish(es) forums for and provide(s) time and resources for participating in quality improvement activities.
4. Employees in this workgroup receive training in quality improvement.
5. In this workgroup, people value the work of quality improvement teams.
6. My immediate supervisor(s) is knowledgeable about techniques for quality improvement.
7. People in this workgroup frequently use quality improvement tools (i.e. PDSA cycles) to improve performance.

Sixteen other questions have been selected from the huge list of questions obtained from COLMR (phone call to Dr. Martin Charns, August 2011), though the sources of the items were not known. The remaining questions were added by the research team. The intention of adding questions was to look at constructs that had not been captured by other questions. Some of these questions ask about specific involvement in the Systems Redesign and System Improvement Initiatives that are ongoing at the PVAMC, including those that are occurring due to Improvement Capability Grant.

Some of the questions ask about the cooperation the employee receives from the immediate supervisor, co-workers or employees from other services. The questions also capture the level of involvement of the employees in improving their work and the communication between and within services. Concepts of Lean principles such as developing and using Standard Operating Procedures (SOP) and the amount of involvement of employees in process redesign were also included. Most of the processes of change, current culture and lean questions were built using a 5-point Likert scale of 'strongly disagree' to 'strongly agree'. Eight of the questions were asked on a 6-point Likert scale of 'strongly disagree' to 'do not know'. Seven questions were asked on a 5-point Likert scale of 'not at all satisfied' to 'extremely satisfied'. The initial instrument that was developed and used in spring 2011 is shown in Appendix C. The processes of change, current culture and lean questions were grouped together so that the questions with common Likert scales appear on the same page and to have more visual appeal to employees completing the survey on the internet. Also, two open ended questions were added at the end of the survey to know more about the work place culture. The instrument also includes five demographic questions – workgroup, work shift, age, length of service at the VA and supervisory level. The demographics were consciously placed at the beginning of the survey so that even the partial survey responses can be used in the hypotheses analysis.

3.3 Survey Administration

The research survey has been approved by the Institutional Review Board (IRB) at University of Rhode Island and Providence VA Medical Center. The survey

disclosure form that was approved by both IRB boards is attached in Appendix D. As part of this study, the survey will be administered twice each year (fall and spring) from 2011-2013 for a total of five times and the time plan is attached is Appendix A. The survey will be administered through Survey Monkey, which is a private company that enables users to create their own web-based surveys. The responses collected from the surveys will be anonymous and Survey Monkey allows various user settings that can protect the identity of a respondent. The web link with the survey was sent to all employees to their work e-mail address. Paper copies were also made available at department offices and meetings if respondents preferred this format. The research team worked with the office of the director at PVAMC to send survey links and reminder e-mails to all employees.

3.4 Survey Analysis

This section provides a summary of the statistical methods used to analyze the data collected from the surveys. After the survey is administered at each time point, the results were collected from Survey Monkey and multivariate data analysis was conducted, according to standard methods (Carmines and Zeller, 1979; Chen and Starosta, 2000; Golafshani, 2003; Zulkefly and Baharudin, 2010) as well as methods applied in previous studies using TTM (Levesque, et al., 2001; Prochaska, et al., 2006). SAS and SPSS software were used to conduct the statistical analysis.

Missing data: Before conducting statistical analysis, the survey data was examined to delete any responses that have no values beyond demographics. Univariate statistics

were run on the survey data to examine outliers, percentage of missing values and normality of the data. A t-test was done to test whether the respondents with missing data differ from the respondents without missing data. Also, the p-value from the t-test provides information about the pattern of missing values. There are several methods available to treat missing data like listwise deletion, mean substitution, expectation maximization (EM), multiple imputation etc. The listwise deletion is the most widely used, and in the analysis the whole case is dropped if there is missing data on any variable. Though it is simple to use, large amounts of data will be lost in the analysis (Schafer, 1997). In the mean imputation method the missing value is replaced with its mean value. Both these methods are only good when a small amount of data is missing completely at random (MCAR). The EM method is an iterative process, where in the E step it uses other variables to impute a value and in the M step it calculates the maximum likelihood estimate to maximize the value from the E step. The EM method is better than other imputations because it can be applied even if data is missing at random (MAR) and it preserves the relationship with other variables. This method is also suggested for instrument development and when factor analysis has to be done (Schafer and Olsen, 1998). Thus, EM method is used in this research to impute missing values because it can be used for both MCAR and MAR data and for its suggestible use for instrument development.

Descriptive Statistics: Descriptive statistical analysis is done after the missing value analysis to look at mean, standard deviation, skewness and kurtosis of the items. Skewness and kurtosis are used to determine normality of the data. Skewness is

defined as asymmetry in the distribution of data values. The acceptable range for skewness values are between –1 to +1. Indication of greater skewness implies less normality. Kurtosis is defined as the degree of peakedness of data relative to normal distribution. Acceptable range for kurtosis values are between –1.5 to +2 (Harlow, 2005). If any of the items does not fall between the ranges of values for skewness or kurtosis the items are considered non-normal and data transformations are applied. Descriptive statistics are used to find the average and variation between demographic groups at each time point.

Reliability of the scale: Reliability of the survey instrument are important for its success. According to Carmines and Zeller (1979), reliability is defined as the accuracy with which the measuring instrument produces the same results on repeated trials. In other words, if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable. There are different methods to test the reliability of the scale such as test-retest reliability, alternate form reliability, and internal consistency reliability. Since using any one of these methods is not very dependable in scale development a technique called triangulation which facilitates validation of data through cross verification from more than one method is used in this study. Cronbach's coefficient alpha is used to measure the internal consistency of the items for each of the sub scales. The higher the coefficient, the more likely those items contribute to a reliable scale. According to Nunnally and Bernstein (1994), a coefficient greater than 0.7 is acceptable and is said to be reliable. Since the survey is administered at five different time points the test-

retest reliability test is done after each survey administration. Split-half alternate form reliability test is done by splitting the responses that were received after survey administration. If the correlation coefficient between such two survey responses is greater than 0.7 then the instrument is said be stable.

Principal Component Analysis: Principal Component Analysis (PCA) with varimax rotation is done to determine the number of components or factors to retain and to find the correlation between the factors. Varimax (orthogonal) rotation was used based on previous TTM research (Hall and Rossi, 2008; Harlow, 2005). PCA is done for each of the sub-scales (efficacy, decisional balance and processes of change) to check the construct validity of the scales. The number of components to retain in each of the sub-scales is determined by using both MAP analysis and parallel analysis. (Harlow, 2005; Zwick and Velicer, 1986). After the number of components to retain was decided, factor loadings were analyzed and items that loaded on more than one factor or loadings less than 0.4 or items that do not load on any factor were removed from the scale (Redding et al., 2006). The analysis for number of retained components is repeated until all the retained items load perfectly on the number of factors retained. After any item removal, the process of PCA and item analysis was repeated to assess the new distribution of variance until there are least three items with significant loadings on each retained component and the rotated factor pattern shows a simple pattern. Correlations are run on items and components to check that none of the components are collinear with each other. Additionally, the internal consistency reliability of each factor was reexamined using Cronbach's coefficient Alpha.

Validity of the instrument: Validity determines the degree to which the research instrument truly measures that which it was intended to measure (Carmines and Zeller, 1979). In order to assess the external validity of the decisional balance, self-efficacy scales they were assessed across stage of change to examine the functional relationships. Also, as the validity of All Employee Survey and the quality improvement survey were already established, the items that were picked to be used in the current instrument were tested against the items from those survey results. The results from the PCA will be used to examine the construct validity of the instrument which determines if the items are grouped together in the manner intended. If the items that measure the same factor show strong correlation then the instrument is said to have high validity.

Analysis of Variance (ANOVA): ANOVA's and MANOVA's will be conducted to measure how the demographics affect the items in the scale or sub-scales. ANOVA will be used to test whether there are mean differences among groups (work groups, supervisory level, age…) due to a combination of factors. If the ANOVA's between groups are significant, post hoc Tukey's test will be conducted to determine which groups differ significantly from each other. Significance level of 0.05 was considered to accept the null hypothesis or not.

CHAPTER 4

ANALYSIS

This chapter discusses about how the data analysis is carried out after each of the surveys. Firstly, data is cleaned up to delete non-conforming responses and examined for missing data which is replaced using the appropriate imputation method. Descriptive statistics are examined to find out normality of the data and identify any outliers. Cronbach's alpha were run to check the reliability of the scales. Principal component analysis was run to find out the factor structure of the scales. MANOVA analysis was done to find out the external validity of the scales.

4.1 Treating missing values

After the survey responses were received, the data was examined and any respondents that did not answer beyond demographics were deleted. Univariate statistics were run to examine outliers, missing values and normality of the data. EM algorithm method was chosen based on Little's test between respondents with missing data and without missing data. If the null hypothesis is rejected in Little's test, we can say data is missing completely at random (MCAR) and if null hypothesis accepted the data is missing at random (MAR). The data is checked for any outliers that are +/-3 from its mean value. The normality of the data is tested based on the skewness and kurtosis values of the items. The same steps were followed each time the survey was administered.

Spring 2011: The 88 question survey which includes 5 demographics and 2 open-ended questions, received 516 responses (42% response rate), 448-online and 68-paper, of which 460 responses remained for statistical analysis. The individual items had missing values ranging between 2% to 21%. Little's test shows data is missing at random (MAR) and the Expectation Maximization (EM) method is used to substitute missing values for each of the sub-scales. The data does not have any outliers and met assumptions of normality.

Fall 2011: The 64 item questionnaire, with 5 demographics and 2-open ended questions, received 550 responses (44.5% response rate) of which 478 were received online and 72 by paper. A total of 489 responses remained for analysis. The items had missing values ranging between 1% and 14%. The data is MAR and missing values are substituted using EM method. The data is said to be normal and does not have any outliers.

Spring 2012: The third round of the survey with 65 items included 5 demographic and 2 open-ended questions and received 549 responses (44.2% response rate) of which 496 were received online and 53 by paper. A total of 504 responses remained for analysis and items had missing values ranging between 1.2% and 17.1%. Data is MCAR (Chi-square=4066.597, $p<0.001$) and EM method is used to substitute missing values. The data does not have any outliers and met all of the requirements of normality.

Fall 2012: A 67 item questionnaire with 5 demographics and 2 open ended questions received 275 responses (22.1% response rate) through web version. 245 responses remained for statistical analysis which had missing values ranging between 1% and

14%. Data is MCAR (Chi-square=3391.3, p=0.008) and missing values are substituted using EM algorithm. The data is normal and does not have any outliers. Spring 2013: The fifth and final round of the survey contained 75 questions with 5 demographic and 2 open ended questions and received 463 responses (35.5% response rate) of which 431 were received online and 32 by paper. A total of 399 responses remained for further analysis. The variables had missing values ranging between 1.8% and 19.7%. Data is MCAR and values are substituted using EM method. The data does not have any outliers and assumptions of normality are met.

4.2. Descriptive Statistics

The means and standard deviations of individual items in stage of change, decisional balance and self- efficacy for each survey administration are shown in table 4.1. The mean of questions about training and tools are skewed to the left in spring 2011 and there was an overall positive shift towards spring 2013. The mean of stage of change in spring 2011 is 3.04 and saw a positive shift towards spring 2013 with mean of 3.31. The mean of cons questions was high in spring 2011compared to spring 2013 and the mean of pros was low in spring 2011 compared to spring 2013. The characteristics of the survey respondents in spring 2011 are shown in table 1 in appendix E. 93% of the respondents are from day shift and the other 7% of respondents are from the evening or night shifts. The age demographic shows that 50% of the respondents are below 50 years of age and the rest are above. Over 55% of respondents have a length of service of less than 5 years with the majority of them between one to three years. From the demographic supervisory level, 70% of the respondents are front line employees and

30% of the respondents have some kind of supervisory control ranging from a team leader to an executive. The characteristics of the employees that responded to the survey in fall 2011 are shown in table 2 in appendix E. 92% of the respondents are from day shift and 50% of the respondents are below 50 years of age. Over 53% of respondents have a length of service of less than 5 years with the majority of them between two to five years and 73% of the respondents are front line employees. The characteristics of the employees that responded to the survey in spring 2012 are shown in table 3 in appendix E. Of the respondents 93% work day shift, 47% of the respondents are below 50 years of age, 49% of respondents have a length of service of less than 5 years with the majority of them between two to five years and 69% of the respondents are front line employees. Table 4 in appendix E shows the percentage of respondent demographics from the fall 2012 survey. A little over 92% of the respondents are from day shift and 50% of the respondents are below 50 years of age. Over 48% of respondents have a length of service of less than 5 years with the majority of them between two to five years and 69% of the respondents are front line employees. The employee characteristics who responded to the survey in spring 2013 are shown in table 5 in appendix E. 92% of the respondents are from day shift with 48% below 50 years of age. Over 48% of respondents have a length of service of less than 5 years and 74% of the respondents are front line employees.

Training and Involvement (At this point in time, how much have you)	*Spring 2011* Mean(SD) n = 459	*Fall 2011* Mean(SD) n = 489	*Spring 2012* Mean(SD) n = 504	*Fall 2012* Mean(SD) n = 245	*Spring 2013* Mean(SD) n = 395
been trained in at least one of the systems improvement techniques (Microsystems, Lean, PDSA, VA-TAMMCS).	1.81 (1.25)	2.08 (1.41)	2.31 (1.48)	2.22 (1.45)	2.35 (1.47)
used PDSA or VA-TAMMCS tools in my work group.	1.70 (1.18)	1.85 (1.31)	2.09 (1.39)	2.04 (1.34)	2.16 (1.43)
been involved in improvement projects or continuous improvement initiatives.	2.65 (1.44)	2.79 (1.45)	2.85 (1.50)	2.83 (1.49)	2.91 (1.59)
incorporated continuous improvement into everyday work.	3.10 (1.44)	3.13 (1.46)	3.25 (1.41)	3.13 (1.38)	3.18 (1.45)
Stage of Change Considering that being involved in systems improvement can include both specific improvement projects or everyday continuous improvement, are you involved in systems improvement?	3.04 (1.69)	3.18 (1.69)	3.28 (1.69)	3.34 (1.69)	3.31 (1.69)
Self-Efficacy (How confident are you that you could begin to participate or continue participating in systems improvement activities)	*Spring 2011* Mean(SD) n = 459	*Fall 2011* Mean(SD) n = 489	*Spring 2012* Mean(SD) n = 504	*Fall 2012* Mean(SD) n = 245	*Spring 2013* Mean(SD) n = 395
when unexpected problems arise during projects.	3.32 (1.05)	3.28 (1.02)	3.42 (0.99)	3.41 (0.92)	3.36 (1.06)
when conflicts arise between team members.	3.27 (1.09)	3.28 (1.01)	3.33 (0.97)	3.36 (0.95)	3.30 (1.05)
if meetings conflict with your regular job duties.	2.97 (1.09)	3.03 (1.02)	3.03 (1.03)	3.07 (1.05)	3.04 (1.07)
when other employees are absent or leave the workgroup.	3.14 (1.08)	3.16 (1.02)	3.25 (1.01)	3.25 (0.95)	3.23 (1.03)

if the project on which you are working concludes.	3.29 (1.04)	3.32 (0.99)	3.39 (0.97)	3.38 (0.92)	3.32 (1.03)
if the systems improvement team is in need of a new leader.	3.09 (1.09)	3.11 (1.06)	3.16 (1.03)	3.16(0.99)	3.13 (1.07)
if you do not already have some of the necessary skills or training.	2.99 (1.06)	3.04 (1.04)	3.08 (1.01)	3.11 (0.96)	3.13 (0.99)
Decisional Balance (How important are the following reasons in your decision of whether or not to participate in systems improvement activities.)	*Spring 2011* Mean(SD) n = 459	*Fall 2011* Mean(SD) n = 489	*Spring 2012* Mean(SD) n = 504	*Fall 2012* Mean(SD) n = 245	*Spring 2013* Mean(SD) n = 395
It would take a lot of effort.	3.56 (1.08)	3.58 (1.09)	3.52 (1.13)	3.71 (1.13)	3.56 (1.09)
My coworkers would not respect my involvement.	4.09 (1.08)	4.09 (1.12)	4.18 (1.07)	4.08 (1.14)	4.09 (1.09)
It would not directly benefit me.	3.93 (1.10)	4.03 (1.09)	4.03 (1.09)	4.04 (1.10)	3.95 (1.08)
I would enjoy learning new skills and applying them.	3.54 (1.09)	3.59 (1.09)	3.61 (1.08)	3.39 (1.18)	3.53 (1.07)
My job would become easier in the future.	3.29 (0.99)	3.29 (1.05)	3.34 (1.01)	3.00 (1.13)	3.26 (1.01)
My work group would share information with other work groups.	2.84 (1.09)	2.87 (1.11)	2.87 (1.15)	2.82 (1.17)	2.79 (1.09)
Veteran care and patient safety would improve.	3.15 (1.05)	3.13 (1.13)	3.11 (1.14)	3.11 (1.17)	3.03 (1.10)
Employee turnover would go down.	3.58 (1.16)	3.62 (1.19)	3.65 (1.18)	3.59 (1.19)	3.63 (1.15)
It would be difficult to continue improving after initial gains.	3.79 (0.93)	3.8 (0.96)	3.69 (1.13)	3.40 (1.11)	3.69 (0.93)
My job satisfaction would increase.	3.58 (1.05)	3.67 (0.99)	3.65 (1.07)	3.80 (0.90)	3.66 (1.03)
It would be difficult to get other people involved.	3.47 (1.03)	3.53 (1.03)	3.52 (1.09)	3.67 (0.98)	3.51 (1.01)
I would not have time for my other job duties.	4.22 (0.97)	4.35 (0.87)	4.33 (1.08)	4.20 (0.92)	4.30 (0.82)
The ideas I work on might never be implemented or acted on.	3.59 (1.11)	3.63 (1.13)	3.60 (1.01)	3.84 (1.08)	3.60 (1.09)

I would not be sufficiently recognized or rewarded for my involvement.	3.78 (1.01)	3.81 (1.01)	3.77 (1.15)	3.60 (1.13)	3.74 (0.98)
The quality of work my work group produced for others would improve.	3.74 (0.97)	3.70 (0.98)	3.75 (1.14)	3.52 (1.14)	3.67 (0.93)
I would have better procedures for handling problems.	3.78 (1.00)	3.81 (0.96)	3.80 (1.18)	3.84 (0.93)	3.75 (0.95)

Table 4.1. Means and Standard deviation of items in SOC, Decisional Balance and Self-Efficacy scales

Training and Involvement in projects

Figure 4.2 shows the bar graph of percent of respondents between spring 2011 and spring 2013, who reported that they had not received any training in systems improvement, who had not used process improvement tools, that they had never been part of an improvement project, and that they had not incorporated continuous improvement principles in everyday work. Overall the percent of respondents who said to had not received any training reduced from spring 2011 to spring 2013 and number of respondents who said to have not been involved in projects and not using continuous improvement in everyday activities stayed the same.

