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Systems thinking and six sigma: exploring an integrated model for quality management

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SYSTEMS THINKING AND SIX SIGMA: EXPLORING AN INTEGRATED MODEL FOR QUALITY MANAGEMENT

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by

Marlene Derian Robertson

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June Schmieder-Ramirez, Ph.D. – Dissertation Chairperson

SYSTEMS THINKING AND SIX SIGMA: EXPLORING AN INTEGRATED MODEL

This dissertation, written by

Marlene Derian Robertson

under the guidance of a Faculty Committee and approved by its members, has been submitted to and accepted by the Graduate Faculty in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

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SYSTEMS THINKING AND SIX SIGMA: EXPLORING AN INTEGRATED MODEL

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DEDICATION

To my father, Yeprem Der Ghazarian and my mother, my best friend, Knar Der Ghazarian, who are not here to witness my accomplishment of this goal. I often wished my mother were here to see me go through this journey of higher learning as she was a firm believer in the lifelong pursuit of one's education. Married at a very young age, she was a dedicated mother to four children and a wonderful wife. She set aside her educational goal to ensure her children attained theirs. I will never forget how her eyes gleamed with tears as I read to her my acceptance letter from Pepperdine University in the Doctoral Program in Organizational Leadership. I am thankful that I was able to share that experience with her. I am deeply grateful and lucky to have had a mother who was a strong woman, believed in me and always supported me even when I sometimes made the wrong decisions. She was proud then and I know she is even more proud now. I love you mom!

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I owe my gratitude to all those individuals who have made this dissertation possible. My dissertation journey began 10 years ago and during that time as a newlywed, I spent the first 3 years of it fighting for my life. Without my husband's unconditional love, support, and continued belief in my strength, I would not have been able to write this dissertation. Glenn encouraged me to persevere even when my focus to my dissertation was at its minimal. He listened to my ideas and reviewed my notes while tending to my well-being. Glenn, THANK YOU for wiping the tears, the jokes and at times for driving me crazy. I am forever grateful to you for believing in me, for your unconditional love, and for being my life partner, my best friend, my pillar.

To Dr. Chet McCall, who is no longer with us. His passion and utter enjoyment in simplifying statistics made it easier for me to understand and develop the love for it as he had. I shall never forget his kindness and generous guidance. I am saddened that I am only able to have kept part of my promise to him. You see, Chet, as he wanted us to call himm said to me, "Marlene, I would like to hood you before I die." This helped me persevere, and with each day I struggled and fought for my life, my promise to him made it one-step closer to make his wish come true. Thank you, Chet! Although you are not with us and you will not be able to hood me, I know you are smiling because I finally did it.

I want to acknowledge my dissertation committee. To my dissertation chair, Dr. June Schmieder-Ramirez, thank you for agreeing to be my chair on such a short notice. You guidance and support helped me get through with my research. To Dr. Farzin Madjidi, I thoroughly enjoyed your class and even more so valued your guidance and opinion as a member of my committee. Thank you for your input and making my dissertation more meaningful. To Dr.

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I also want to acknowledge the faculty and staff at Pepperdine University for their support, especially Christie Dailo, for her guidance and help.

The utmost special thank you to Dr. Christina Santos Mosher. My dearest friend. I am so grateful to Pepperdine University to have been the host for our meeting. If it was not for our program, I would not have had the opportunity to meet you and that would have been a shame. You are an amazing friend; you never gave up on me even when at times I doubted myself. You never said you were too busy for me, always took the time from your family and reviewed my dissertation, provided guidance and listened to my frustration. I will not have been able to finish this if it was not for you believing in me. Thank you for being part of my journey. You completed your doctorate back in 2004 and it only took me 9 years to catch up with you. I am proud to say I am there with you at the finishing line. THANK YOU my dear, dear friend.

I also want to thank my family and friends who by now have gotten exhausted hearing me say I cannot take part in their social gathering because I have to work on my dissertation. Thank you for being patient and for not taking it personally when I declined your invitations. To my in-laws, thank you for your enthusiasm and interest in my research. Your support and prayers have helped me get through life's challenges and helped me get through my dissertation.

Students of leadership who wonder if pursuing their doctorate degree is worthwhile, I will say only you can answer that question. It requires time, commitment, sacrifice, and the

desire for learning. Do not do it for the title, do it for the pursuit of your passion. While you may choose to follow the path of many others before you, take the time to discover yourself in this journey. Take the time to learn who you are and how you want others to remember you. Leadership is not just leading; it comes with the great responsibility to inspire others to believe in themselves and help them strive to do their best, so that they may one day inspire others.

VITA

CAREER SUMMARY

- Proven track record of success in large-scale program and project management with 17 years of experience
- 11 years of developing and managing staff
- Seasoned training content developer and a trainer
- Experience in developing key performance indicators, scorecards and implementing metrics tracking systems with leading and lagging success indicators
- Recognized for building new teams and new departments
- 12 years of management experience in diverse industries that includes import and export, biopharmaceutical, and health insurance

COMPETENCIES & RELEVANT EXPERIENCE

Portfolio, Program and Project Management

- Accountable for up to $50 million IT project portfolio that consistently delivered projects on time, on budget and meeting business objectives
- Built Project Management Office including intake, governance, and implementation processes
- Executed large-scale system integrations, new product launches, mandates, and small system enhancements
- Implemented knowledge management systems that leveraged execution best practices throughout the enterprise
- Implemented strategic programs working with regulatory agencies and other stakeholders to expand Medicaid programs

Performance Improvement and Training

- Implemented centralized knowledge sharing processes for 16 regional Human Resource departments nationwide
- Conducted gap analysis, designed over 50 technical and non-technical training programs
- Developed corporate Business Professional Ethical Standards and E-policies for the E-commerce division
- Increased productivity process by 30% using performance improvement solutions
- Authored customer service, sales and new product training programs
- Implemented mentorship program

Consultancy

- Led team members with consulting services to TRW. Conducted Six Sigma gap analysis and performance assessment of IT network infrastructure and customer satisfaction.
- Provided consulting services to Mount St. Mary's campus-wide laptop initiative, which included literature research, interviews with program leaders, development of program budget and proposal for federal funding, and identification of opportunities for joint venture with vendors.

WORK HISTORY

Technical Manager Senior	WellPoint Enterprise	2011 - Present
Portfolio Director	WellPoint Dental & Vision	2008 – 2010
Program Director	WellPoint Medicaid	2005 – 2008
Senior Project Manager	Amgen	2003 – 2005
Senior Project Manager	Health Net	2000 – 2003
Senior Performance Development Specialist	Health Net	1998 – 2000
National Medicare Policy Analyst	Health Net	1997 – 1998
Appeals & Grievance Researcher	Health Net	1996 – 1997
Manager Project Management Office	Guardian Int'l	1986 - 1995

PROFESSIONAL ORGANIZATIONS

Project Management Institute
American Society for Quality Control
Systems Dynamic Society

PUBLICATIONS

Systems Thinking and Six Sigma: Exploring an Integrated Model for Quality Management Survey

CERTIFICATIONS

Project Management Professional, Project Management Institute

ABSTRACT

Despite the popularity and financial benefits Six Sigma programs produce, Six Sigma has its weaknesses. Critics of Six Sigma recommend inclusion of systems thinking, a method that examines an organization as a system and views its processes holistically with Six Sigma. The purpose of this quantitative study is to compare organizations that use Six Sigma only and organizations that use an integrated approach. The research questions explore to what extent organizations that implement an integrated quality improvement method differ in the success and duration of their Six Sigma programs compared to those that implement Six Sigma as a standalone method. In addition, the study investigates factors that contribute to the success of integrating Six Sigma and system thinking, as well as differences in leadership support for an integrated model compared to those that use Six Sigma only. Conceptually, this study is framed within the theories of Six Sigma and systems thinking. The data was collected through an electronic survey of 289 participated from professional associations, whose membership include practitioners of Six Sigma and systems thinking. A descriptive analysis was conducted including frequency distribution and cross tabulation analysis. The results of this study suggest there is no statistically significant difference in the Six Sigma program success between those organizations that use Six Sigma only compared to those that use an integrated approach; they both report success. However, there is evidence of organizations that use the integrated approach of systems thinking tend to use feedback loops more frequently, have a more holistic view of quality management, and examine their organization's interdependencies more than organizations that use Six Sigma only. There is evidence that as the duration of the organization's use of Six Sigma matures so does the respondents' support for factors of systems thinking concept. Evidence also supports that an integrated approach contributes to the success

of Six Sigma programs. No empirical research on an integrated approach to quality management was available. This study contributes to providing an explorative foundation for further research as well as creating a survey questionnaire previously not available to explore the integrated approach with Six Sigma programs.

Chapter 1: Introduction

Sources of products and services available to consumers are expanding around the globe, including emergent companies from the Far East. In 2006, China had 80% of the world export, making China the leading exporting country, followed by 75% from the Newly Industrialized Economies, comprising Chinese Taipei; Hong Kong, China; the Republic of Korea; Malaysia; Singapore and Thailand (Bacchetta et al., 2008). In 2009, both China and the United States export amounted to over $2 trillion each, followed by the European Union, who exported over $9 trillion (World Trade Organization, 2010).

These emerging companies are providing various products and choices at low costs, while challenging those offered by established organizations. These companies are listening and appeasing consumers' demands, thus creating fierce competition both against and among American corporations (Beckford, 1998).

Organizations that do not listen to the demands of consumers for reliable, high quality goods and services will face the possibility of fading away. One of the ways organizations can defend themselves against fading and distinguishing themselves from competitors is by providing quality products and services at a comparable price. D. H. Stamatis writes, "in a competitive economy continuous quality improvement and cost reduction are necessary to stay in business. Organization must earn a reasonable profit to survive. Profit is the result of reducing manufacturing cost and increasing revenue" (Stamatis, 1997, p. 232). He further states that companies may increase their market share by providing high quality products at low cost and the search for increasing quality and decreasing cost should be a never-ending goal for organizations. Therefore, quality has become not a choice, but an integral part of many American corporations.

Although many definitions of "quality" exist, Juran identified two noteworthy meanings. First, he defined quality as those features of products that meet customer needs and provide customer satisfaction. Second, "quality" signifies freedom from deficiencies (Juran & Godfrey, 1999).

Poor quality affects profits, sales, and overall company performance, including customer satisfaction. Independent studies over the last 30 years have suggested that poor quality costs U.S. industry billions of dollars each year and amounts to 5-40% of gross sales for manufacturing and service companies (Archambeau, 2004; Norman, 2000). In *Juran's Quality Handbook* (1999), "quality" signifies freedom from deficiencies; the author asserts that within U.S. manufacturing industries, about a third of the work done consisted of redoing work previously done.

Organizations that seek to improve their products and services apply quality improvement methods. There are various quality methods available, one of which is Six Sigma.

Six Sigma as a Measurement of Quality

Six Sigma is a business strategy based on statistical method that looks to identify problems and remove causes of errors, defects, or failures in any processes by focusing on outputs that are important to customers (Antony, 2004; Velocci, 2002). It focuses on delivered value from a customer's perspective and strives to remove non-value-added activities for each product or service (Basu, 2001).

The method requires companies to measure and analyze their business processes and build their business around an understanding of their customers' requirements (Blakeslee, 1999). "Six Sigma is less about statistical tools than about creating a business management system to deliver greater value to customers" (Velocci, 2002, p. 56). Linderman, Schroeder, Zaheer, and

Choo (2003) defines Six Sigma as "an organized and systemic method for strategic process improvement, new product, and service development that relies on statistical methods to make dramatic reductions in customer defined defect rates" (Linderman et al., 2003, p. 195). Linderman et al. further defined a crucial component of the concept is determining exactly what the customer wants and needs and then establishing business goals based on the customer.

Six Sigma based programs are project driven. The Project Management Institute defines project as, "A project is a temporary endeavor to create a unique product, service, or result" (Project Management Institute, 2008, p. 5). It has a beginning and an end. "The end is reached when the project objectives have been reached, or the project has been stopped because the objectives will not or cannot be met, or when the need for the project no longer exist" (p. 5). According to Ronald D. Snee (2001), a Six Sigma project is linked to business priorities, it represents a major improvements in both process performance (greater than 50%) and significant bottom line results (greater than $175,000); it has a start and end date (doable in 3 to 6 months); it can be measured; it has support and approval of management. Organizations identify projects that focus on continuously reducing variations in their business processes by concentrating on one or more key areas: cost savings, cycle time reduction, and quality. The goal is to identify the functional characteristics of a defective process and identify the underlying root cause of conflict. It is a measure of quality that strives for near elimination of defects using statistical methods.

The prevalence of Six Sigma in organizations. Among the organizations that have adopted Six Sigma method are General Electric (Bane, 2002; Ettinger, 2001), Motorola (Anonymous, 2002; Association, n.d.), Allied Signal (Challener, 2001), Citibank (Rucker, 2000), DuPont Chemical Co. and Dow Chemical Company (Challener, 2001), Raytheon (King, 2004),

Ford Corporation (McClusky, 2000), and American Express (Martens, 2001) to name a few. They have adopted Six Sigma methods to improve processes, identify root cause problems, and reduce costs associated with defects. They have made substantial financial investment in implementing Six Sigma programs (Pande, Newman, & Cavanagh, 2000). Implementation cost of a Six Sigma program for an organization with fewer than 1,000 employees may range from $500,000 - $2,000,000, while for large organizations with more than 1,000 employees, the implementation cost may be anywhere from $2.5 million and upwards.

Various organizations have reported success with Six Sigma. According to Plotkin (1999), General Electric estimated that Six Sigma efforts added more than $600 million to the company's bottom line in fiscal 1998, and an estimated annual savings of $6.6 billion by the year 2000 (Air Academy Association, n.d.). Commonwealth Health Corporation claimed in 2002, the organization invested about $900,000 in their Six Sigma initiative and reported improvements of over $2.5 million (Lazarus & Stamps, 2002). Motorola, between 1987 and 1994, reduced their manufacturing cost by $1.4 billion; and AlliedSignal, between 1992 through 1996, reduced cost by $1.4 billion, increased growth by 14% a quarter, reduced new product introduction time by 16%, and reduced billing cycle by 24% (Air Academy Association, n.d.).

Henderson and Evans (as cited in Antony & Banuelas, 2002), have identified crucial success factors implementing Six Sigma programs, which include upper management support, training, application of statistical tools, and a link to human resources-based actions (such as bonuses or promotions). However, others have outlined several factors contributing to the failure of Six Sigma initiatives. These include: (a) a narrow focus of the program on the selected project while the results impact the organization, (b) the focus of process improvements are on

the individual process rather than the overall integrated system of processes, and (c) organizations reported difficulty sustaining the programs (Basu, 2001).

Relevance of Systems Thinking Theory to Six Sigma Theory

An organization is a system of interrelated functions. To solve problems effectively in organizations, it is critical to identify and address the real causes of a problem. Without clear understanding of the overall organization, leaders tend to focus only on the behaviors and events associated with the immediate problem rather than on the systems and structures that caused the problems to occur in the first place (McNamara, 2004).

In a competitive environment, inefficiencies or continuing to repeat mistakes without finding the root cause of a problem can be costly to an organization (Wilson, Dell, & Anderson, 1993). These costs may include schedule delays, loss in productivity, increased litigation, and customer dissatisfaction, all of which adversely affect an organization from being competitive. Wilson et al. (1993) outline in their book, *Root Cause Analysis: A Tool for Total Quality Management*, the cost to an organization associated with not solving a problem. They state that "for every wronged customer who complains, 26 others remain silent; 91% of unsatisfied customers will never purchase goods or services from you again; the average wronged customer will tell 8 to 16 others; it costs 5 times as much to attract new customers as it cost to keep old ones" (p. 6).

Today's management needs to understand the operations of the business as a system (Senge, Kleiner, Roberts, Ross, & Smith, 1994). When implementing quality programs, organizations can no longer rely mainly on managing the outputs of the business system. They must focus on how the business system is itself designed to produce the desired output. Treating a business organization as a system helps to break down the complexity and provides a

framework for understanding cause-and-effect relationships that go on inside the system. In a typical company, there are hundreds of process cycles operating, all interrelated all running on different schedules, and many of them feeding back on each other. Processes do not move in one direction.

An understanding of how the systems and subsystems of an organization are performing and whether they are helping achieve the organization's objectives is necessary for management when implementing quality improvement programs. It also requires the systemic use of quality tools at all levels to improve individual processes and identify systems that are not meeting internal and external customer expectations (D. K. Gordon, 2002).

Systems thinking is a process of discovery and diagnosis by inquiring into the governing processes underlying problems an organization faces (Senge et al., 1994). The approach is to understand how the whole system works rather than search for direct cause-and-effect relationships on key processes. The systems thinking approach looks at the interactions between the processes. Since an organization is a system of interrelated functions (Kujala & Lillrank, 2004), one can trace links that represent influence from any element in a situation on another element (Senge et al., 1994). An action in one part of the system can have consequences in other parts. However, links never exist alone. They always comprise a circle of causality with a feedback loop in which every element is both cause and effect. The links are influenced by some, and influence others, so every one of its effects eventually comes back to where it began (Senge et al., 1994).

As cited in the chapter, many organizations use Six Sigma to address product defects or use Six Sigma for process improvement. Six Sigma focuses on reducing variation and in doing so, the assumption is through reducing variation the overall organization's performance will be

improved (Nave, 2002). Six Sigma aims to understand the customers' needs, identify key processes linked to these needs, apply statistical and quality tools to reduce process variations of those key processes, and sustain improvement overtime (El-Homsi, 2010). Systems thinking views at the dynamic interrelationships of the many processes that exist in an organization, not just focus on the key processes. Each part of a process must be considered in light of the whole organization, focusing on the customer. Most organizations today, have become distracted by more visible, immediate or urgent issues (Haines & McKinlay, 2007) . Their focus has become finding one solution at a time and lose the sense of organization-wide focus on meeting the customer's needs and wants.

According to John Beckford (1998), organizations must approach quality systematically. He writes "quality is not something which can be achieved through enhancing only independent functional units – however effective they may become individually" (p. 168). It requires examination how each of the parts of the organization interacts with every other. The performance of individual parts of an organization becomes less important with emphasis shifting to their total interaction with the rest of the organization. This means examining not just performing functional units such as production or sales but, how the performance of those parts is interacting to produce goods or services to meet customer's needs.

Statement of the Problem

Organizations are investing heavily in Six Sigma initiatives, varying from $500,000 dollars upwards to $2.5 million and more (Pande et al., 2000). Yet, many have difficulty integrating it successfully with their organization (Basu, 2001). Six Sigma is failing because it has narrow focus, its focus is on individual process rather than the overall system; it is difficult to

sustain the program, and it focuses on the immediate problem rather than on the system structure, and tends to look for direct, linear cause-and-effect relationship.

Quality requires examination how each part of the organization interacts with each other (Beckford, 1998). Failing to understand how organization's processes are interrelated to produce the desired output can be costly (Wilson et al., 1993). Organizations need to look at their organizations as a system (Senge et al., 1994). Systems thinking is a method that examines an organization as a system and views its processes holistically (D. K. Gordon, 2002).

The successes and failures of Six Sigma improvement initiatives may come about because they are part of a whole system in which organizations operate.

Purpose of the Study

While there is an abundance of literature that describes the Six Sigma method, its required components, and the importance of systems thinking within organizations, little research exists about the dependencies both theories have on one another for successfully implementing a Six Sigma program. Because Six Sigma should be a comprehensive approach throughout an organization, it is essential to consider the value of integrating systems thinking theory as part of the overall implementation.

The purpose of this study is to explore the extent to which organizations that implement Six Sigma with systems thinking as an integrated quality management method differ in the success and duration of their Six Sigma programs, compared to those that implement Six Sigma as a standalone method. The study also examines the factors that contribute to the success of the integration of Six Sigma with systems thinking, and explores the extent to which organizational leadership support for an integrated model differs from their support for a standalone method, if any.

Research Questions

1. To what extent do organizations that implement Six Sigma with systems thinking as an integrated quality improvement method differ in the success and duration of their Six Sigma programs, as compared to those that implement Six Sigma as a standalone method?
2. What are the factors that contribute to the success of the integration of Six Sigma with systems thinking as an integrated organizational management method?
3. To what extent does organizational leadership support for an integrated model differ from support of Six Sigma as a standalone method? Importance of the Study

There are a number of literature reviews written about both methods, and some even suggest advantages of using both methods combined and call for the need to use both methods, as it is discussed later in Chapter 2. However, there is no empirical research data that has been identified by this researcher that shows the use of an integrated model that combines both Six Sigma and systems thinking together that identifies the extent and duration of success. Further, no research has been found that includes identification of key success factors from both to suggest a better approach to quality improvement as opposed to using Six Sigma alone. Therefore, this researcher will use this study to explore further, what has been written in the literature reviews to compare between systems thinking success and success of Six Sigma. This study will also contribute to the body of knowledge of quality practices as well of the body of knowledge related to Six Sigma. The results of this study will provide a preliminary basis for future study to research further the correlation of Six Sigma and systems thinking.

Conceptual Definitions

The following terminologies are used throughout this manuscript and are necessary to understand the Six Sigma and systems thinking concept.

Analyze. The goal of the *Analyze* phase of Six Sigma is to identify the root cause(s) of quality problems, and to confirm those causes using the appropriate data analysis tools (StatSoft, 2006).

Black Belt. The Black Belt is a full-time Six Sigma project team leader responsible for implementing process improvement projects within the business to increase customer satisfaction and business productivity. The Black Belt leads three to four Six Sigma teams a year. They are seasoned and experienced in the use of the Six Sigma method and tools. Black Belts have typically completed 4 weeks of Six Sigma training, and have demonstrated mastery of the subject matter through completing a project and an exam. (Black Belt, n.d.).

Champion. The Champion is also known as the Sponsor within Six Sigma programs. He or she is the business leader or the senior manager who sets and maintains the broad goals of the improvement project, ensures the project aligns with the business priorities, and ensures that resources are available (Champion, n.d.). The Champion is usually the process owner who guides the project team strategically, help in selecting the team, providing resources, and remove roadblocks that get in the way of the team doing its work (Pande et al., 2000).

Control. The goal of the *Control* phase of Six Sigma is to evaluate and monitor the results of the previous phase (*Improve*; StatSoft, 2006).

Cycle time. Cycle time is the total time from the beginning to the end of a process, as defined by an organization and its customer. Cycle time includes process time, during which a

unit being processed closer to an output, and delay time, during which a unit is spent waiting for the next action (Cycle Time, n.d.).

Data set. A collection of related data items usually come from observations obtained by sampling a statistical population (Data Set, n.d.).

Defect. A defect is any instance or event in which the product or process fails to meet a customer requirement (Pande et al., 2000).

Define. The *Define* phase in Six Sigma is concerned with defining project goals and boundaries, and identifying issues that need to be addressed to achieve the higher sigma level (StatSoft, 2006).

Demographics. Demographics are characteristics of survey participants.

DMAIC. DMAIC is an acronym for the five interconnected phases that make up the *Six Sigma* effort: *Define* (*D*), *Measure* (*M*), *Analyze* (*A*), *Improve* (*I*), *Control* (*C)*. The Six Sigma DMAIC processes evaluates an existing process that is not meeting specification and looks for incremental improvement comprise an improvement (DMAIC, n.d.).

DPMO. Defects per million opportunities (DPMO) is the average number of defects per unit observed during an average production run, divided by the number of opportunities to make a defect on the product under study during that run, normalized to 1 million (Defects Per Million Opportunities, n.d.).

Duration of Six Sigma Program. The scope of a Six Sigma program is typically set for completion in a 3-to-6 month time frame (Keller, 2005). Larger projects are broken down to smaller projects that average 3-to-6 months.

Feedback Loop. The path by which some of the output of a circuit, system, or device is returned to the input.

Green Belt. A Green Belt is trained on the Six Sigma improvement method and leads quality improvement teams. Their degree expertise associated with Six Sigma is less than that of a Black Belt or Master Black Belt. The Green Belt is part-time position, usually a middle manager (Eckes, 2001). Extensive product knowledge in their company and possession of project management skills are necessary in their task of process improvement. The Green Belt employee plays an important role in executing the Six Sigma process at an organizational level.

Holistic. Stressing the importance of the whole and the interdependence of its parts. That the "parts of a whole are in intimate interconnection, such that they cannot exist independently of the whole, or cannot be understood without reference to the whole, which is thus regarded as greater than the sum of its parts" (Holism, 2010).

Improve. The goal of the *Improve* phase in Six Sigma is to implement solutions that address the problems (root causes) identified during the previous (*Analyze*) phase (StatSoft, 2006).

Master Black Belt. Master Black Belt is equivalent to an internal consultant in Six Sigma. They are not full-time members of the team, but help the team with the technical aspect of their work on as-needed basis. Master Black Belts are Six Sigma Quality experts who are responsible for the strategic implementations within an organization. Main responsibilities of a Master Black Belt include training and mentoring of other Black Belts and Green Belts. They help set priorities, select, and charter high-impact projects. They are responsible for preserving the integrity of the Six Sigma measurements, improvements and tollgates; and developing, maintaining, and revising Six Sigma training materials. The Master Black Belts are qualified to teach other Six Sigma facilitators the methodologies, tools, and applications in all functions and levels of the company (Master Black Belt, n.d.)

Mean. "Mean is the average of all scores in a distribution (sum divide by number of scores)" (Tashakkori & Teddlie, 1998, p. 113).

Measure. The goal of the *Measure* phase in Six Sigma is to gather information about the current situation, to obtain baseline data on current process performance, and to identify problem areas (StatSoft, 2006).

Non-value Added. Non-value added refers to activities that do not advance a product or a service that a customer is willing to pay. These activities add no value to a product or services from a customer's perspective and therefore customers are unwilling to pay for such activities (Carreira, 2005).

Process. "Set of interrelated resources and activities that transform inputs into outputs"(Juran & Godfrey, 1999). It is a "systematic series of actions directed to achieving a goal" (Juran, 1992) – a series repeatable steps leading to a desired result, including creating a product or service that will satisfy a customer or a group of customers.

Project. "A project is a temporary endeavor to create a unique product, service, or result. It has a beginning and an end. The end is reached when the project objectives have been achieved, or the project has been terminated because the project objectives will not or cannot be met, or when the need for the project no longer exist" (Project Management Institute, 2008, p. 5)

Quality. Quality means freedom from deficiencies, from errors that require doing work again. Quality means those features of products which meet customer needs and thereby provide customer satisfaction (Juran & Godfrey, 1999).

Root Cause. The origin of a problem.

Sampling. A technique used in selecting a small element of a population that is a representative of the population. This is done to increase the likelihood to generalize accurately about the population (Vogt, 1999).

Scientific Method. The process of seeking knowledge used by scientist for formulating a problem, collecting data through observation and experiment, and the formulation and testing of hypotheses (Scientific Method, n.d.).

SIPOC. SIPOC is an acronym for the five major elements that make up the core processes of an organization (Wortman, 2001). SIPOC stands for: (a) Supplier: The person or organization providing resources to the process of concern; (b) Input: The information, materials, or service provided; (c) Process: The set of action steps that transforms the input to outputs by adding customer value; (d) Output: The final product or service resulting from the process; and (e) Customer: The person, process or organization that receives the output.

Six Sigma. Sigma (σ) is the 18th letter of the Greek alphabet (Six Sigma, n.d.). Statisticians to denote the standard deviation for a set of data use it. Six Sigma is six standard deviations from the mean (Keller, 2005). The Six Sigma discipline tries to achieve 3.4 defects per million opportunities or 99.99966%.

Standalone Method. Self-contained and usually independently operating (The American Heritage Dictionary of the English Language, 2009a).

Standard Deviation. The standard deviation is the most common statistical measurement used for measuring how widely spread the values are dispersed around the mean in a data set. The more spread apart the data is, the higher the deviation. If many data points are close to the mean then the standard deviation is small; if many data points are far from the mean, then the standard deviation is large. If all the data values are equal, then the standard deviation is

zero. A standard deviation is symbolized as SD, *s,* the Greek letter σ, or written out the word sigma (Vogt, 1999).

Success. Achieving something desired, planned, or attempted (The American Heritage Dictionary of the English Language, 2009b).

Success Factors. Characteristics, conditions, or variables that have a direct and serious impact on the effectiveness, efficiency, and viability of an organization, program, or project to promote the interest or cause of (Support, n.d.).

System Thinking. Systems thinking is a holistic approach to analysis. The approach focuses on the way a system's parts interrelates within the context of larger systems. It views organizations from a broad perspective of its structures, patterns, and events taken within and outside the organization (Tymofyeyev & Strom, 2003).

Value added. Value added activities are those that make a product more complete. These are activities that are valued by the customer and customers are willing to pay to have them performed (Carreira, 2005).

Voice of the Customer (VOC). The "voice of the customer" is a process used to capture the stated and unstated requirements and feedback from the customer (internal or external). This process promotes proactivity and constant innovation to capture the changing requirements of the customers. The voice of the customer can be captured in various ways: interviews, surveys, focus groups, customer specifications, observation, warranty data, field reported, and complaint logs (Voice of the Customer, n.d.).

Assumptions and Limitations of the Study

This research study assumes that participants' self-reported response to survey items were truthful, being the participants are from associations that advocate practitioners'

professionalism and encourages the need for further research in their field for the betterment of their profession. It is assumed the variables in this study have been clearly defined and are measurable. Further, it is assumed that the survey instrument that was used is a valid and reliable instrument to measure those variables.

Limitations may have included the quality and availability of the available data from organizations that shows the rate of success or failure by Six Sigma initiatives. Further, there may be a limited number of organizations that incorporate systems thinking with Six Sigma method in their process improvement initiatives. There may have also been limitations with getting survey participation. The survey participants were limited to four organizations, American Society for Quality, International Society of Six Sigma Professionals (ISSSP), International Society for the Systems Science (ISSS), and Systems Dynamics Society and may limit representativeness of the findings and generalization.

Organization of the Study

Five chapters comprise the structure of this dissertation. Chapter 1 introduces the reader to an overview of Six Sigma and systems thinking theories. It highlights some of the organizations using Six Sigma program and its benefits. Further, it briefly states some of the success factors and provides a few reasons of failures of the program. Finally, Chapter 1 offers the purpose of the study, states the research question, provides the significance of the study, and discusses limitations of the study. Chapter 2 presents the literature review relevant to the subject. It provides a historical background for both Six Sigma and systems thinking theories, explains how the theories wok and their successes and failures. Chapter 3 provides details about the research design, data gathering methods, approaches, and analysis procedures. Chapter 4

details the results of the study, while Chapter 5 draws conclusions based on the results and recommendations for further study.

Summary

Worldwide competition is compelling many organizations to understand and meet the expectations of their customers. This imposes organization to focus on quality of their products. Regardless of the products they offer, what makes an organization compete and successfully continue to operate is how it can distinguish itself by producing quality products at a low cost.

Many American organizations have adopted Six Sigma as their quality method to design and create their processes or products, including identify root causes of defects of their products. Some organizations have spent thousands, even millions of dollars in training their employees and implementing Six Sigma tools. Some have been successful yet many have abandoned it. Several factors have been identified the abandonment and failure of Six Sigma, one of which is that Six Sigma does not engage the entire system.

Critics of Six Sigma suggest that organizations need to approach solving problems with an understanding how the entire system works rather than search for direct cause-and-effect relationships. It is suggested that a systems thinking approach examines the interactions and the interdependencies between processes may contribute to the success of Six Sigma programs. Thus, the purpose of this paper is to explore the extent to which organizations that use Six Sigma as a quality management differ in the success and duration from those organizations that use both Six Sigma and systems thinking together. Further, this study will explore the success factors of the integrated model and learn more about the leadership of these organizations.

Chapter 2: Review of Related Literature

Numerous organizations incorporate Six Sigma into their approach to developing new processes or improving existing ones for quality improvement in their organization. The popularity of Six Sigma is based on delivering bottom line results. The aim of Six Sigma is to meet customers' requirements while reducing defects and reducing cost. Despite its popularity, critics have identified limitations and have proposed the use of an integrated approach that includes a systematic approach to Six Sigma programs. Such an approach is offered using systems thinking. In this chapter, a literature review of both Six Sigma and systems thinking will present the background of each, applications and weaknesses of both, as well as suggestions by critics of an integrated approach.

Background and Review of Six Sigma Methods

Historical background. The philosophies that contributed to developing Six Sigma have existed and traced back to the late 1700s. To understand the root and history of Six Sigma, it is critical to analyze some of the earlier contributors to the evolution of the method.

The Six Sigma method encompasses many elements from earlier quality concepts. Eli Whitney, the inventor of the cotton gin, had a great impact on modern manufacturing when he introduced his revolutionary uniformity system (Folaron & Morgan, 2003). In 1798, Eli proved it was possible to "produce interchangeable musket parts that were comparable enough and consistent in fit with the original parts and function to allow for random selection of parts in the assembly of the muskets" (p. 38). This implied that manufacturers could have fewer customized parts and less variances between the interchangeable parts, thus allowing manufacturers to reduce the cost of building customized parts and increase efficiency.

In 1913, with the Industrial Revolution at its highest peak, Henry Ford introduced the moving assembly line. It was critical during this time to ensure that mass-produced parts were similar to the original product to meet the increased demands of mass production. Traditional testing of pieces one-by-one was both time and cost prohibitive, therefore sampling methods and methods to monitor for consistency of the process that produced the parts were necessary (Folaron & Morgan, 2003).

Shewhart's Control Chart. In 1924, Walter Shewhart introduced the Control Chart. This was a new form for data collection, display, and analysis to document the percentage of defective products of mass-produced items that are randomly sampled, measured, and the observations averaged (Folaron & Morgan, 2003).

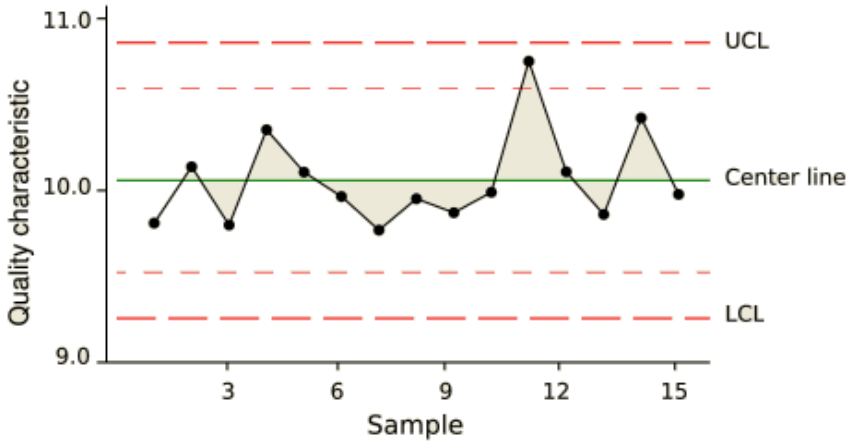

Figure 1. Shewhart's Control Chart with upper and lower limits (Prins, 2003). Copyright by National Institute of Standards and Technology (NIST). Reprinted with permission

A Control Chart (see Figure 1) is a time-based, two-dimensional plot used to determine the progress of process overtime. The horizontal dimension of a Control Chart represents time, with samples displayed in chronological order. The earliest sample taken appears on the left and each newly acquired sample is plotted sequentially to the right on the chart with upper and lower control limits. Upper and lower control limits show the threshold at which the process is

conside-red statistically unlikely to occur (Natrella, 2010). If the process is in control, all points will plot within the control limits. Any observations outside the limits, or patterns within, suggest introducing a new source of variation. If such change is detected, the process is stopped and an investigation is conducted to discover the cause(s) for the change. Once the cause of the change has been discovered and any needed corrective action has been taken, the process is resumed. The vertical dimension represents the value of the sample statistic. This could be the sample mean, range, or standard deviation with measurement by variables (Control Chart, 2010).

Control charts provide graphical way to identify conditions where the process level or variation has changed because of a variable cause; thus the process is no longer in statistical control (Hunter, 2002). Control charts actively monitors variations in a process. Since increased variation in any process means increased costs in rework, control charts signal the presence of a special-cause that prompts the controller to examine the situation immediately.

Shewhart's was the first known example of a process control chart and signals the beginning of the age of statistical quality control. Using the statistically based control chart, product inspectors are able to identify early the causes of the change and target improvements.

Deming's Plan-Do-Check-Act Cycle. During 1945, the Japanese quality movement began. Japanese business leaders considered the use of statistics the secret weapon that helped Allies win World War II and wanted to learn more about the practical application of statistics (Folaron & Morgan, 2003). In 1950, Edward Deming, a statistician, went to Japan to teach statistics and U.S. quality methods. He reinforced the value of looking at data against calculated statistics to quantify variation and predict future process performance. Inspired with the works of Shewhart, Deming saw that Shewhart's ideas could apply not only to manufacturing processes, but also to the processes by which enterprises led and managed. Throughout the

years, Deming promoted the use of continuous improvement method. He concurred with organizations could increase quality and simultaneously reduce costs (from waste, rework, and staff attrition, while increasing customer loyalty) by continuously practicing improvement and by thinking of manufacturing as a system, not as bits and pieces. He developed the Deming, Shrewhart PDCA cycle – Plan-Do-Check-Action (PDCA) cycle (see Figure 2; Beckford, 1998).

Figure 2. Deming's Plan-Do-Check-Act (PDCA) Cycle (Tague, 2004). Copyright 2004 by American Society for Quality. Reprinted with permission

The Plan-Do-Check-Act Cycle is a four-step model. In the *Plan* step, an organization's management must recognize an opportunity and plan a change. *Do* involve organizations carrying out the processes. In the *Check* step, management must monitor and evaluate the processes and results against objectives and specifications and reported the outcome. Finally, *Act* requires that management must also apply actions to the outcome for necessary improvement. The purpose of the PDCA cycle is to be iterative once a process is completed; it will recommence and continues to monitor and improve on itself. According to Deming, it is only after repeating this cycle that an organization can achieve continuous quality improvement.

Crosby's theory of zero defects. In the early 1960s, Philip Crosby, in his book, *Quality is Free*, introduced the idea of zero defects (Folaron & Morgan, 2003). Zero defects is simply a performance standard, a notion that defects are not acceptable, and that everyone should do it right the first time. Crosby believed it to be an objective business should aim for. He defined a

defective product as one that did not "conform" to its specifications. Put differently, a defective product is one that does not meet the requirements of the customer.

According to Crosby, there are four main principles that govern the philosophy of zero defects method (as cited in Folaron & Morgan, 2003).

Quality is conformance to requirements – This sets the benchmark of how quality is defined. Even a low cost disposable pen can be quality if it conforms to all the predetermined requirements; that it writes, does not clog or skip under normal use, and lasts the time specified.

Defect prevention is preferable to quality inspection – The cost of resources needed to discover and then correct defects is usually significantly more than the cost of prevention; therefore, prevention is the preferred approach.

Zero defects is the quality performance standard – If a requirement expresses what is needed, and then any unit that does not meet the requirements will not satisfy the customer's need and is no good. Should units not meet the requirements, but still satisfy the need, the requirements should be amended.

Quality is measured in monetary terms. Every defect has a cost associated with it. More often than not, this will be a hidden cost. These costs include inspection time, rework, wasted material and labor, and lost reputation. By identifying and accounting the extent of these costs, it allows previously unquantifiable losses to become measurable, allowing businesses to decide based on relative returns.

Over the next 20 years, Japanese manufacturers placed a persistent importance in improving manufacturing quality. They focused on defect elimination and reducing cycle time to bring new products to market, which resulted in significant developments and successes for Toyota and other Japanese companies (Folaron & Morgan, 2003).

Deming's 14-Points management theory. Deming went on to introduce the 14-Points management theory, which contributed to the philosophy of Six Sigma. The 14 Points are:

1. "Create constancy of purpose to improve product and service;
2. Adapt to the new philosophy of the day; industries and economics are always changing;
3. Build quality into a product throughout production by using the Plan-Do-Check-Act cycle plan;
4. End the practice of awarding business based on price tag alone; instead, try a long-term relationship based on proved loyalty and trust;
5. Work to improve quality and productivity;
6. Institute on-the-job training;
7. Teach and institute leadership to improve all job functions;
8. Drive out fear and create trust, create a climate for innovation;
9. Strive to reduce intradepartmental conflicts by breaking down barriers between departments;
10. Remove slogans and urge to influence, focus on the system;
11. Expel work standard quotas for production and management by objectives;
12. Remove barriers that rob people of pride of workmanship;
13. Encourage education and self-improvement for everyone; and
14. Include everyone in the company to carry out the transformation" (Beckford, 1998, p. 75).

Deming believed the 14-Points foster a foundation in which an efficient workplace, higher profits, and increased productivity could grow. He defined the 14-Points to be duties of top management to work on forever. They provide the criteria to everyone in the company.

Juran's contribution to Six Sigma. The quality awareness and the use of statistical methods continued to grow, but during this period, statisticians were seen as separate from management. In 1954, Joseph M. Juran was invited to Japan to help integrate the two concepts, where quality through management emerged.

Juran stressed that management was responsible for quality. According to him, "management controllable defects account for over 80% of the total quality problems" (Beckford, 1998, p. 111). He held management responsible for quality and the need to set goals and identify target for improvement. He introduced the project-by-project approach to quality improvement initiatives, with project defined as a problem scheduled for solution. Project-by-project approach focuses on the vital few problems in an organization. He urged management to establish an annual quality improvement program, where specific projects were chosen year after year and objectives were set, with clear responsibility for action (Hartman, 2002).

Juan believed that planned improvement had to be specific and measurable. It consisted of four elements (Beckford, 2005):

- Management is responsible for setting up specific goals to be reached by identifying what needs to be done;
- Management plans for reaching the goals by providing a structured process;
- Management assigns clear responsibilities for meeting the goals; and
- Rewards are based on results.

ISO. In 1987, the Geneva-based International Organization for Standardization known as ISO introduced a series of quality standards that most of the industrialized world adopted (Folaron & Morgan, 2003). ISO is a network of national standards institutes from 157 countries. Those who take part in the ISO requirements agree to a third-party audit to collaborate to the

standards and promote uniformity between countries. The standards ensure desirable characteristics of products and services such as quality, environmental friendliness, safety, reliability, efficiency, and interchangeability. During this time, the United States government introduced the Malcolm Baldrige National Quality Award. Two key parts of this award were promoting best practice sharing, and settling a benchmark for quality systems that focused on customer satisfaction as the key driver of business design and execution.

Simultaneously, Motorola's pager business was suffering, and in an attempt to improve the pocket pager business, Motorola adopted best practices from the best companies. This included comparing the process performance and capability to the product specifications, which aggressively drove down defects. The calculation for capability became defects per million opportunities (DPMO). Defects per million opportunities is the average number of defects per unit observed during an average production run, divided by the number of opportunities to make a defect on the product under study during that run normalized to one million (Defects Per Million Opportunities, n.d.).

To support the calculation for DPMO per million opportunities, Motorola researchers defined a series of steps for analyzing and improving business performance that became part of the foundation of Six Sigma method. It consisted of five phases: (a) Defining an opportunity, (b) Measuring performance, (c) Analyzing the opportunity, (d) Improving performance, and (e) Controlling performance - thus creating DMAIC (Studt, 2002). Motorola used this method to improve the quality of their business pager, which resulted them in being the first company to win the Baldrige Award (Folaron & Morgan, 2003, p. 42).

Historical application of Six Sigma. AlliedSignal was the first company to adopt Six Sigma approach. The CEO of AlliedSignal, Larry Bossidy, showed the idea and the value of Six

Sigma effectively turned around his company (Eckes, 2003b). In 1995, he introduced the idea to Jack Welch, CEO of General Electric. Welch made the method a corporate requirement and placed it throughout his organization.

The original goal of Six Sigma focused on the manufacturing process. Over the years, it has been used in nonmanufacturing industries such as financial services (Antony, 2004) and the healthcare industry, and in nonmanufacturing departments such as marketing, purchasing (Velocci, 2002), billing, and customer service (Antony, 2004). The Treasury department of Allied Signal used Six Sigma to evaluate and improve the revenue chain process, including the accuracy of shipments and the accuracy of invoices sent to customers. They studied customer disputes and identified their root cause, taking corrective action that resulted in a $50 million cash flow improvement (Dale, Williams, & van der Wiele, 2000). Since Motorola introduced Six Sigma, numerous organizations have incorporated the approach in developing new processes or improving existing ones for quality improvement in their organization.

Defining Six Sigma. Six Sigma is a process-focused quality improvement approach based on statistical method that identifies problems and removes causes of errors, defects, or failures in any processes by focusing on outputs that are critical to customers (Antony, 2004; Velocci, 2002). It focuses on delivered value from a customer's perspective and strives to eliminate non-value-added activities for each product or service (Basu, 2001). The fundamental idea behind Six Sigma is to reduce variation in processes and aim at removing defects or failures from every product, service and transactional process (Antony & Banuelas, 2002). As a result, the bottom-line is effected through savings and increased revenue because of improved process performance and customer satisfaction (Bisgaard, Hoerl, & Snee, 2002). The method requires companies to measure and analyze their business processes as well as build their business around

an understanding of their customers' requirements. The key part of the idea is finding out exactly what the customer requires, and then setting up business goals based on the customer requirements (Linderman et al., 2003).

Sigma (σ) is the 18th letter of the Greek alphabet (Six Sigma, n.d.). Statisticians use Sigma to represent standard deviation of a population. It is a measure of the average amount the scores in a distribution deviate from the mean (μ) in a set of data –called a Gaussian bell curve, which is also known as a standard normal distribution. In a standard normal distribution, the most frequent value is the average (the mean); 50% of the values are above the mean, and 50% are below the mean. If the collected data points are close to the mean, then the standard deviation is small. If the collected data points are far from the mean, then the standard deviation is large. The larger the standard deviation, the more widely the scores are spread out from the mean. Thus the further away a particular value is from the mean the less frequent that value will occur (68-95-99.7 rule, 2010).

A standard normal distribution has a mean of 0 and a standard deviation of 1. Any particular value has a likelihood it will fall in 34.1% between the mean (μ) and 1 standard deviation below or above the mean (see Figure 3). Any particular value falls in 13.6% likelihood between 1 and 2 standard deviations below or above the mean. Finally, any particular value falls in 47.7% likelihood within 2 standard deviations below or above the mean. The areas beyond 3 standard deviations contain 30% percent of the total area. This means that in a normally standard distribution, the likelihood of a value lying more than 3 standard deviations from the mean is .3%, or .15% at the top end (above the mean) and .15% at the bottom end (below the mean). Therefore, it is difficult for an observed value in a normal distribution to occur more than 3 standard deviations from the mean (Johnston, 2000). This suggests that a process or a product

is meeting the requirements or the quality standard almost all the time. However, on rare occasion, there is a defect, a variance, which does not meet the requirements. The chance of this is at .3% out of 100%.

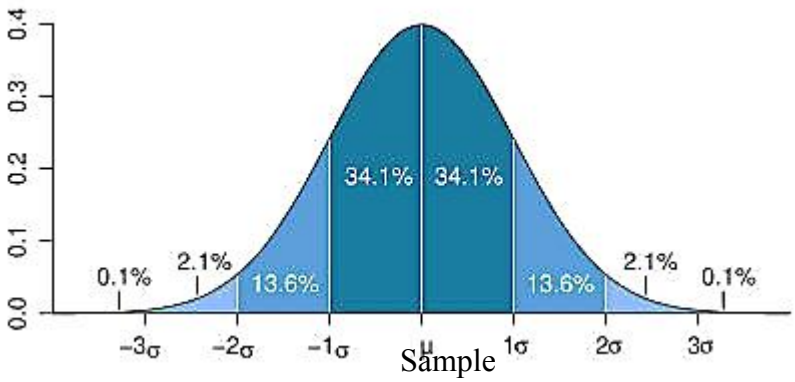

Figure 3. Standard normal distribution diagram. From "The Normal Distribution" by (Gordon, 2006). Copyright 2006 by The University of Sydney. Reprinted with permission.

A standard normal distribution is used to express defects associated with the quality of a product. Mathematically, 1 σ process would produce about 32% defects (100% - 68.27%), whereby a 2 σ process would produce about 5% defects (100% -95.45%). A 6 σ process, therefore, produces only 0.0000002% defect (100% - 99.9999998%) (Tavormina & Buckley, 1992), as shown in Table 1.

Table 1

Six Sigma Conversion Table.

Specific Limit	Percent	Defects PPM
± 1 σ	68.27	317300
± 2 σ	95.45	45500
± 3 σ	99.73	2700
± 4 σ	99.9937	63
± 5 σ	99.999943	0.57
± 6 σ	99.9999998	.002

Note. Table 1 is adapted from Breyfogle's book Six Sigma Smarter Solution Using Statistical Methods (F. W. I. Breyfogle, 1999, p. 9). Copyright 1999 by John Wiley & Sons. Adapted with permission.

In a standard normal distribution, the data is scattered normally and the process is stable and centered at the mean. The mean of a manufacturing or business process, though, usually shifts overtime because of inherent shifts in material or processes, while the statistical variation about the mean remains unaffected (Tavormina & Buckley, 1992). To address this shift from a specification-centered value, Six Sigma assumes that processes always operate within ± 1.5 of their mean (see Figure 4; M. W. James, 2002). According to Joe Schofield (2006), the assumption is that short-term performance of 6 σ is actually 4.5 σ. In the long-term the 1.5 shift adjusts for the entropy that sets in. An improvement from a 3 σ to a 4 σ quality level is not the same as an improvement from a 5 σ to a 6 σ quality level. This shift makes a much more difficult improvement effort than a shift from 3 σ to 4 σ (Lalovic, 2002).

In business processes, sigma is a measure of how many defects or failures are likely to occur if there were 1 million opportunities. The greater the sigma number, the fewer the defects associated with the process, and the lower costs of rework, and the lower the cycle time of the - process (Dale et al., 2000). The average product or process defect rate at most major organizations is around three or four sigma performance level. That means producing products at the rate of 6,200 defectives or 99.37% for every million a product or service is produced (Plotkin, 1999) compared to 3.4 defectives per million or 99.9997% perfect at the Six Sigma level (see Table 2).

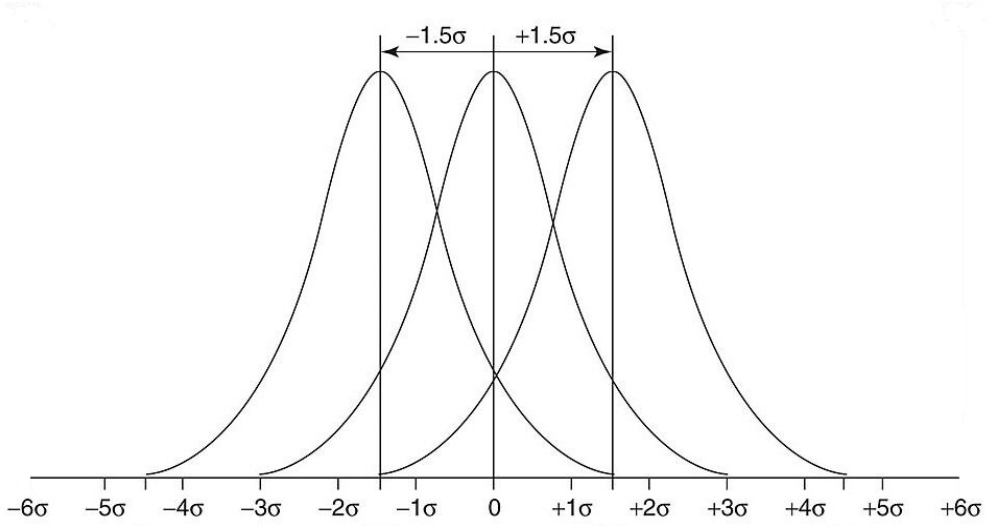

Figure 4. Sigma process with a 1.5 Sigma Shift in the mean. Adapted from Foundation of Six Sigma Management (Levine, Gitlow, & Popovich, 2006). Copyright 2006 by PH Professional Business. Reprinted with permission.