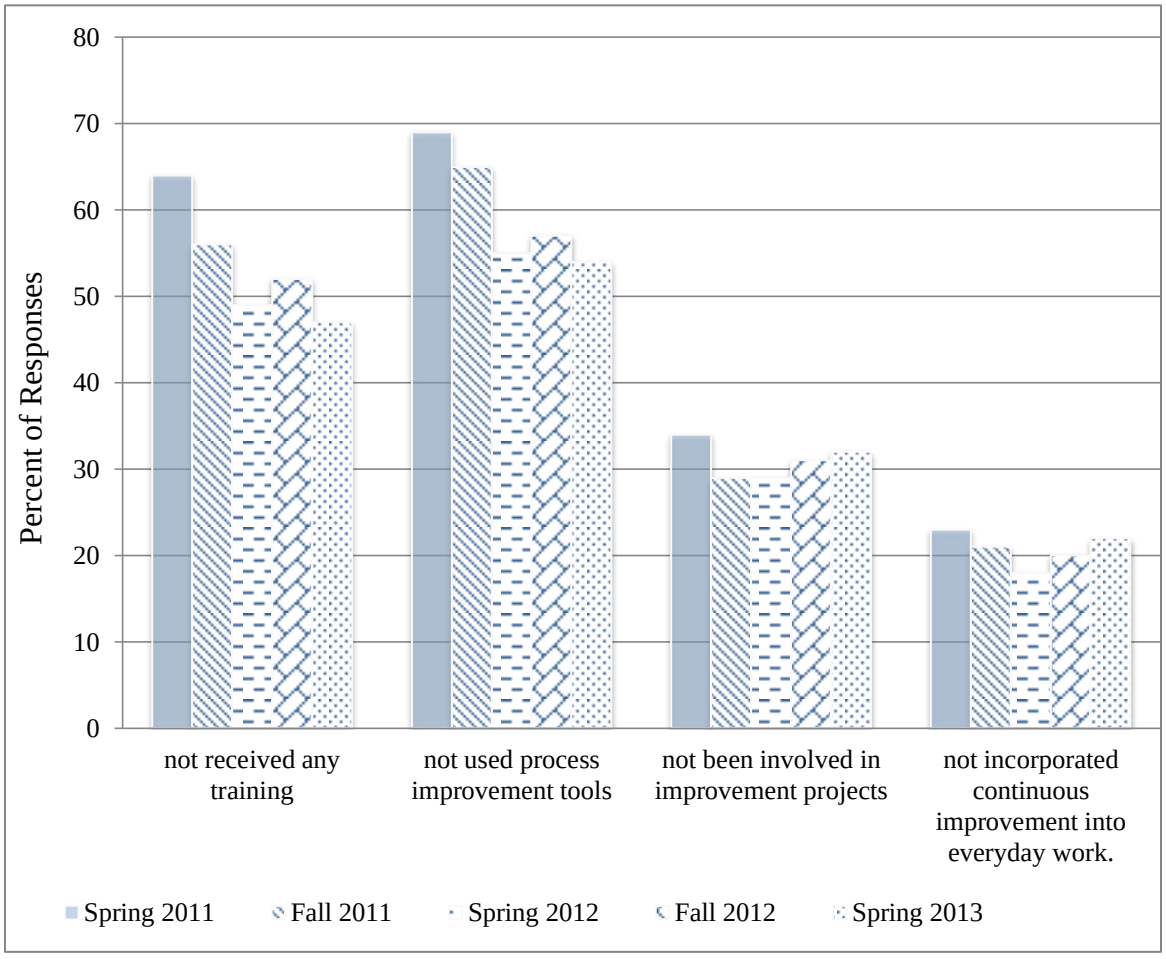

Figure 4.1. Percent of respondents on training and involvement questions

Stage of Change

The stage of change distribution for the respondents at each survey time is shown in table 4.2. From the table, it is clear that the percent of respondents who are in pre-contemplation stage decreased as time progressed and at the same time the percent of respondents in maintenance stage increased. Between spring 2011 and spring 2013, there has been a decrease of 6.7% of employees who are not involved and do not plan to be involved and an increase of 7.7% of employees in maintenance stages. The graph of percent of respondents shows a bath tub pattern at all the time points and is shown in figure 4.2. Tables 4.3 to 4.7 report the stage of change by demographics for each of the surveys from spring 2011 to spring 2013.

Time point	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
	n = 445	n = 479	n = 493	n = 246	n = 425
Pre-contemplation	32.6%	29.6%	27.6%	25.6%	25.6%
Contemplation	13.5%	12.5%	12.8%	15.4%	14.8%
Preparation	4.7%	3.5%	2.4%	0.8%	4.7%
Action	15.3%	18.2%	18.1%	18.3%	13.2%
Maintenance	33.9%	36.1%	39.1%	40.2%	41.6%

Table 4.2. Distribution of respondents by stage of change at each time points

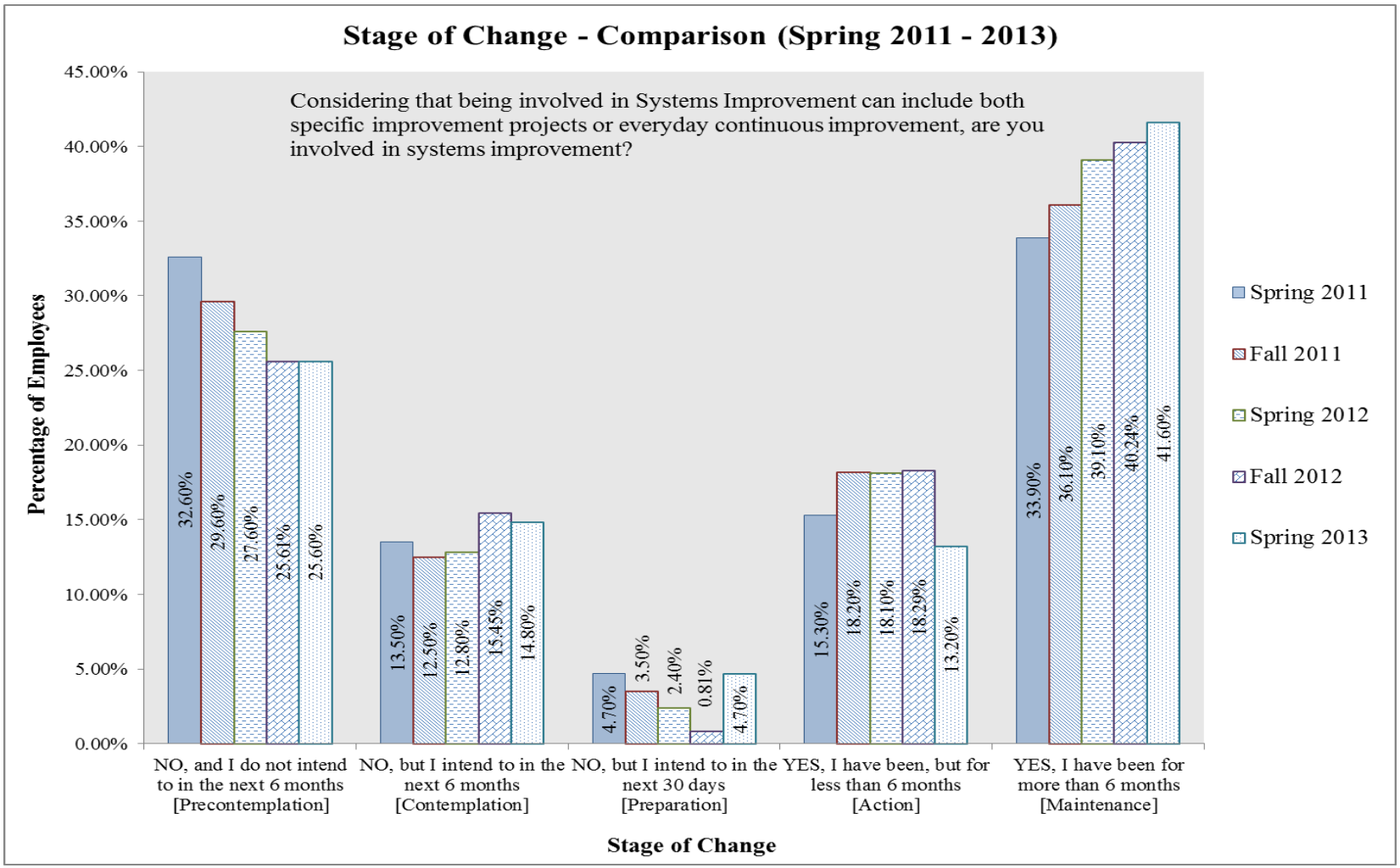

Figure 4.2. Stage of Change at all survey time points

Spring 2011						
Length of Service	**n**	PC	C	P	A	M
less than 6 months	30	37%	27%	7%	23%	0%
6 months to 1 year	30	33%	20%	0%	23%	13%
one to three years	132	34%	15%	4%	16%	30%
four to five years	61	31%	15%	10%	15%	26%
six to ten years	88	27%	9%	3%	17%	42%
11 to 20 years	60	35%	10%	3%	12%	33%
more than 20 years	59	25%	5%	5%	3%	58%
Supervisory Level	**n**	PC	C	P	A	M
None	322	39%	16%	6%	16%	24%
Team leader	50	28%	12%	10%	16%	34%
First line supervisor	46	11%	11%	4%	17%	57%
Manager	30	10%	0%	7%	10%	73%
Executive	12	17%	0%	8%	0%	75%
Age	**n**	PC	C	P	A	M
less than 20	3	67%	0%	0%	0%	33%
20-39	31	29%	35%	0%	10%	26%
30-39	92	32%	20%	9%	18%	22%
40-49	104	35%	8%	8%	16%	34%
50-59	153	29%	14%	5%	17%	34%
60 or older	77	35%	3%	8%	9%	45%

Table 4.3. Stage of Change by demographics in spring 2011

Fall 2011						
Length of Service	**n**	PC	C	P	A	M
Less than 6 months	25	24%	28%	4%	44%	0%
6 months to 1year	31	32%	16%	10%	32%	10%
One to two years	48	15%	35%	0%	17%	33%
Two to five years	155	30%	7%	4%	14%	45%
Five to ten years	104	29%	7%	7%	15%	42%
10 to 15 years	37	30%	8%	0%	19%	43%
15 to 20 years	27	30%	22%	0%	26%	22%
More than 20 years	62	37%	10%	8%	15%	31%
Supervisory Level	**n**	PC	C	P	A	M
None	355	34%	14%	3%	19%	30%
Team leader	42	29%	2%	7%	17%	45%
First line supervisor	43	19%	12%	16%	14%	40%
Manager	40	5%	13%	3%	20%	60%
Executive	9	11%	0%	0%	0%	89%
Age	**n**	PC	C	P	A	M
less than 20	1	0%	0%	0%	100%	0%
20-39	29	14%	21%	3%	28%	34%
30-39	87	26%	15%	6%	20%	33%
40-49	127	33%	15%	4%	22%	26%
50-59	159	32%	11%	4%	15%	38%
60 or older	86	26%	8%	6%	14%	47%

Table 4.4. Stage of Change by demographics in fall 2011

Spring 2012						
Length of Service	**n**	PC	C	P	A	M
Less than 6 months	24	33%	13%	13%	42%	0%
6 months to 1 year	26	38%	8%	8%	31%	15%
One to two years	49	12%	12%	2%	14%	59%
Two to five years	148	26%	13%	3%	18%	39%
Five to ten years	97	24%	19%	5%	13%	39%
10 to 15 years	57	30%	9%	4%	18%	40%
15 to 20 years	27	37%	11%	0%	11%	41%
More than 20 years	76	30%	12%	1%	16%	41%
Supervisory Level	**n**	PC	C	P	A	M
None	346	33%	13%	5%	19%	30%
Team leader	60	18%	17%	3%	12%	50%
First line supervisor	49	18%	20%	2%	22%	37%
Manager	37	5%	0%	0%	11%	84%
Executive	12	8%	0%	0%	8%	83%
Age	**n**	PC	C	P	A	M
less than 20	5	40%	20%	0%	0%	40%
20-39	33	21%	21%	9%	18%	30%
30-39	78	23%	15%	5%	21%	36%
40-49	121	26%	14%	3%	22%	34%
50-59	169	26%	11%	4%	17%	42%
60 or older	98	34%	9%	2%	12%	43%

Table 4.5. Stage of Change by demographics in spring 2012

Fall 2012						
Length of Service	**n**	PC	C	P	A	M
less than 6 months	13	46%	23%	0%	31%	0%
6 months to 1 year	7	29%	14%	0%	43%	14%
one to three years	55	20%	16%	2%	25%	36%
four to five years	44	16%	14%	0%	27%	43%
six to ten years	55	22%	13%	4%	13%	49%
11 to 20 years	39	26%	13%	0%	10%	51%
more than 20 years	32	41%	19%	0%	3%	38%
Supervisory Level	**n**	PC	C	P	A	M
None	169	30%	15%	1%	22%	33%
Team leader	24	21%	25%	0%	8%	46%
First line supervisor	22	9%	23%	5%	23%	41%
Manager	23	13%	4%	4%	4%	74%
Executive	7	14%	0%	0%	0%	86%
Age	**n**	PC	C	P	A	M
less than 20	1	0%	100%	0%	0%	0%
20-39	13	15%	23%	0%	38%	23%
30-39	49	24%	12%	0%	24%	39%
40-49	60	15%	20%	0%	25%	40%
50-59	79	30%	14%	4%	11%	41%
60 or older	43	33%	9%	0%	9%	49%

Table 4.6. Stage of Change by demographics in fall 2012

Spring 2013						
Length of Service	**n**	PC	C	P	A	M
Less than 6 months	15	13%	40%	20%	27%	0%
One to two years	33	9%	33%	3%	15%	39%
Two to five years	110	23%	8%	5%	18%	46%
Five to ten years	88	26%	16%	3%	10%	44%
10 to 15 years	39	10%	13%	8%	10%	59%
15 to 20 years	21	29%	10%	10%	10%	43%
More than 20 years	55	33%	9%	4%	11%	44%
Supervisory Level	**n**	PC	C	P	A	M
None	292	30%	16%	6%	12%	37%
Team leader	30	17%	30%	3%	20%	30%
First line supervisor	28	11%	21%	4%	21%	43%
Manager	37	0%	5%	0%	16%	78%
Executive	8	13%	0%	0%	13%	75%
Age	**n**	PC	C	P	A	M
less than 20	0	-	-	-	-	-
20-39	27	30%	26%	7%	11%	26%
30-39	81	20%	21%	4%	16%	40%
40-49	82	24%	13%	7%	16%	39%
50-59	132	23%	14%	5%	13%	45%
60 or older	73	29%	14%	3%	10%	45%

Table 4.7. Stage of Change by demographics in spring 2013

4.3 Reliability of the scales

In all of the five surveys, the Cronbach's aplha for the subscales is greater than 0.7 which shows the items have great internal consistency. The alpha values for each of the subscales for every time period are shown in table 4.8

	SOC	Self-efficacy	Pros	Cons	POC
Spring 2011	0.846	0.953	0.932	0.838	0.955
Fall 2011	0.864	0.949	0.911	0.847	0.935
Spring 2012	0.883	0.956	0.908	0.852	0.914
Fall 2012	0.871	0.949	0.855	0.807	0.929
Spring 2013	0.895	0.961	0.923	0.847	0.966

Table 4.8. Cronbach's Alpha for sub-scales at all time points

4.4 Exploratory Factor Analysis - Principal Component Analysis

Decisional Balance: All 16 items from the decisional balance scale were included in the exploratory principal component analysis (PCA). PCA with varimax rotation was conducted to determine the factor structure of the decisional balance measure. Both MAP and parallel analysis indicated a two component solution. All of the 16 items loaded on the two components, with 8 items on each component representing the pros and cons. All items' loadings were greater than 0.4 and the internal consistency was good for both the pros and cons as seen in the previous section. The two factors accounted for 57.37 % of the total variance. The exploratory factor loadings of the decisional balance items are shown in Table 4.9. In all of the other survey time points two factors were extracted from the decisional balance scale and the items showed

similar patterns. The variance explained by two factors in fall 2011 is 56.09%, in spring 2012 is 56.19%, in fall 2012 is 48.53% and in spring 2013 is 57.39%.

Self-Efficacy: All 7 items from the scale were included in the exploratory PCA with varimax rotation. Both MAP and parallel analysis indicated a one component solution. All 7 items loaded on the one component with factor loadings greater than 0.8 and the internal consistency for the subscale is good as seen in the previous section. The single factor accounted for 78.09 % of the total variance. The exploratory factor loadings of the decisional balance items are shown in Table 4.10. At other survey time points all items loaded on a single factor. The variance explained by the factor in fall 2011 is 76.73%, in spring 2012 is 79.31%, in fall 2012 is 76.09% and in spring 2013 is 81.27%.

Pros and Cons	Factor Loadings				
	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
It would take a lot of effort.	.668	.633	.650	.407	.682
My co-workers would not respect my involvement.	.702	.707	.680	.789	.688
It would not directly benefit me.	.741	.735	.762	.619	.737
It would be difficult to continue improving after initial gains.	.704	.717	.708	.645	.675
It would be difficult to get other people involved.	.763	.718	.752	.742	.735
I would not have time for my other job duties.	.585	.595	.583	.482	.577
The ideas I work on might never be implemented or acted on.	.639	.700	.681	.769	.710
I would not be sufficiently recognized or rewarded for my involvement.	.644	.676	.720	.766	.712
I would enjoy learning new skills and applying them.	.782	.796	.765	.675	.801
My job would become easier in the future.	.771	.766	.761	.687	.797
My workgroup would share information with other workgroups.	.798	.758	.791	.688	.809
Veteran care and patient safety would improve.	.827	.821	.769	.781	.793
Employee turnover would go down.	.753	.722	.657	.583	.750
My job satisfaction would increase.	.801	.721	.752	.718	.803
The quality of work my workgroup produced for others would improve.	.839	.814	.829	.715	.808
I would have better procedures for handling problems.	.844	.819	.858	.746	.854

Table 4.9. Factor Loadings for Decisional Balance scale

Self-Efficacy items	Factor Loadings				
	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
When unexpected problems arise during projects.	.901	.866	.895	.889	.912
When conflicts arise between team members.	.885	.854	.893	.855	.917
If meetings conflict with your regular job duties.	.837	.834	.844	.839	.856
When other employees are absent or leave the workgroup.	.901	.911	.908	.862	.928
If the project on which you are working concludes.	.916	.904	.913	.909	.928
If the systems improvement team is in need of a new leader.	.888	.885	.889	.892	.886
If you do not already have some of the necessary skills or training	.857	.875	.890	.891	.881

Table 4.10. Factor Loadings for Self-efficacy scale

Processes of Change: All 40 items from the processes of change scale were analyzed using varimax rotation to determine the factor structure of the processes of change scale. In spring 2011, MAP analysis indicated 7 factors and parallel analysis indicated 5 factors. PCA was run multiple times on both possibilities deleting items that loaded on more than one factor or items that had not loaded on any factors or had factor loadings of less than 0.4. The 5 factor solution with 34 items retained seemed to be an optimal solution with the five factors accounting for 61% of the total variance. In fall 2011, both MAP and parallel analysis indicated a 3 factor structure with 27 items retained and the 3 factors accounted for 53% of total variance. PCA was not performed at other time points as processes of change had not produced reliable numbers and the questions that were removed in spring 2011 and fall 2011 were added back in spring 2013 to be used for longitudinal analysis on individual items.