How does Six Sigma work? Six Sigma is project-driven, defined to concentrate on one or more key areas: cost, schedule, and quality. The scope of a project is set for completion typically in a 3- to 4-month period, and must deliver a minimal annualized return, such as $150,000 (Antony & Banuelas, 2002).

Table 2

Six Sigma Conversion Table with 1.5 Sigma Shift.

Specific Limit	Percent	With 1.5σ shift defects PPM
± 1 σ	30.23	697700
± 2 σ	69.13	308700
± 3 σ	93.32	66810
± 4 σ	99.3790	6210
± 5 σ	99.97670	233
± 6 σ	99.999660	3.4

Note. Table 2 is adapted from Breyfogle's book *Six Sigma Smarter Solution Using Statistical Methods* (F. W. I. Breyfogle, 1999, p. 14). Copyright 1999 by John Wiley & Sons. Adapted with permission.

Six Sigma has a defined series of steps for analyzing and improving business processes. The steps follow the Deming's Plan-Do-Check-Act Cycle. The Six Sigma DMAIC (Define, Measure, Analyze, Improve, and Control) method consists of the following five phases:

Step 1 - Define the problem. The first step to any Six Sigma process entails defining the problem and defining critical quality characteristics, which are most important to the customers. This includes identifying internal problems that cause customer problems and what are the customers' needs and expectations (Antony & Banuelas, 2002). During the Define phase, data is collected and all the background information on a product or process; even customers are defined. This includes getting baseline data and data that pinpoints a problem location or instance. According to experts as cited in Studt (2002), it is recommended that a "30,000-foot view" is taken to identify the key process outputs and list what is important to the customer. Defining the problem involves discovering "defects" in procedures or processes such as long cycle time, variations, redundant, or reworked processes. Various tools are used to validate the impact of defects and possible improvements. Six Sigma projects often employ streamlining techniques to improve productivity and workflow (Lazarus & Butler, 2001). Tools employed include such as stakeholder analysis, process flowchart, SIPOC diagram, and Voice of the Customer to validate the impact of defect and possible improvements.

Step 2 - Measure the problem. During the analysis phase, the team develops theories, confirms the theories with experimental data and identifies root causes of the problem. The team selects the most appropriate output quality characteristics for improvement and establishes the unacceptable performance or a defect for such characteristics. The team then identifies how key processes are measured and how they are performing (Antony & Banuelas, 2002). The objective is to gain the full measure of performing key process variables and to understand how these

measures work together within a complex system to produce timely good products, at the best cost, that meets the needs of the customer and the company (Pearson, 2001). Measuring includes accuracy, as measured by correct financial figures, and completeness of information. It includes measuring cycle time (how long a process takes) and the cost of rework to correct mistakes have to be fixed. Finally, it includes measuring customer satisfaction if also needed (Bisgaard et al., 2002). There are several statistical tools for this phase, including cause and effect control charts, flow diagrams, design of experiments studies, regression analysis, and statistical visualizations.

Step 3 - Analyze the data. This step includes analyzing preliminary data to evaluate current process performance and capability to identify the root causes of defects or failures. It identifies through data analysis value and non-value added processes to a problem, identifies sources of variation, and discovers the root cause of the variation. Understanding the data by using statistical tools such as scatter plots, histograms; using tools such as histogram, ANOVA, hypothesis testing, regression analysis and the Ishikawa Cause and Effect diagram (Antony & Banuelas, 2002).

Step 4 - Improve the system. Includes identifying how the causes of defects or failures can be removed; identifying the key variables which caused the problem; documenting and testing solutions, and measuring results (Antony & Banuelas, 2002). Once the root cause is identified, the team's goal is to implement solutions that minimize, reduce, or eliminate the root cause of the problem. The team then evaluates the solutions by looking at before and after data and monitoring the overall process, and documenting the overall recommendations. Tools include Design of Experiments, brainstorming, House of Quality, Failure Mode, and Effects Analysis.

Step 5 - Control and sustain the improvement. This final step requires the team to identify how improvements can be maintained or sustained and establish standards of measures to monitor for future performance (Antony & Banuelas, 2002). Tools used include a control plan and control charts.

Six Sigma implementation is a management driven approach. The CEO usually sponsors and leads the effort, and executive management teams are the Champions for each project. The Champion is responsible for the success of the project, supplying the necessary resources and removing organizational barriers (Lucas, 2002).

The project leader is called a Black Belt (BB) and the project team members are called Green Belt (GB). A Master Black Belt (MBB) is a resource for the project teams. MBBs are often veteran BBs who have worked on many projects. They have knowledge of advanced tools, business and leadership training, and have teaching experience. The primary responsibility of MBBs is to train and mentor new BBs in the organization (Lucas, 2002).

The bottom-line savings is a key driver in Six Sigma. All Six Sigma projects are assessed for financial impact. According to Lucas (2002), organizations on the average expect savings of $175,000 from each project.

Six Sigma aims to increase the effectiveness and efficiency of an organization. Effectiveness is the degree to which an organization meets and exceeds its customer requirements. According to George Eckes (2003a), "the average organization has only a 50% efficiency rating and rates a "C" in customer satisfaction." Once the success criteria measurements are created, projects that have impact to the overall business objectives yet the projects have inefficiencies are chosen. Eckes (2003a) indicates that many organizations omit

these steps and go directly to authorizing teams for improving efficiency. Without this pre-work, Eckes writes, many Six Sigma projects have little impact on the business.

Therefore, the first step in creating Six Sigma as a management philosophy is to identify the key processes that help meet the organization's business objectives. This includes identifying and setting priorities the business objectives and the key processes that support them. Key outputs from the core processes and the key customers of these outputs must then be identified. Using this information, a process map is produced for each of the core processes and the interconnectedness of these processes. This provides an understanding of the business and its interdependencies (Antony & Banuelas, 2002). Once this is complete, the next step is to define the customer's requirements. According to Antony and Banuelas (2002), organizations must recognize the customer's needs, demands, and attitudes change overtime. Therefore, it is important for organizations to have the voice of the customer system to gather customer data and prioritize projects based on the ability to meet the customers' needs.

What is different about Six Sigma? Six Sigma is different from other quality improvement methods. It is unique because the customer defines the defect, the program is data-driven, and it emphasizes fixes to ensure defects are at near zero (Shand, 2001).

According to James M. Lucas (2002), Six Sigma focuses on a divide and conquer approach, not a continuous improvement philosophy. It provides a short-term solution to long-term problems. It has a narrow focus and driven by senior management (Lazarus & Butler, 2001).

Lazarus and Butler (2001) believe the traditional quality methods such as Total Quality Management solutions are "grass roots," continuing initiatives where incremental change delivers incremental benefit. It focuses on defect elimination for sake of perfection, not for the

customer, as does Six Sigma (Shand, 2001). Other quality initiatives focus on teaching employees to become more quality-focused in their jobs with the hope that in time the entire organization will embrace the method.

In contrast, Six Sigma requires top-down directives. It is project based. Projects have concrete objectives and provide opportunities for planning, review and learning compared with other quality method where quality is a company-wide quality movement. With Six Sigma, employees are trained and become improvement specialist such as Project Champions, Black Belts, and Green Belts- something not seen with other quality methods (Linderman et al., 2003). Six Sigma projects concentrate on one or more key areas such as cost, schedule, and quality. It relies heavily on statistics and requires quantitative boundaries that can be measured consistently (Shand, 2001). This method uses traditional process control, measures boundaries, and modifies the process based on the measurements. The calculations are not random, but instead based on statistics, especially standard deviations. The primary differences between Six Sigma and other quality initiatives is the relentless focus on data, on processes and business results.

Six Sigma also incorporates a series of analytical tools, and the practitioner's role is to apply the proper tool to address the problem (Lazarus & Butler, 2001). The practitioner's ultimate goal is to identify the characteristics of a defective process by examining the relationship between processes and the underlying root cause of conflict. Their immediate objective is defect reduction (Raisinghani, Ette, Pierce, Cannon, & Dripaly, 2005), to minimize defects to 3.4 per million, whereas other approaches to quality focuses on defects per hundred or defects per thousand (Shand, 2001).

Clear focus and getting bottom-line results is another characteristic of Six Sigma not stressed in previous quality improvement approaches. A Six Sigma project is not approved

unless bottom-line impact has been identified. Average project savings can range from $50,000 to $200,000 (Breyfogle & Meadows, 2001). The goal of Six Sigma is to produce products and services of highest quality, produced at the lowest cost and delivered exactly when the customer wants them (Velocci, 2002). The final goal is the net income generated through savings from reducing defects and reduced cost of rework.

Six Sigma builds on improvement methods shown to be effective and integrates the human and process elements of improvement. Other quality approaches focus on the human elements like teamwork; Six Sigma focuses on the process of improvement such as statistical process control. The five-phase improvement process, DMAIC, creates a sense of urgency by emphasizing rapid project completion in 3 to 6 months. According to Blakeslee (1999), unlike other quality methodologies, the Six Sigma principles apply not only to manufacturing and electronics, but also to any business, from banking and financial services to chemicals, pharmaceuticals, utilities, health care, or entertainment.

Key reasons for Six Sigma program success. Six Sigma improvement projects are integrated with the overall goals of the organization (Lucas, 2002). It is successful because it breaks the process, product, or customer's requirements into comprehensive compartment.

There are fundamental ingredients of Six Sigma that contribute to the program's success. According to Antony and Banuelas (2002), the following are key success reasons to a Six Sigma program, listed in order of importance:

1. There is a strong leadership and top management commitment. Six Sigma-driven companies have leaders who support and promote streamlining the organization; they support the cultural change and motivate their employees towards quality.

2. The organization's culture and its employees' attitude support Six Sigma, and therefore, project teams have the support of the organization.

3. Organizations that use Six Sigma have an infrastructure that is cross-functional. It includes project teams with the leader such as the CEO or vice president of an organization, Master Black Belts, Black Belts, Green Belts, project sponsors, or Champions who are committed to the success of the program.

4. The IT system receives, organize, and help translate data into effective decisions for the organization. The IT system supports collecting data from the process. It provides a means for effective communication and sharing of data across the organization.

5. Engaged trained improvement specialist(s), often referred to as the Belt System, know and have project management skills to meet the various deadlines or milestones during the project. Understanding the Six Sigma method, tools, techniques, and metrics DMAIC by employees contributes to the success of the program.

6. Every project is linked between the project objectives and the organization's strategy because Six Sigma is part of the whole business strategy, (Sandholm & Sorquist, November, 2002). There are three generic criteria used for project selection (Pande et al., 2000). Business benefits (impact on meeting external customer requirement, financial impact, and impact on core competencies), feasibility (resources required, complexity, expertise available), and organizational impact criteria (cross-functional benefits, and learning benefits such as knowledge gained about the business, customer, and processes).

7. Six Sigma projects are linked to customer requirements. Organizations identify, define and prioritize company core business processes. From the core processes, they outline the key outputs and the key customers that these outputs serve. In doing so, they produce process maps

for each of the core processes and shows how they are interconnected by getting a better understanding of the business and its interdependencies. Successful organizations gain insight to their customers' needs and establish guidelines for customer satisfaction.

8. Six Sigma programs are linked to Human Resources. Organizations include rewards programs to promote desired behavior. According to Antony and Banuelas (2002), 61% of the top performing companies link their rewards to their business strategies, while lower performing companies create minimal linkage (Harry & Schroeder, 2000).

9. The principles are extended to suppliers to build strong partnership and for suppliers to take part in the drive for quality. This enables suppliers to know the standards and the processes by which an organization performs, bringing the suppliers closer to the customers, and therefore improving the quality of product or process.

For non-Six Sigma companies, the cost of poor quality is often extremely high. Companies performing at three or four sigma typically spend between 25% and 40% of their revenues fixing problems (Velocci, 2002). According to Velocci, companies performing at Six Sigma typically spend less than 5% of their revenues fixing problems. Further, he states that because Six Sigma focuses on efficiency and doing right the first time, following results of this focus is increased customer satisfaction and loyalty.

Benefits of Six Sigma highlight the financial returns and accentuate financial returns to the balance sheet of an organization. It also accentuates on efficiency and savings in process time and increase productivity (Velocci, 2002). According to Velocci, a study conducted of 45 large companies in the United Kingdom by Jiju and Ricardo reported 75% of the companies surveyed gained financial benefits (i.e. more than 100,000 per annum) because of Six Sigma implementation.

Examples of success with Six Sigma. Many U.S. corporations have adopted Six Sigma methods to improve process quality performance and reduce cost associated with defects. Some of these organizations include but not limited are General Electric (Bane, 2002; Ettinger, 2001), Motorola (Anonymous, 2002; Association, n.d.), Allied Signal (Challener, 2001), Citibank (Rucker, 2000), DuPont Chemical Co. and Dow Chemical Co (Challener, 2001), Raytheon (King, 2004), American Express (Martens, 2001) and the list of organizations adapting Six Sigma continues to grow.

Many of these organizations have reported success with Six Sigma. According to Plotkin (1999), General Electric estimated that Six Sigma efforts added more than $600 million to the company's bottom line in their 1998 fiscal year. This was an estimated annual savings of $6.6 billion by the year 2000 (Air Academy Association, n.d.). Commonwealth Health Corporation claimed that in 2002, the organization invested about $900,000 in a Six Sigma initiative and reported improvements more than $2.5 million (Lazarus & Stamps, 2002). Motorola, between 1987 and 1994, reduced their manufacturing cost by $1.4 billion. AlliedSignal, between 1992 through 1996, reduced cost by $1.4 billion, increased growth per quarter by 14%, reduced new product introduction time by 16%, and reduced billing cycle by 24% (Air Academy Association, n.d.).

Six Sigma has been used in evaluating companies' financial value by the shareholders and by financial analysts. Its quality initiatives result in savings that increases companies' value. For example, in 1999, Allied Signal (now Honeywell) reported to its shareholders the use of Six Sigma program enabled them to expand earnings per share by 13% (Dale et al., 2000).

Six Sigma claims it will solve process and business problems by focusing on the reduction of variation. By using a set of statistical tools to understand a fluctuating process,

management can begin to predict the expected outcome of that process. Through a rigid and structured investigation method, the process elements are better understood. The assumption is that the outcome of the entire process will be improved by reducing varying multiple elements. Another assumption is that through reducing variation of all the processes, the overall performance of the organization will be improved.

Six Sigma's weaknesses. Despite the benefits of Six Sigma, most attempts by companies to sustain its use have ended in failure. Companies have found it difficult to continue successful Six Sigma process improvement initiatives (Basu, 2001). Basu writes that successful Six Sigma improvement programs have sometimes led to declining business performance, causing layoffs and low employee morale. For example, Motorola announced in 1998 that its second quarter profit was almost non-existent, thus it was cutting 15,000 of its 150,000 jobs.

According to Dusharme (2004), there is a trend for companies to abandon Six Sigma at year 3 or 4. There are several reasons why this might be the case. The most likely, Dusharme reports, is that in reality, Six Sigma is not different from other quality programs. If Six Sigma shows the results companies are looking, companies will continue to use it until they reap the immediate benefits. At that point, the major cost savings because of reduced waste have been realized. Dusharme further states that if Six Sigma is not expanded to the rest of the organization, then companies most likely abandon the program. Another reason he identifies in his article is attrition. Managers or executives come and go, and if Six Sigma is not part of a company's culture, this attrition will lead to the gradual natural subsiding of the strong support for the initiative.

In 2004, Dusharme conducted a survey of 25,107 quality professionals who subscribe to *Quality Digest* (Dusharme, 2004). Of the population, 1,287 individuals responded. Some of the

respondents suggested that Six Sigma is another tool for CEOs to reduce personnel and increase profit. They also reported that it seemed companies trained people in Six Sigma, but refused to implement improvements because of cost or lack of management support.

Because Six Sigma requires managing by fact and data, it requires a change in the management philosophy, because most organizational cultures are less scientific and do not think about processes, measurements, and data (Bisgaard et al., 2002). Bisgaard states that while executives see the need for change and accept it readily, most in the organization will not. This often creates resistance toward the philosophy, as well as resistance towards those individuals who develop expertness of Six Sigma tools and techniques because it makes others feel inadequate.

Most companies view Six Sigma as a statistical tool to solve problems with processes, rather than viewing it as an overall organizational behavior (Velocci, 2002). Most Six Sigma process management literature calls for first identifying the key business processes. Then organizations develop the inputs and outputs that include its customers and suppliers. Following is the development of the key measures that characterize its performance (Eckes, as cited in Burton & Pennotti, 2003). Although this provides a critical understanding of how each process works and how performance can be improved, Six Sigma process management is often delegated to the specialized few of the organization. This overlooks the fact that a business is not just a collection of separate processes managed by those trained in Six Sigma, but an integrated system of processes that includes the entire organization (Porter, as cited in Burton & Pennotti, 2003).

As discussed, Six Sigma is a project-focused approach with a single set of problem-solving techniques, such as DMAIC. These projects are set out for 3 to 6 months, focused on a specific performance problem with the bottom-line in mind (Snee, 2001). With the pressure to

show results and demonstrate success, many Six Sigma practitioners work on problems that are related to the 'here' and 'now' around them. Because of this concentration, Six Sigma initiatives often do not anticipate changes that may occur outside their focus such as increasing demand for new products and services, changing lifestyles, new technologies, customization, that of increasing importance to customers from a globalized environment. Rather, it focuses on a single trend preoccupied with internal objectives (Snee, 2001).

Some of Six Sigma's early adopters, such as Kodak, Xerox, and even Motorola, have experienced significant business reversals (Hammer, 2002). According to Hammer, many companies that have been successful with Six Sigma have learned that it has limits and some have abandoned the method. For instance, IBM showed movement in the mid-1990s after it had experimented with Six Sigma, but then abandoned it. In early 1996, Bombardier, a Canadian corporation active in transport and financial services, had decided to commit to Six Sigma. They trained 200 Black Belts and more than 500 projects were launched. They achieved a 5-year net cash-flow savings of $137 million (Canadian dollars). In 1999, Bombardier assessed Six Sigma efforts and inferred that despite the success they achieved, Six Sigma initiatives had serious limitation. They concluded that

> Most of the Six Sigma projects were narrowly focused, concentrating on low-level and small-scale activities, typically within one functional unit of the organization. When managers tried to apply Six Sigma to larger-scale projects, the results were unsatisfactory until the scope was narrowed. Although each Six Sigma project was worthwhile, it was not well aligned with the strategy of the organization as a whole; and it did not contribute to larger corporate goals. (Hammer, 2002, p. 30)

Given that Six Sigma is a project-focused approach, it has an inherent limitation. It uses statistical tools to analyze and uncover flaws with existing processes (Hammer, 2002). Often, a wide array of Six Sigma programs and initiatives are disconnected and it struggles to coexist

under one corporate umbrella. While one part of the organization's focus is on driving cost-cutting initiatives, another part is figuring out how to improve customer perception, while still another is considering options for lowering delivery times (Harry 2000). According to Harry (2000), it does not have the ability to organize, unify, and focus the overall organizational system.

Six Sigma teaches executives and those who practice the method the reductionism way of breaking a problem down into smaller elements that can easily be analyzed and develop solutions that focus on a single issue (Harry, 2000). This approach tries to understand the nature of complex things by examining the interactions of the components and understanding cause and effect between those parts. It focuses on issue resolution and solution optimization at a component level in an organization that addresses short-term issues, but it lacks a holistic long-term problem focus that includes all levels of an organization.

While most modern science such as physics or chemistry use reductionism to understand complex things by reducing them to the smaller units, there is controversy when reductionism is applied solving complex problems in an organization (Reductionism, 2008). According to Checkland (1981), complex problems that threaten organizations involve richly interconnected sets of parts. The relationships between these parts can be more important than the parts themselves, and therefore, complex systems are inherently irreducible and that a holistic approach is needed to understand them. Such a holistic approach to complex issues resolution is one provided by systems thinking.

Background and Review of Systems Thinking Theory

Introduction. Systems thinking is a holistic approach to analysis that focuses on the way a system's parts interrelates, and how systems work overtime within the context of larger

systems. It views organizations from a broad perspective of its structures, patterns, and events taken within and outside the organization. The broad view helps one to identify the real causes of issues and know where to work to address them (Tymofyeyev & Strom, 2003).

Historical background. Systems thinking traces back early in human history. It dates from the golden age of Greece during the pre-scientific stage and was used for centuries. Great philosophers such as Plato and Aristotle contributed to the theory (Skyttner, 1996), including Hegel, who originated "the whole is more than the sum of the parts" (p. 18). However, it was not until the Industrial Revolution that formal recognition of the systems approach was applied to management (Skyttner, 1996). In 1940, an Austrian biologist, Ludwig von Bertalanffy, introduced systems thinking idea to manage technological complexities that arose on the fields of engineering and science. He stated that we must look at individuals and organizations within the context of their environment, as they are not an island unto themselves, but are part of a larger network (von Bertalanffy, 1968).

Defining a system. Oxford English Dictionary defines "system" as "a set or assembly of things connected, associated, or interdependent, to form a complex unity. It is a whole composed of parts in orderly arrangement according to some scheme or plan, rarely applied to a simple or small assemblage of things" (System, n.d.). Simply stated, a system is a collection of parts that interact with each other to function as a whole.

A system is a collection of different elements connected to perform a unique function not by the elements alone, but as a whole (Harrington, Carr, & Reid, 1999). The whole emerges from the interactions between the parts, which affect each other through complex networks of relationships. A system has a collection of subsystems that are interdependent and integrated, working together to carry out an overall goal.

According to Ackoff (as cited in Backlund, 2000, p. 447), "the behavior of each subsystem has an effect on the behavior on the whole; the behavior of the subsystems and their effects on the whole are interdependent." Systems and each subsystem have its own boundaries and include various inputs, processes, outputs, and outcomes with continuing feedback among the various parts geared to achieve the overall goal for the entire system. A system interacts and responds to its environment and with other systems. Inputs from its environment cross over into the system where these inputs interact in a transformation process, and then leave the system as outputs (Cusins, 1994).

Inputs to a system include many sources such as political influences, regulations, social influences, raw materials, money, technologies, suppliers, employees, competitors, and customers and therefore organizations are dependent on their external as well as internal environment to survive (Cusins, 1994). These inputs go through a process where they are aligned, moved, and carefully coordinated, eventually to achieve the goals set for the system. An example would be the cooling system of a car. It consists of a radiator, a fan, a water pump, a thermostat, a cooling jacket, and several hoses and clamps. Together they work to keep the engine from overheating, but separately they are useless.

Outcomes of a system are those functions, attributes, or behaviors, which would not exist except for the system's operation. Outputs are tangible results produced by processes in the system, such as products or services for consumers. Transforming inputs to output is the process by which the goals are achieved. If one part of the system is removed, then the disposition of the system is changed. Harrington et al. (1999) used the automobile transportation as an example. According to them, an automobile has certain parts and these parts may or may not include the best tires and axle, but they must be set at the right angle of each other for it to produce

transportation. Otherwise, if not configured exactly as required, the interrelationship of these parts will fail to yield automobile transportation (Harrington et al., 1999).

Systems that exist and preserve its state rely on its connections and relationship within its subsystems and its environment by using feedback control, also known as a feedback loop (Kast & Rosenzweig, 1972). Feedback is information from output of a system, fed back as an input into the system that influences the transmitter's resulting actions (Harrington et al., 1999). Feedback arises from various sources such as employees who carry out processes in an organization. Other sources include consumers who buy or do not buy a product offered by an organization, and suppliers who supply services or materials to an organization nationally and globally. The larger environment such as government, society, economics, and technologies influences organizations in the way it interacts with its environment.

Defining systems thinking. Systems thinking is a powerful approach used to analyze systems. It provides tools for the better understanding of an organization and its respective environment's difficult management problems (Cooper, 2005).

It examines how the studied subject interacts with the other members of the system, rather than separating individual pieces, as reductionists do. The approach requires a shift in the way we think about an organization's performance. It requires that we move away from looking at isolated events and their causes, and start to look at the organization as a system made up of interacting parts (Kirkwood, 1998). At the University of Virginia School of Education, Forrester (1996) stated in his lecture, "People seldom realize the pervasive existence of feedback loops in driving everything that changes through time" (Forrester, 1996, p. 5). Most people, he stated, think in linear, non-feedback terms. Systems thinking encourages managers to view problems from a larger perspective by looking at the larger pattern of interconnections, or causal links of a

problems are a part. Using this method requires organizations to look at the internal structure of the system and external events in creating the problem (Kirkwood, 1998).

As stated earlier, systems thinking approach sees the organization as a system in constant interaction with its environment (Jackson, 2002). Other theories of management, such as reductionist theory, are based on a mechanical image of the world and linear causality to explain an occurrence. Reductionist method focuses on task and structure by breaking down to individual pieces, studying each part by itself for the root cause of a problem; then a conclusion is drawn about the whole (Aronson, 1998). This linear causal thinking model assumes that certain causes are acting together linearly to result in an event. The assumption is that outcome of an event does not affect input. The linear casual thinking, according to Holling and Meffe (as cited in Hjorth & Bagheri, 2006), solves problems either through control of the processes that leads to the problem or adjusting to the processes to correct the problem after it occurs. This paradigm assumes the problem is defined relatively simple and linear with cause and effect (Hjorth & Bagheri, 2006). Its use of statistical models, according to Senge et al. (1994), is limited to explaining past behavior to predict future trend. The problem with this approach is the whole often take on a form that is not recognizable from the parts.

Organizations are complicated to be predicted and controlled in a linear fashion. Systems thinking model focuses on the pattern of relationships and how it interacts with the other parts of the systems (Aronson, 1996). It investigates how one or more variables of interest change overtime, and looks for similar patterns of behavior in various situations. Thus, this method of analysis compels organizations to look at the underlying system structures that cause the problems (Kirkwood, 1998). In doing so, organizations identify and modify the system structure that brings forth the possibility of permanently removing the problem pattern of the behavior.

To show the difference between traditional and systems thinking forms of analysis, Daniel Aronson provides an example of action taken to reduce crop damage by insects. He writes that when an insect is eating a crop, the most common response is to spray the crop with a pesticide designed to kill that insect. The traditional form of analysis is tempted to believe that removing the insects eating the crops will solve the problem. When pesticide is applied the crop damaging by insect is reduced or eliminated, thus crops are saved (see Figure 5; A [spray pesticide], causes B [pesticide kills crop eating insects] causes C [crop is saved]). However, this is a linear approach and offers a short-term solution.

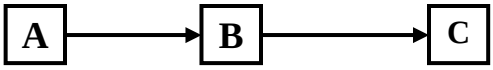

Figure 5. Crop-eating insect example with short-term cause and effect.

The systems thinking form of analysis, on the other hand, looks at the problem holistically. It explores the crop damaging insect interrelatedness as it interacts with the environment at large. This approach explores the effects of pesticides would have to the entire system, not just the crop-eating insects. It is a nonlinear approach. It turns out in the following years, according to Aronson (1998), the problem of crop damage gets worse, and the pesticide that formerly was effective does not solve the problem anymore. That is because the insect that was eating the crops was also controlling the population size of several kinds of other insects by preying on them. Once the crop-eating insect is eliminated, the control it used to impose on other kinds of insects is also eliminated. This means that once controlled populations of insects are now the new threat, causing more damage than the eliminated insect used to (see Figure 6). A (spray pesticide), causes B (pesticide kills crop eating insects), causes C (crop is saved); but A also causes D (other insects thrive), and in the end destroys C (destroy the crop). In the short-

term, one might believe that A solves the problem, but looking at the final long-term solution in a linear way of root cause analysis one concludes A did not. On the contrary, when the same analysis of the problem is expanded to include the entire system, it shows A does solve the problem, but it also influences unanticipated variable in the long-term that causes the crop destruction. This example explains how a systems thinking holistic approach to analysis expands the focus on the way a system's parts interrelates. It provides an insight into how systems work within the context of larger systems that affects the ultimate solution of the problem.

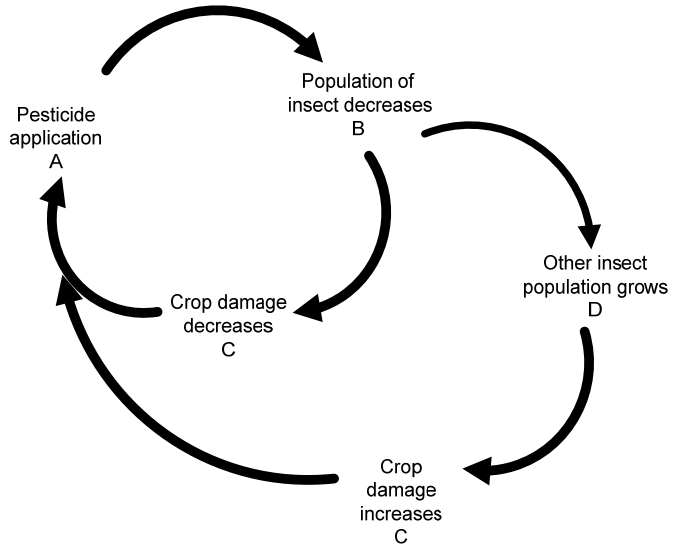

Figure 6. Crop eating insect example with long-term cause and effect.

A change that is important to an organization from the outside or within an organization may be minor and insignificant. However, when an organization is dependent on that process' interaction and interrelation within the organization and its environment, a change to any one process often results in compensatory change in others. Consequently, any effort to carry out change through isolated single effort is likely to fail because it is impossible to know all the facts and values on which to decide the isolated solution. Therefore, to understand how changing one

element in an organization changes the rest, a holistic systemic perspective is needed for a lasting and successful change to any process (Cao, Clarke, & Lehaney, 2000).

To better understand the system structures which cause the patterns of behavior, Senge emphasizes the importance of feedback loops and account for the speed at which influencing factors impact the feedback loops (Senge et al., 1994). Feedback loops can be positive, also known as reinforcing feedback loop, or they can be negative, known as balancing feedback loop. A positive, reinforcing, feedback means that a change in one part of a system causes a change in another part of the system. Positive feedback loops are effective for creating change, but result in negative outcomes if not moderated by negative feedback loops. This is because one point of the feedback loop eventually works their way back to reinforce or amplify the original change. Such systems eventually run out of control. For example, as described by Senge in his book *The Fifth Discipline: The Art and Practice of the Learning Organization* (Senge et al., 1994), an increase in foreign arms increases U.S. arms, which tends to stir up increases in foreign arms – one reinforces the other. If a balance is not put in place, then the increase in arms could potentially cause more harm than its original intended.

A negative feedback, known as a balancing feedback loop, exists whenever a change in one part of a system causes a change in another part of the system, which then in turn counteracts the original change. Senge et al. (1994) exemplifies this by using a control room temperature. That is, if the current room temperature is greater than the desired room temperature, the air-conditioning unit adjusts upwards pushing cool air to adjust the temperature to the desired state. If the current room temperature is lower than desired state, then the heater unit pushes hot air to adjust the room temperature to the desired state. Such systems tend to be self-regulating and are not prone to run out of control. Negative feedback loops help system keep stability, maintain

current state, and improve in the future, by adjusting based on the feedback received from its environment.

"Feedback is thought of as outputs of information about the system, which, when fed back into the system as inputs, are able to modify the system while the process is in progress. This makes the system responsive and flexible" (Cusins, 1994, p. 22). Feedback can be internal or external. Internal feedback loops that occur within a system can be thought of as subsystems within the system. In external feedback loops, the feedback information is obtained outside a system; they contain information about the outcomes which, when fed back into the system, are able to modify the process while in progress.

Senge further asserts that "delays are subtle, usually taken for granted, often ignored altogether, always under estimated" when changes are applied (Senge et al., 1994, p. 119). The lag time, or a delay, of a feedback can have enormous influence in a system. In reinforcing loops, for example, delays can rise to questioning our confidence in a process because growth does not come as quickly as expected. In balancing loops, delays can dramatically change the behavior of the system. When delays are not acknowledged, people react impatiently, wondering why they are not seeing the expected result. Senge points out that it is important to identify and recognize delays for the process changes that take place because delays are often source of waste; removing delays is a key method for speeding up cycle time for any change.

A final element to understand is that feedback loop is a closed loop with sequences of causes and effects. The closed loop shows how variable X affects variable Y and, in turn, how variable Y affects variable X through a chain of causes and effects (Lapp & Ossimitz, 2008). A circular systematic process is one that no longer focuses only on one interaction between two variables, but focuses on the entire system with its many variables and its many causes and

effects (Jackson, 2003). It facilitates understanding of how the processes, organizational boundaries, delays, information, and strategies of systems interact to create system behavior. Whereas a linear chain of cause and effect does not close back on itself and therefore it is considered an open loop. According to Kirkwood (1998), analysis of a process that does not incorporate feedback loops indicates thinking that is not considering the full range of impacts of a proposed action.

The causal loop diagram illustrates the feedback loop relationship between the variables with an arrow, and at the end of the arrow the cause and effect relationship is displayed with (+) noting positive influence. This means the two variables move in the same direction; and (-) noting a negative influence, the two variables are moving the opposite direction from each other (Senge et al., 1994). The overall effect of the relationships is a closed system because the feedback loop has input and output to the system, where the output of the system is fed back into the system as part of its input. Using causal loop diagram with the crop-eating insect exemplifies as follows (see Figure 7).

As the pesticide spray is applied (A), the crop eating insect population is decreased (B), and the crop damage decreases as well (C). In this case, the feedback loop is a balanced one because one counteracts the other sustaining stability for these variables (linear cause-and-effect). However, applying systems thinking with CLD analysis that includes accounting of the delay of the pesticide application (marked by the double line) shows the interrelation to the other insect. Therefore, continued application of the pesticide creates reinforcing feedback to the unaccounted variable, the other crop-damaging insect. The more insect B population decreases, the more that the other crop damaging insect population increases (D), and therefore, the pesticide application do not address the long-term solution. The destruction to the crop

continues unless the problem is analyzed from a systemic perspective and a holistic solution is identified to solve for all influencing variables. The short-term effects of applying the pesticide did exactly what it was intended; the long-term effects were different.

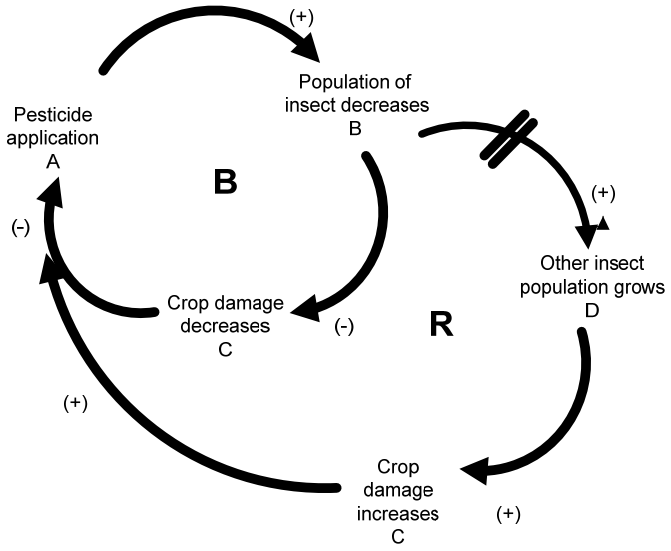

Figure 7. Crop-eating insect example with feedback loops.

The systemic interrelationships between feedback loops make up the structure of the system. A key lesson of feedback loops is that they are connected; changing one variable in a system will affect other variables in that system and other systems. This structure is the prime determinant of how a system behaves (Jackson, 2003). Any system that is going to survive long enough, according to Kauffman (1980), has to have the ability to cope with the changes. According to Hjorth and Bagheri (2006), "missing feedback is one of the most common causes of system malfunctions" (Hjorth & Bagheri, 2006, p. 86). Understanding feedback is important because those who implement solutions or improvement to the existing processes must not only consider particular elements of a solution, but also the relationship of the solution has with its

environment and its interrelated parts. The feedback it receives, and how the system as a whole behaves to the greater environment, is key to the success of process changes.

Systems thinking application. Systems thinking approach includes systems diagramming. It is a method used to represent the chosen system and to reproduce the problem area for analysis. It provides managers the structure of complex systems so they can intervene to ensure solutions identified best fits with their goals. There are five phases of analyzing a problem using systems thinking.

First, an organization must identify the problem. This entails identifying outside entities that are involved or affected by the issue, then expanding who else is indirectly affected and developing the connection between the entities (Anderson & Johnson, 1997). The basic method to identify the structure of an organization is to follow the chain of events from the input through its transformation to the output. Second, the organization must diagram a feedback loop model to show the relationships between the variables, as interactions or no interactions of these variables impacts to the behavior of the system. Third, the organization needs to model and simulate the system to explore implications of process changes before it is implemented, and examine their organization's behavior to reveal consequences when changes are made within any elements in the system. This requires developing a model of business issues and testing to show both the external and internal boundaries and interdependencies and linkages between processes. It provides a practice opportunity where managers can see the designed solutions' application and consequences. Fourth is for the organization to conduct scenario planning. This allows managers to imagine their proposed solutions with different possible outcomes by testing strategies under varying conditions. Last for the organization is to implement and share learning with their constituents (Jackson, 2003).

Integrating Systems Thinking with Six Sigma Method

Globalization and worldwide competition has driven the need to focus quality understanding and anticipating customer expectations. To survive and to prosper, companies must improve the quality of their products or services by adapting to the feedback received from their environment by continuously adjusting themselves (Mole, 2004). Historically, organizations have attempted to implement changes in their processes to achieve quality improvements through functional hierarchy. Whether the organization is a manufacturing, sales and marketing, or a financial institution, these organizations rarely achieved high levels of customer satisfaction. Eckes (2003a) states the reason being is that functions are aligned vertically. Vertical hierarchy ignores the organization's customers interacting with an organization. Customers' experience go through organizations horizontally, through a series of cross-functional, interdepartmental processes.

There are many quality management theories outlined in Chapter 1 that companies use to improve quality of their services or products. One of those theories that are used often by organizations is Six Sigma. Usually Six Sigma is implemented as a stand-alone program to identify immediate improvement opportunities to a process and measure outputs (Brletich, 2002). Six Sigma normally analyzes processes linearly and not in a circular manner, and defines them as an input of the current state-process and transformation-output to the desired state model. Six Sigma translates an operational problem into a statistical problem, makes use of statistical techniques tools to solve it, and translates the results to practical actions (Pourdehnad & Robinson, 2001). It is a top-down initiative carried out by a hierarchy of trained personnel, is project focused with an expressed timeline, results, and is financially results-oriented. There is a tendency to use Six Sigma as a predominant, if not the only, basis for expressing project

objectives and qualifying achievements. It applies linear cause-and-effect and heavily focuses on the DMAIC model to solve problems. Further, those who are trained, such as Black Belts and Green Belts, are recognized and rewarded for the results they produce. As a result, their focus is on the project rather than looking at the larger picture and long-term solutions for the organization. This model of solving problems works when there is a need for immediate resolution.

According Frank R. Brletich (2002), most Six Sigma programs, however, draw attention away from the root causes for a long-term solution, and thus, it is blamed for not meeting the expectations of the organization and its stakeholders. As an approach to organizational excellence, Goh (2002) states that Six Sigma can be improved by incorporating methodologies of systems thinking to break away from the narrow attention span of 'here' and 'now'.

Improving organizational processes relates to other internal process that flow within the organizational structure. Forrester (1998) writes that we do not live in a unidirectional world in which a problem leads to an action that leads to a solution. Instead, he writes, we live in a constant circular environment. Each action is based on current conditions, such actions affects future conditions, and changed conditions become the basis of later action. Forrester considers there is no beginning or end to a process.

Therefore, Forrester (1998) states, to make Six Sigma relevant and useful in the long-term, organizations need to integrate system analysis into Six Sigma model. According to Goh and Xie (2004), Six Sigma process improvement can be extended from micro to macro management and from incremental improvements to long-term excellence, while integrating systemic perspective in process improvement (Goh & Xie, 2004; Pourdehnad & Robinson, 2001).

The review of the pertinent literature review supports this assertion. Several research studies conducted suggest that one of the shortcomings of present quality management models is lack of a systems perspective in identifying and resolving complex organizational problems. In 2005, Conti asserts that one of the shortcomings of present quality management models is the lack of systems perspective. He further states there is an urgency in introducing systems thinking into quality thinking (Conti, 2005). According to Conti, quality management, despite their assertion to embrace the systems view of the organization, seems inadequate. Conti believes all quality management models praise the systems view of organizations, but the analytic perspective, with cause–effect bilateral relations, are characteristics of a holistic view that is lacking. He advocates and believes that the emphasis on processes is good, but it is time that we think quality management with an integrated systems thinking management model to address complexity with current organizational issues.

In 2008, Floyd called out the need to include systems thinking and practice in response to a deeper approach to deal with complex problem. In his article, Floyd (2008) cites Hjorth and Bagheri, who suggest the traditional linear way often used in many quality management methods for solving complex problems no longer supports how current complex organizations can sustain themselves. Hjorth and Bagheri further state that, "sustainability should not be perceived as a 'project' that has an end point, but as an ongoing process that needs to be regarded on everyday work" (as cited in Peter & Ali, 2006, p. 75).

Brletich (2002) stresses that we need to have all the variables necessary to be integrated as part of the quality improvement. Because a system responds to its environment, inputs from its environment cross over into the system; and within the system, inputs interacts in a transformation process. The transformed inputs leave the systems as outputs; there is a flow

between an organization and its environment (Cusins, 1994). To do so, we need to look at any system as a circle where the environment and feedback are integrated (Brletich, 2002). When quality improvements to a process, product, or a service are made, organizations must ensure each process improvement is compatible with surrounding processes and consider the overall system and its many subsystems (Harrold, 2002).

Organizations are purposeful systems, and the biggest mistake that can be made is managing organizations as if they were a standalone entity within the larger environment (Conti, 2006).

There is a link between quality thinking and systems thinking, and it is found in relations of those interactions of the organization's constituent parts. Quality alone has neither positive nor negative implications. However, it will take on a value when customers' perceptions evaluate quality based on their satisfaction of the product or service they receive. A deep understanding of customers' expectations is critical for improving quality. Therefore, focusing on improving quality of a product or process cannot be based on quality management thinking model alone. Systems thinking must be integrated to identify solutions that improve the quality of a product or service and improve the relations interdependence and interrelated parts of an organization.

Summary

The foundation of Six Sigma was built on the need for uniformity during the 1700s. The philosophies of Six Sigma have evolved from uniformity to consistency; and further evolution was brought by the Industrial Revolution. Manufacturing caused the need for data collection and sampling to identify where the variance occurred and control the variance to meet customers' requirements. In 1945, businesses recognized that the value of examining data to predict future

performance improvement was not only limited to manufacturing, but rather, there was an opportunity to apply it to the entire organization. Globalization and the need to remain competitive among market demands resulted in the need to function more efficiently, almost at near zero level of variance, reduce cost, and increase customer satisfaction. All of these were the building block for the origin of Six Sigma method known and used currently by many organizations.

The Six Sigma approach is target driven by data and has clear focus on getting the bottom-line result. Its goal is to produce products and services of highest quality with the use of many statistical tools. Several American corporations have adopted Six Sigma methods to improve processes. However, many attempts have resulted in failure. Many companies have abandoned the use of Six Sigma because it is project based with short-term solutions. Critics of Six Sigma have argued that it does not engage the entire system. It tries to solve complex problems without involving the interconnected parts of an organization; it lacks a holistic approach to complex issues. Therefore, Six Sigma success is often short-lived because most Six Sigma tools do not consider causes that may affect the long-term prolonged improvements. It does not adequately address systems feedback in organization and recommends behavioral approaches to change should be integrated to ensure sustainability (Allen & Davenport, 2009).

In a typical organization, there are hundreds of processes, all interrelated, running at different schedules and rates, and many of them feeding back on each other. Traditional cause-and-effect demonstrates interdependencies but it is static picture of what is going on in the organization. Systems thinking view looks at the dynamic interrelationships by using feedback and causal loops, while considering for delays (Senge et al., 1994). The main concept in systems thinking is to look for interconnections, feedback, and time delays. Thus, to solve a problem one

must look at the symptom of an underlying pattern. Feedback refers to the cause-and-effect relationship found among system elements. Systems thinking proponents identify two types of cause-and-effect relationships, reinforcing and balancing relations

The benefits of understanding feedback loops is that it often helps managers to look beyond the obvious mess presented by surface appearances to see if there are any underlying patterns of feedback loops that are determining system behavior. An understanding of how feedback loops interact and cause system behavior can tell the way managers work. For example, they become much more aware of the dangers of unintended consequences, of treating symptoms rather than causes, of the importance of 'delays', etc. Rather than jumping to what appear to be obvious solutions to problems, managers need to appreciate that complex systems often behave in subtle and unexpected ways. It is worth spending time searching for smaller interventions that, nevertheless, may be the levers to bring about substantial changes. System dynamics supports the conclusion that 'no man is an island'. It is of no benefit, therefore, to blame the environment or other people for our problems. Our decisions are part of the set of relationships resulting in the difficulties that we face (Jackson, 2003).

Chapter 3: Methods

Overview

This chapter will discuss the research method that was used for this study, the research questions, the survey instrument developed, and a discussion on the validity and reliability of the instrument. Appendices A and B contain the survey instrument that was developed and the validation survey sent to expert reviewers, respectively. A description of the survey population and the data analysis that was used is also included, as well as Human Subjects considerations.

Re-state Research Questions

Following are the research questions that were explored in this study.

1. To what extent do organizations that implement Six Sigma with systems thinking as an integrated quality improvement method differ in the success and duration of their Six Sigma programs, compared to those that implement Six Sigma as a standalone method?
2. What are the factors that contribute to the success of the integration of Six Sigma with systems thinking as an integrated organizational management method?
3. To what extent does organizational leadership support for an integrated model differ from support of Six Sigma as a standalone method?

Research Method and Design

This study used quantitative research method. Quantitative research involves "explaining phenomena by collecting numerical data that are analyzed using mathematical based methods (in particular statistics)" (Muijis, 2004, p. 1). Quantitative research looks for distinguishing characteristics and tend to measure "how much" or "how often."

The study was non-experimental in design, as this research did not require any changing or manipulation of the variables. To explore the identified research questions, a comparative

descriptive research with cross tabulation analysis was conducted to answer research questions 1, 2, and 3.

Descriptive methods include presenting the results using statistics and graphic display. The objective of the analysis is to provide a summary and illustrations that helps readers to understand the variables and their relationships (Tashakkori & Teddlie, 1998). The researcher described the basic features of the data through analysis and presenting the data and characteristics of what is being studied by looking at the study frequencies, averages, graphics analysis, and other statistical calculations.

The data collection for this survey included both closed-ended, multiple-choice questions and some multiple-choice questions with an open-ended option for participants to provide added information.

Population

In determining who will receive the survey, a target population must be defined. The target population is "the ideal group of all individuals who possess knowledge and views pertinent to the survey content" (Edwards, Thomas, Rosenfeld, & Booth-Kewley, 1997, p. 55). A population is a group of people or institutions that shares a set of common traits (Black, 1999). A sample is a group of subjects selected from a larger group, in the hopes that studying this smaller group results in generalizations that can be made of the population (Muijis, 2004). "People who volunteer to take part in survey research are likely to be those people who have particularly strong views on the research subject" (p. 40).

The population for this study consisted of members of International Society for the Systems Science (ISSS), System Dynamic Society, iSixSigma, International Society for

Performance Improvement (ISPI), and Project Management Institute (PMI) organizations. These members are from academia or practitioners of either Six Sigma or systems thinking or both.

International Society for the Systems Science (ISSS) is among the first and oldest organizations devoted to inquiry into the nature of complex systems. The Society was first formed in 1954 at the Stanford Center for Advanced Study in the Behavioral Sciences by Ludwig von Bertalanffy (International Society for the Systems Sciences, n.d.).

The System Dynamics Society is an international, nonprofit organization, with members in 55 countries, devoted to encouraging the development and use of systems thinking around the world. The Society members includes researchers, educators, consultants, and practitioners in the corporate and public sectors (About the Society, n.d.).

iSixSigma was established in the early 2000. They provide comprehensive essential Six Sigma resources to businesses anywhere. Their membership consists of more than half a million monthly online readers. According to iSixSigma, they are "the world's leading publisher and content provider for the Six Sigma community. iSixSigma helps hundreds of thousands of monthly readers learn new skills, advance their careers, and contribute to the success of their organizations through a wide range of articles, tools, conferences, practitioner forums as well as publications such as iSixSigma Magazine" (iSixSigma.com, 2002).

Project Management Institute (PMI) is the world's leading nonprofit organization for project management professionals. They are recognized for their global advocacy for project management standards and credentials, and have extensive research program, with their professional development opportunities. Their membership consists of more than half a million members and credential holders in 185 countries (About Project Management Institute (PMI), n.d.)

The researcher sought volunteers from these professional organizations' membership to self-identify the degree of their integration of systems thinking with their Six Sigma program. These professional organizations are a central point of contact where practitioners of Six Sigma and systems thinking share knowledge and are a source for remaining current with their field; therefore, this target population was a good sample. Although this population was easier to identify, it may be problematic from the point of view of unbiased sample. Nevertheless, these organizations' membership consisted of practitioners of Six Sigma and System Thinking, and therefore could be used to draw conclusions about the organization in which these practitioners practice Six Sigma or systems thinking or both.

Data Collection by Web-Based Electronic Surveys

The proposed study used survey as the mode of gathering data, as survey is an appropriate method to use to provide descriptions of the characteristics of the target population. After reviewing the literature, it was determined that no suitable survey instrument preexisted; therefore, the researcher created a new electronic survey to gather data to answer the research questions.

Using surveys as a method for data collection. A survey is a method of obtaining "self-reported information about the attitudes, beliefs, opinions, behaviors, or other characteristics of a population" (Edwards et al., 1997, p. 1). Further, it consists of relatively systematic, standardized approaches to collecting information on a population.

There are two general survey questions categories: closed-ended and open-ended. Closed-ended questions ask respondents to choose from a fixed set of alternative responses. Examples include multiple-choice, yes-no, and questions with a numerical rating scale (Edwards

et al., 1997). An example of questions with a numerical rating scale may be in the form of scale such as 1 = Strongly Agree to 5 = Strongly Disagree.

There are many advantages of closed-ended questions. According to Edwards et al. (1997), respondents usually find closed-ended questions easy to answer, because they provide the convenience of selecting the answer from predefined answers, and they communicate the same frame of reference to everyone. In addition, closed-ended questions are easier for a researcher to process. However, close-ended questions also have limitations. One of which is that close-ended questions may influence the respondent by forcing the respondent to choose an answer among the alternatives that may not reflect their real feelings about the topic. Further, Edwards et al. note that the responses may be unduly influenced by the specific alternatives provided, and may compel respondents to express an attitude when they have no opinion on the matter or they may not understand the question.

Open-ended questions ask the participants to respond in their own words, fill-in partial statements, or provide short answers or essays. The answers to open-ended questions are often given in narrative form, like an essay (Edwards et al., 1997). The advantage of open-ended questions is that respondents often convey information that cannot be drawn from responses to a fixed, pre-specified list of answers. It also allows the respondents to answer using their own frame of reference, without undue influence from pre-specified answers. However, open-ended questions may take the respondent a lot of time to complete. In addition, it can result in more time and efforts required of the researcher to process and analyze answers to open-ended questions. In addition, open-ended questions are not effective way to measure intensity of opinion. Since individuals vary in their ability to articulate narrative answers, Edwards et al. note that it may be difficult for a researcher to distinguish if the differences in responses are

because of respondents' difference in their ability to recount their answers or because there is truly a difference in opinion or experience between respondents.