5.5 External Validity:

Spring 2011: MANOVA was conducted to determine if the self-efficacy or pros and cons scales differed by the stage of change. There was a significant main effect for stage of change with Wilk's Lambda = 0.263, F (12, 1365) = 10.93 with $p<.001$. The follow up ANOVA on self-efficacy gives the *p*-value that is significant (F= 4, 455) = 29.622, $p<0.001$ which says that self-efficacy differs significantly with stage of change. Tukey's test showed that respondents in the pre-contemplation stage showed significantly lower confidence compared to those in other stages and respondents in the maintenance stage showed significantly higher confidence compared to respondents in other stages. ANOVA test shows pros significantly differed by SOC with (F= 4, 455) = 17.139,

p<0.001. Tukey's test showed respondents in the pre-contemplation stage had a lower perception of pros than those in other stages. The ANOVA for the cons was not significant, F (4, 455) = 1.332, p=0.257. Figure 4.2 shows the T-scores for the pros, cons and self-efficacy by the stage of change.

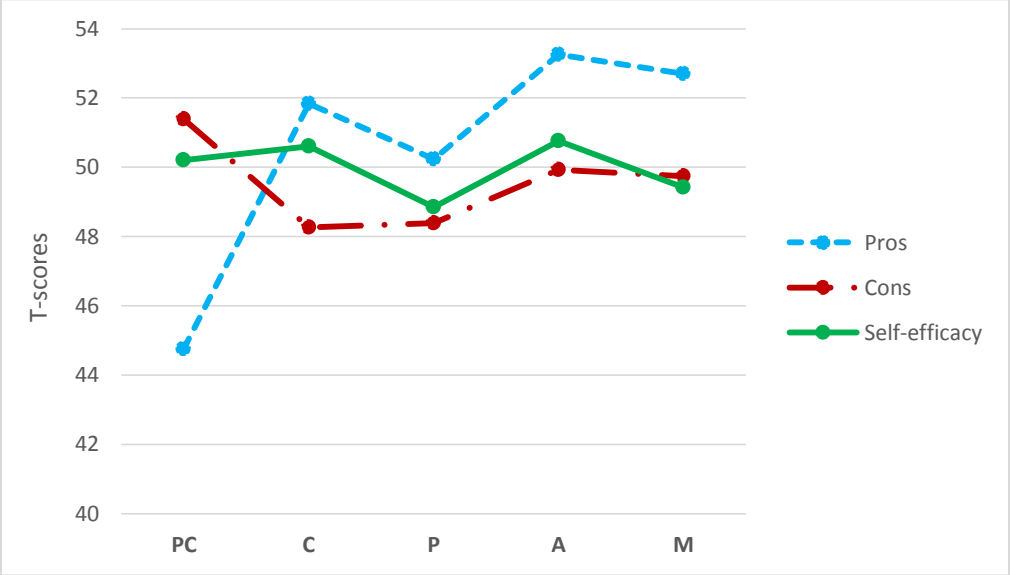

Figure 4.3. Pros, Cons and Self-efficacy by Stage of Change for spring 2011

Fall 2011: MANOVA on fall 2011 data showed that there was a significant main effect for stage of change with Wilk's Lambda = 0.788, F (12, 1275.544) = 10.013 with p<0.001. The follow up ANOVA on self-efficacy gives the *p*-value that is significant (F= 4, 484) = 26.068, p<0.001 which says that self-efficacy differs significantly with SOC. Post-hoc tests showed that respondents in the pre-contemplation and contemplation stages showed significantly lower confidence compared to those in maintenance. Also, pre-contemplation and maintenance stages significantly differed from other stages. ANOVA test showed that pros significantly differed by SOC with (F= 4, 484) = 11.491 p<0.001. Tukey's test showed respondents on pre-contemplation stage had

significantly lower pros compared other stages. The ANOVA for the cons was not significant with F (4, 484) = 0.662, p=0.618 showing no significant difference between stages. Figure 4.3 shows the T-scores for the pros, cons and self-efficacy by the stage of change for fall 2011.

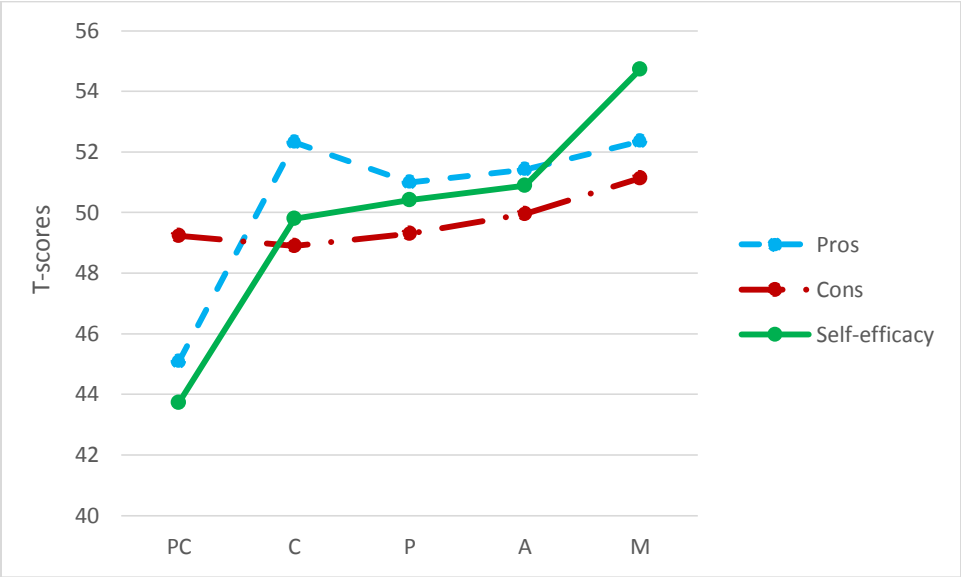

Figure 4.4. Pros, Cons and Self-efficacy by Stage of Change for fall 2011

Spring 2012: MANOVA on spring 2012 data showed there was a significant main effect for stage of change with Wilk's Lambda = 0.788, F (12, 1497) = 6.438 with p<0.001. The follow up ANOVA on self-efficacy gives the *p*-value that is significant (F= 4, 499) = 18.274, p<0.001 which says that self-efficacy differs significantly with SOC. Post-hoc tests showed that respondents in pre-contemplation and contemplation stages had significantly lower confidence compared to those in maintenance, and also pre-contemplation and maintenance stages significantly differ from other stages. ANOVA test showed that pros significantly differed by SOC with (F= 4, 499) = 6.153, p<0.001. Tukey's test showed respondents in the pre-contemplation stage had significantly lower

pros compared to other stages. The ANOVA for the cons was not significant with F (4, 499) = 0.366, p=0.833 showing no significant difference between stages. Figure 4.4 showed the T-scores for the pros, cons and self-efficacy by the stage of change for spring 2012.

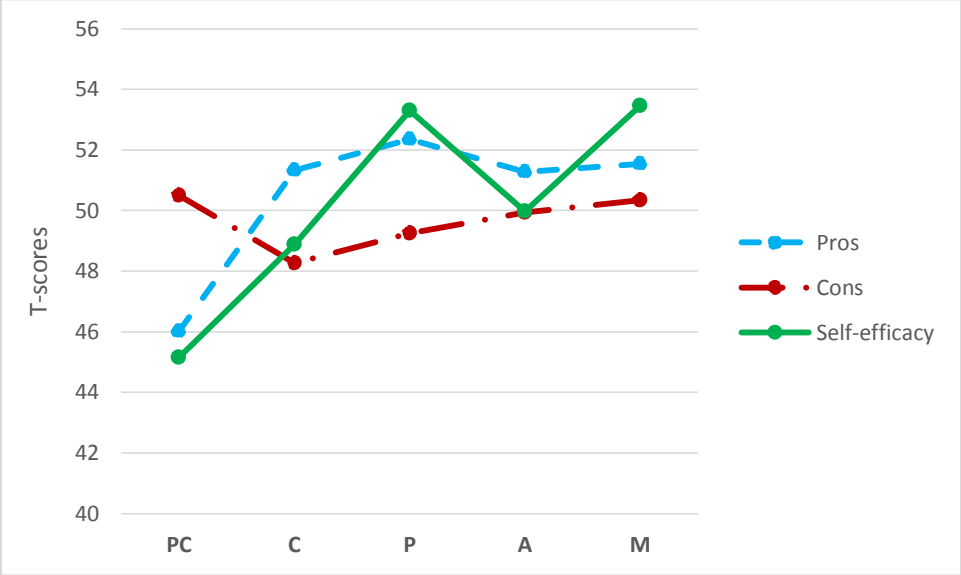

Figure 4.5. Pros, Cons and Self-efficacy by Stage of Change for spring 2012

Fall 2012: MANOVA on fall 2012 data showed there was a significant main effect for stage of change with Wilk's Lambda = 0.820, F (12, 629.980) = 4.077 with p<0.001. The follow up ANOVA on self-efficacy gives the *p*-value that is significant (F= 4, 240) = 6.664, p<0.001 which says that self-efficacy differs significantly with SOC. Post-hoc tests showed that respondents in the pre-contemplation stage had significantly lower confidence compared to those in the action and maintenance stages. ANOVA test showed that pros significantly differed by SOC with (F= 4, 240) = 4.030 p=0.004. Tukey's test showed that respondents in the pre-contemplation stage had significantly lower pros compared to those in maintenance. The ANOVA for the cons was significant with F (4,

240) = 2.458, p=0.046 showing no significant difference between stages. Follow up tests showed respondents in contemplation stage significantly differed to those in maintenance stage. Figure 4.5 shows the T-scores for the pros, cons and self-efficacy by the stage of change for fall 2012.

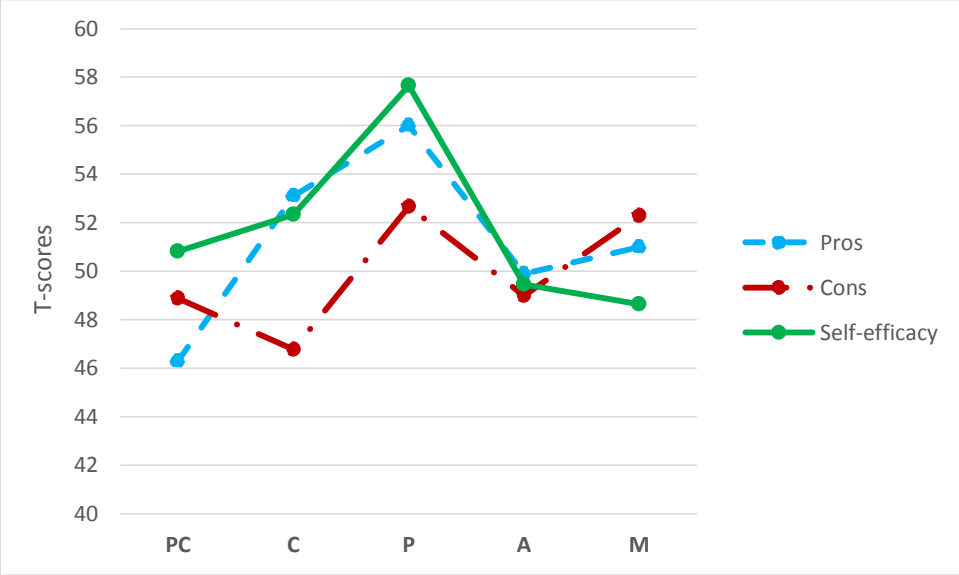

Figure 4.6. Pros, Cons and Self-efficacy by Stage of Change for fall 2012

Spring 2013: MANOVA on spring 2013 data showed that there was a significant main effect for stage of change with Wilk's Lambda = 0.781, F (12, 1026.843) = 8.398 with p<.001. The follow up ANOVA on self-efficacy gives the *p*-value that is significant (F= 4, 390) = 20.86, p<0.001 which says that self-efficacy differs significantly with SOC. From Tukey's test, it is clear that respondents in the pre-contemplation and contemplation stages had significantly lower confidence compared to those in maintenance. ANOVA test showed pros significantly differed by SOC with (F= 4, 390) = 8.123, p<0.001. Tukey's test showed respondents in the pre-contemplation and contemplation stages had lower pros than those in the maintenance stage. The ANOVA

for the cons was significant, F (4, 390) = 2.442, p=0.046. Follow up post hoc tests showed there are differences between stages of respondents. Figure 4.6 shows the T-scores for the pros, cons and self-efficacy by the stage of change for spring 2013.

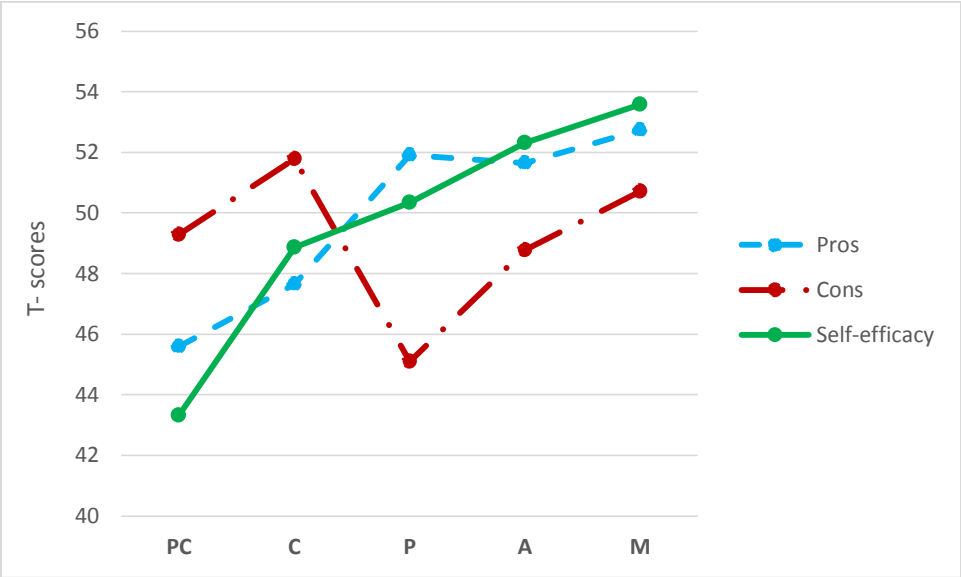

Figure 4.7. Pros, Cons and Self-efficacy by Stage of Change for spring 2013

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Descriptive analysis showed that the data is completely normal and missing values are imputed using EM algorithm. The scales have good reliability with Cronbach's alpha greater than 0.8. Principal component analysis returned a two-factor structure for decisional balance scale with 8-items on pros and 8-items on cons and a single factor structure with 7 items for self-efficacy. MANOVA analysis was done to find out the external validity of the scales. The scales showed good external validity with self-efficacy, pros and cons significantly differed between stages of change.

CHAPTER 5

FINDINGS

This chapter includes results from the hypothesis testing that was described in the methodology section. The scales for stage of change, self-efficacy, and pros and cons are tested to see how they vary with supervisory level, age of employee, length of service of employee, current work group in which they work and the amount of training received.

5.1 Hypothesis 1

In order to test hypothesis 1, that employees in a supervisory role adopt process improvement initiatives earlier than employees who do not have any supervisory role, ANOVA's are conducted to check if SOC, self-efficacy and decisional balance scales are different between different supervisory levels.

Stage of Change by supervisory level

The sample size, means and standard deviations of the stage of change, which is measured on a scale of 1 to 5, for different supervisory levels in all five surveys are shown in table 5.1. The test of homogeneity are significant ($p<0.01$) for all of the surveys which tells us that the variances within each group are statistically different from each other. The ANOVA tests in all 5 surveys are significant which says that there is significant difference between different supervisory levels. In spring 2011 $F= 13.856$, $p<0.001$; in fall 2011, $F= 7.253$, $p<0.001$; in spring 2012, $F= 11.712$, $p<0.001$; in fall 2012, $F= 3.619$, $p=0.015$ and in spring 2013, $F= 9.202$, $p<0.001$. Follow up Tukey's test

are conducted to find which groups differed and the groups that are different are shown in table 5.2. Figure 5.1 shows the mean stage of change by supervisory level at all survey time points.

Supervisory level	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
None	*322* 2.72 (1.65)	*355* 2.97 (1.69)	*346* 3.02 (1.69)	*169* 3.14 (1.69)	*292* 3.09 (1.73)
Team leader	*50* 3.16 (1.67)	*42* 3.48 (1.73)	*60* 3.59 (1.65)	*24* 3.33 (1.74)	*30* 3.17 (1.56)
First line supervisor	*46* 3.98 (1.44)	*43* 3.40 (1.58)	*49* 3.39 (1.59)	*22* 3.64 (1.46)	*28* 3.64 (1.49)
Manager	*30* 4.39 (1.25)	*40* 4.18 (1.26)	*37* 4.68 (0.94)	*23* 4.22 (1.48)	*37* 4.68 (0.75)
Executive	*12* 4.17 (1.59)	*9* 4.56 (1.33)	*12* 4.58 (1.17)	*7* 4.43 (1.51)	*8* 4.38 (1.41)
Total	*460* 3.04 (1.69)	*489* 3.18 (1.69)	*504* 3.28 (1.69)	*245* 3.34 (1.69)	*395* 3.31 (1.69)

Table 5.1. Descriptive analysis of stage of change by supervisory level

Supervisory level	None	Team leader	First line supervisor	Manager	Executive
None	-		S11	S11, F11, S12, F12, S13	S11, F11, S12
Team leader	-	-		S11, S13	S11
First line supervisor	-	-	-	S11,S12	
Manager	-	-	-	-	S12
Executive	-	-	-	-	-

S11-spring 2011, F11-fall 2011, S12-spring 2012, F12-fall 2012, S13-spring 2013

Table 5.2 Tukey's test - group differences on different supervisory levels

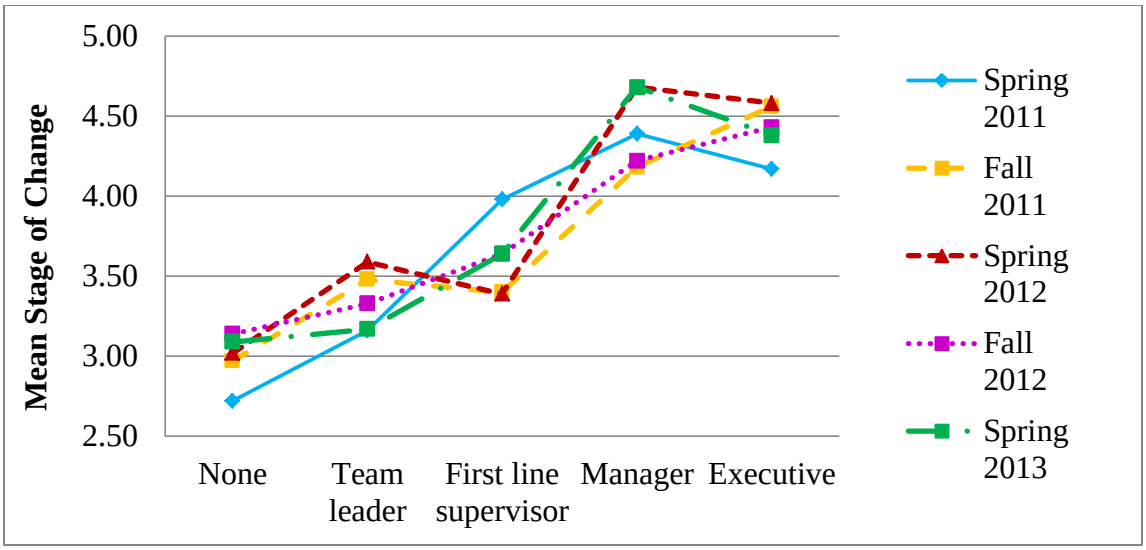

Figure 5.1. Mean stage of change by supervisory level

Self-Efficacy by supervisory level

The sample size, means and standard deviations of the self-efficacy scale by supervisory level for all five surveys are shown in table 5.2. The test of homogeneity of variances is not significant in all of the surveys, which says the variances within self-efficacy for different supervisory levels are not statistically different from each other. ANOVA test is conducted to check if there is a statistically significant difference in the self-efficacy of employees as their supervisory level changes. In spring 2011, the ANOVA test gives a significant *p*-value ($F= 5.822$, $p<0.001$) which says there is statistically significant difference in the self-efficacy of employees with a change in supervisory level. Tukey's test shows there is significant difference between employees with no supervisory control and employees with supervisory control of first line supervisor or higher. In fall 2011, the ANOVA gives a significant *p*-value ($F= 4.594$, $p<0.001$) and Tukey's test shows there is a significant difference between employees with no supervisory control compared to their managers and executives.