According to Edwards et al. (1997), many survey books infer that closed-ended questions are preferable to open-ended questions. However, they found that it is a good practice to incorporate one or more open-ended questions in a survey for the reasons outlined in the advantages of using open-ended questions. Therefore, the researcher used both types of questioning in this study to provide respondents an opportunity to supplement their answers to closed-end questions.

Advantages and disadvantages of survey administration via Web. The survey was administered by Web-based electronic survey SurveyGizmo™. According to Andrews, Nonnecke, and Preece (2003), electronic surveys provide a cost effective means to conduct studies, and electronic survey provides speedy distribution and response (Andrews et al., 2003). Web surveys are also convenient for participants, since they can usually be completed at the respondent's leisure (Sax, Gilmartin, & Bryant, 2003).

However, according to Edwards et al. (1997), one of the biggest challenges faced by those who conduct survey is getting people to participate. The percentage of people who complete and return a survey is referred to as the response rate. Response rates are important because lower response rate could produce inadequate data for analysis or conclusions (Edwards et al., 1997). Another limitation is that security may present potential problems. Individuals may be suspicious about online survey administration and may have concerns about confidentiality (Sax et al., 2003). In addition, Edwards et al. (1997) identify that when conducting a survey, participants may encounter technical troubles when their browsers are not equal in terms of their capacity to view Web sites. This may cause respondents not accessing the survey, or the survey

appearing different from respondent to respondent, thus causing frustration and potentially discouraging respondents from participation (Sax et al., 2003). The following section addresses these issues of concern on the use of electronically based surveys in this study.

Response rate. The response rate is the number of people from whom surveys are received divided by the number of people to whom the survey was sent (Edwards et al., 1997). The most important factor in obtaining a good response rate, according to Edwards et al. (1997), is to follow up with the members of the sample reminding them to complete the survey. Heberlein and Baumgartner (as cited in Edwards et al., 1997) estimate the first follow-up nets a return of above 20% of the initial mailing, a second-follow-up yields 12% more, and a third follow-up yields 10%. In addition, it is recommended that the follow up reminder be sent about 2 weeks after the first survey mailing (Mangione, as cited in Edwards et al., 1997). To maximize response rate, the organizations listed under Population section sent a reminder notice to participant 2 weeks after the original survey reminding them to complete the survey, as well as posting reminders on their website and in their newsletters.

Another approach to increase response rate is to provide an incentive to the participants. Incentives seem to have an effect on response rates, increasing them by as much as 25% (Yammarino, Skinner, & Childers, as cited in Edwards et al., 1997). Therefore, to motivate the potential respondents to complete the survey the researcher offered the participants the opportunity to "win" $50 (USD) certificate from Amazon.com, an online book retailer.

Access to the Internet. The population was comprised of members of the professional associations listed under Population section in the preceding pages. Approval request (Appendix C) to access professional association membership distribution was obtained to deliver the link to the survey electronically. Since the members received the survey by way of the organizations'

website or electronic newsletter or discussion boards, it was assumed participants had access to the Internet.

Security and confidentiality. To safeguard confidentiality, the survey tool settings, offered by SurveyGizmo, was adjusted to ensure participant's responses could not be tracked to the source, including his or her IP address. The researcher was the sole person who had access to the survey tool and suvey data; further it was password protected and only the researcher had access the survey website. The data was downloaded for analysis to present publicly at Pepperdine University. Only aggregate (group) results were presented or documented, not individual answers. Once the final defense was completed, the survey data was downloaded from the SurveyGizmo™ server, kept in a secure, locked file cabinet, and was permanently deleted from the server.

Participants had an opportunity to be entered a drawing . If participants voluntarily chose to participate; his or her email contact information for the drawing was collected and kept independently from participant's answers and was kept in a secure, locked file cabinet . The sole purpose of the email address was to inform a participant if he or she is the recipient of the gift card. Once the final defense was completed, participant email address were permanently deleted from the researcher's data collection.

Browser compatibility. SurveyGizmo ™ is a Web-based hosted survey software solution and therefore, respondents did not have to install a survey application onto their computer.

Data Collection Tool and Procedures

A Web-based electronic survey was made available for participants to complete online through SurveyGizmo™ via their association's website. The survey instrument (located in

Appendix A) included 20 items. The survey consisted of a combination of seven closed-ended items and eight open-ended items to provide an opportunity for participants to supplement their responses with further explanation and more information, and five rating items. At the end of the survey, participants had the opportunity to enter the drawing and to view a summary of the survey results. For further explanation about participants enter the drawing can be found in the Incentive subsection listed under the Procedure section in the following pages.

The survey took no more than 20 - 30 minutes to complete, depending on how much information the respondent provides to the open-ended questions. To allow for increased participation, survey items were kept simple and as short as possible (Edwards et al., 1997).

The e-survey was created using SurveyGizmo™, a Web-based survey application designed for creating online survey. SurveyGizmo™ Enterprise-Student version, presently version 3.01. It was an easy to use on-line survey application that allowed users to create complex surveys, view results in real time, and conduct analysis of the data (Kupferman, 2007).

Instrument Content Validity. Because the researcher determined a survey instrument did not exist that met the purpose of the proposed study, the researcher designed the survey and integrated feedback from an expert judges and a pilot study to gather information related to the research questions about integration of systems thinking to Six Sigma programs (see Appendix B). As a result, the content validity and reliability of the instrument had to be demonstrated through the expert panel and pilot study before execution of the survey to the larger study population.

Validity is defined as the extent to which an instrument measures what it is intended to measure (Zhang, Waszink, & Wijngaard, 1999). The three most popular method to evaluate validity of constructs are content validity, criterion-related validity and construct validity

(Carmines and Zeller, as cited in Das, Paul, & Swierczek, 2008). Content validity is a subjective measure of how appropriate the items are viewed by judge panel who are subject-matter experts (Zhang et al., 1999). The expert evaluate for content validity by reviewing the survey contents to ensure that it includes everything it should and does not include anything it should not.

To ensure the survey instrument had established content validity, the researcher consulted with two expert judges who were informed of the study objectives and purpose and were asked to validate the content of the survey. The researcher selected an individual who has previously completed doctoral-level research at Graduate School of Education and Psychology at Pepperdine University. The other individual selected is one who is considered an authority on Six Sigma, Quality Management, and systems thinking. He is the originator of the CREŌTM problem solving model and authored two books, "Corporate Sigma: Optimizing the Health of Your Company with Systems Thinking," and "TPS-Lean Six Sigma: Linking Human Capital to Lean six Sigma – A new Blueprint for Creating High Performance Company." The selected individuals were invited to analyze the instrument and provide comment on the clarity of the questions. The survey was e-mailed to them, with instructions to provide feedback on the appropriateness of each survey item in its ability to provide information to answer the research questions and about the appropriateness of the wording for each question. Additionally, at the end of each section, they were asked to comment on whether they believed the questions being asked would be sufficient to gather the data required to answer the proposed research questions. Unfortunately, Anwar El-Homsi, Ph.D. was unable to complete his review and therefore further consultation was not conducted. Christina Santos Mosher, Ed.D. however, was consulted for any other suggestions she may have to improve the overall quality of the survey (see Appendix B, Email and Feedback Form Provided to Expert Judge). Based on feedback the expert provided,

extensive modifications were made including specific wording changes on some items for clarity, additions to the drop down responses from which respondents were able to select from, and improving the overall formatting of the survey.

Once the modifications were made to the survey items, they were entered into the SuveyGizmo™ using drop-down lists, check boxes, radio buttons, and free-text boxes as appropriate.

Instrument Reliability Assessment. Reliability has to do with the extent to which an experiment, test, or any measuring procedure yields the same results on repeated trials (Zhang et al., 1999). It means getting consistent result from the same measure. To ensure the instrument produced consistent result, the researcher took steps through the pilot study to produce a reliable survey. This included strategies proposed by Babbie (as cited in Wagenaar & Babbie, 2009). According to him, there are a number of strategies a researcher can use to help create a more reliable instrument. These include (p. 150):

- Ask only about things to which the respondents are likely to know the answer
- Ask about things that are relevant to the respondent
- Be clear in what you are asking

These points were taken into account while developing the survey instrument for this study.

Pilot Study. Once content validity was established and the electronic survey instrument was created, it was then tested by the researcher to ensure that it was working properly. The pilot study was also used to test for the survey instrument's internal consistency reliability.

The survey was sent to a subset of the target population, asking volunteers to participate as a member of the pilot group for the study (see Appendix D). The target population for the pilot study included volunteers from the Systems Thinking World Discussion Group on LinkedIn

with a membership of 5,073 members. The researcher posted the link to the survey on the group's LinkedIn Discussion board. Volunteers who were interested taking the survey did so by clicking on the SurveyGizmo™ link. There participants were provided with clear instructions and purpose of the survey. The purpose of the pilot group, which was representative of the targeted population, was to determine the usability of the e-survey tool and to assist in confirming the reliability as well as the ease of use of the instrument; no other data analysis or inferences from the pilot study data were made. At the end of the survey, a special section for the pilot group was included to learn the survey's ease of use, estimated completion time, any difficulties experienced by the participants with the electronic survey, and any suggestions or comments for improving wording the items and navigation of the survey.

The researcher anticipated 20 volunteers from this organization. Thirteen individuals responded to the researcher's invitation to participate in the pilot survey. This pilot test helped determine the approximate time to complete the survey, which was estimated between 20-30 minutes based on the results obtained from the pilot group. Additionally, the results obtained helped determine whether the questions were appropriately worded to obtain the type of information that was sought. Concurrently, the pilot test ensured the usability of the survey tool and consistency of information collected.

Based on the feedback received from the pilot study, modification was made to one of the survey questions to ensure mapping of the conditional question was linked to the appropriate list of drop-down answers. Another survey item had to be modified so that the multiple selection worked properly, free-text items were provided more space for participants to write, and modification was made in the way summary reported was made available to participants who wished to receive a copy of the survey result.

Dependability of Survey Creation Software. Once the survey was created, the researcher tested the dependability of the online tool by using mock data to ensure the application is working properly. To determine the dependability of the software, the researcher tested the electronic survey to ensure that the tool worked properly and identified additional modifications. Mock data was used to ensure the accurate recording and output of responses. SurveyGizmo™ allowed the user to conduct a testing phase before publishing the survey online, thus allowing the survey owner to test for reliability and usability of the survey without gathering actual responses from participants. Once it was determined, the survey software was working properly, the survey was launched.

Procedures. Permission to gain access to the associations' membership distribution or access to the association message board was obtained from the organizations listed, International Society for the Systems Science, System Dynamic Society, iSixSigma, International Society for Performance Improvement, and Project Management Institute organizations. Depending on each association, their members were informed of the survey by either an email communication from the association, a post in their newsletter, or a direct link to the survey web site. They asked for volunteers to participate in the study (see Appendix A). The associations also sent reminder notices to their membership to complete the survey.

The data collection period lasted for 3 weeks, during which participants were able to complete the survey at their own convenience. Once the data collection period ended, the researcher downloaded the results as a tab delimitated file, which was imported into a spreadsheet in Microsoft Excel. Then the data was imported to SPSS statistical package for further data analysis.

Incentives. All participants, including pilot group members, were offered an incentive for participating in the study and responding to the e-survey. Volunteer participants who wished to participate were entered a drawing for one of three gift certificates for $50.00 (USD) from Amazon.com. After the data collection period ended, the researcher printed out the e-mail addresses of the respondent from the main study, as well as the pilot study, and cut them into equal sized individual pieces of paper. These pieces, each with an e-mail address of a respondent printed on it, were placed in a bowl and tossed about to mix the pieces up. Another individual unrelated to the study picked the three winning email addresses out of the bowl. Three pieces of paper were randomly selected out of the bowl and these three winners were contacted by email and informed that they had won the gift certificate. After acquiring the necessary information, the winners were sent the certificate via US mail or e-mail, depending on their preference.

Data Analysis

The survey included 20 items. These 20 questions were multiple-choice. For these items a descriptive statistical analyses were used to tabulate and summarize results obtained from the e-survey. The e-survey software calculated frequency distributions and percentages automatically as results were received. Once the data collection period ended, the data were calculated for cross-tabulations using a statistical tool that was part of the e-survey software to discover relationships between the various characteristics and categorical data. Following are research questions, a description of the data analysis, and a sample of the data presentation used in Chapter 4.

Research Question 1. Research Question 1 was addressed using survey items 1- 6, 7a, 7b, 8a – 8h, 9a - 9f, 10-12, 14a, 14b, 16, 17, 17a, 17b, 18, 19a, all of which are Likert style items,

except for items 1, 2, 10-12, 17a, and 17b. Table 3 illustrates a sample layout used in Chapter 4 to analyze the frequency of responses collected for these items on the survey instrument.

Table 3

Sample Layout for Frequency and Percentage Distribution for Items 3 – 6, 7a, 7b, 8a - 8h, 9a - 9f, 14a, 14b, 16, 17, 18 and 19a.

Feedback From Internal/External Stakeholders	Frequency	%
Always	51	18
Often	62	22
Sometimes	56	20
Rarely	17	6
Never	9	3
I do not know	11	4
Not applicable	25	9

Pareto charts, a bar graph visual of frequency distribution tables used in Chapter 4, for easy visualization of the data. Figure 8 illustrates a sample a Pareto chart that is used when analyzing items, as a group, 16 and 18 of the survey instrument.

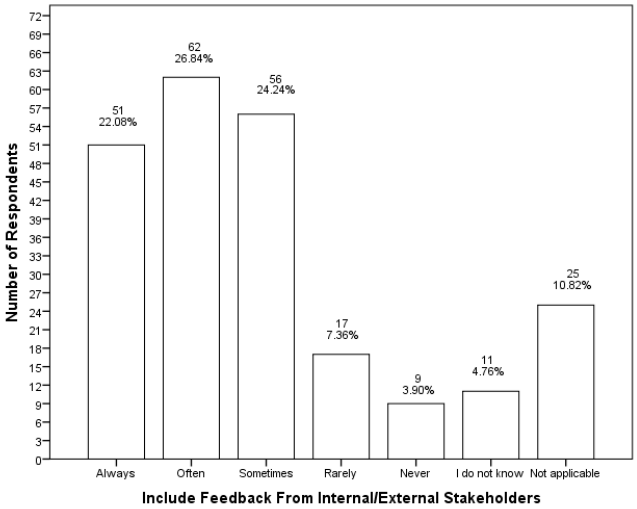

Figure 8. Sample Pareto chart to be used for analyzing items 3 – 6, 7a, 7b, 8a - 8h, 9a -9f, 14a, 14b, 16, 17, 18 and 19a.

Research Question 2. Research Question 2 was addressed using survey items 13, 14c and 14d, and 15a all of which are Likert style items, except for items 13 and 15a. Table 4 illustrates a sample layout used in Chapter 4 to analyze the frequency of responses collected for these items on the survey instrument.

Table 4

Sample Layout for Frequency and Percentage Distribution for Items 13, 14c, 14d, and 15a.

Accountable for Holistic Approach to Process Improvement	Frequency	%
Always	21	7
Often	33	12
Sometimes	37	13
Rarely	44	15
Never	27	9
I do not know	6	2
Not applicable	9	3

Pareto charts, a bar graph visual of frequency distribution tables, is used in Chapter 4, for easy visualization of the data. Figure 9 illustrates a sample a Pareto chart used when analyzing item 13 of the survey instrument.

Research Question 3. Research Question 3 was addressed using survey items 9g, 19b - 19d all of which are Likert style items. Table 5 illustrates a sample layout used in Chapter 4 to analyze the frequency of responses collected for these items on the survey instrument.

Pareto charts, a bar graph visual of frequency distribution tables used in Chapter 4, for easy visualization of the data. Figure 10 illustrates a sample a Pareto chart that is used when analyzing items, as a group 9g and 19d of the survey instrument.

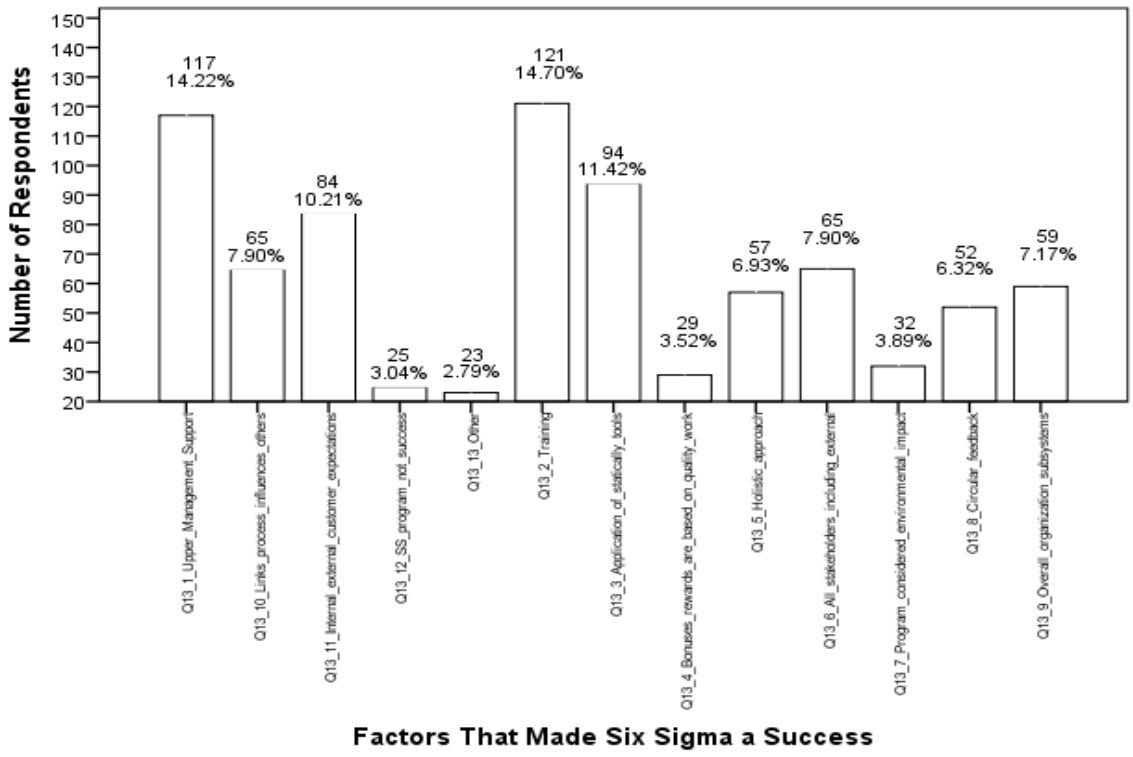

Figure 9. Sample Pareto chart to be used for analyzing items 13, 14c, 14d, and 15a.

Table 5

Sample Layout for Frequency and Percentage Distribution for Items 9g, 19b - 19d.

Leaders Recognize and Reward Individuals Who Use Holistic Approach	Frequency	%
Always	28	9
Often	31	11
Sometimes	65	23
Rarely	42	15
Never	19	7
I do not know	12	4
Not applicable	7	2

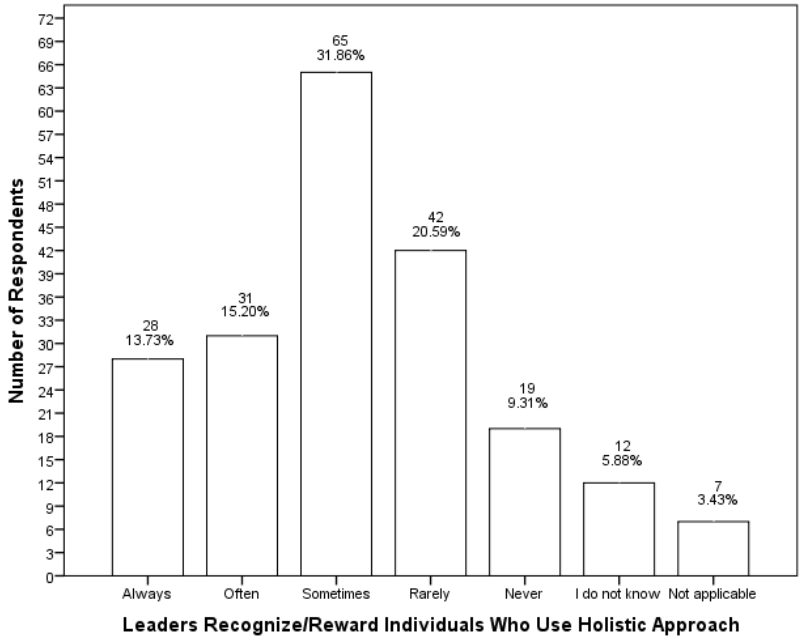

Figure 10. Sample Pareto chart to be used for analyzing items 9g, 19b - 19d.

Content Analysis. Out of the 20 multiple-choice questions, nine included an open-ended category for the responded enter their responses. For these, which were items 1, 10-13, 15a, 17, 18 and 20, content analysis was used, which consisted of coding the information gathered from the open-ended questions and assigning them a category (Newton & Rudestam, 1999). All responses to the open-ended questions were imported into *Microsoft Word, Windows 2007 version.* The text was placed on the right of the page with the left side left blank to-insert the codes of each item. The researcher explored the data collected from open-ended responses by performing content analysis following recommendations of John W. Creswell. In his book, *Research Design: Qualitative and Quantitative Approaches* (1994), he explains that qualitative data analysis consists of classifying non-numerical data such as things, person, and events. Throughout the data analysis process, the collected data was organized categorically, coded and

the researcher sought to identify and describe patterns and themes from the perspective of the participant(s).

The researcher read all the collected information to get a sense of the overall feel of the statements provided by the survey participants. The researcher then noted recurrent themes; patterns among the responses and those of similar phrases or words were given the same code. For a question that asked respondents to identify the industry from which they were representing, in addition to the list provided, five additional categories were created. Five codes were created for question that asked participants to identify constituents their organization-sought feedback from as part of their Six Sigma program. Five codes were created for question that asked participants to identify their organization's communication on process improvement programs. For the question that asked participants to explain key reason(s) their organization investigated the interdependencies and interrelationship of the organization's processes, only one code was created. Twelve codes were created for a question that asked participants who identified factors their Six Sigma program was not successful; an additional five codes were created for those participants who identified factors their Six Sigma program was successful. One code was created for question that asked participants identify factor(s) that contributed their organization to abandon Six Sigma. For a question that asked participants to describe the level of their Six Sigma program success, 17 codes were created, and six codes were created for the question those participants described why their Six Sigma programs were not successful. Nine codes were created for the question that asked participants described the reason why their company's quality management program was successful. Finally, four codes were created for a question that asked participants to describe key reasons for their organization adopted Six Sigma. The open-ended

questions were then classified and coded using this short list codes and descriptions, and the frequencies for each code were tabulated and summarized in a table.

To ensure the reliability of the coding classification system, Mackey and Gass (2012) recommend that an independent evidence of reliability be obtained to ensure a coder assigns the same coding categories to the same to the same data on different occasions. Christina Mosher, Ed.D, and Anwar El-Homsi, Ph.D. were provided with the coding classification system and descriptions for each code, and were then asked to review the researcher's coding of responses and indicate agreement or disagreement with the coding done by the researcher. Differences were then compared between the researcher's coding and that of the individuals. Any disagreements in the codes assigned to each statement were then discussed until consensus was reached.

Table 6 depicts a matrix, which specifies the research questions and associated survey items, and the proposed method of analysis for each facilitating a better understand the relationship between the e-survey items (Appendix A) and the research questions investigated.

Human Subjects Considerations

Under the Pepperdine University policy on research involving human participants/subjects, this study complied with all accepted ethical, federal, and professional standards for research. Human subjects, based on the definition provided in the Pepperdine University's *Protection of Human Participants in Research: Policies and Procedures Manual defined* as:

> Living individual(s) about whom an investigator (whether professional or student) conducting research obtains (a) data through intervention or interaction with the individual, or (b) identifiable private information. Human subjects may also be referred to as human participants by Pepperdine IRBs in order to recognize the active relationship of persons in our research endeavors. (*Pepperdine University,* 2009, p. 10)

Table 6

Matrix of Research Questions, Survey Items, and Proposed Method of Analysis

	Research Question	Survey Question	Concepts	Lit Review Authors	Method of Analysis
1.	To what extent do organizations that implement Six Sigma with systems thinking as an integrated quality improvement , differ in the success and duration of their Six Sigma programs, as compared to those that implement Six Sigma as a standalone method?	1- 6, 7a, 7b, 8a – 8h, 9a - 9f, 10-12, 14a, 14b, 16, 17, 17a, 17b, 18, 19a	Demographic, Duration, Feedback Loop, Holistic View, Interrelationship and Interdepen-dencies, Success	Tymofyeyev & Strom 2003, Lucas, 2002, Harry & Schroeder 2000, Checkland 1981, Cao, Clarke, & Lehaney, 2000, Senge, et al., 1994, Allen & Davenport 2009, Floyd 2008, Gordon 2002, Brletich, 2002, Harrold 2002, Conti 2006, McNamara 2004, Senge, Kleiner, Roberts, Ross, & Smith 1994, Kujala & Lillrank 2004, D. K. Gordon 2002, Plotkin 1999	Freq. Distribution & Cross Tabs: 1-6, 7a, 7b, 8a - 8h, 9a - 9f, 10-12, 14a, 14b, 16, 17, 17b, 18, 19a Content Analysis: 11, 12, 17a, 17b
2.	What are the factors that contribute to the success of the integrated model?	4 and 5, 6, 13, 14c, 14d, 15a	Factors	Henderson and Evans 2002, Basu 2001, Folaron & Morgan 2003, Lucas, 2002, Banuelas 2002, Sandholm & Sorquist 2002, Pande et al., 2000	Freq. Distribution & Cross Tabs: 4 and 5, 6, 14c, 14d, 15a Content Analysis: 13, 15a
3.	To what extent does organizational leadership support for an integrated model differ from support of Six Sigma as a standalone method?	4 and 5, 6, 9g, 19b - 19d	Leadership	Banuelas 2002, McNamara 2004, Beckford 1998, Hartman 2002, Beckford 2005, Harry & Schroeder 2000	Freq. Distribution & Cross Tabs: 4 and5, 6, 9g, 19b - 19d

The researcher took all necessary steps to adhere to the basic ethical principles contained in the federal law passed in July 1974 referred to as the National Research Act (Public Law 93-348, as cited in Public Welfare Department of Health and Human Services, 2005b) and codified in the federal code of regulations, Title 45 CFR § 46. Further clarification is offered on subject recruitment, risks and benefits, informed consent, confidentiality and privacy, and IRB application.