Supervisory level	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
None	*322* 3.06 (0.979)	*355* 3.07 (0.926)	*346* 3.13 (0.92)	*169* 3.14 (0.886)	*292* 3.13 (0.998)
Team leader	*50* 3.08 (1.085)	*42* 3.31 (0.841)	*60* 3.42 (0.81)	*24* 3.54 (0.779)	*30* 3.03 (0.85)
First line supervisor	*46* 3.48 (0.836)	*43* 3.28 (0.959)	*49* 3.29 (0.87)	*22* 3.36 (0.658)	*28* 3.46 (0.793)
Manager	*30* 3.63 (0.718)	*40* 3.5 (0.877)	*37* 3.68 (0.92)	*23* 3.61 (0.988)	*37* 3.7 (0.702)
Executive	*12* 3.92 (1.165)	*9* 4 (0.707)	*12* 4.08 (0.90)	*7* 3.71 (0.951)	*8* 4 (0.926)
Total	*460* 3.16 (0.989)	*489* 3.16 (0.928)	*504* 3.24 (0.93)	*245* 3.26 (0.884)	*395* 3.22 (0.969)

Table 5.3. Descriptive analysis of self-efficacy by supervisory level

In spring 2012, ANOVA gives a significant *p*-value ($F= 6.707$, $p<0.001$) and Tukey's test shows there is significant difference between employees with no supervisory control and their managers and executives. In fall 2012, ANOVA gives a significant *p*-value ($F= 2.961$, $p=0.020$) and Tukey's test shows there is no significant difference between different levels of supervisory control. In spring 2013, ANOVA gives a significant *p*-value ($F= 5.101$, $p<0.001$) and Tukey's test shows there is a significant difference between managers compared to employees with no supervisory control and team leaders. The plot showing the mean self-efficacy by supervisory level is shown in figure 5.2.

Figure 5.2. Mean self-efficacy by supervisory level

Decisional Balance (pros and cons) by supervisory level of employee

The sample size, means and standard deviations of pros and cons scales by supervisory level for all five surveys are shown in tables 5.3 and 5.4. The test of homogeneity for pros and cons scale are not significant in any of the surveys, which says the variances within pros and cons for various supervisory levels are not statistically different from each other. The ANOVA's conducted to check if there is a significant difference in the pros and cons of employees as their supervisory level changes in all surveys gave non-significant *p*-values with no significant difference between pros and cons for different of supervisory levels.

Supervisory level	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
None	*321* 3.71 (0.82)	*354* 3.78 (0.81)	*346* 3.75 (0.76)	*169* 3.7 (0.76)	*291* 3.73 (0.8)
Team leader	*50* 3.78 (0.86)	*42* 3.61 (0.67)	*60* 3.73 (0.85)	*24* 3.86 (0.7)	*30* 3.72 (0.72)
First line supervisor	*46* 3.91 (0.61)	*43* 3.97 (0.66)	*49* 3.82 (0.74)	*22* 3.84 (0.67)	*28* 3.92 (0.61)
Manager	*30* 3.85 (0.83)	*40* 3.86 (0.76)	*37* 3.89 (0.83)	*23* 3.79 (0.49)	*37* 3.7 (0.82)
Executive	*12* 3.52 (1.09)	*9* 3.85 (0.42)	*12* 3.76 (0.81)	*7* 3.61 (0.72)	*8* 3.95 (0.53)
Total	*459* 3.74 (0.82)	*488* 3.79 (0.78)	*504* 3.77 (0.77)	*245* 3.73 (0.72)	*394* 3.74 (0.78)

Table 5.4. Descriptive analysis of pros by supervisory level

Supervisory level	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
None	*321* 3.56 (0.69)	*354* 3.52 (0.78)	*346* 3.57 (0.75)	*169* 3.48 (0.75)	*291* 3.45 (0.79)
Team leader	*50* 3.26 (0.91)	*42* 3.46 (0.71)	*60* 3.42 (0.79)	*24* 3.51 (0.84)	*30* 3.47 (0.57)
First line supervisor	*46* 3.31 (0.76)	*43* 3.38 (0.82)	*49* 3.35 (0.92)	*22* 3.41 (0.76)	*28* 3.52 (0.79)
Manager	*30* 3.39 (0.81)	*40* 3.68 (0.68)	*37* 3.71 (0.7)	*23* 3.37 (0.77)	*37* 3.61 (0.56)
Executive	*12* 3.7 (0.75)	*9* 3.92 (0.93)	*12* 3.53 (0.95)	*7* 3.59 (0.64)	*8* 3.75 (0.59)
Total	*459* 3.5 (0.74)	*488* 3.52 (0.77)	*504* 3.54 (0.78)	*245* 3.47 (0.75)	*394* 3.48 (0.75)

Table 5.5. Descriptive analysis of cons by supervisory level

5.2. Hypothesis 2

In order to test hypothesis 2, which states that employees' perception of change depends on the length of service at the organization, ANOVA's were done for stage of change by the length of service at each survey time point.

Stage of change by length of service

The sample size, means and standard deviations of the stage of change by length of service for all five surveys are shown in table 5.5. The test of homogeneity are significant ($p<0.01$) for all of the surveys which indicates that the variances within each group are statistically different from each other. In spring 2011, the ANOVA test gives a significant *p*-value ($F= 5.382$, $p<0.001$) which says that there is a statistically significant difference between levels. Tukey's test shows that employees with less than 1 year of experience are significantly different compared to employees with more than 6 years of experience. At other time points, the ANOVA gives a non-significant *p*-value with no significant difference between employees with different length of experience.

Self-Efficacy by length of service

The sample size, means and standard deviations of the self-efficacy scale by length of service for all five surveys are shown in table 5.6. The test of homogeneity of variances is not significant in all of the surveys, which says the variances within self-efficacy for various lengths of service are not statistically different from each other.

Length of service	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
6 months to 1 year	*60* 2.35 (1.38)	*56* 2.70 (1.37)	*50* 2.7 (1.47)	*20* 2.45 (1.47)	*49* 3.27 (1.74)
1 to 5 years	*193* 2.92 (1.67)	*203* 3.30 (1.72)	*197* 3.47 (1.66)	*99* 3.53 (1.57)	*141* 3.57 (1.63)
6 to 10 years	*88* 3.39 (1.71)	*104* 3.36 (1.73)	*97* 3.26 (1.67)	*55* 3.55 (1.69)	*87* 3.18 (1.68)
11 to 20 years	*60* 3.00 (1.74)	*64* 3.17 (1.71)	*84* 3.23 (1.77)	*39* 3.49 (1.78)	*60* 3.20 (1.74)
more than 20 years	*59* 3.59 (1.78)	*62* 2.89 (1.74)	*76* 3.25 (1.76)	*32* 2.75 (1.87)	*57* 3.02 (1.74)
Total	*460* 3.04 (1.70)	*489* 3.18 (1.69)	*504* 3.28 (1.69)	*245* 3.34 (1.69)	*394* 3.32 (1.69)

Table 5.6. Descriptive analysis of stage of change by length of service

Length of service	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
6 months to 1 year	*59* 3.25 (0.99)	*56* 3.09 (0.86)	*50* 3.16 (0.93)	*20* 2.3 (0.47)	*50* 3.2 (0.88)
1 to 5 years	*193* 3.1 (0.96)	*203* 3.29 (0.86)	*197* 3.35 (0.88)	*99* 2.09 (0.41)	*141* 3.24 (0.87)
6 to 10 years	*88* 3.35 (0.79)	*104* 3.27 (0.9)	*97* 3.19 (0.96)	*55* 2.24 (0.43)	*87* 3.38 (1.07)
11 to 20 years	*60* 2.89 (0.96)	*64* 2.98 (0.92)	*84* 3.2 (0.95)	*39* 2.36 (0.54)	*60* 3 (1.12)
more than 20 years	*59* 3.19 (1.01)	*62* 2.91 (0.92)	*76* 3.11 (0.95)	*32* 2.34 (0.48)	*57* 3.18 (0.93)
Total	*459* 3.15 (0.95)	*489* 3.18 (0.89)	*504* 3.24 (0.92)	*245* 2.22 (0.46)	*395* 3.22 (0.97)

Table 5.7. Descriptive analysis of self-efficacy by length of service

In spring 2011, the ANOVA test gives a significant *p*-value (F=2.464, p=0.044) which says that there is a statistically significant difference in the self-efficacy of employees with a change in length of service. Tukey's test shows that there is a significant difference between employees with 6 to 10 years' experience and employees with 11 to 20 years' experience. In fall 2011, the ANOVA gives a significant *p*-value (F= 3.429, p=0.009) and Tukey's test shows that there is a significant difference between employees with 1 to 5 years of experience and employees with more than 20 years of experience. In spring 2012, ANOVA gives a non-significant *p*-value (F= 1.290, p=0.273) showing no difference by employees based on length of service. In fall 2012, ANOVA gives a significant *p*-value (F= 3.751, p=0.006) and Tukey's test shows that there is a significant difference between employees with 1 to 5 years of experience and employees with more than 10 years of experience. In spring 2013, ANOVA is not significant with F= .420, p=0.227. The mean plot of self-efficacy by length of service is shown in figure 5.3.

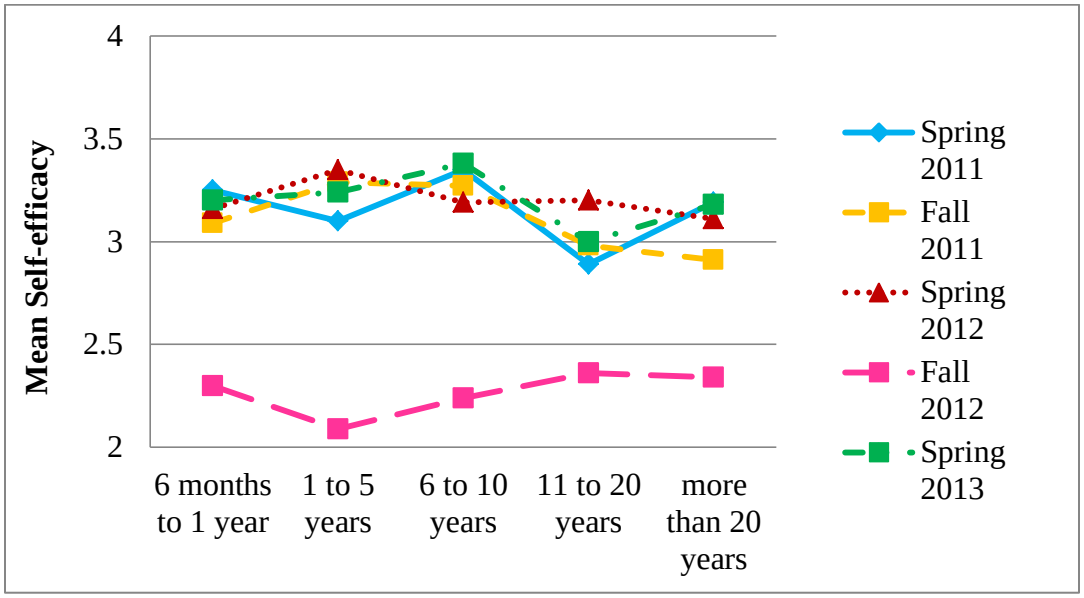

Figure 5.3. Mean self-efficacy by length of service

Decisional Balance (pros and cons) by length of service of employee

The sample size, means and standard deviations of pros and cons scales by length of service for all five surveys are shown in tables 5.7 and 5.8. The test of homogeneity for the pros and cons scales are not significant in any of the surveys, which says the variances within pros and cons for different lengths of service are not statistically different from each other. The ANOVA's conducted gave non-significant *p*-values which says there is no significant difference on pros and cons between employees with different length of service.

Length of service	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
6 months to 1 year	*59* 3.91 (0.74)	*56* 3.7 (0.95)	*50* 3.83 (0.67)	*20* 3.56 (0.66)	*50* 3.59 (0.76)
1 to 5 years	*193* 3.72 (0.83)	*203* 3.87 (0.72)	*197* 3.86 (0.78)	*99* 3.72 (0.79)	*141* 3.81 (0.76)
6 to 10 years	*88* 3.87 (0.79)	*103* 3.87 (0.73)	*97* 3.84 (0.72)	*55* 3.9 (0.64)	*87* 3.83 (0.83)
11 to 20 years	*60* 3.65 (0.91)	*64* 3.7 (0.78)	*84* 3.64 (0.83)	*39* 3.57 (0.7)	*60* 3.73 (0.9)
more than 20 years	*59* 3.57 (0.78)	*62* 3.57 (0.83)	*76* 3.55 (0.76)	*32* 3.81 (0.71)	*57* 3.59 (0.6)
Total	*459* 3.74 (0.82)	*488* 3.79 (0.78)	*504* 3.77 (0.77)	*245* 3.73 (0.72)	*395* 3.74 (0.78)

Table 5.8. Descriptive analysis of pros by length of service

Length of service	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
6 months to 1 year	*59* 3.53 (0.75)	*56* 3.57 (0.76)	*50* 3.59 (0.7)	*20* 3.39 (0.66)	*50* 3.54 (0.77)
1 to 5 years	*193* 3.5 (0.72)	*203* 3.52 (0.76)	*197* 3.56 (0.8)	*99* 3.58 (0.74)	*141* 3.38 (0.79)
6 to 10 years	*88* 3.48 (0.68)	*103* 3.57 (0.81)	*97* 3.48 (0.83)	*55* 3.43 (0.72)	*87* 3.57 (0.73)
11 to 20 years	*60* 3.41 (0.9)	*64* 3.51 (0.73)	*84* 3.47 (0.79)	*39* 3.46 (0.67)	*60* 3.58 (0.82)
more than 20 years	*59* 3.58 (0.76)	*62* 3.43 (0.81)	*76* 3.61 (0.69)	*32* 3.24 (0.93)	*57* 3.44 (0.6)
Total	*459* 3.5 (0.74)	*488* 3.52 (0.77)	*504* 3.54 (0.78)	*245* 3.47 (0.75)	*395* 3.48 (0.75)

Table 5.9. Descriptive analysis of cons by length of service

5.3 Hypothesis 3

To test hypothesis 3, which is that employees in different age groups adopt process improvement initiatives differently, ANOVA's are done to check if SOC, self-efficacy and decisional balance scales are different between employees in different age groups. To test the hypothesis the survey responses are classified based on age into two categories- employees who are less than 50 years old and employees who are more than 50 years old.

Stage of Change by age of employee

The sample size, means and standard deviations of stage of change by age of employee for all five surveys are shown in table 5.10. The test of homogeneity of variances in all five surveys is not significant, and the variances within each age group are not statistically different from each other. ANOVA test is conducted to check if there is a statistically significant difference in the stage of change of employees as their age

changes. The mean plot of stage of change for two age groups of employees is shown in figure 5.4. In all the five surveys, ANOVA tests give non-significant *p*-values which tell that there is a no statistically significant difference in the stage of change of employees between the two employee age groups. The F and p-values for the surveys are shown in table 5.11.

Age	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Less than 50 years	*230* 3.04 (1.64)	*244* 3.16 (1.68)	*237* 3.24 (1.64)	*123* 3.46 (1.58)	*189* 3.40 (1.65)
More than 50 years	*230* 3.05 (1.76)	*245* 3.21 (1.71)	*267* 3.32 (1.74)	*122* 3.23 (1.79)	*206* 3.24 (1.71)
Total	*460* 3.04 (1.69)	*489* 3.18 (1.69)	*504* 3.28 (1.69)	*245* 3.34 (1.69)	*395* 3.31 (1.69)

Table 5.10. Descriptive analysis of SOC by age of employee

Self-Efficacy by age of employee

The sample size, means and standard deviations of self-efficacy by age of employee for all five surveys are shown in table 5.10 and the mean plot is shown in figure 5.4. The test of homogeneity of variances in all five surveys is not significant which shows the variances within each level of age of employee are not statistically different from each other on self-efficacy. In spring 2011, the ANOVA is non-significant which says that self-efficacy is not different for employees of two age groups. In all other surveys, ANOVA tests are significant showing there is significant difference on self-efficacy of employees for the two age groups. The F and p-values for the surveys are shown in table 5.11.