Subject Recruitment. The study included adult population and did not involve vulnerable populations, such as children, prisoners, pregnant women, mentally disabled persons, or economically or educationally disadvantaged persons as outlined in Title 45 § 46.111(3) (Public Welfare Department of Health and Human Services, 2005b).

The researcher obtained approval from professional associations, listed previously under the Population section in the preceding pages of this chapter. The associations agreed to post a link to the survey website. They also agreed to notify their membership of the survey through newsletters, posting on their website and through email distribution. The membership of these organization comprised of adults who are practitioners of Six Sigma or systems thinking and are not from a protected group. The associations asked for volunteers to participant in the survey. Members were free to choose if they wanted to participate in the survey without any penalty or prejudice.

Risks and Benefits. All research with human subjects must ensure that risks to participants are minimal. Title 45 Code of Federal Regulations § 46.102 (I) defines minimal risk as meaning that "the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the

performance of routine physical or psychological examinations or tests" (Public Welfare Department of Health and Human Services, 2005c).

The study neither presented more than a minimal risk to the participants nor disclosed the data outside the study place the participants at risk of criminal, civil liability or damage to their financial standing, employability, or reputation. The only foreseeable risk associated with participation in this study was the imposition on the participant's time and possible boredom because of responding to the survey.

Informed Consent. Informed consent is an essential part of the research process. Investigators must educate potential subjects to ensure that they can reach a truly informed decision about whether or not to participate in the research. Subjects must be given sufficient advance notice of study-related procedures to allow potential subjects time to reflect on the potential benefits, and risks and possible discomforts of participation. Potential subject informed consent must be given freely, without coercion, and must be based on a clear understanding of what participation involves. Title 45 § 46.117(a) states that an "informed consent shall be documented by the use of a written consent form approved by the IRB and signed by the subject or the subject's legally authorized representative. A copy shall be given to the person signing the form." (Public Welfare Department of Health and Human Services, 2005d). Under the federal guidelines 45CFR § 46.116, IRB can approve study procedures that involve the waiver of informed consent in two situations:

1. "The research involves no more than minimal risk to the subjects;
2. The waiver or alteration will not adversely affect the rights and welfare of the subjects;
3. The research could not practicably be carried out without the waiver or alteration; and

4. Whenever appropriate, the subjects will be provided with additional pertinent information after participation." (Public Welfare Department of Health and Human Services, 2005a)

Although under the federal guidelines a researcher must provide informed consent to subjects, the researcher for this study sought from IRB a waiver of informed consent because this study met all the guidelines outlined under Title 45 CFR § 46.116 (d). Even though the researcher sought for a waiver of informed consent, in the instruction section of the survey all participants were informed of the purpose of the study and the intended use for the information. Subjects were informed their participation in the study was voluntary and respondents could terminate their participation in the study without prejudice or penalty, refer to Appendix A.

Confidentiality and Privacy. In Pepperdine University's *Protection of Human Participants in Research: Policies and Procedures Manual* confidentiality is defined as "when personally identifiable and private information is entrusted to an investigator to not disclose it" (*Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual*, 2009, p. 23). Based on the guideline, the survey did not ask for information that could directly identify the participant. To safeguard confidentiality, the survey tool settings, offered by SurveyGizmo™, were adjusted to ensure participant's responses could not be tracked to the source, including his or her IP address. The researcher was the sole person who had access to the survey tool and survey data; further it was password protected and only the researcher was able to access the survey website. The data was downloaded for analysis and presented publicly at Pepperdine University. Only aggregate (group) results was presented or documented, not individual answers. Once the final defense was completed, the survey data was downloaded from the SurveyGizmo™ server, was encrypted and password secured on an external hard drive, which was locked in file cabinet and was deleted permanently from the SurveyGizmo™ server.

Participants had an opportunity to be entered a drawing . Should participants voluntarily chose to participate; his or her contact information for the drawing was collected and kept independently from participant's answers and as kept in a secure, locked file cabinet . The sole purpose of the email address was used to inform a participant if he or she was the recipient of the gift card. On the final defense was completed, participant email address was permanently deleted from the researcher's data collection. The survey was set up in such there was no tracking of personal data including no tracking of the participants' IP address.

Based on the reasoning provided in this section, the researcher sought qualification of this study as Exempt Research, as per to the Federal Guidelines for Human Subject Considerations. An application was sent to Pepperdine University's Institutional Review Board (IRB) for this research project to undergo the Human Subjects' approval process, and the researcher obtained approval before conducting the study (Appendix E). This study complied with the guidelines set forth by Pepperdine University regarding the use of human subjects and the following were ensured:

- Participation was voluntary and participants were asked to indicate their informed consent in the beginning of the e-survey.
- The purpose of the study was made clear to participants.
- Confidentiality of each respondent was maintained.
- All identifying information such as their e-mail address was protected and was not available to anyone other than the researcher and was blinded from his or her survey responses.

- Email addresses were not released or used for any other purposes, other than for awarding the incentive. For this, the participants were informed and were asked for permission.
- Had additional identifying information been provided by the respondents, such as name of their organization and specific job titles, that this information also omitted from the reporting of the data.

Summary

The design of this research included both comparative and descriptive analysis to study organizations that have integrated methods of Six Sigma and systems thinking. The method of the study included both quantitative and qualitative questions using electronic survey. Some qualitative data were obtained to acquire a deeper understanding of the issue being studied. An electronic survey was used as the data collection tool. Information was obtained from practitioners about the integrated method used in their organizations, if any. Further, information was obtained on the extent of the success, duration of their integrated method, and identifies factors that may have contributed to their success. The overall objective was to explore and gain a better understanding of organizations that use integrated Six Sigma and systems thinking as a method for quality improvement.

Chapter 4: Results

A total of 289 subjects responded to the invitation to take part and complete the electronic survey created by the researcher. The participants were from those organizations the researcher had gained approval to invite volunteers to complete the survey. This chapter presents results of the completed electronic surveys. The results from the survey are reported and grouped categorically. The results will begin with the demographic data, followed by the results from the survey are grouped and presented as they relate to each of the research questions. Please note that due to rounding, percentages may not total 100.

Demographic Information

The survey instrument contained five survey questions about the participant's background, including items such as the industry from which the participant's organization is from; the country in which the participant's organization headquarter is found; the estimated number of employees in the organization; the participant's expertise with Six Sigma and systems thinking.

Survey item 1. Survey item 1 asked participants about the industry in which they belonged. Table 7 shows of the 285 respondents out of 289 participants who responded to the survey, 23.9% (n = 68) were from Manufacturing, followed by 8.4% (n = 24) Finance/Banking/Insurance, 8.1% (n = 23) Aerospace/Aviation/Automotive, 7.7% (n = 22) Consulting, and 7.7% (n = 22) Healthcare/Medical industries.

In addition to investigating the industries from which participants' organization represented using the North American Industry Classification System (NAICS) list, participants were provided with an opportunity to write-in the industry from which their organization were from, if it differed or was not listed on the NAICS list. This identified four other industries.

Table 8 displays the four industries grouped into categories, coded and counted. The most prominent response was the Security industry.

Table 7

Industry from Which the Participant's Organization is from (N=285)

Industry	Frequency	%
Aerospace / Aviation / Automotive	23	8.1%
Biotechnology	1	0.4%
Business / Professional Services	9	3.2%
Business Services (Hotels, Lodging Places)	2	0.7%
Computers (Hardware, Desktop Software)	11	3.9%
Communications	1	0.4%
Construction / Home Improvement	2	0.7%
Consulting	22	7.7%
Education	18	6.3%
Engineering / Architecture	5	1.8%
Finance / Banking / Insurance	24	8.4%
Food Service	1	0.4%
Government / Military	18	6.3%
Healthcare / Medical	22	7.7%
Internet	2	0.7%
Manufacturing	68	23.9%
Marketing / Market Research / Public Relations	3	1.1%
Mining / Quarrying / Oil and Gas Extraction	3	1.1%
Non-Profit	3	1.1%
Pharmaceutical / Chemical	14	4.9%
Research / Science	4	1.4%
Retail	5	1.8%
Telecommunications	7	2.5%
Transportation / Distribution	6	2.1%
Utilities	3	1.1%
Other	8	2.8%
Total	285	100.0%

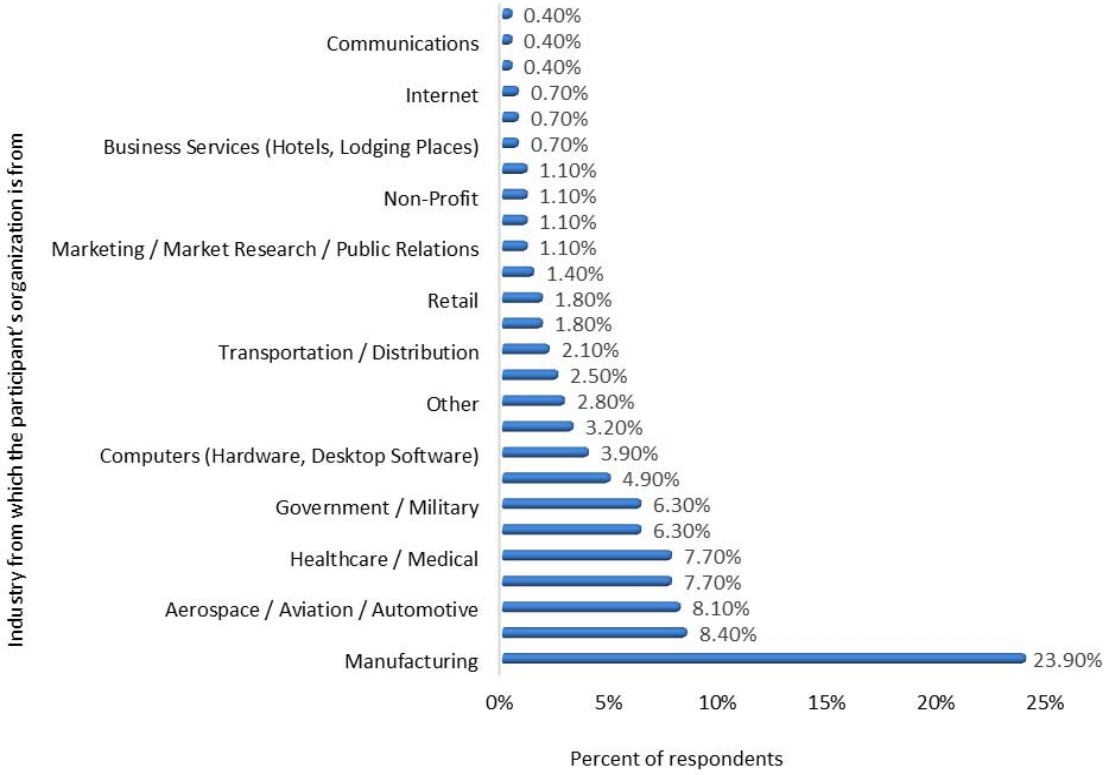

Figure 11. Responses for participants' industries.

Table 8

Other Industry from Which the Participant's Organization is from (N=5)

Industry	Frequency	%
Conglomerate	1	20.0%
Infrastructure	1	20.0%
Security	2	40.0%
Equipment	1	20.0%
Total	5	100.0%

Survey item 2. Survey item 2 asked participants the country in which their organization was based. The highest number of participants to the survey were from United States of America, 57.9% (n = 165) of 285 respondents out of 289 participants who responded to the

survey. A tie for the second highest respondents were from India, 6.3% (*n* = 18), and United Kingdome of Great Britain 5.6% (*n* = 16), Table 9.

Table 9

Country in Which the Participant's Organization Headquarter is Located (N=285)

Country	Frequency	%
Argentina	2	0.7%
Australia	7	2.5%
Austria	3	1.1%
Brazil	1	0.4%
Bulgaria	1	0.4%
Canada	11	3.9%
China	1	0.4%
Czech Republic	1	0.4%
Ecuador	1	0.4%
Fiji	1	0.4%
Germany	13	4.6%
India	18	6.3%
Indonesia	1	0.4%
Iran	1	0.4%
Ireland	3	1.1%
Israel	2	0.7%
Japan	1	0.4%
Malaysia	5	1.8%
Mexico	3	1.1%
Netherlands	5	1.8%
Netherlands Antilles	1	0.4%
New Zealand	2	0.7%
Pakistan	1	0.4%
Peru	1	0.4%
Philippines	1	0.4%
Romania	1	0.4%
Saudi Arabia	5	1.8%
Singapore	2	0.7%
South Africa	3	1.1%
Sri Lanka	1	0.4%
Sweden	2	0.7%
Switzerland	3	1.1%
United Kingdom of Great Britain	16	5.6%
United States of America	165	57.9%
Total	285	100.0%

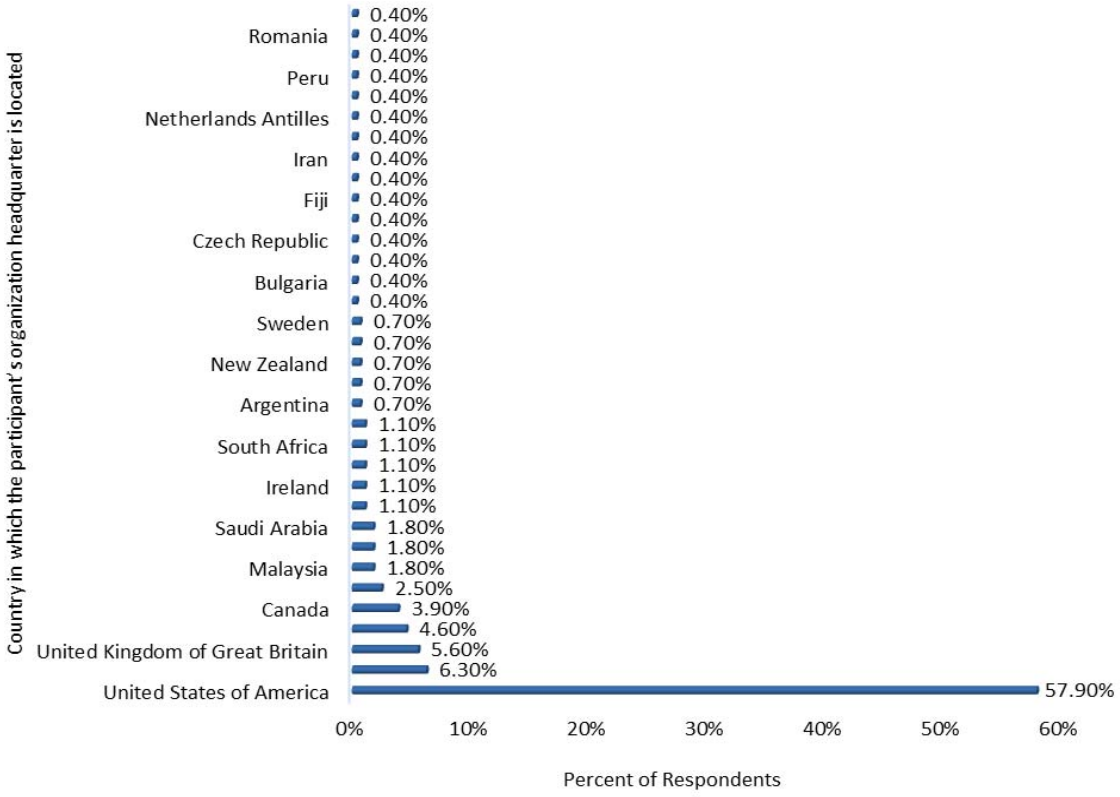

Figure 12. Country in which the participants' organization headquarter is located.

Survey item 3. Survey item 3 asked participants the number of employees of their organization. Table 10, shows 37.9% (*n* = 108) of 285 respondent out of 289 participants reported the number of employees of their organization to be 10,000 or more, followed by 27.0% (*n* = 77) of the respondents reported the number of employees of their organization is between 500 – 4,999, and 23.9% (*n* = 68) of the respondents reported the number of employees of their organization is between 1 – 499.

Table 10

Number of Employees at the Participant's Organization (N=285)

Number of Employees	Frequency	%
1 – 499	68	23.9%
500 - 4,999	77	27.0%
5,000 - 9,999	32	11.2%
10,000 or more	108	37.9%
Total	285	100.0%

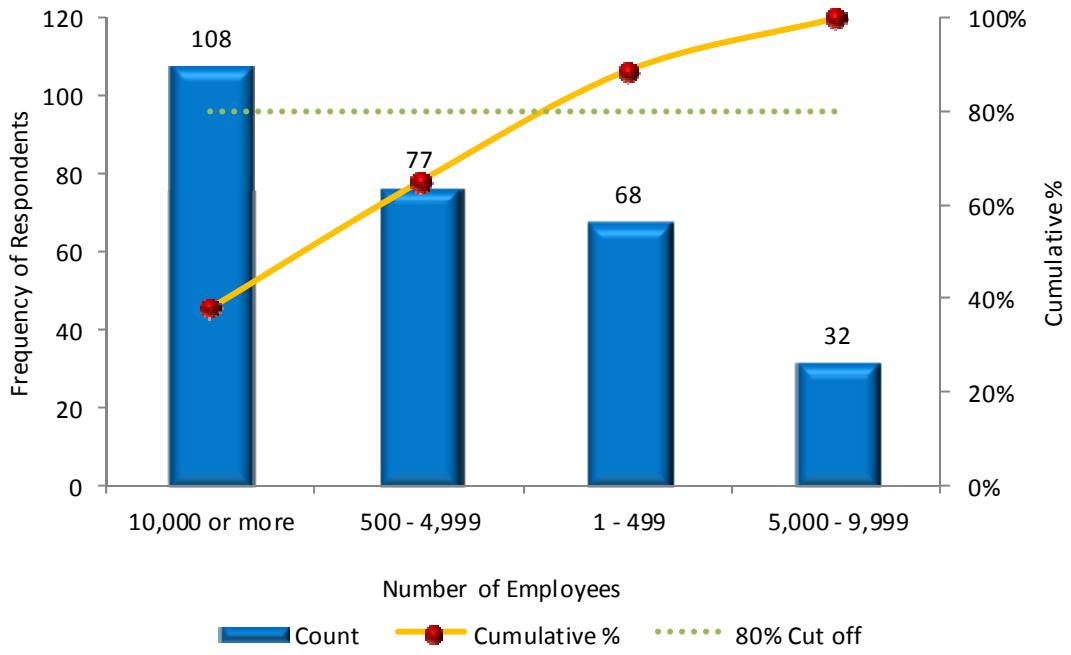

Figure 13. Number of employees at the participants' organization.

Survey items 4 and 5. The purpose of survey items 4 and 5 is to explore the length of participants' organization use of Six Sigma, systems thinking or integrated method as a quality method for their process improvement programs. Survey item 4 asked participants to the length of their organization's use of Six Sigma method. Table 11 presents the frequency and percentage distribution. The distribution shows 32.4% of the respondents (n = 92) of 284 respondents out of

285 participants reported their organization use of Six Sigma as quality method is between 2 to 5 years.

Table 11

How Many Years Has Your Organization Used Six Sigma as a Quality Method? (N = 284)

Years Six Sigma Use	Frequency	%
1 year or less	16	5.6%
2 - 5 years	92	32.4%
6 - 10 years	67	23.6%
Over 10 years or more	52	18.3%
My organization does not use Six Sigma	49	17.3%
I do not know if my organization uses Six Sigma	8	2.8%
Total	284	100.0%

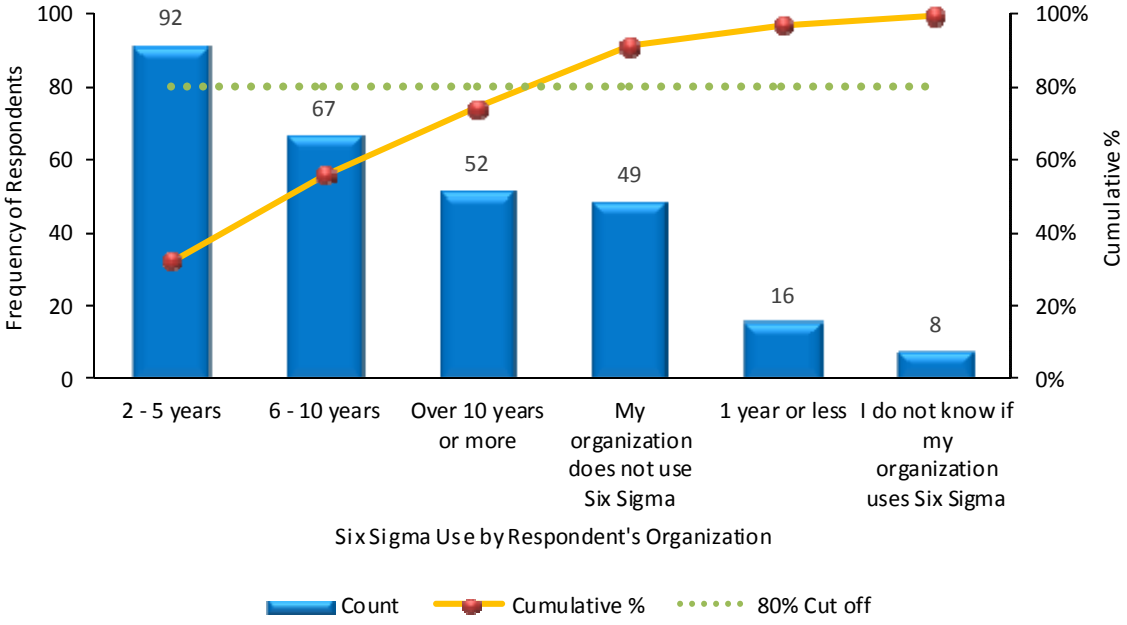

Figure 14. Number of years participants' organization used Six Sigma.

Survey item 5 asked participants to the length of their organization's use of systems thinking method. Table 12 presents the frequency and percentage distribution. The distribution shows of the participants, 25.0% (n = 71) of 284 respondents out of 285 participants reported

their organization did not use systems thinking. However, closely followed was of those participants 21.5% (*n* = 61) of 284 respondents reported their organization use of systems thinking was between 2 to 5 years.

Table 12

How Many Years Has Your Organization Used Systems Thinking Method as a Holistic Approach to Solving Problems or for Process Improvement? (N = 284)

	Frequency	%
1 year or less	31	10.9%
2 - 5 years	61	21.5%
6 - 10 years	29	10.2%
Over 10 years or more	56	19.7%
My organization does not use systems thinking	71	25.0%
I do not know if my organization uses systems thinking	36	12.7%
Total	284	100.0%

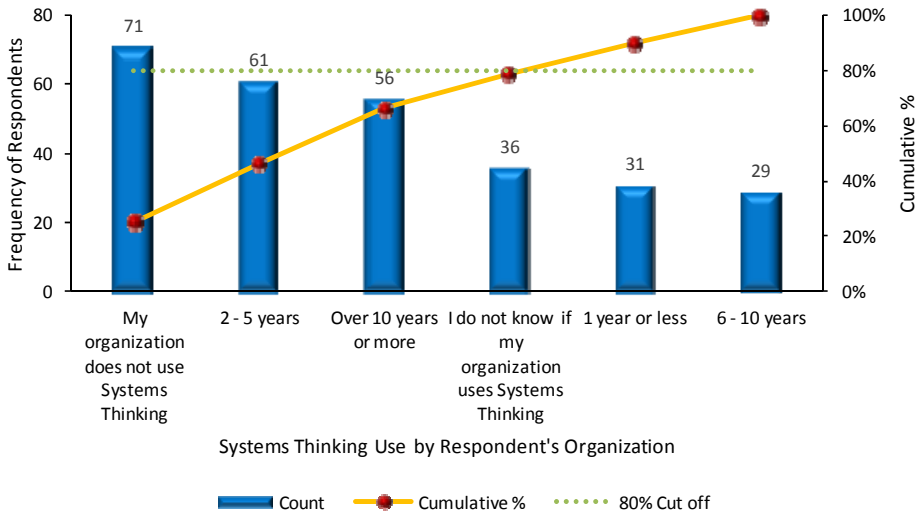

Figure 15. How many years has your organization used systems thinking method as a holistic approach to solving problems or for process improvement?

Survey item 6. The goal of this researcher was to explore to what extent the participants reported difference between organizations that used Six Sigma alone and those organization that used an integrated model. Therefore, it was important to first identify the percentage of the participant's organization use an integrated model. Survey item 6 asked participants to rate the length of their organization's use of integrated method. Table 13 presents the frequency and percentage distribution shows 35.0% (n = 82) of 234 respondents out of 285 participants reported their organization did not use an integrated model. Of the participants, 19.7% (n = 46) of 234 respondents reported their organization use of integrated model was between 2 to 5 years.

Table 13

Does Your Organization Use an Integrated Model (Integrated Model is Defined as Combining Six Sigma and Systems Thinking Methods) for Solving Problems or for Process Improvement? If Yes, Indicate the Length of Time. (N = 234)

	Frequency	%
1 year or less	25	10.7%
2 - 5 years	46	19.7%
6 - 10 years	24	10.3%
Over 10 years or more	26	11.1%
Not applicable, my organization doesn't use an integrated model	82	35.0%
I do not know if my organization uses an integrated model	31	13.2%
Total	234	100.0%

Survey items 7a and 7b. The researcher investigated the level of expertise of the participants to establish a better familiarity of the respondent's background in Six Sigma and systems thinking, since the purpose is to explore how organizations that use an integrated model differ from those that use Six Sigma method alone. Therefore, survey items 7a and 7b asked respondents about his or her level of expertise in each of the methods.