Age group	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
less than 50 years	*230* 3.16 (0.93)	*244* 3.29 (0.87)	*237* 3.34 (0.81)	*123* 3.36 (0.73)	*189* 3.12 (0.95)
More than 50 years	*230* 3.14 (0.97)	*245* 3.07 (0.91)	*267* 3.15 (0.95)	*122* 3.13 (0.93)	*206* 3.29 (0.93)
Total	*460* 3.15 (0.95)	*489* 3.18 (0.89)	*504* 3.24 (0.89)	*245* 3.25 (0.85)	*395* 3.21 (0.94)

Table 5.11. Descriptive analysis of self-efficacy by age of employee

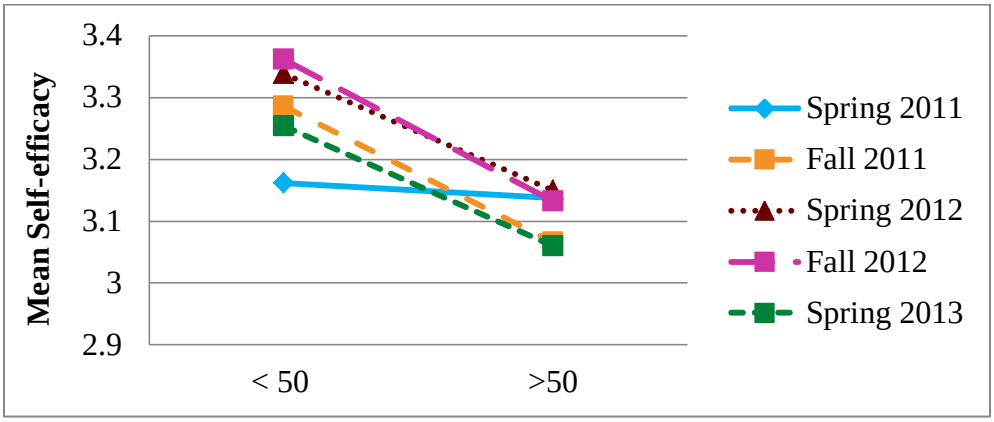

Figure 5.4. Mean self-efficacy by age of employee

Decisional Balance (pros and cons) by age of employee

The sample size, means and standard deviations of pros and cons by age of employee for all five surveys are shown in tables 5.11 and 5.12. The test of homogeneity of variances in all five surveys is not significant which shows the variances within each level of age of employee are not statistically different from each other on their pros and cons. Except in fall 2011, the ANOVA tests are not significant which tells that pros and cons are not different for employees of two age groups. The F and p-values for the surveys are shown in table 5.11.

Age	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Less than 50 years	*230* 3.76 (0.83)	*244* 3.92 (0.70)	*237* 3.78 (0.79)	*123* 3.82 (0.72)	*189* 3.74 (0.79)
More than 50 years	*230* 3.73 (0.80)	*244* 3.66 (0.83)	*267* 3.75 (0.76)	*122* 3.64 (0.72)	*206* 3.74 (0.78)
Total	*460* 3.74 (0.82)	*488* 3.79 (0.78)	*504* 3.77 (0.77)	*245* 3.73 (0.73)	*395* 3.74 (0.78)

Table 5.12. Descriptive analysis of pros by age of employee

Age	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Less than 50 years	*230* 3.44 (0.74)	*244* 3.45 (0.81)	*237* 3.51 (0.78)	*123* 3.45 (0.73)	*189* 3.45 (0.75)
More than 50 years	*230* 3.56 (0.74)	*244* 3.60 (0.73)	*267* 3.57 (0.78)	*123* 3.49 (0.77)	*206* 3.51 (0.76)
Total	*460* 3.49 (0.74)	*488* 3.52 (0.77)	*504* 3.54 (0.78)	*245* 3.47 (0.75)	*395* 3.48 (0.75)

Table 5.13. Descriptive analysis of cons by age of employee

Scale	Survey	F	*p*-value
SOC	Spring 2011	0.003	0.956
	Fall 2011	0.136	0.712
	Spring 2012	0.296	0.587
	Fall 2012	1.099	0.295
	Spring 2013	0.881	0.348
Self-efficacy	Spring 2011	0.074	0.785
	Fall 2011	7.511	0.006
	Spring 2012	5.668	0.018
	Fall 2012	4.595	0.033
	Spring 2013	4.756	0.034
Pros	Spring 2011	0.169	0.681
	Fall 2011	14.469	<0.001
	Spring 2012	0.141	0.707
	Fall 2012	3.955	0.048
	Spring 2013	0.010	0.919
Cons	Spring 2011	3.221	0.073
	Fall 2011	4.789	0.029
	Spring 2012	0.690	0.407
	Fall 2012	0.193	0.661
	Spring 2013	0.664	0.416

Table 5.14. ANOVA test values of SOC, self-efficacy, pros and cons by age

Hypothesis 4

Hypothesis 4 is that employees' adoption of process improvement initiatives depends on the work group in which they are working at the time of surveys. To test this hypothesis, the work groups are classified as those that are patient care units, support services and other administrative units. ANOVA's are done to check if SOC, self-efficacy and decisional balance scales are different between different work group classifications.

Stage of Change by work group classifications

The sample size, means and standard deviations of the stage of change by work group classifications for all five surveys are shown in table 5.15 and the mean plot is shown in figure 5.5. The test of homogeneity is significant in all of the surveys which tells us that the variances within each group are statistically different from each other. In spring 2011, the ANOVA test gives the significant *p*-value (F= 3.380, p=0.038) which says that there is a statistically significant difference between levels. Tukey's test shows that employees who provide direct patient care are significantly different on their stage of change compared to employees who work in support services. In fall 2011, the ANOVA test is not significant (F= 1.227, p=0.294). In spring 2012, the ANOVA test gives the significant *p*-value (F= 3.493, p=0.031) and Tukey's test shows that employees who provide direct patient care are significantly different on their stage of change compared to employees who work in support service. In fall 2012, the ANOVA test is not significant (F= 2.070, p=0.128). In spring 2013, the ANOVA also gives a non-significant *p*-value (F= 0.229, p=0.795).

Work Group	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Patient care units	197 3.21 (1.65)	237 3.14 (1.69)	248 3.44 (1.63)	118 3.37 (1.68)	171 3.35 (1.62)
Support services	179 2.79 (1.7)	155 3.1 (1.7)	155 2.99 (1.75)	78 3.08 (1.71)	126 3.34 (1.74)
Administrative units	84 3.19 (1.75)	97 3.42 (1.69)	101 3.35 (1.69)	49 3.69 (1.61)	98 3.21 (1.72)
Total	460 3.04 (1.69)	489 3.18 (1.69)	504 3.28 (1.69)	245 3.34 (1.69)	395 3.31 (1.68)

Table 5.15. Descriptive analysis of stage of change by work group classifications

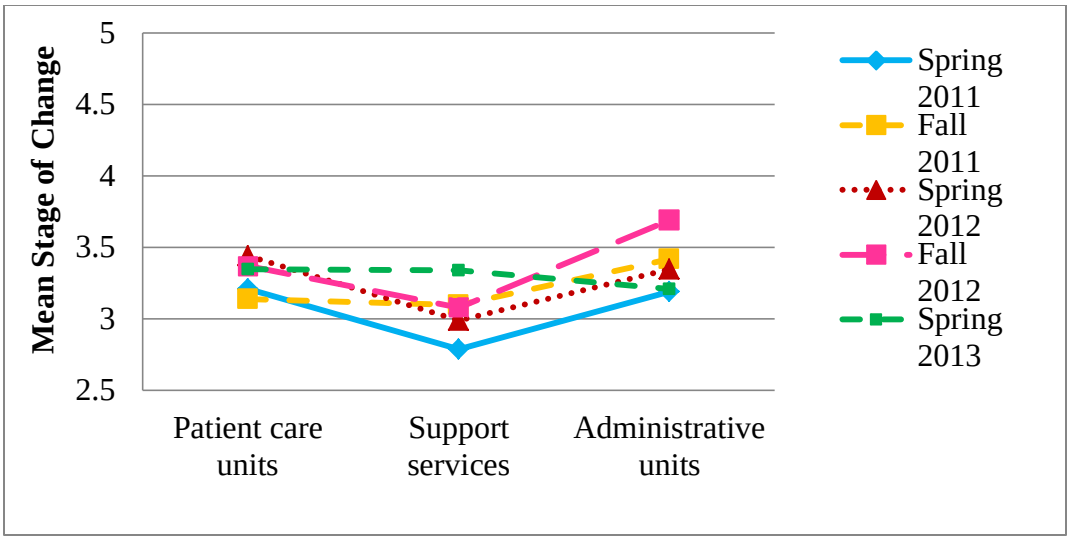

Figure 5.5 Mean stage of change by work group

Self-Efficacy by work group classifications

The sample size, means and standard deviations of self-efficacy scale by work groups for all five surveys are shown in table 5.16. The test of homogeneity of variances is significant in all of the surveys, which says the variances within self-efficacy on work groups are statistically different from each other.

Work Group	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Patient care units	197 3.13 (0.85)	237 3.14 (0.90)	248 3.19 (0.84)	118 3.16 (0.75)	171 3.23 (0.91)
Support services	179 3.12 (0.99)	155 3.14 (1.03)	155 3.22 (0.99)	78 3.22 (0.93)	126 3.19 (1.06)
Administrative units	83 3.27 (1.07)	97 3.26 (0.82)	101 3.4 (1)	49 3.55 (1.04)	98 3.24 (0.95)
Total	459 3.15 (0.95)	489 3.16 (0.93)	504 3.24 (0.92)	245 3.26 (0.88)	395 3.22 (0.97)

Table 5.16. Descriptive analysis of self-efficacy by work groups

The ANOVA in spring 2011 is not significant (F= 0.774, p=0.462) which says there is not a statistically significant difference in the self-efficacy of employees who are in different work groups. In fall 2011, ANOVA is not significant (F= 0.652, p=0.522) In spring 2012, ANOVA gives a non-significant *p*-value (F= 1.853, p=0.158) with no difference between work groups. In fall 2012, ANOVA gives a significant *p*-value (F= 3.552, p=0.030) and Tukey's test shows there is a significant difference between employees who work in patient care units and those who are in administrative units. In spring 2013, ANOVA is not significant (F= 0.096, p=0.908) which shows no significant difference for different work groups.

Decisional Balance (pros and cons) by work group

The sample size, means and standard deviations of pros and cons scales for different work groups for all surveys are shown in tables 5.17 and 5.18. The test of homogeneity for pros and cons scale are not significant in any of the surveys, which says the variances within pros and cons for various work groups are not statistically different from each other. The ANOVA's conducted to check if there is a significant difference in the pros and cons between work groups gave non-significant *p*-values with no significant difference between pros and cons between different work groups.

Work Group	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Patient care units	197 3.79 (0.74)	237 3.8 (0.67)	248 3.83 (0.69)	118 3.69 (0.69)	171 3.77 (0.71)
Support services	179 3.65 (0.89)	154 3.74 (0.92)	155 3.67 (0.89)	78 3.79 (0.75)	126 3.72 (0.82)
Administrative units	84 3.82 (0.79)	97 3.85 (0.79)	101 3.77 (0.75)	49 3.75 (0.77)	98 3.71 (0.85)
Total	460 3.74 (0.82)	488 3.79 (0.78)	504 3.77 (0.77)	245 3.74 (0.72)	395 3.74 (0.78)

Table 5.17. Descriptive analysis of pros by work groups

Work Group	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Patient care units	197 3.51 (0.67)	237 3.52 (0.72)	248 3.54 (0.72)	118 3.48 (0.63)	171 3.45 (0.75)
Support services	179 3.45 (0.83)	154 3.44 (0.83)	155 3.46 (0.86)	78 3.39 (0.89)	126 3.49 (0.75)
Administrative units	84 3.58 (0.73)	97 3.66 (0.78)	101 3.66 (0.76)	49 3.58 (0.78)	98 3.52 (0.78)
Total	460 3.5 (0.74)	488 3.52 (0.77)	504 3.54 (0.78)	245 3.47 (0.75)	395 3.48 (0.75)

Table 5.18. Descriptive analysis of cons by work groups

Hypothesis 5

Hypothesis 5 is that employees who have greater exposure to training will be more positive about the culture of CI compared to employees who do not have training. To test this hypothesis, ANOVA's are run on SOC, self-efficacy and decisional balance scales for different training responses on the question 'amount of training'.

Stage of Change by amount of training received

The sample size, means and standard deviations of the stage of change by amount of training received for all five surveys are shown in table 5.19. The test of homogeneity is significant in all of the surveys which tell us that the variances within each group are statistically different from each other. In all five surveys, the ANOVA test gives significant *p*-values which says that there is a statistically significant difference between SOC of employees based on amount of training received and the mean plot of SOC by training is shown in figure 5.6. The F and *p*-values for all of the surveys are shown in table 5.21. Follow up Tukey's test shows there is a significant difference between employees who were completely trained to employees who have not received any training.

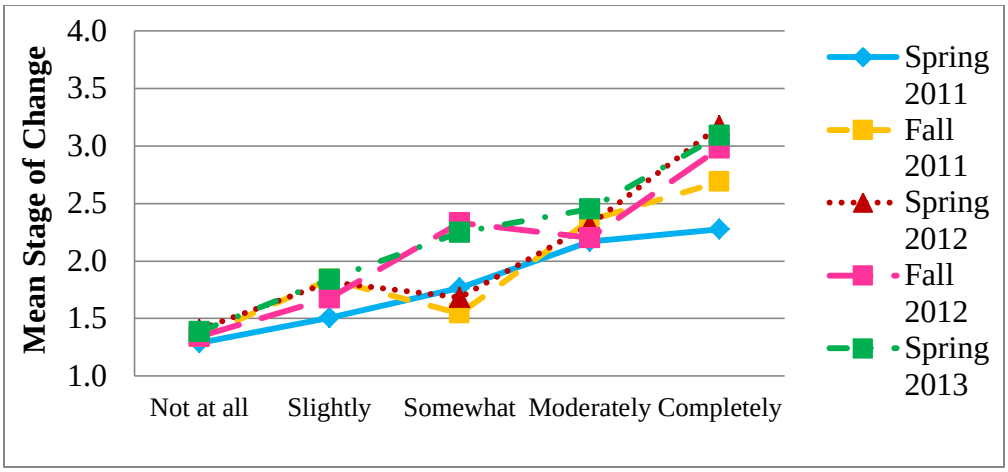

Figure 5.6 Mean stage of change by amount of training

Training	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Not at all	295	273	247	127	184
	2.64 (1.69)	2.67 (1.7)	2.51 (1.62)	2.64 (1.65)	2.52 (1.64)
Slightly	46	54	51	23	43
	3.13 (1.61)	3.13 (1.58)	3.32 (1.53)	3.57 (1.62)	3.23 (1.53)
Somewhat	54	58	63	28	56
	4.02 (1.28)	3.54 (1.49)	3.78 (1.44)	3.72 (1.56)	3.88 (1.54)
Moderately	41	60	88	47	70
	3.66 (1.44)	4.32 (1.02)	4.24 (1.3)	4.32 (1.18)	4.2 (1.17)
Completely	24	44	55	20	42
	4.63 (1.01)	4.43 (1.23)	4.64 (0.93)	4.75 (0.72)	4.62 (1.01)
Total	460	489	504	245	395
	3.62 (1.21)	3.62 (1.39)	3.7 (1.18)	3.8 (1.21)	3.69 (1.29)

Table 5.19. Descriptive analysis of stage of change by amount of training received

Self-Efficacy by amount of training received

The sample size, means and standard deviations of the self-efficacy scale by amount of training received for all five surveys are shown in table 5.19. In all five surveys, ANOVA tests give significant *p*-values which says that there is a statistically significant difference in the self-efficacy of employees with the amount of training they

received. The F and p-values for all of the surveys are shown in table 5.20. The mean plot of self-efficacy by training is shown in figure 5.7.

Training	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Not at all	295 2.98 (1.01)	273 2.95 (0.96)	247 3.01 (0.96)	127 3.08 (0.88)	184 3.03 (1.04)
Slightly	46 3.23 (0.71)	54 3.04 (0.85)	51 3 (0.8)	23 2.96 (0.93)	43 3 (1)
Somewhat	54 3.34 (0.72)	58 3.26 (0.61)	63 3.35 (0.65)	28 3.21 (0.57)	56 3.04 (0.63)
Moderately	41 3.56 (0.70)	60 3.57 (0.81)	88 3.41 (0.81)	47 3.51 (0.75)	70 3.46 (0.67)
Completely	24 3.92 (0.79)	44 3.95 (0.71)	55 4.09 (0.75)	20 4.2 (0.83)	42 4.14 (0.78)
Total	460 3.15 (0.95)	489 3.16 (0.93)	504 3.24 (0.93)	245 3.26 (0.88)	395 3.22 (0.97)

Table 5.20. Descriptive analysis of self-efficacy by training

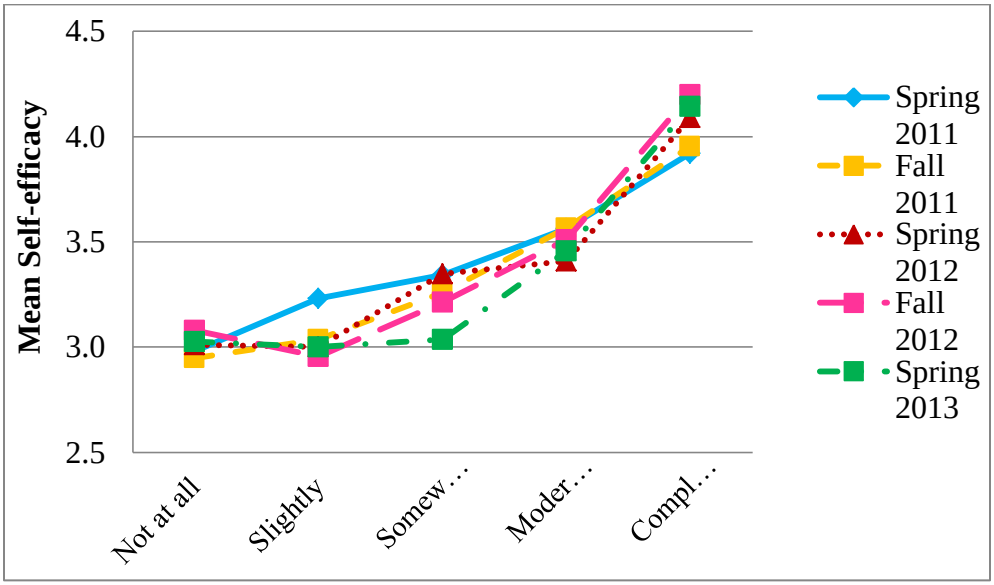

Figure 5.7 Mean self-efficacy by amount of training

Scale	Survey	F	*p*-value
SOC	Spring 2011	17.62	<0.001
	Fall 2011	23.38	<0.001
	Spring 2012	39.62	<0.001
	Fall 2012	16.95	<0.001
	Spring 2013	29.72	<0.001
Self-efficacy	Spring 2011	9.530	<0.001
	Fall 2011	16.812	<0.001
	Spring 2012	19.784	<0.001
	Fall 2012	9.878	<0.001
	Spring 2013	15.430	<0.001
Pros	Spring 2011	4.078	0.003
	Fall 2011	4.844	0.001
	Spring 2012	3.790	0.005
	Fall 2012	0.530	0.714
	Spring 2013	5.650	<0.001
Cons	Spring 2011	1.276	0.279
	Fall 2011	0.332	0.856
	Spring 2012	2.458	0.045
	Fall 2012	0.230	0.922
	Spring 2013	0.544	0.704

Table 5.21. ANOVA test values of self-efficacy, pros and cons by training

Decisional Balance (pros and cons) by amount of training

The sample size, means and standard deviations of pros and cons scales by amount of training received for all five surveys are shown in tables 5.22 and 5.23. The ANOVA's for pros gave significant *p*-values except in fall 2012, which indicates that there is a significant difference in employees' perception of pros with the amount of training they received. The ANOVA's for cons gave non-significant *p*-values which says there is no significant difference on cons between employees who received different

amounts of training or no training. The F and p-values for all of the surveys are shown in table 5.20. The mean plots of pros scale by training are shown in figure 5.8.

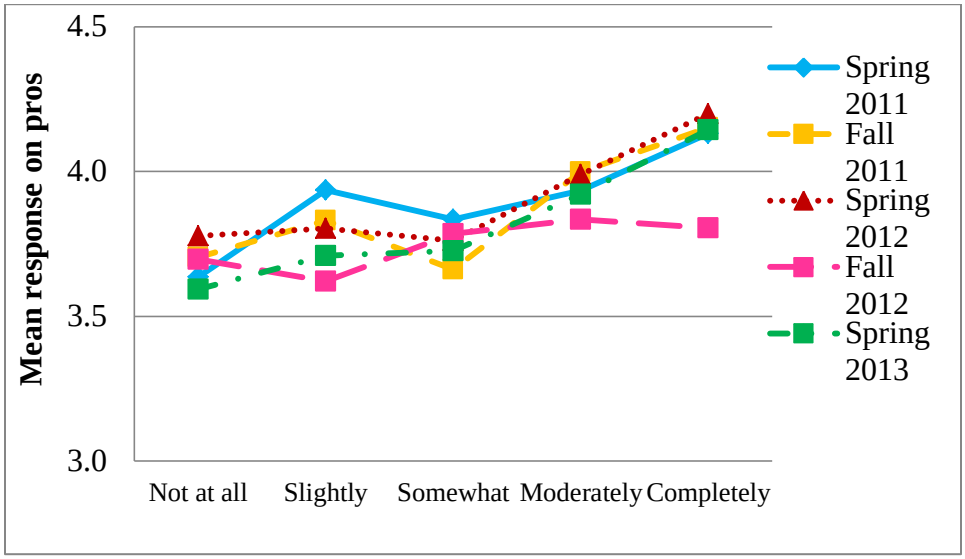

Figure 5.8 Mean pros scale by amount of training

Training	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Not at all	295 3.64 (0.87)	272 3.7 (0.85)	247 3.78 (0.85)	127 3.7 (0.75)	184 3.59 (0.86)
Slightly	46 3.94 (0.64)	54 3.83 (0.66)	51 3.8 (0.75)	23 3.62 (0.79)	43 3.71 (0.68)
Somewhat	54 3.83 (0.75)	58 3.66 (0.71)	63 3.76 (0.82)	28 3.79 (0.78)	56 3.73 (0.75)
Moderately	41 3.94 (0.67)	60 4 (0.61)	88 3.99 (0.77)	47 3.84 (0.67)	70 3.92 (0.58)
Completely	24 4.13 (0.67)	44 4.15 (0.58)	55 4.2 (0.85)	20 3.81 (0.56)	42 4.14 (0.64)
Total	460 3.74 (0.82)	488 3.79 (0.78)	504 3.86 (0.83)	245 3.74 (0.73)	395 3.74 (0.78)

Table 5.22. Descriptive analysis of pros by training

Training	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Not at all	295 3.54 (0.71)	272 3.52 (0.78)	247 3.75 (0.83)	127 3.48 (0.76)	184 3.47 (0.83)
Slightly	46 3.56 (0.76)	54 3.57 (0.66)	51 3.49 (0.93)	23 3.43 (0.72)	43 3.51 (0.65)
Somewhat	54 3.34 (0.75)	58 3.51 (0.71)	63 3.68 (0.76)	28 3.41 (0.87)	56 3.56 (0.60)
Moderately	41 3.42 (0.8)	60 3.59 (0.74)	88 3.6 (0.79)	47 3.44 (0.653)	70 3.39 (0.71)
Completely	24 3.35 (0.94)	44 3.42 (0.95)	55 3.44 (0.83)	20 3.6 (0.82)	42 3.56 (0.78)
Total	460 3.5 (0.74)	488 3.52 (0.77)	504 3.66 (0.83)	245 3.47 (0.75)	395 3.48 (0.75)

Table 5.23. Descriptive analysis of cons by training

In conclusion, stage of change and self-efficacy are different for employees with different supervisory controls. Length of service showed significant impact on self-efficacy of employees. Employees who provide direct patient care are different on their stage of change compared to employees who work in support services. Employees who are less than 50 and more than 50 years showed significant difference on self-efficacy of employees. Training showed significant impact on SOC, self-efficacy of employees. Decisional Balance is not impacted by any of the demographics tested in the study.

CHAPTER 6

LONGITUDINAL ANALYSIS

This chapter discusses the results of the survey items over time to compare the change happening in the organization. All of the longitudinal analysis was conducted using the first and the last time point surveys from spring 2011 and spring 2013.

Longitudinal analysis of sub-scales

A repeated measures ANOVA on SOC with an assumption of sphericity determined that the variance between means for stage of change is not statistically different between different time points with F (4, 976) = 0.987, p = 0.414. Analysis between spring 2011 and spring 2013 data is statistically different (F (1, 394) = 4.112, p = 0.04) with higher mean SOC in spring 2013 which says that a large number of employees are moving from left to right in the stages of change. The number of respondents in pre-contemplation saw a 21.47% percentage decrease between spring 2011 and spring 2013 and there was a 22.71% increase on maintenance stage. The mean plot of stage of change for all five surveys is shown in figure 6.1 with the highest mean in fall 2012.

Repeated measures ANOVA between time points on self-efficacy violates the assumption of sphericity which says that the variances of the differences between time points are not equal. The Greenhouse-Geisser test shows that the mean self-efficacy is statistically different between time points with F (3.274, 798.913) = 30.986, p <0.001.

Follow up post-hoc tests show that mean self-efficacy at fall 2012 is statistically different to self-efficacy at other times.

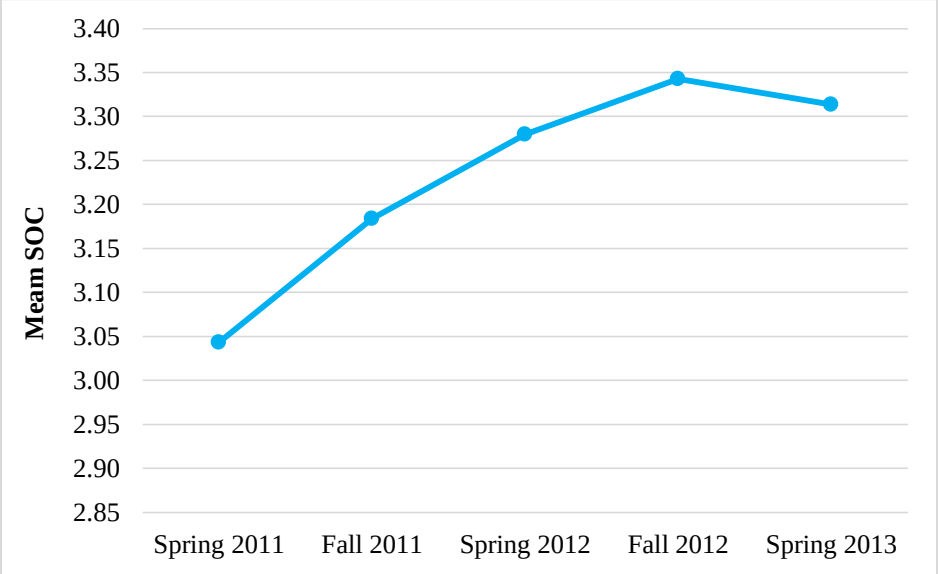

Figure 6.1. Mean plot of Stage of Change

Analysis between spring 2011 and spring 2013 data on self-efficacy is statistically different ($F(1, 394) = 364.966$, $p<0.001$) with lower mean self-efficacy in spring 2013. The mean plot of self-efficacy for all surveys is shown in figure 6.2. The employees' confidence to participate in systems improvement initiatives increased slightly between spring 2011 to spring 2012 and later decreased over time. The decrease in self-efficacy over time means that the confidence to take part in improvement initiatives has reduced. This means that employees are more influenced by external factors to continue to be involved in improvement initiatives than their self-confidence. This can be due to a lot of factors like immediate supervisor or co-worker(s) support, inadequate training, or failure to assess the personal benefits of being a participant.

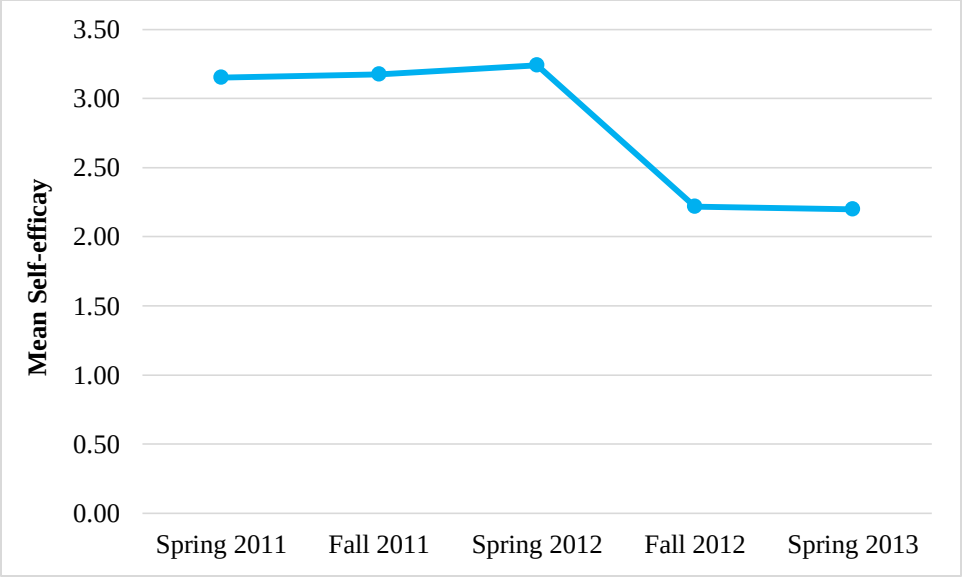

Figure 6.2. Mean plot of self- efficacy over time

Repeated measures ANOVA on pros with assumed sphericity is statistically different between time points with F (4, 976) = 2.495, p =0.04. Post-hoc test reveals that mean pros from fall 2011 is significantly different from other time points. ANOVA between spring 2011 and spring 2013 data on pros is not statistically different (F (1, 394) = 0.010, p=0.919) with higher pros in spring 2013. Repeated measures ANOVA on cons scale with sphericity assumed gives a non-significant F (4, 976) = 1.052 p =0.379 which says that mean cons is not statistically different between different time points. ANOVA between spring 2011 and spring 2013 cons is not statistically different (F (1, 394) = 0.004, p=0.948) with lower cons in spring 2013. The mean plot of pros and cons is shown in figure 6.3. Overall the perception about pros remained the same and cons have decreased with time.

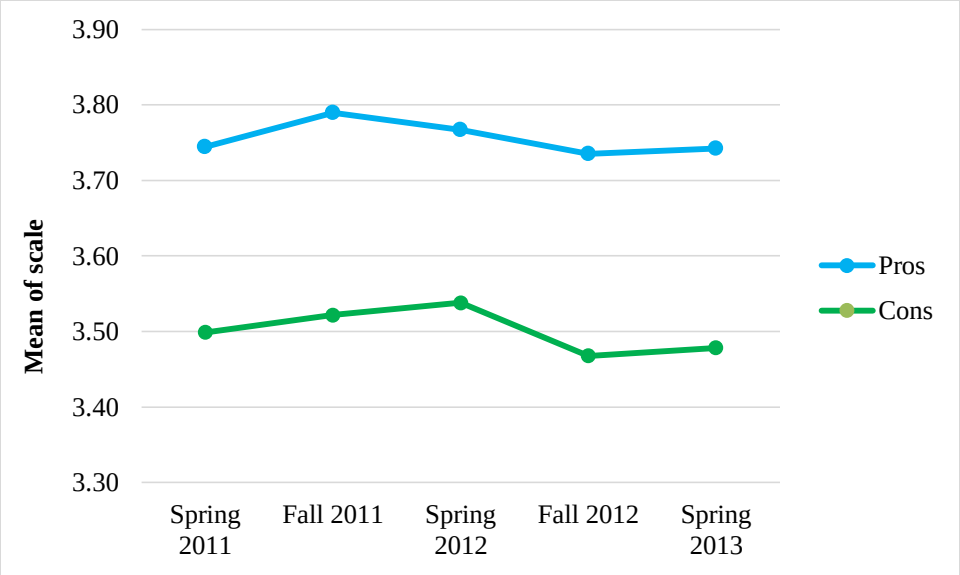

Figure 6.3. Mean plot of pros and cons over time

Longitudinal analysis of trainings and involvement

ANOVA on 'I have been trained on systems improvement initiatives' question between spring 2011 and spring 2013 is statistically different ($F(1, 394) = 31.385$, $p<0.001$) with higher mean trainings in spring 2013. The question on 'I have been using tools' questions shows higher mean in spring 2013 and is significant between spring 2011 and spring 2013 ($F(1, 394) = 23.580$, $p<0.001$). ANOVA for question 'I have been involved in projects' question between spring 2011 and spring 2013 is ($F(1, 394) = 4.797$, $p=0.029$) is significant with higher mean in spring 2013. The question 'I have incorporated continuous improvement in everyday activities' question ($F(1, 394) = 0.260$, $p=0.610$) is not statistically significant with a slightly higher mean in spring 2013. The mean plots of the four questions about training and involvement in improvement initiatives for all surveys are shown in figure 6.4.

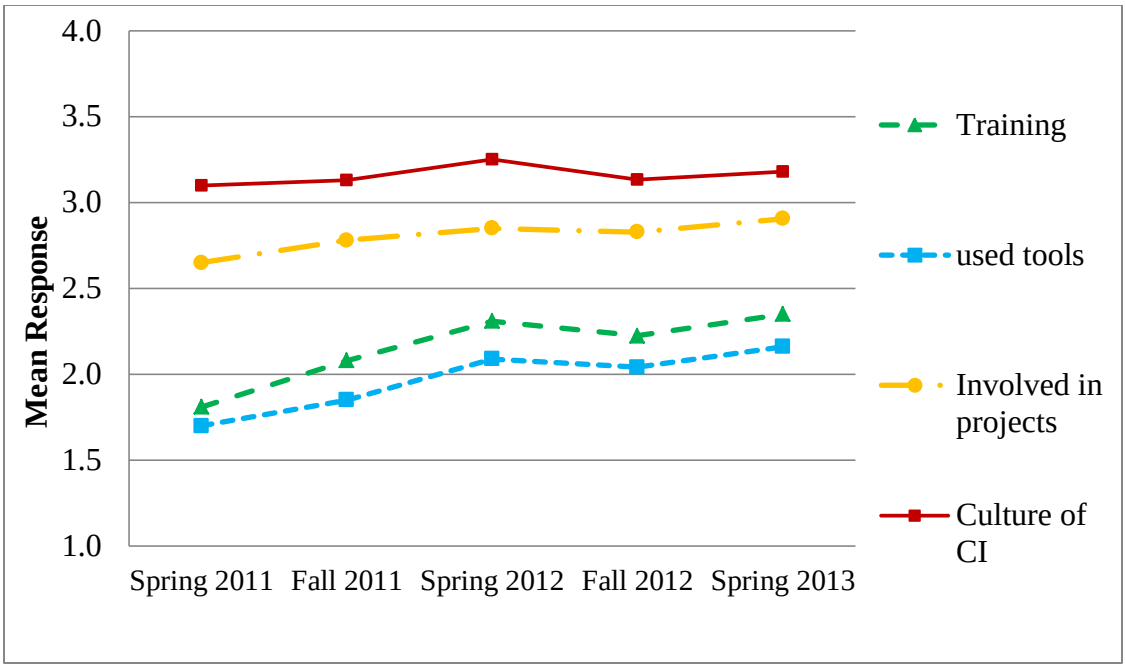

Figure 6.4. Mean plot of training and involvement in improvement initiatives questions over time

Longitudinal analysis of individual items

Since the processes of change scale has not shown the required validity, the scale is not used in longitudinal analysis. Instead, individual items that were part of both the spring 2011 and spring 2013 surveys were selected to analyze how they changed over time. T-tests were done to check if there is a significant difference between the mean responses over time. The means, t-scores and *p*-values for the items are shown in table 6.1. The question 'Successful projects are shared and recognized' showed significant difference between the two time points with a higher mean in spring 2013, which says that organization had moved in a positive direction of recognizing success that might motivate other employees to take active involvement in process improvement projects. The mean for the question 'New practices and ways of doing business are encouraged in

my work group' is significantly higher in spring 2013 which shows that managers are empowering their employees by providing freedom to rethink processes and implement changes. The question 'Facility leadership provides time for employees to work on systems improvement' is significant with a higher mean in the later survey showing that leadership is providing dedicated time apart from regular job duties to work on process improvement projects. This helps to reduce stress on employees and motivates more employees to be involved in improvement initiatives which creates a culture of continuous improvement. The question 'I see benefits for employees who become involved in systems improvement activities' is significant with a higher mean in spring 2013 which shows employees are recognizing the benefits of adopting improvement methodologies like reduced stress due to better processes or leadership recognition.