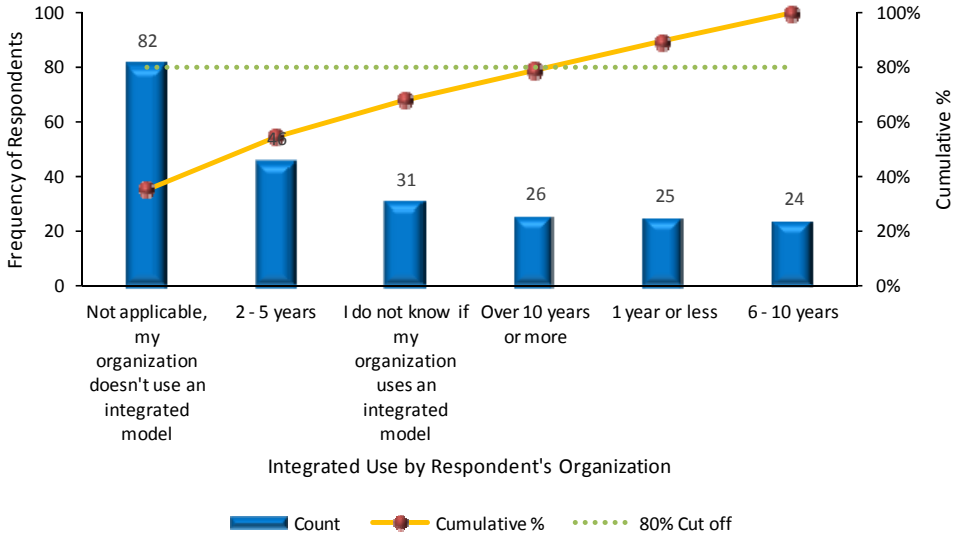

Figure 16. Number of years participants' organization used integrated model.

Survey item 7a asks participant's level of expertise in Six Sigma. Table 14 presents the frequency and percentage distribution shows 38.6% of the respondents (n = 90) of 233 respondents reported having extensive experience, 5 years or more, in Six Sigma. Survey item 7b asks participants level of expertise in systems thinking.

Table 14

Participant's Level of Expertise in Six Sigma (N = 233)

Six Sigma Experience	Frequency	%
No Experience	20	8.6%
Some Experience (less than 4 years)	79	33.9%
Extensive Experience (5 years or more)	90	38.6%
Expert (10 years or more)	44	18.9%
Total	233	100.0%

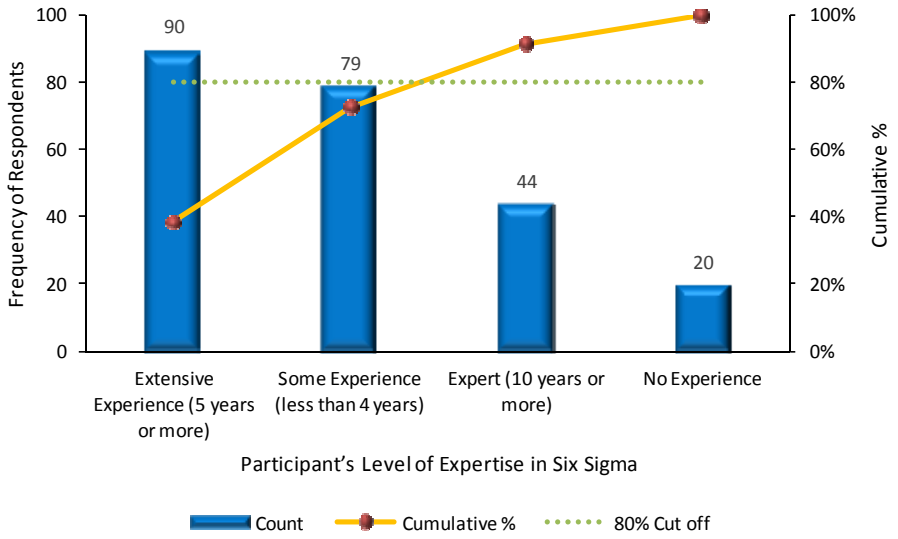

Figure 17. Participant's level of expertise in Six Sigma.

Table 15 present the frequency and percentage distribution shows 30.2% (*n* = 70) of 232 respondents out of 289 participants reported having experience less than 4 years in systems thinking.

Table 15

Participant's Level of Expertise in Systems Thinking (N = 232)

Systems Thinking Experience	Frequency	%
No Experience	58	25.0%
Some Experience (less than 4 years)	70	30.2%
Extensive Experience (5 years or more)	45	19.4%
Expert (10 years or more)	59	25.4%
Total	232	100.0%

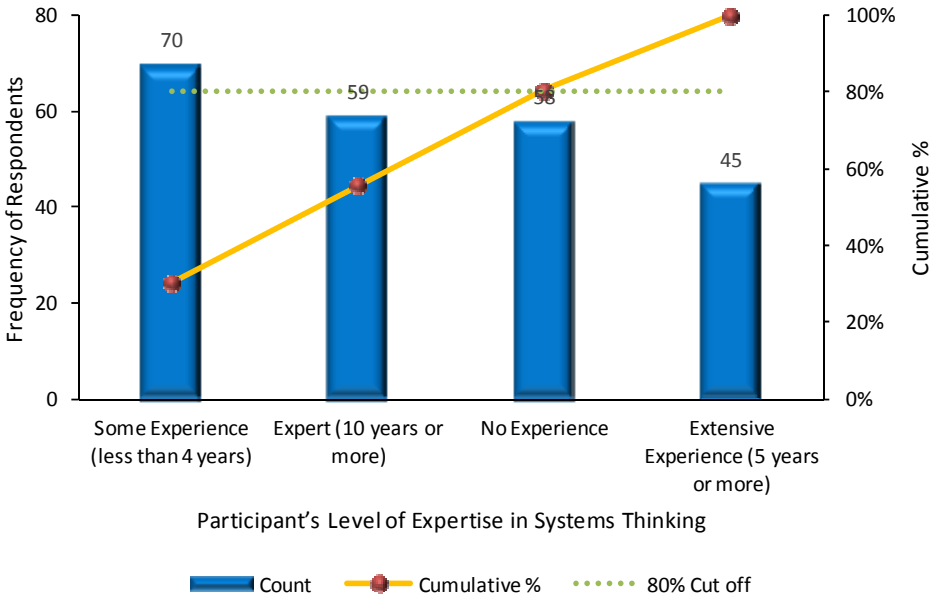

Figure 18. Participant's level of expertise in systems thinking.

Once the level of expertise of the participants was established and responded reported their organization's number of years of integrated use, then the goal of the researcher was to explore to what extent the participants reported difference between organizations that used Six Sigma alone and those organization that used an integrated model. A crosstab analysis between the variables organization size and the number of years the organization used Six Sigma or integrated model was performed. Table 62, Appendix F, shows overall those participants who responded 32.4% (n = 92) of 284 participants reported their organization Six Sigma use was between 2 to 5 years. Of the 284 respondents, 38% (n = 108) had 10,000 or more employees, 12% (n = 33) of 284 respondents reported their employee size was between 500 – 4999 and use of their organizations' Six Sigma was 2 – 5 years.

Participants who responded shows their organization's use of integrated model 35.2% (n = 82) of 233 participants reported their organization did not use integrated model. Of those who responded their organization used integrated model, 24% (n = 6) of 233 participants reported

their organization had 5000 – 9999 employees and used Six Sigma between 2 to 5 years. Overall, 39% (*n* = 90) of 233 participants reported their organization had 10,000 or more employees used integrated model for solving problems or for process improvements, Table 63, Appendix F.

A crosstab analysis was performed with variables industry and by number of years the respondent's organization used Six Sigma and integrated model to solve problems or for process improvements. Table 64, in Appendix F, shows of the respondents 32% (*n* = 92) of 284 participants responded their organization use of Six Sigma was between 2 to 5 years. Of the respondents, 23.9% (*n* = 68) of 284 participants responded were from Manufacturing, followed by 8.5% (*n* = 24) from Finance. Respondents from both industries, Manufacturing 9.5% (*n* = 27) and Finance 3.5% (*n* = 10) reported the use of Six Sigma by their organization was between 2 to 5 years.

Table 65 reports the crosstab analyses performed with variable industry and the number of years the respondent's organization used integrated method. The table shows of the respondent 35.2% (*n* = 82) of 233 participants reported their organization did not use an integrated method to quality management. The table shows only 19.3% (*n* = 45) of 233 respondents reported their organization used integrated method between 2 to 5 years. Of the participants, 7.7% (*n* = 18) of 233 participants reported their organization were from Manufacturing and used integrated method between 2 to 5 years.

Research Question 1

Before the researcher could answer Research Question 1, the investigator first needed to research and see if the survey participants' organization included variables feedback loop, holistic approach, and interdependencies, key characteristics of systems thinking, in their quality

management practice. After which, analysis was performed to determine if there was a difference between organizations who included these characteristics compared to those that did not.

The responses to survey items 8a – 8h, 9a -9f, 10 – 12, 14a, 14b, 16 – 17b, 18, and 19a provided information to assist answer Research Question 1, which is: *To what extent do organizations that implement Six Sigma with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma programs, as compared to those that implement Six Sigma as a standalone method?*

Survey items 8a – 8f and 10. Survey questions 8a – 8f and 10 asked questions about feedback loops. Survey item 8a – 8f, and 10 asked respondents to rate the frequency in which their organization engaged in the practice of when Six Sigma teams in their organization included feedback from the stakeholders, such as internal and external stakeholders. Table 16 presents the frequency and percentage distribution for survey item 8a; my organization includes feedback from internal and external stakeholders as part of the Six Sigma initiative. Of the 231 respondents out of 285 participants, 26.8% (n = 62) reported their organization often included feedback from internal and external stakeholders as part of their Six Sigma program.

Table 16

Frequency and Percentage of Organizations Include Feedback from Internal and External Stakeholders (N = 231)

	Frequency	%
Always	51	22.1%
Often	62	26.8%
Sometimes	56	24.2%
Rarely	17	7.4%
Never	9	3.9%
I do not know	11	4.8%
Not applicable	25	10.8%
Total	231	100.0%

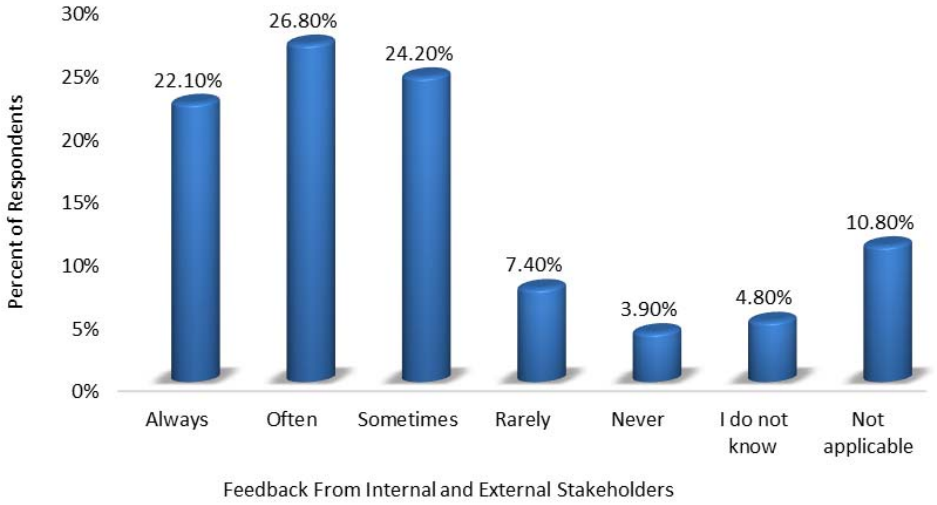

Figure 19. Frequency and percentage of organizations include feedback from internal and external stakeholders.

Table 66, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and the respondents' organization included feedback from internal and external stakeholders as part of their Six Sigma imitative. Of those respondents, 27.0% (n = 62) of 230 participants reported their organization often includes feedback from internal and external stakeholders as part of the Six Sigma initiatives. A little over 9.1% (n = 21) of 230 respondents reported their organization's use of Six Sigma was between 2 to 5 years and that sometimes their organization included feedback from their internal and external stakeholders.

Similar crosstab analysis was performed with the variables of organization use of integrated model and the respondents' organization inclusion of feedback from internal and external stakeholders as part of their Six Sigma initiative. Table 67, Appendix F, shows of the participants who responded, 26.8% (n = 62) of 231 participant reported their organization often included feedback from internal and external stakeholders. Of the participants, 6.9% (n = 16) of 231 respondents reported their organization's use of integrated model was between 6 to 10 years and that their organization often included feedback from their internal and external stakeholders.

Survey item 8b asked respondents to rate the frequency in which their organization processes included circular feedback from internal resources and external resources. Table 17 presents the frequency and percentage distribution. Of the 231 respondents out of 285 participants who responded to the survey, 29.4% (*n* = 68) reported their organization processes sometimes included circular feedback from their internal and external resources. Closely followed by 29.0% (*n* = 67) of 231 respondents reported their organization often include circular feedback from internal and external resources.

Table 17

Processes in Your Organization Include a Circular Feedback from Internal and External Resources (N = 231)

	Frequency	%
Always	37	16.0%
Often	67	29.0%
Sometimes	68	29.4%
Rarely	32	13.9%
Never	9	3.9%
I do not know	11	4,8%
Not applicable	7	3.0%
Total	231	100.0%

Figure 20. Processes in your organization include a circular feedback from internal and external resources.

Table 68, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and the respondents' organization inclusion of circular feedback from internal resources and external resources. Of those respondents, 29.6% (n = 68) of 230 participants reported their organization sometimes included circular feedback from internal and external resources. Of the participants, 12.2% (n = 28) of 230 respondents reported their organization's use of Six Sigma was between 6 to 10 years and sometimes included circular feedback from their internal and external stakeholders.

Table 69, Appendix F, shows a crosstab analysis with the variables of organization use of integrated model and the respondents' organization inclusion of circular feedback from internal and external stakeholders as part of their Six Sigma initiative. Of the participants, 29.4% (n = 68) of 231 participants reported their organization sometimes included circular feedback from internal and external resources. However, when analysis is investigated by the years of organizations' integrated approach use, of the participants, 7.8% (n = 18) of the 231 respondents reported their organization's use of integrated model was between 2 to 5 years and often included circular feedback from their internal and external stakeholders for their Six Sigma initiatives.

To investigate survey respondent's level of understanding of feedback loop concept, survey item 8c asked respondents to rate the frequency circular relationships depicted in feedback loops that drew connections to the consequences of specific actions taken by their organization, highlighting cause and effect. Table 18 presents the frequency and percentage distribution about participants' opinion about circular relationships drew connections to cause and effect. Of the 230 respondents out of 285 participants who participated in the survey, 39.1%

(*n = 90*) reported that often circular relationships illustrated in feedback loops drew connections between cause and effect.

Table 18

In Your Opinion, the Circular Relationships Depicted in Feedback Loops Draws Connections to the Consequences of Specific Actions Taken; Highlighting Cause and Effect (N = 230)

	Frequency	%
Always	39	17.0%
Often	90	39.1%
Sometimes	49	21.3%
Rarely	22	9.6%
Never	3	1.3%
I do not know	18	7.8%
Not applicable	9	3.9%
Total	230	100.0%

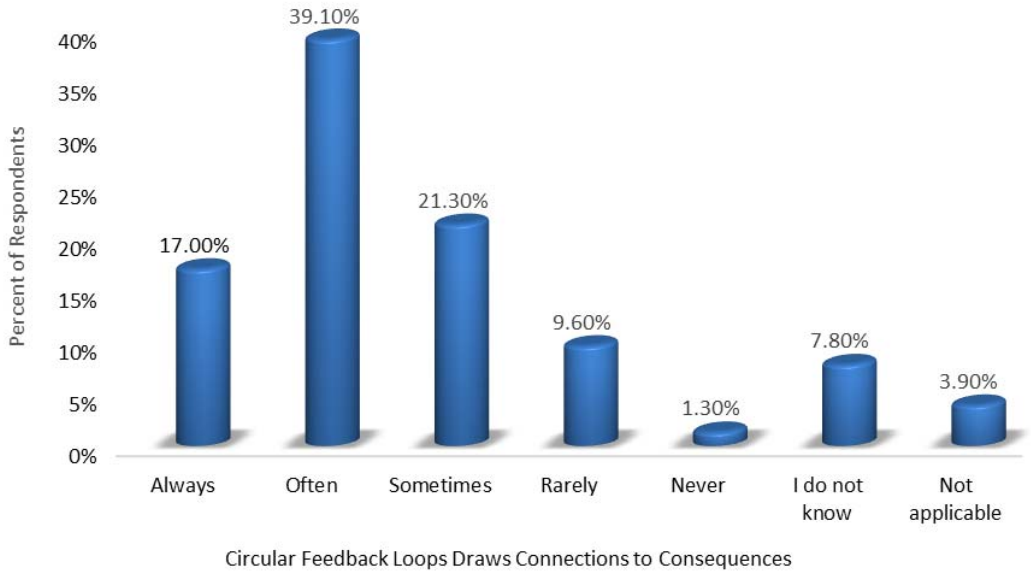

Figure 20. In your opinion, the circular relationships depicted in feedback loops draws connections to the consequences of specific actions taken; highlighting cause and effect.

Table 70, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and the respondents' opinion about circular relationships depicted in feedback

loops draws connections to the consequences of specific actions taken highlighting cause and effect. Overall, 38.9% (n = 80) of 229 respondents reported in their opinion circular relationships often depicted in feedback loops drew connections to the consequences of specific actions taken highlighting cause and effect. Of the participants, 13.5% (n = 31) of 229 participants reported their organization's use of Six Sigma was between 6 to 10 years, and that in their opinion circular relationships often depicted in feedback loops drew connections to the consequences of specific actions taken highlighting cause and effect.

Table 71, Appendix F, shows a crosstab analysis with the variables of organization's use of an integrated method and the respondents' opinion about inclusion circular relationships depicted in feedback loops drew connections to the consequences of specific actions taken highlighting cause and effect. Of the participants who responded, 39.1% (n = 90) of the 230 respondents reported in their opinion inclusion of circular relationships often depicted in feedback loops drew connections to the consequences of specific actions taken; highlighting cause and effect. Of the participants, 7.8% (n = 18) of 230 participants reported their organization's use of integrated model was between 2 to 5 years and in their opinion inclusion of circular relationships often depicted in feedback loops drew connections to the consequences of specific actions taken; highlighting cause and effect.

Survey item 8d asked respondents to rate the frequency in which their organization invited input and suggestions from their clients how their organization could improve their performance. Table 19 presents the frequency and percentage distribution. Of the 230 respondents out of 285 participants who responded to the survey, 35.2% (n = 81) reported their organization often invited input and suggestions from their clients how they might improve their performance.

Table 19

My Company Invites Input and Suggestions from Our Client on How We Might Improve Our Performance (N = 230)

	Frequency	%
Always	53	23.0%
Often	81	35.2%
Sometimes	62	27.0%
Rarely	22	9.6%
Never	2	.9%
I do not know	5	2.2%
Not applicable	5	2.2%
Total	230	100.0%

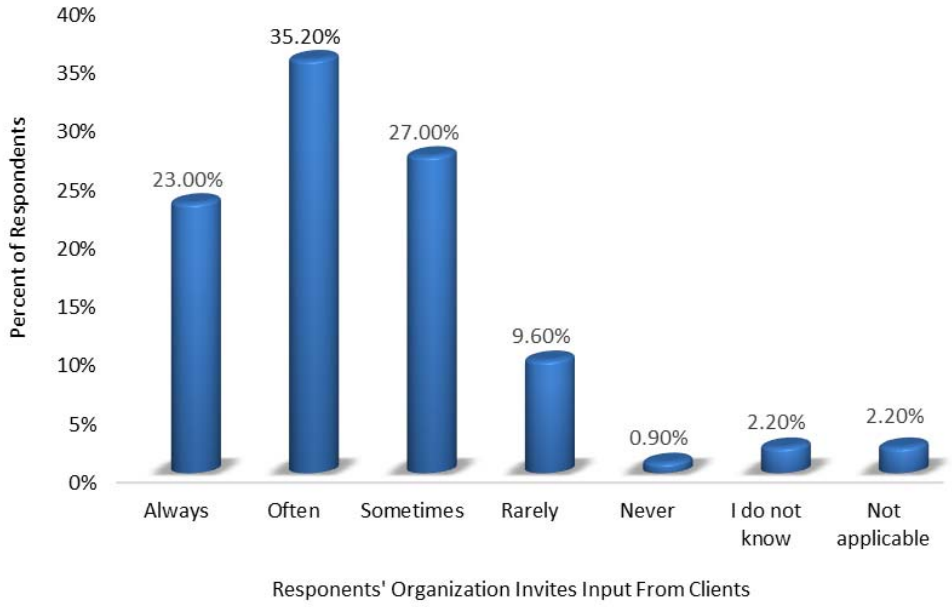

Figure 21. My company invites input and suggestions from our client on how we might improve our performance.

Table 72 shows crosstab analysis between the variables year organizations use of Six Sigma and the respondents' company invited input and suggestions from their clients how might they improve their performance. Of the respondents, 35.4% (*n* =81) of 229 participants reported their organization often invited input and suggestions from their clients how to improve their

performance. Of the participants, 9.6% (n = 22) of 229 reported their organization use of Six Sigma was between 2 and 5 years and often invited input and suggestions from their clients how might they improve their performance. Equally, 9.6% (n = 22) respondents also reported that their organization sometimes invited input and suggestions from their clients.

Table 73, Appendix F, shows a crosstab analysis with the variables of organization use of integrated model and the respondents' company invited input and suggestions from their clients how they might improve their performance. Of those who participated, 35.2% (n = 81) of 230 participants reported often their organization invited input and suggestions from their clients how to improve their performance. Of the 285 participants, only 7.4% (n = 17) of 230 respondents reported their organization used integrated model was between 2 to 5 years and that their company often invited input and suggestions from their clients how they might improve their performance.

Survey item 8e asked respondents' opinion about systemic loops serve as an objective way of analyzing and interpreting balancing and reinforcing force. Table 20 presents the frequency and percentage distribution about participants' opinion about systemic loops provides an objective way of analyzing and interpreting balancing and reinforcing forces. Of the 230 respondents out of 285 participants who participated in the survey, 46.1% (n = 106) reported in their opinion they viewed systemic loops can serve as an objective way of analyzing and interpreting balancing and reinforcing force.

Table 74, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and the respondents' opinion about systemic loops could serve as an objective way of analyzing and interpreting balancing and reinforcing force. Of the respondents, 45.9% (n = 105) of 229 participants reported in their opinion they often viewed systemic loops can serve

Table 20

In Your Opinion, Systemic Loops Can Serve as an Objective Way of Analyzing and Interpreting Balancing and Reinforcing Forces (N = 230)

	Frequency	%
Always	46	20.0%
Often	106	46.1%
Sometimes	47	20.4%
Rarely	8	3.5%
Never	0	0%
I do not know	19	8.3%
Not applicable	4	1.7%
Total	230	100.0%

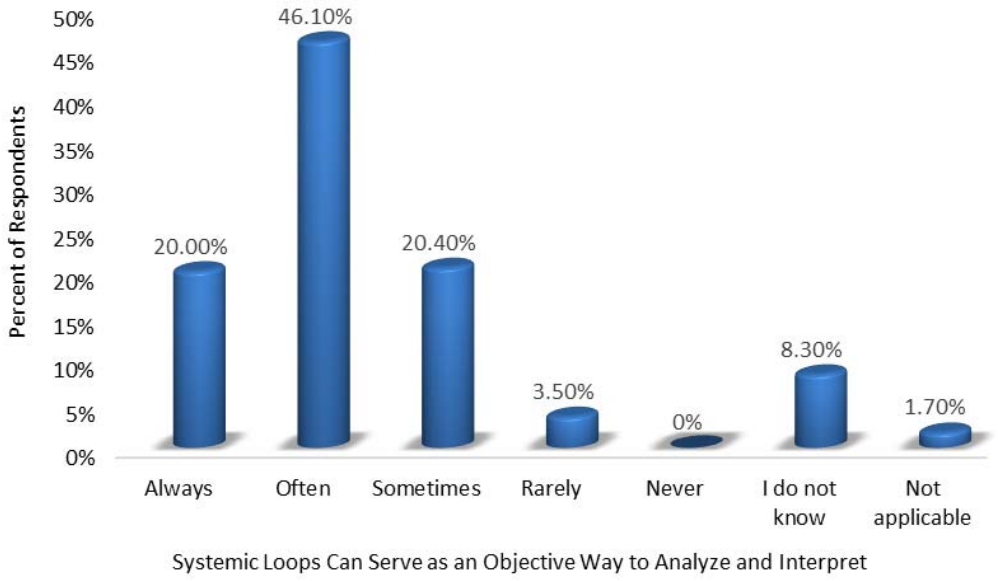

Figure 22. In your opinion, systemic loops can serve as an objective way of analyzing and interpreting balancing and reinforcing forces.

as an objective way of analyzing and interpreting balancing and reinforcing forces. Of the respondents 13.1% (*n* = 30) of 229 reported their organization use of Six Sigma was between 2 to 5 years and that they often viewed systemic loops can serve as an objective way of analysis and interpreting balancing and reinforcing force

Table 75, Appendix F, shows a crosstab analysis with the variables of organization use of integrated model and the respondents' opinion about systemic loops could serve as an objective way of analyzing and interpreting balancing and reinforcing force. Of those who participated, 46.1% (n = 106) of 230 participants reported in their opinion systemic loops often serves as an objective way of analyzing and interpreting balancing and reinforcing forces. Of the participants, only 8.3% (n = 19) of 230 respondents reported their organization use integrated model was between 2 to 5 years and that and the respondents' opinion often systemic loops can serve as an objective way of analyzing and interpreting balancing and reinforcing force.