	Spring 2011	Spring 2013	t-scores	*p*-value
My supervisor has helped me to rethink the way I do things	3.37	3.35	0.134	0.894
My immediate supervisor (s) is knowledgeable about techniques for quality improvement	3.61	3.61	-0.045	0.964
Facility leaders are strongly committed systems improvement	3.36	3.46	-1.373	0.170
My immediate supervisor (s) establishes forums for and provides time and resources for participating in quality improvement activities	3.31	3.37	-0.677	0.498
My work group is ready to adopt new ideas from other work groups, if found successful	3.54	3.56	-0.314	0.754
In this work group people value the work of quality improvement teams	3.53	3.55	-0.171	0.864
In this work group there is time to relect on how well our processes work for providing patient care	3.20	3.32	-1.732	0.084
People treat each other with respect in my work group	3.50	3.60	-1.315	0.189
A spirit of cooperation and team work exists in my work group	3.49	3.57	-0.972	0.332
Until there is a situation of emergency, nothing is changed or improved	3.22	3.17	0.764	0.446
Changes are made without talking to people involved in those processes	2.84	2.83	0.193	0.847
Successful projects are shared and recognized	3.36	3.50	-2.120	0.035
I have adequate information regarding the improvement projects in my work group	3.19	3.29	-1.529	0.127
I understand how systems improvement can benefit patient care	3.97	3.91	0.907	0.365
I am given a real opportunity to develop my skills in my work group	3.55	3.51	0.584	0.559
I am willing to change the way I work, if it improves the outcomes	4.21	4.16	1.021	0.308
Employee ideas should be shared with supervisors to help improve the work	4.24	4.22	0.295	0.768
Systems improvement is important for this facility to cost effectively serve veterans	4.22	4.11	1.905	0.058
I am comfortable with the way that I accomplish my daily tasks	3.88	3.84	0.680	0.497
New practices and ways of doing business are encouraged in my work group	3.39	3.58	-2.470	0.014

Facility leadership provides time for employees to work on systems improvement	3.01	3.17	-2.009	0.045
I see benefits for employees who become involved in systems improvement activities	3.20	3.38	-2.272	0.024
My work group needs to preserve and stretch its available resources to accomplish tasks	2.23	2.32	-1.150	0.251
How satisfied are you with the cooperation your supervisor provides for improvement projects	3.65	3.70	-0.673	0.501
How satisfied are you with the cooperation your fellow employees provides for improvement projects	3.55	3.52	0.465	0.642
How satisfied with the amount of recognition an employee receives	3.05	3.13	-1.034	0.302

Table 6.1. Individual item comparisions between spring 2011 and spring 2013

Longitudinal analysis showed significant difference on stage of change and self-efficacy between spring 2011 and spring 2013 with higher stage of change in spring 2013 and higher self-efficacy in spring 2011. Though, pros and cons between spring 2011 and sprong 2013 are not significantly differernt , the mean of pros increased and cons decreased as time progressed.

CHAPTER 7

CONCLUSIONS

This is the first study to develop and validate stage of change, decisional balance and self-efficacy TTM measures for measuring change in healthcare organizations due to adopting process improvement principles from other sectors. Exploratory factor analyses for the decisional balance and self-efficacy scales showed factor structures consistent with other TTM studies and indicated good model fit. The scales showed good internal validity and acceptable external validity. The measures demonstrated good breadth of content, reliability, and validity. This study helped initial development and validation for the stage of change, decisional balance and self-efficacy measures to measure change in healthcare organizations trying to adopt process improvement methodologies from other sectors. With further development these scales may be beneficial for developing training and support strategies in healthcare organizations to help adopt improvement methodologies. The TTM theory was developed and has been applied to help understand individual behavior change, but recently, the model has been applied to measure organizational change like measuring physician readiness for continuous quality improvement and advancement of women faculty in STEM disciplines. The results from these studies showed support for the application of the TTM to organizational change.

Training and involvement in projects

Repeated measures ANOVA on the question about training and using process improvement tools showed significant increase in mean which says that more employees received training on process improvement methodologies over the duration of the study.

ANOVA on getting involved in improvement projects and incorporating everyday improvement have not significantly changed over time which shows that employees who were trained are not all using those skills to work on improvement projects. Aspects like training schedules, project start dates, and number of projects that the organization can support may be out of control, but encouraging employees by providing dedicated time to get involved in improvement projects may generate positive results. In all of the surveys, the pre-contemplation and contemplation stages varied significantly with action and maintenance stages on the amount of training received. Involvement in projects and incorporating continuous improvement in everyday work varied significantly between all stages of change. A positive correlation was found between employees' stage of change and the amount of training received and involvement in improvement projects which validates the stage of change responses. From this, it can be concluded that the distribution of stages is a true reflection of the state of the organization.

Stage of Change

The stage of change measure for assessing cultural change in the healthcare organization was based on the traditional individual behavior application of TTM using 6 months as the timeframe between stages. The SOC responses plotted followed a bath-tub pattern in all of the surveys with the majority of the respondents categorizing themselves as in either the pre-contemplation or maintenance stages. The overall shift was positive between stages as time progressed but the percentage of respondents in the pre-contemplation and action stages was lowered as time progressed. Management should take action to not lose employees who said they want to be involved in improvement activities by providing the right kind of motivation and finding strategies to sustain the

employees who were already involved in improvement initiatives. This can be done by continuously promoting improvement methodologies, providing dedicated time to get involved in improvement initiatives and recognizing teams that were successful.

Self-Efficacy

Self-efficacy for readiness to get involved in process improvement activities produced a single factor construct in all of the surveys. These results are consistent with the findings from previous TTM studies where self-efficacy varied across stages (Velicer et al., 1990). Confidence to get involved in improvement activities was lower for respondents in the earlier stages of change and higher for those in the later stages. These results support the use of this measure for assessing self-efficacy in employees and also support the need to increase confidence to get involved in process improvement and the need for providing trainings to increase confidence in employees. The mean self-efficacy for the organization increased between spring 2011 and spring 2012 and later decreased. This shows the need for continuous support for employees until a stable condition is reached in the change process.

Decisional Balance

In the study the exploratory analyses provided a two factor uncorrelated decisional balance scale with 8 items on the pros scale and 8 items on the cons scale, which is similar to previous TTM studies. Both the pros and cons scales showed good internal consistency in all of the surveys and both scales were nearly orthogonal. The uncorrelated model shows that the respondents discriminated between benefits and barriers of getting involved in process improvement methodologies. A MANOVA test conducted on pros and cons scales revealed that individuals in various stages of change

differed significantly in their discrimination of pros and cons for getting involved in process improvement initiatives. The respondents in pre-contemplation and contemplation stages rated cons as more important than pros for their decision to get involved in process improvement initiatives, while respondents in the maintenance stage showed an opposite pattern. The variance between stages of change of getting involved in process improvement initiatives accounted for variability of between 7% and 13% for pros and between 1% and 4% for cons, which is consistent with previous TTM studies (Velicer et al., 1999) and supports the external validity of the decisional balance scale. Overall, the mean of pros and cons slightly reduced with time while the mean difference between pros and cons stayed the same at all time points.

Hypothesis 1

As hypothesized, employees in a supervisory role are more inclined to adopt process improvement initiatives than employees without any suoervisory control. ANOVA's on stage of change and self-efficacy by supervisory level showed significant difference on employees with no supervisory control compared to their managers and executives. This shows that employees who have supervisory control have more confidence to adopt new methodologies as they will have easy access to tranings and new information with less hierarchical process to get approval for involvement. The perception of pros and cons have not changed significantly between employees with different supervisory control and also showed similar pattern in all surveys.

Hypothesis 2

Hypothesis 2 is that employees with longer length of service at the organization are less inclined to adopt process improvement initiatives than employees with shorter length of service. ANOVA's on stage of change and self-efficacy by length of service showed a significant difference for employees with longer lengths of service compared to employees with less service with means increasing with length of service. Though there is difference between employees based on their length of service, we reject the hypothesis. This could be due to employees who are new to the organization might not be aware of the available resources to be involved in trainings and projects and might be busy with learning how to get the day to day activities done. The perception of pros and cons have not changed significantly between employees with different lengths of service and showed similar pattern in all five surveys.

Hypothesis 3

Hypothesis 3 is that employees who are older in age are less inclined towards adopting process improvement initiatives compared to younger employees. The ANOVA's conducted for employee groups who are less than 50 years and more than 50 years on stage of change, pros and cons by age are not significant, showing that there is no difference between employees age groups. Self-efficacy showed significant difference between the two age groups and employees who are older than 50 years showed much more confidence to participate in improvement initiatives compared to the other group.

Hypothesis 4

Hypothesis 4 is that employees who are in different work groups adopt improvement methodologies differently. ANOVA's on stage of change by work group

showed significant difference between employees who are working in direct patient care work groups compared to employees who are working in support services, with a higher stage of change for employees who are in patient care groups. ANOVA's on self-efficacy, or pros and cons by work group are not significant showing no difference on their adoption rate. This may be due to the fact that employees in direct patient care groups may be employees with higher education compared to employees in support services. Also, many of the support services which includes food services and housekeeping may have part time employees which provides less opportunity to be be involved in trainings.

Hypothesis 5

Hypothesis 5 states that employees who receive more amount of training exhibit more positive attitides towards culture of continuous improvement. ANOVA's on stage of change, self-efficacy and pros by training showed significant difference between employees who received complete training compared to who have not been trained. Employees who have been trained showed higher means on their SOC, confidence and perception of pros. ANOVA's on cons are not significant showing no difference between employees who got trained and who have not.

Limitations and Future work

Using a single model of change is not optimal to effectively capture the different traits of organizational cultural change. Also, literature shows that surveys are not the

best tools to use to measure culture, even though they are used beacause of their cost effectiveness. The self reporting nature of the surveys results in biased responses based on employees perception of questions and the things happening around them while responding to the survey. There is no external standard to compare the results except training records of employees which helps validate the stages of change. The medical center or the research team have not provided any incentives for taking part in the survey and also, there are other surveys that were admistered at the same time in fall 2012 and spring 2013 which caused the lower response rates and more missing values towards the end of the survey. Though processes of change were included in the research this study could not establish a proper factor structure for the items. Future research is needed to refine current items in processses of change to establish proper factor structure for processes of change. This would also help understand the behaviors necessary for healthcare workers to adopt process improvement initiatives and continue practicing them so as to move through various stages of change. That would help develop a complete TTM model to measure organizational culture in healthcare organizations.

Recommendations

The Providence VA Medical Center has made significant improvement in the journey towards creating a culture of continuous improvement. The leadership showed their support by creating a systems redesign department and providing resources for

trainings. Between spring 2011 and spring 2013 there is 6.7% decrease in number of employees who are not involved and do not plan to be involved and an increase of 7.7% of employees who report sustained involvement. Results also showed that front line employees are low on their stage of change and have less confidence to be involved in improvement initiatives. Leadership should focus on providing protected time for front line staff to get involved in trainings and improvement projects, which helps develop more confidence in getting involved in continuous improvement. Also, leadership should think of including improvement methodology training in new employee orientation which helps communicate the focus and direction of the organization to the new employees helping them to get more involved in trainings when opportunity comes. Analysis of workgroups shows that employees who are involved in direct patient care are more involved in improvement initiatives compared to employees in support services, so recommendations would be to target employees in support services like logistics, housekeeping, and business units supporting the medical center.

APPENDICES

APPENDIX A: Research time plan:

Activity	Timeline
Understanding the systems redesign and improvement grant of PVAMC	May 2010
Developing surveys	May - Dec 2010
Preparing and getting IRB and R&D approvals at PVAMC and URI	June 2010-Jan 2011
Survey 1	February 2011 (along with AES 2011)
Factor analysis, testing validity and reliability of survey items	June 2011
Analyze survey data and report to management	July 2011
Survey 2	Oct 2011
Analyze survey data and report to management	Jan 2012
Survey 3	April 2012 (along with AES 2012)
Analyze survey data and report to management	July 2012
Survey 4	Oct 2012
Analyze survey data and report to management	Jan 2013
Survey 5	April 2013 (along with AES 2013)
Final report to PVAMC management	August 2013

APPENDIX B: VA Improvement Capability Grant Proposal

Providence Veterans Affairs Medical Center
Veterans Health Administration

Developing a Culture of Continuous Improvement

_____

System Redesign Capability Grant Proposal FY 2010

_____

"If there's a good idea whose time has come, we must act on it quickly, and 'make it happen.'"
Secretary Eric K. Shinseki

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APPENDIX C: Initial survey developed and sent in spring 2011

Assessing Climate for Systems Improvement Initiatives in Healthcare

Providence VA Medical Center, 830 Chalkstone Avenue, Providence, RI 02908
Department of Mechanical, Industrial and Systems Engineering, University of Rhode Island, 203 Wales Hall, Kingston RI 02881
Project Title: **Assessing Climate for Systems Improvement Initiatives in Healthcare**

DISCLOSURE FORM FOR RESEARCH

You are invited to take part in a study that deals with climate change and systems improvement initiatives in different healthcare settings. If you have questions please contact Associate Professor Valerie Maier-Speredelozzi at 401-874-5187. You must be at least 18 years old to take part in this research project.

What will be done: If you decide to take part in this study, you will be asked to complete surveys for research purposes approximately twice per year through the year 2013, in addition to the annual All Employees Survey. Each survey about systems improvement initiatives and workplace climate should take approximately 15-20 minutes.

Risks or discomfort, and decision to quit at any time: There is not any foreseeable risk or discomfort associated with the study. The decision to take part in this study is entirely voluntary and your employer will not know what you decide. Your responses will not be reported with your name or any identifying information other than your workgroup code. Combinations of demographic groups with less than 10 employees will not be identified. You may skip any question. If you decide not to take part in the study, you may quit at any time.

Benefits of this study: Although there is no direct benefit to you for taking part in this study, the researcher may learn more about the ways that different hospital departments implement system redesign and problems that can occur. Thus, the research findings will benefit the hospital in general and may help to improve processes and patient care.

Confidentiality: Your participation in this study is confidential. None of the information will identify you by name. The researchers will not be able to access your email or IP address in Survey Monkey. You are encouraged to read the privacy agreement of Survey Monkey before participating. Data will be analyzed and kept on password protected computers in locked offices at the University of Rhode Island and in restricted folders at Providence VA Medical Center that are only accessible to the project investigators. Data will only be reported in aggregate, and any groups with less than 10 respondents will not be reported.

Rights and Complaints: If you are not satisfied with the way this study is performed, you may discuss your concerns with Associate Professor Valerie Maier-Speredelozzi at 401-874-5187, anonymously, if you choose. In addition, you may contact the office of the Vice President for Research, 70 Lower College Road, Suite 2, University of Rhode Island, Kingston, Rhode Island, telephone: (401) 874-4328, or you may contact the VA Research Office at 401-273-7100 ext. 3066.

If you have read and understand this consent form, and now agree to participate in this study, please indicate your consent by clicking the button below to begin the survey.

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APPENDIX D

DISCLOSURE FORM

Prov*idence VA Medical Center, 830 C*halkstone Avenue, Providence, RI 02908

Department of Mechanical, Industrial and Systems Engineering,

University of Rhode Island, 203 Wales Hall, Kingston RI 02881

Project Title: Assessing Climate for Systems Improvement Initiatives in Healthcare

DISCLOSURE FORM FOR RESEARCH

Description of the project: You are invited to take part in a study that deals with climate change and systems improvement initiatives in different healthcare settings. If you have questions please contact Associate Professor Valerie Maier-Speredelozzi at 401-874-5187. You must be at least 18 years old to take part in this research project.

What will be done: If you decide to take part in this study, you will be asked to complete surveys for research purposes approximately twice per year through the year 2013, in addition to the annual All Employees Survey. Each survey about systems improvement initiatives and workplace climate should take approximately 30 minutes.

Risks or discomfort, and decision to quit at any time: There is not any foreseeable risk or discomfort associated with the study. The decision to take part in this study is entirely voluntary and your employer will not know what you decide. Your responses will not be reported with your name or any identifying information other than your workgroup code.

Combinations of demographic groups with less than 10 employees will not be identified. You may skip any question. If you decide to take part in the study, you may quit at any time.

Benefits of this study: Although there is no direct benefit to you for taking part in this study, the researcher may learn more about the ways that different hospital departments implement system redesign and problems that can occur. Thus, the research findings will benefit the hospital in general and may help to improve processes and patient care.

Confidentiality: Your participation in this study is confidential. None of the information will identify you by name. The researchers will not be able to access your email or IP address in Survey Monkey. You are encouraged to read the privacy agreement of Survey Monkey before participating. Data will be analyzed and kept on password protected computers in locked offices at the University of Rhode Island and in restricted folders at Providence VA Medical Center that are only accessible to the project investigators. Data will only be reported in aggregate, and any groups with less than 10 respondents will not be reported.

Rights and Complaints: If you are not satisfied with the way this study is performed, you may discuss your concerns with Associate Professor Valerie Maier-Speredelozzi at 401-874-5187, anonymously, if you choose. In addition, you may contact the office of the Vice President for Research, 70 Lower College Road, Suite 2, University of Rhode

Island, Kingston, Rhode Island, telephone: (401) 874-4328, or you may contact the VA Research Office at 401-273-7100 ext. 3066.

If you have read and understand this consent form, and now agree to participate in this study, please indicate your consent by clicking the button below to begin the survey.

If you prefer to complete the survey on paper, please print the attached file or call 401-874-5187 to request a paper copy. All completed surveys should be placed in a sealed envelope, marked "Systems Improvement Survey" and sent to mail code 00-SRC.

APPENDIX E Table 1 Frequencies of the demographics from spring 2011

Shift			
	Frequency	Percent	Cumulative Percent
Day	429	93.3	93.3
Evening	21	4.6	97.8
Night	10	2.2	100
Total	460	100	
Age			
	Frequency	Percent	Cumulative Percent
less than 20	3	0.7	0.7
20-39	31	6.7	7.4
30-39	92	20	27.4
40-49	104	22.6	50
50-59	153	33.3	83.3
60 or older	77	16.7	100
Total	460	100	
Length of service			
	Frequency	Percent	Cumulative Percent
Less than 6 months	30	6.5	6.5
six months to one year	30	6.5	13
one to three years	132	28.7	41.7
four to five years	61	13.3	55
six to ten years	88	19.1	74.1
11 to 20 years	60	13	87.2
more than 20 years	59	12.8	100
Total	460	100	
Supervisory level			
	Frequency	Percent	Cumulative Percent
None	322	70	70
Team leader	50	10.9	80.9
First line supervisor	46	10	90.9
Manager	30	6.5	97.4
Executive	12	2.6	100
Total	460	100	

Shift			
	Frequency	Percent	Cumulative Percent
Day	452	92.4	92.4
Evening	24	4.9	97.3
Night	13	2.7	100.0
Total	489	100.0	
Age			
	Frequency	Percent	Cumulative Percent
Less than 20	1	.2	.2
20-29	29	5.9	6.1
30-39	87	17.8	23.9
40-49	127	26.0	49.9
50-59	159	32.5	82.4
60 or older	86	17.6	100.0
Total	489	100.0	
Length of Service			
	Frequency	Percent	Cumulative Percent
Less than 6 months	25	5.1	5.1
Six months to one year	31	6.3	11.5
One to two years	48	9.8	21.3
Two to five years	155	31.7	53.0
Five to ten years	104	21.3	74.2
10 to 15 years	37	7.6	81.8
15 to 20 years	27	5.5	87.3
More than 20 years	62	12.7	100.0
Total	489	100.0	
Supervisory Level			
	Frequency	Percent	Cumulative Percent
None	355	72.6	72.6
Team leader	42	8.6	81.2
First line supervisor	43	8.8	90.0
Manager	40	8.2	98.2
Executive	9	1.8	100.0
Total	489	100.0	

Table 2. Frequencies of the demographics from fall 2011 survey

Shift			
	Frequency	Percent	Cumulative Percent
Day	467	92.7	92.7
Evening	23	4.6	97.2
Night	14	2.8	100.0
Total	504	100.0	
Age			
	Frequency	Percent	Cumulative Percent
Less than 20	5	1.0	1.0
20-29	33	6.5	7.5
30-39	78	15.5	23.0
40-49	121	24.0	47.0
50-59	169	33.5	80.6
60 or older	98	19.4	100.0
Total	504	100.0	
Length of Service			
	Frequency	Percent	Cumulative Percent
Less than 6 months	24	4.8	4.8
Six months to one year	26	5.2	9.9
One to two years	49	9.7	19.6
Two to five years	148	29.4	49.0
Five to ten years	97	19.2	68.3
10 to 15 years	57	11.3	79.6
15 to 20 years	27	5.4	84.9
More than 20 years	76	15.1	100.0
Total	504	100.0	
Supervisory Level			
	Frequency	Percent	Cumulative Percent
None	346	68.7	68.7
Team leader	60	11.9	80.6
First line supervisor	49	9.7	90.3
Manager	37	7.3	97.6
Executive	12	2.4	100.0

Table 3. Frequencies of the demographics from spring 2012 survey

Shift			
	Frequency	Percent	Cumulative Percent
Day	226	92.2	92.2
Evening	9	3.7	95.9
Night	10	4.1	100.0
Total	245	100.0	
Age			
	Frequency	Percent	Cumulative Percent
Less than 20	1	.4	.4
20-29	13	5.3	5.7
30-39	49	20.0	25.7
40-49	60	24.5	50.2
50-59	79	32.2	82.4
60 or older	43	17.6	100.0
Total	245	100.0	
Length of service			
	Frequency	Percent	Cumulative Percent
Less than 6 months	13	5.3	5.3
six months to one year	7	2.9	8.2
one to three years	55	22.4	30.6
four to five years	44	18.0	48.6
six to ten years	55	22.4	71.0
11 to 20 years	39	15.9	86.9
more than 20 years	32	13.1	100.0
Total	245	100.0	
Supervisory level			
	Frequency	Percent	Cumulative Percent
None	169	69.0	69.0
Team leader	24	9.8	78.8
First line supervisor	22	9.0	87.8
Manager	23	9.4	97.1
Executive	7	2.9	100.0
Total	245	100.0	

Table 4. Frequencies of the demographics from fall 2012 survey

Shift			
	Frequency	Percent	Cumulative Percent
Day	364	92.2	92.2
Evening	20	5.1	97.2
Night	11	2.8	100.0
Total	395	100.0	
Age			
	Frequency	Percent	Cumulative Percent
20-29	27	6.8	6.8
30-39	81	20.5	27.3
40-49	82	20.8	48.1
50-59	132	33.4	81.5
60 or older	73	18.5	100.0
Total	395	100.0	
Length of service			
	Frequency	Percent	Cumulative Percent
Less than six months	15	3.8	3.8
Six months to one year	34	8.6	12.4
One to two years	33	8.4	20.8
Two to five years	110	27.8	48.6
Five to ten years	88	22.3	70.9
10 to 15 years	39	9.9	80.8
15 to 20 years	21	5.3	86.1
More than 20 years	55	13.9	100.0
Total	395	100.0	
Supervisory level			
	Frequency	Percent	Cumulative Percent
None	292	73.9	73.9
Team leader	30	7.6	81.5
First line supervisor	28	7.1	88.6
Manager	37	9.4	98.0
Executive	8	2.0	100.0
Total	395	100.0	

Table 5. Frequencies of the demographics from spring 2013 survey

BIBLIOGRAPHY

1. Armstrong, D.; Reyburn, H. and Jones, R. (1996). "A study of general practitioners' reasons for changing their prescribing behavior". *BMJ: British Medical Journal,* Vol. 312, No. 7036, pp. 949-952.
2. Ashkanasy, N. M; Broadfoot, L. E. and Falkus, S. (2000) Questionnaire Measures of Organizational Culture In Ashkanasy, N. M.; Wilderom, C. P.M. and Peterson, M. F. (Eds.), (pp. 131-145) Handbook of *Organizational Culture and Climate*. CA: Sage Publications.
3. Balle, M; Regnier, A. (2007). "Lean as a learning system in a hospital ward" *Leadership in Health Services*, Vol. 20 No. 1, pp. 33-41
4. Barker, R.T. and Barker, S.B. (1996). "An Alderian approach to managing organizational change". *Individual Psychology: Journal of Adlerian Theory, Research and Practice,* Vol. 52 No.2, pp.181-192.
5. Brandao de Souza, Luciano (2009). "Trends and approaches in lean healthcare" *Leadership in Health Services,* Vol. 22 No. 2, pp. 121-139.
6. Brewer, E. and Shapard, L. (2004). "Employee Burnout: A Meta-analysis of the Relationship Between Age or Years of Experience". *Human Resource Development Review,* Vol. 3 No.2, pp.102-123.
7. Carmines, E.G. and Zeller, R. A. (1979). R*eliability and validity assessment.* Sage University Paper Series on Quantitative applications in the Social Sciences, 07-04. Newbury Park, CA: Sage.

8. Charns, Martin, Phone call to Dr. Martin Charns, Director, COLMR, Department of Veterans Affairs, and Professor, Boston University School of Public Health, Massachusetts. August 2011.
9. Chatman, J.A. and Flynn, F. (2001). "The influence of demographic heterogeneity on the emergence and consequences of cooperative norms in work teams" *Academy of Management Journal*, Vol.44, pp.956-974.
10. Chatman, J. A. and Jehn, K. A. (1994). "Assessing the relationship between industry characteristics and organizational culture: How different can you be? "*Academy of Management Journal.* Vol.37 No. 3, pp.522-533.
11. Chen, G.M. and Starosta, W.J. (2000). "The Development and Validation of the Intercultural Sensitivity Scale". *Human Communication*, Vol. 3 No.1, pp.1-14.
12. Community Medical Center, 2004, *A3 Reports: Tools for Process Improvement*, a report of the Community Medical Center, Missoula, MT
13. Cooke, R.A. and Lafferty, J.C. (1987). "The Organizational Culture Inventory". Plymouth:MI. Human Synergistics International.
14. Cooper, R.F.; Mohabeersingh, C. (2008). "Lean thinking in a healthcare system-innovative roles" *Journal of Pre-Clinical and Clinical Research*, Vol. 2 No. 2, pp. 110-117
15. Crocker, L. and Algina, J. (1986). *Introduction to classical and modern test theory*. Wadsworth Publishing; 1st edition.

16. De Koning, H; Verver, J.P.S; Van den Heuvel, J; Bisgaard, S; Does R. J. M. M (2006). "Lean Six sigma in Healthcare" *Journal for Healthcare Quality*, Vol. 28, No.2, pp. 4-11
17. Detert, J. R. and Schroeder, R. G. (2000). "A Framework for Linking Culture and Improvement Initiatives in Organization" *Academy of Management Review*, Vol. 25, No. 4, pp. 850-863
18. Edelwich, J. and Brodsky, A. (1980). *Burnout: Stages of Disillusionment in the Helping Professions*. Human Sciences Press; 1st edition.
19. Gawande, A. (2009). The Cost Conumdrum: What a Texas town can teach us about health care. *The New Yorker*. June 1, 2009.
20. Golafshani, N. (2003). Understanding Reliability and Validity in Qualitative Research. *The Qualitative Report*, Vol. 8 No. 4, pp.597-607.
21. Gorsuch, R. L. (2003). Factor Analysis In Schinka, J. A.; Velicer, W. F. and Weiner, I. B. (Eds.) (pp. 143-164). Research Methods in Psychology. *Handbook of Psychology,* Vol. 2, NJ: John Wiley & Sons Inc.
22. Gowing, M. K., and Lancaster, A. R. (1996). Federal government surveys: Recent practices and future directions. In A. Kraut (Ed.), Organizational surveys: Tools for assessment and change (pp. 360-380). San Francisco: Jossey-Bass.
23. Graban, Mark "Lean Hospitals: Improving quality, patient safety and Employee satisfaction" 2008 New York: *CRC Press*

24. Hall K.L, and Rossi J.S. (2008). Meta-analytic examination of the strong and weak principles across 48 health behaviors. *Preventive Medicine,* Vol.46, No.3, pp.266–274.
25. Helms-Mills, J., Dye, K. Mills, A.J (2009): Understanding Organizational Change. New York: Routledge.
26. Helliwell P.S. (1996). "Comparison of a Community Clinic with a Hospital Out-patient Clinic in Rheumatology" *British Journal of Rheumatology*, 1996, Vol. 35, pp. 385-388
27. Heuvel, Jaap van den; Does, Ronald J.M.M.; Verver, John P.S. "Six Sigma in healthcare: lessons learned from a hospital" *International Journal of Six Sigma and Competitive Advantage,* Vol. 1, No. 4, pp: 380-388
28. Harlow, L.L (2005). "*The essence of Multivariate Thinking: Basic Themes and Methods*" Psychology Press.
29. Inceoglu, I. (2002). *Organizational Culture, Team Climate, Workplace Bullying and Team Effectiveness: An empirical study on their relationship.* Germany: Herbert Utz Verlag.
30. King, Diane L.; Ben-Tovim, David I.; Bassham, Jane (2006). "Redesigning emergency department patient flows: Application of Lean thinking to health care" *Emergency Medicine Australasia,* Vol. 18, pp. 391-397
31. Kollberg, Beata; Dahlgaard, J. Jens (2007)."Measuring lean initiatives in health care services: issues and findings" *International Journal of Productivity and Performance Management,* Vol. 56 No. 1, pp. 7-24

32. Kopelman, R. E.; Brief, A. P. and Guzzo, R. A. (1990). The role of climate and culture in productivity. In B. Schneider (Ed.), *Organizational climate and culture* (pp. 282-318). San Francisco: Jossey-Bass.
33. Latta, G. F. (2009). A process model of organizational change in cultural context (OC3 Model): The impact of organizational culture on leading change. *Journal of Leadership and Organizational Studies,* Vol. 16 No.1, pp.19-37.
34. Leiyu Shi, Douglas A. Singh (2009); *"Essentials of the U.S. Health Care System"* 2/E, Jones and Bartlett Publishers
35. Levesque, D.A.; Prochaska, J.O. and Prochaska, J.M. (1999). Stages of change and integrated service delivery. *Practice and Research,* Vol.51, pp.226-241.
36. Levesque, D.A.; Prochaska, J.O.; Prochaska, J.M.; Dewart, S.R.; Hamby, L.S. and Weeks, W.B. (2001). Organizational Stages and Processes of Change for Continuous Quality Improvement in Healthcare. *Consulting Psychology Journal: Practice and Research,* Vol.53, pp.139-153.
37. Liker, Jeffrey K. (2004) *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer.* New York: McGraw-Hill.
38. Little, R.J.A (1988). "A Test of Missing Completely at Random for Multivariate Data with Missing Values" *Journal of American Statistical Association,* Vol. 83 No. 404, pp. 1198-1202
39. Lukas, C. V.; Holmes, S. K.; Cohen, A. B.; Restuccia, J.; Cramer, I. E.; Shwartz, M. and Charns, M. P. (2007) Transformational change in health care systems: An organizational model. *Healthcare Management Review,* Vol.32 No.4, pp.309-320.

40. Mahon-Haft, T. A. and Dillman, D. A. (2010). Does Visual Appeal Matter? Effects of Web survey Aesthetics on Survey Quality. *Survey Research Methods*, Vol.4 No.1, pp.43-59.

41. Nagy, M.S. (2002). Using a single-item approach to measure facet job satisfaction. *Journal of Occupational and Organizational Psychology*, Vol. 75, pp.77-86.

42. Nunnally, J. C. and Bernstein, I. H. (1994). *Psychometric theory*. New York: McGraw-Hill, 3rd edition.

43. Ohno, T. (1998). *The Toyota Production System: Beyond Large Scale Production.* Productivity Press, Portland.

44. Osatuke, K.; Fishman, J., Moore, S. C. and Dyrenforth S. R. (2009) Relationship between Portrayals of VA Hospitals in the Media, and Employee and Patient Satisfaction: An Exploratory Analysis. Paper presented at the annual national conference of the American Association for Public Opinion Research, Hollywood, FL, May 15, 2009.

45. Ozcan, Yasar A. (2009). Quantitative methods in Healthcare Management: Techniques and Applications. San Francisco: Jossey-Bass; 2nd edition.

46. Palmieri, A.P.; Peterson, L.T.; Pesta, B.J.; Flit, M. A. and Saettone, D.M. (2010). Safety Culture as a Contemporary Healthcare Construct In Fottler, M.D.; Khatri, N.; Savage, G.T. (Eds.) (pp. 97-136). Strategic Human Resource Management in Health Care. *Advances in Health Care Management*, Vol. 9, NJ: Emerald Group Publishing Limited.

47. Pawley, D. and Flinchbaugh, J. (2006). The Current State: Progress Starts Here. *Manufacturing Engineering*. October, 2006. pp.71-81.

48. Pendlebury, D.A. (1996, January). Which psychology papers, places, and people have made a mark? APS Observer, pp.14–18.

49. Prochaska, J.M., Mauriello, L.M., Sherman, K.J., Harlow, L., Silver, B., Trubatch, J. (2006). Assessing Readiness for Advancing Women Scientists Using the Transtheoretical Model. *Sex Roles*, Vol.54, pp.869-880.

50. Prochaska, J.O., Crimi, P., Lapsanski, D., Mantel, L., Reid, P. (1982). Self-change processes, self-efficacy and self-concept in relapse and maintenance of cessation of smoking. *Psychological Reports* Vol.51, pp.983-990.

51. Prochaska, J.O. and DiClemente, C.C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Handbook of Eclectic Psychotherapy*, Newyork:Brunner/Mazel.

52. Prochaska, J.O. and DiClemente, C.C. (1986). The Transtheoretical Approach. *Journal of Consulting and Clinical Psychology*, Vol.51, pp.390-395.

53. Prochaska, J.O., Velicer, W.F., Rossi, J.S., Goldstein, M.G., Marcus, B., Rakowski, W., Fiore, C., Harlow, L.L., Redding, C.A., Rosenbloom, D., and Rossi, S.R. (1994). "Stages of change and decisional balance for 12 problem behaviors." *Health Psychology,*Vol.13, pp. 39-46

54. Prochaska, J.O., Velicer, W.F. (1997). "The Transtheoretical Model of health behavior change" *American Journal of Health Promotion*, Vol. 12, pp. 38–48

55. Prochaska, J., and Norcross, J. (2001). "Stages of Change" *Psychotherapy: Theory, Research, Practice, Training*, Vol. 38, No. 4, pp. 443-448.

56. Prochaska, J., and Norcross, J. (2006). Systems of psychotherapy: A transtheoretical analysis. Pacific Grove, CA: Thomson.

57. Rother, M. (2010). *Toyota Kata: Managing people for improvement, adaptiveness, and superior results*. Mc Graw Hill Companies.

58. Redding, C.A., Maddock, J.E. & Rossi, J.S. (2006). The Sequential Approach to Measurement of Health Behavior Constructs: Issues in Selecting and Developing Measures. *Californian Journal of Health Promotion*, Vol. 4, No.1, pp. 83-101.

59. Schafer, J.L (1997). *Analysis of Incomplete Multivariate Data*. Chapman and Hall, 1st edition.

60. Schafer, J.L. and Olsen, M.K. (1998). "Multiple imputation for multivariate missing-data problems: a data analyst's perspective". *Multivariate Behavioral Research*, Vol. 33, pp.545-571

61. Schein, E. (2004). *Organizational Culture and Leadership*. San Francisco: Jossey-Bass; 3rd edition.

62. Scott, T.; Mannion, R.; Davies, H. and Marshall, M. (2003) The Quantitative Measurement of Organizational Culture in Health Care: A Review of the Available Instruments. *Health Services Research*, Vol. 38 No.3, pp.923-945.

63. Shortell, S. M.; O'Brien, J. L.; Foster, R. W.; Hughes, E. F. X.; Boerstler, H. and O'Connor, E. J. (1995). Assessing the Impact of Continuous Quality Improvement/Total Quality Management: Concept versus Implementation. *Health Services Research*, Vol. 30 No. 2, pp.377-401.

64. Shortell, S. M.; Rousseau, D. M.; Gillies, R.R.; Devers, K. J. and Simons, T.L. (1991) Organizational Assessment in Intensive Care Units (ICU): construct Development, Reliability, and Validity of the ICU Nurse-Physician Questionnaire. *Medical Care*, Vol. 29 No.8, pp.709-726.

65. Singla, A. K.; Kitch, B. T.; Weissman, J. S. and Campbell, E.G. (2006) Assessing Patient Safety Culture: A Review and Synthesis of the Measurement Tools. *Journal of Patient Safety,* Vol.2 No.3, pp.105-115.

66. Spiker, B.K. and Lesser, E. (1995). We have met the enemy. *Journal of Business Strategy,* Vol. 16, No. 2, pp.17-21.

67. Velicer, W.F.; DiClemente, C.C.; Rossi, J.S. and Prochaska, J.O. (1990). Relapse situations and self-efficacy: An integrative model. *Addictive Behaviors,* Vol.15 No.3, pp.271-283.

68. Velicer, W.F.; Norman, G.J.; Fava, J. L. and Prochaska, J.O. (1999). Testing 40 Predictions from the Transtheoretical Model. *Addictive Behaviors,* Vol.24 No.4, pp.455-469.

69. Velicer, W.F.; DiClemente, C.C.; Prochaska, J.O. and Brandenburg, N. (1985). Decisional balance measure for assessing and predicting smoking status. *Journal of Personality and Social Psychology,* Vol.48 No.5, pp.1279-1289.

70. Wellman, J. (2011). Creating High-Powered Healthcare Improvement Engines. In Wellman, J., Hagan, P., and Jeffries, H. (eds.), Leading the Lean Healthcare Journey: Driving Culture Change to Increase Value. New York: CRC Press.

71. Winum, P. and Ryterband, E. and Stephenson, P. (1997). Helping organizations change: A model for guiding consultation. *Consulting Psychology Journal: Practice and Research*, Vol. 49 No.1, pp. 6-16.

72. Womack, J. P.; Jones, D. T. and Roos, D. (1990) The Machine That Changed The World, New York: Free Press

73. Womack, J.P. and Jones, D.T. (1996). Lean Thinking: Banish Waste and Create Wealth in your Corporation. New York: Free Press.

74. Zamutto R.F. and Krakower J.Y. (1991). Quantitative and qualitative studies of organizational culture. *Research in Organizational Change and Development*, Vol.5, pp.83-114**.**

75. Zhang, B., Wright, A.A., Huskamp, H.A., Nilsson, M.E., Maciejewski, M.L., Earle, C.C., Block, S.D., Maciejewski, P.K., and Prigerson, H.G.(2009). Health Care Costs in the Last Week of Life: Associations With End-of-Life Conversations. *Archives of Internal Medicine,* Vol. 169 No.5, pp.480-488.

76. Zulkefly, N.S. and Baharudin, R. (2010). Using the 12-item General Health Questionnaire (GHQ-12) to assess the Psychological Health of Malaysian College Students. *Global Journal of Health Science,* Vol.2 No.1, pp.73-80.

77. Zwick, W.R. and Velicer, W.F. (1986). Comparison of five rules for determining the number of components to retain. *Psychological Bulletin*, Vol. 99, pp.432-442.