To get a better understanding of survey participants' organization the extent by which their organization included feedback in revising their processes, survey item 8f solicited respondents to rate the frequency their organization examined feedback from its employees, customers, suppliers, and regulatory agencies and revised its processes regularly. Table 21 presents the frequency and percentage distribution. Of the 230 respondents out of 285 who participated in the survey, 35.2% (n = 81) reported their organization often included feedback from a number of sources and updated their processes based on the feedback.

Table 76, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and the respondents' organization continuously examine the feedback from its employees, customers, suppliers, and regulatory agencies and revises its processes regularly. Of

Table 21

Your Organization Continuously Examines the Feedback from its Employees, Customers, Suppliers, and Regulatory Agencies and Revises its Processes Regularly (N = 230)

	Frequency	%
Always	42	18.3%
Often	81	35.2%
Sometimes	72	31.3%
Rarely	24	10.4%
Never	3	1.3%
I do not know	6	2.6%
Not applicable	2	.9%
Total	230	100.0%

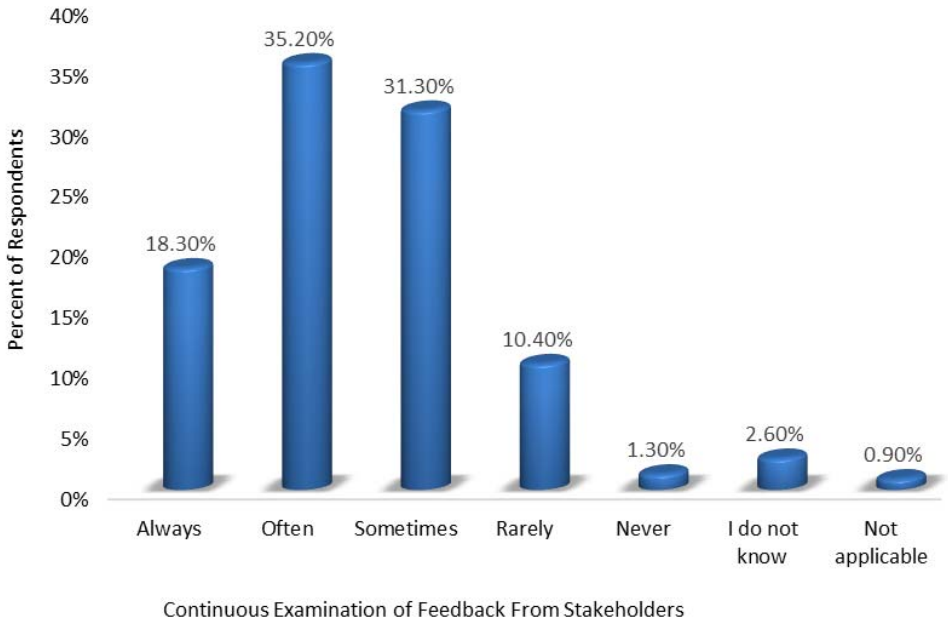

Figure 23. Your organization continuously examines the feedback from its employees, customers, suppliers, and regulatory agencies and revises its processes regularly.

the respondents 35.4 %(*n* = 81) of 229 participants reported their organization often examined the feedback from its employees, customers, suppliers, and regulatory agencies and revised their processes regularly. Of the participants, 12.7% (*n* = 29) of 229 reported their organization use of

Six Sigma was between 2 to 5 years, and often the respondents' organization continuously examined the feedback from its employees, customers, suppliers, and regulatory agencies and revised its processes regularly.

Table 77, Appendix F, shows a crosstab analysis with the variables of organization use of integrated model and the respondents' organization continuously examine the feedback from its employees, customers, suppliers, and regulatory agencies and revises its processes regularly. Of those who participated, 35.2% (n = 81) of 230 participant reported their organization often examined the feedback from its employees, customers, suppliers, and regulatory agencies and revised their processes regularly. Of the participants, 8.3% (n = 19) of 230 respondents reported their organization used integrated model between 2 to 5 years and often their organization continuously examined the feedback from its employees, customers, suppliers, and regulatory agencies and revises its processes regularly.

Survey item 10 asked respondents to identify all applicable areas their organization included part of their Six Sigma process improvement program. Table 22 presents the frequency and percentage distribution about participants' organization seeks feedback from to improve their processes. Table 36 shows that of 203 respondents out of 285 participants who responded to the survey, 25.4% (n = 156) reported their organization included internal stakeholders.

In addition to investigating areas from which participants' organization seeks feedback from as part of their Six Sigma process improvement program, participants were provided with an opportunity to write-in their responses. This identified five other types of response outcomes.

These five response outcomes were grouped into categories, coded, and counted. The most prominent response respondents reported was that their organization does not use Six

Sigma, followed by respondents reported their organization included their stakeholders from whom they seek feedback from as part of their Six Sigma program. Table 23 lists the additional responses cited by the respondents, along with their frequencies and percentages.

Table 22

Select as Many as Applicable, Part of the Six Sigma Process Improvement Program, your Organization Seeks Feedback from (N = 203)

	Frequency	%
Employees of Organization	144	23.5%
Internal Stakeholders	156	25.4%
Consumers	78	12.7%
External Stakeholders	85	13.8%
Suppliers	66	10.7%
Government	46	7.5%
None	21	3.4%
Other	18	2.9%
Total	203	71.0%

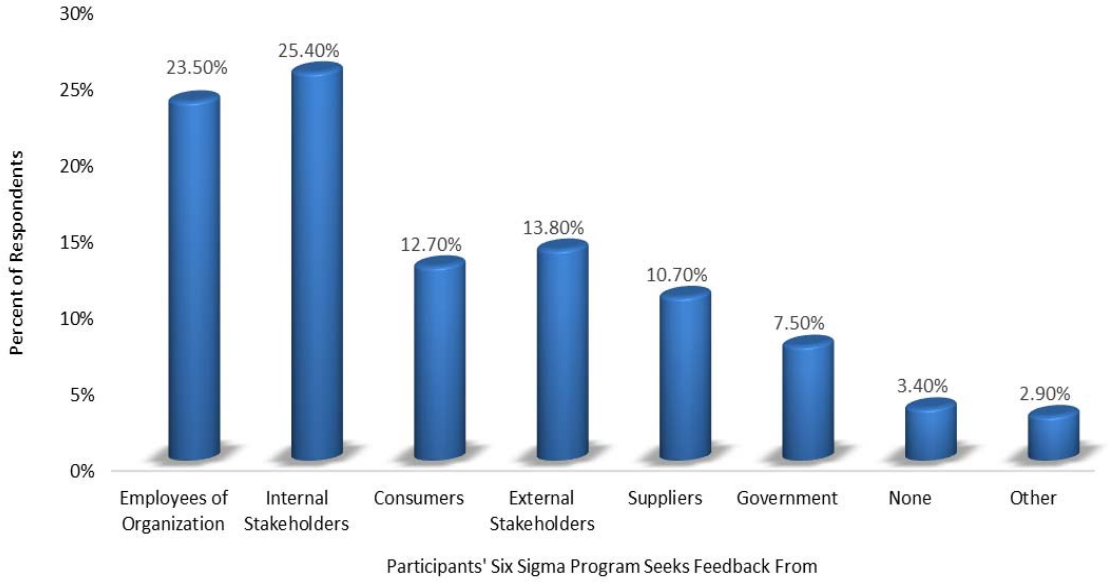

Figure 24. Select as many as applicable, part of the Six Sigma process improvement program, from which your organization seeks feedback.

Table 23

Other Constituents Your Organization Seeks Feedback From as Part of Your Six Sigma Program (N=17)

	Frequency	%
Do not know	2	11.8%
Do not use Six Sigma	7	41.2%
Include expert	1	5.9%
Not applicable	1	5.9%
Include stakeholders	6	35.3%
Total	17	100.0%

Table 78, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and from which the respondents' organization seeks feedback from for their Six Sigma process improvement program. Of the respondents 76.7% (n = 155) of 202 participants reported as part of the Six Sigma process improvement program, their organization sought feedback from their internal stakeholders. Of the participants, 26.2% (n = 53) of 202 reported their organization use of Six Sigma was between 2 to 5 years and part of the Six Sigma process improvement program, respondents' organization sought feedback from internal stakeholders.

Table 79, Appendix F, shows a crosstab analysis with the variables of organization use of integrated model and the part of the Six Sigma process improvement program, respondents' organization seeks feedback. Of those who participated, 76.8% (n = 156) of 203 participants reported their organization sought feedback from their internal stakeholders. Of the participants, 16.7% (n = 34) of 203 respondents reported their organization used integrated model between 2 to 5 years and their organization, as part of the Six Sigma process improvement program, sought feedback from their internal stakeholders.

A summary of crosstab analysis for feedback loop is listed in Table 24. For detailed analysis, refer to Appendix F.

Table 24

Summary Crosstab Ratings with Highest Frequency for Feedback Loops

Number	Survey Item	Six Sigma Only		Integrated	
8a.	Respondent's organization included feedback from internal and external stakeholders as part of the Six Sigma initiative.	Sometimes	2 – 5 years	Often	6-10 years
8b.	Respondent's processes in your organization include a circular feedback from internal resources and external resources.	Sometimes	6-10 years	Often	2-5 years
8c.	Respondent's opinion, the circular relationships depicted in feedback loops draws connections to the consequences of specific actions taken, highlighting cause and effect.	Often	6-10 years	Often	2-5 years
8d.	Respondent's company invites input and suggestions from our client on how we might improve our performance.	Often/ Sometimes	2-5 years	Often	2-5 years
8e.	Respondent's opinion systemic loops can serve as an objective way of analyzing and interpreting balancing and reinforcing forces.	Often	2-5 years	Often	2-5 years
8f.	Respondent's organization continuously examines the feedback from its employees, customers, suppliers, and regulatory agencies and revises its processes regularly.	Often	2-5 years	Often	2-5 years
10.	Respondent's organization Six Sigma process improvement program seeks feedback from	Internal Stakeholders	2-5 years	Internal Stakeholders	2-5 years

Note: A tie in the response rate and frequency when combined Often/Sometimes, reported together. The table only lists a summary of survey items comprise Feedback. For detailed data, refer to Appendix F.

Survey items 8g, 8h, 9a, 9b, 11, 14a, and 19a. Survey questions 8g, 8h, 9a, 9b, 11, 14a, and 19a explores participants' organization holistic approach to quality management.

Survey item 8g asked respondents to rate the frequency in which their organization used central repository where all organizational processes are available to everyone in the

respondent's company. Table 25 presents the frequency and percentage distribution. Of the 227 respondents out of 285 participants, 28.2% (n = 64) reported their organization sometimes used a central repository where all organizational processes were available to everyone in the company.

Table 25

Does Your Organization Use a Central Repository Where All Organizational Processes Are Available to Everyone in Your Company at Any Given Time? (N = 227)

	Frequency	%
Always	38	16.7%
Often	42	18.5%
Sometimes	64	28.2%
Rarely	41	18.1%
Never	27	11.9%
I do not know	11	4.8%
Not applicable	4	1.8%
Total	227	100.0%

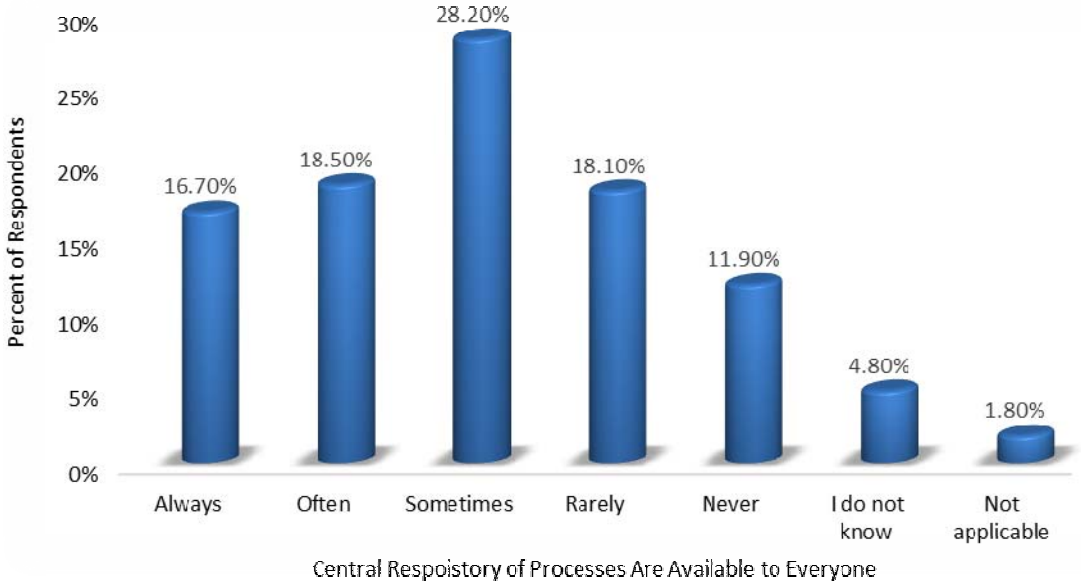

Figure 25. Does your organization use a central repository where all organizational processes are available to everyone in your company at any given time?

Table 80, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization use of central repository where all organizational processes are available to everyone in their organization at any given time. Of the respondents, 28% (n = 63) of 226 participants reported their organization sometimes used central repository where all organizational processes were available to everyone in their organization at any given time their organization. Of the participants, 8.4% (n = 19) of 226 participants reported their organization use of Six Sigma was between 2 to 5 years and sometimes used a central repository where all organizational processes were available to everyone in the company at any given time.

Table 81, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of those who participated, 28.2% (n = 64) of 227 participants reported their organization sometimes used a central repository where all organizational processes were available to everyone in their organization at any given time. Of the participants, 6.6% (n = 15) of 227 participants reported their organization used integrated model was between 2 to 5 years and their organization always used central repository where all organizational processes were available to everyone in their organization at any given time.

Survey question 8h asked respondents to rate the frequency in which their organization had a governance body that reviewed the process repository to identify interrelated and interdependent processes. Table 26 presents the frequency and percentage distribution. Of the 230 respondents out of 285 participants, 20.9% (n = 48) reported their organization had a governance body that reviewed the process repository to identify interrelated and interdependent processes.

Table 26

Does Your Organization Have a Governance Body That Reviews The Process Repository to Identify Interrelated and Interdependent Processes? (N = 230)

	Frequency	%
Always	35	15.2%
Often	42	18.3%
Sometimes	48	20.9%
Rarely	44	19.1%
Never	37	16.1%
I do not know	15	6.5%
Not applicable	9	3.9%
Total	230	100.0%

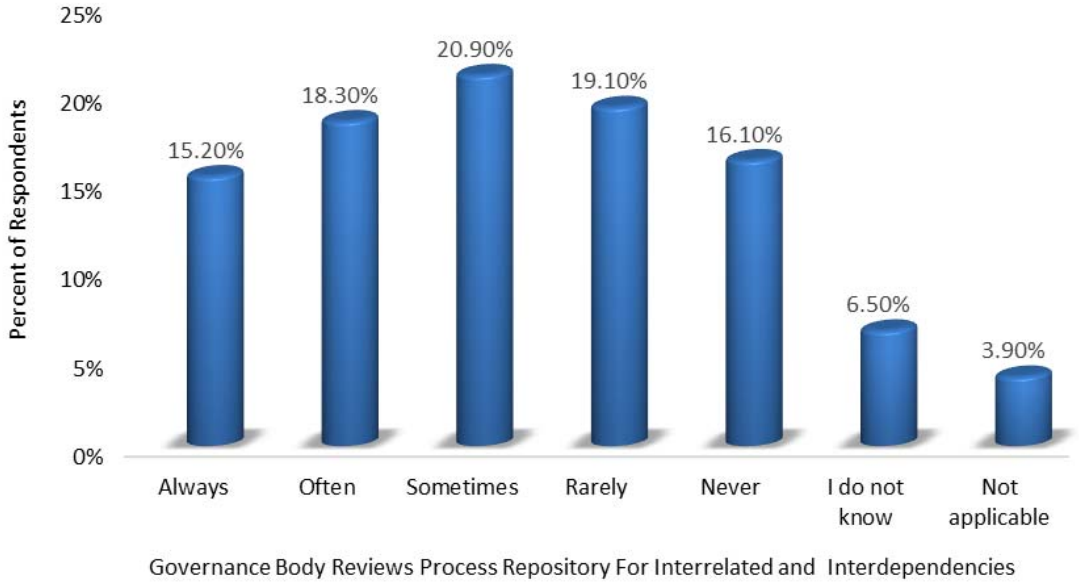

Figure 26. Does your organization have a governance body that reviews the process repository to identify interrelated and interdependent processes?

Table 82, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization have a governance body that reviewed the process repository to identify interrelated and interdependent processes. Of the respondents, 20.5% (n = 47) of 229 participants reported their organization sometimes had a governance body

that reviewed their process repository to identify interrelated and interdependent processes. Of the participants, 10.5% (*n* = 24) of 229 reported their organization use of Six Sigma was between 6 to 10 years and sometimes their organization's governance body reviewed the process repository to identify interrelated and interdependent processes.

Table 83, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of those who participated, 20.9% (*n* = 48) of 230 participants reported their organization sometimes had a governance body that reviewed their process repository to identify interrelated and interdependent processes. Of the participants, 6.5% (*n* = 15) of 230 respondents reported their organization used integrated model was between 2 to 5 years and always used governance body that reviewed the process repository to identify interrelated and interdependent processes.

Survey item 9a asked respondents to rate the frequency in which their organization's governance body reviewed the process improvement initiatives, including reviewing the repository for documented process for internal and external processes. Table 27 presents the frequency and percentage distribution. Of the 204 respondents out of 285 participants, 22.1% (*n* = 45) reported their organization governance rarely reviewed the process improvement initiatives, including reviewing the repository for documented process for internal and external processes; closely followed by 21.6% (*n* = 44) of the respondents reported their organization's governance body sometimes reviewed the repository for documented process for internal and external processes.

Table 27

Indicate The Frequency Your Organization's Governance Body Reviews The Process Improvement Initiatives, Including Reviews The Repository for Documented Process for Internal and External Processes (N = 204)

	Frequency	%
Always	28	13.7%
Often	38	18.6%
Sometimes	44	21.6%
Rarely	45	22.1%
Never	18	8.8%
I do not know	16	7.8%
Not applicable	15	7.4%
Total	204	100.0%

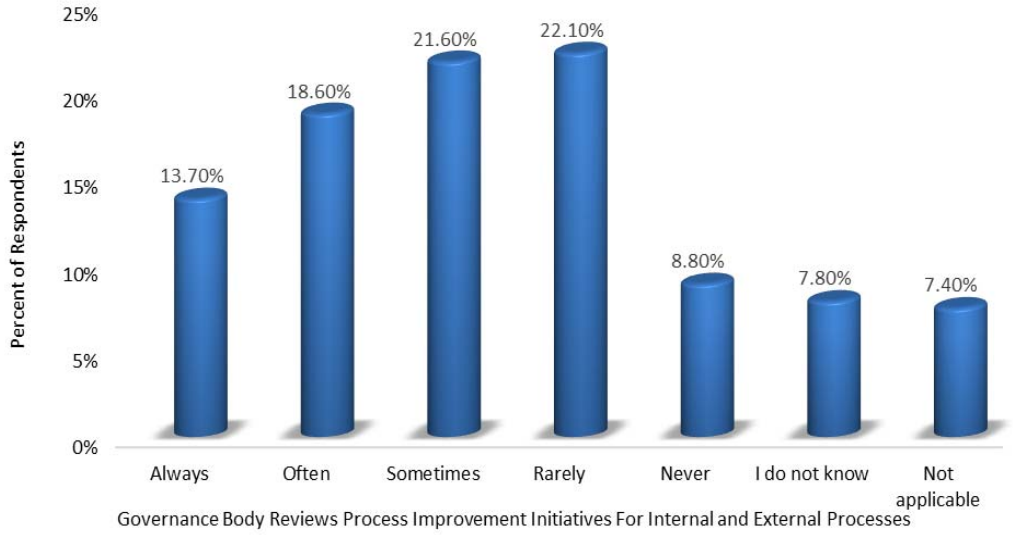

Figure 27. Indicate the frequency your organization's governance body reviews the process improvement initiatives, including reviews the repository for documented process for internal and external processes.

Table 84, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization governance body reviewed the process improvement initiatives, including reviewing the repository for documented process for internal

and external processes. Of the participants who responded, 22.2% (n = 45) of 203 participants reported their organization's governance body rarely reviewed the process improvement initiatives. Of the participants, only 7.4% (n = 15) of 203 respondents reported their organization use of Six Sigma was between 2 to 5 years and their organization governance body sometimes reviewed the process improvement initiatives. Equally, only 7.4% (n = 15) of 203 respondents reported their organization use of Six Sigma was between 6 to 10 years and rarely their organization governance body reviewed the process improvement initiatives. Also, 7.4% (n = 15) of 203 respondents reported their organization use of Six Sigma was over 10 years and reported their organization governance body often reviewed the process improvement initiatives.

Table 85, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 22.1% (n = 45) of 204 participants reported their organization's governance body rarely reviewed their process improvement initiatives. Only 7.4% (n = 15) of 204 respondents reported their organization used integrated model was between 2 to 5 years and their governance body always reviewed the process improvement initiatives.

Survey item 9b asked respondents to rate the frequency in which their organization used metrics to monitor organizational patterns to gain a view of the broader perspective of the organizational structure, including events taken within and outside the organization. Table 28 presents the frequency and percentage distribution. Of the 204 respondents out of 285 participants, 22.0% (n = 63) reported their organization often used metrics to monitor organizational patterns to gain a view of the broader perspective of the organizational structure, including events taken within and outside the organization.

Table 28

Indicate If Your Organization Uses Metrics to Monitor Organizational Patterns to Gain a View of The Broader Perspective of The Organizational Structure, Including Events Taken Within and Outside The Organization (N = 204)

	Frequency	%
Always	38	18.6%
Often	63	30.9%
Sometimes	55	27.0%
Rarely	24	11.8%
Never	12	5.9%
I do not know	7	3.4%
Not applicable	5	2.5%
Total	204	100.0%

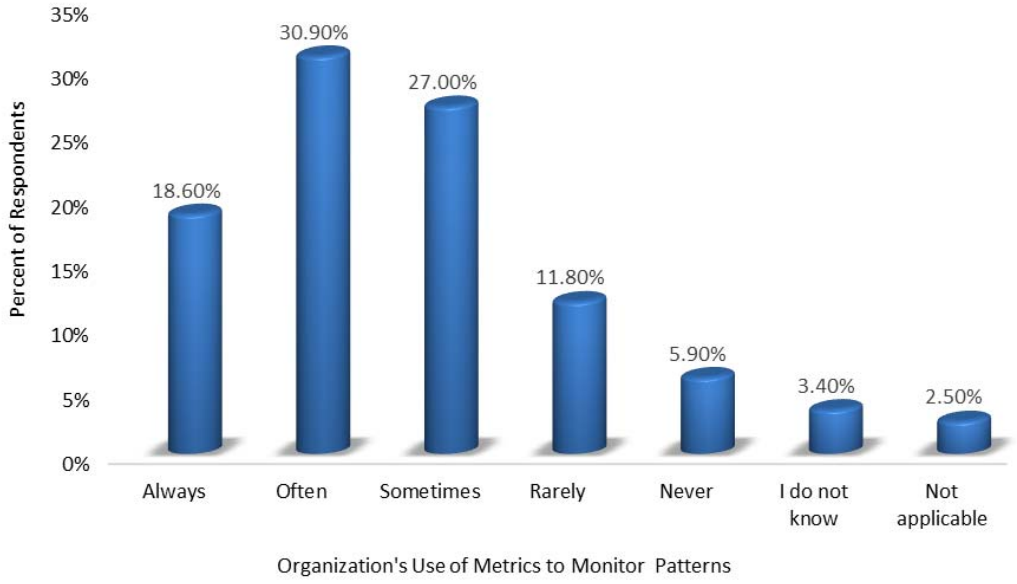

Figure 28. Indicate if your organization uses metrics to monitor organizational patterns to gain a view of the broader perspective of the organizational structure, including events taken within and outside the organization.

Table 86, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization used metrics to monitor

organizational patterns to gain a view of the broader perspective of the organizational structure, including events taken within and outside the organization. Of the respondents, 31% (n = 63) of 203 participants reported their organization often used metrics to monitor their organizational patterns to gain a view of the broader perspective of their organizational structure, including events taken within and outside of their organization. Of the participants, 10.8% (n = 22) of 202 participants reported their organization used Six Sigma was between 2 to 5 years and their organization often used metrics to monitor organizational patterns to gain a view of the broader perspective of the organizational structure, including events taken within and outside the organization.

Table 87, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the respondents, 30.9% (n = 63) of 204 participants reported their organization often used metrics to monitor organizational patterns to gain a view of the broader perspective of their organizational structure. Only 7.8% (n = 16) of 204 respondents reported their organization always used integrated model between 2 to 5 years and always used metrics to monitor organizational patterns to gain a view of the broader perspective of the organizational structure.

Survey item 11 asked respondents to rate the frequency and percentage in which their organization communicated process improvement programs. Table 29 presents the frequency and percentage distribution. Of the 186 respondents out of 285 participants, 23.6% (n = 90) reported their organization communicated to everyone in the organization when process improvement programs impacted a particular department only. Closely followed, 23.3% (n =89) reported their organization communicated to everyone about process improvement programs when it impacted the entire organization.

Table 29

My Organization Communicates Process Improvement Programs (N = 186)

	Responses	
	N	%
When it impacts the entire organization	89	23.3%
When it impacts a particular department only and communicates only to those who are impacted	78	20.4%
When it impacts a particular department only and communicates to everyone in the organization	90	23.6%
When it impacts external stakeholder and communicates to everyone in the organization	56	14.7%
When it impacts external stakeholder and communicates to only those areas that support the customers	42	11.0%
Doesn't communicate process improvement impacts	18	4.7%
Other	9	2.4%
Total	186	65.0%

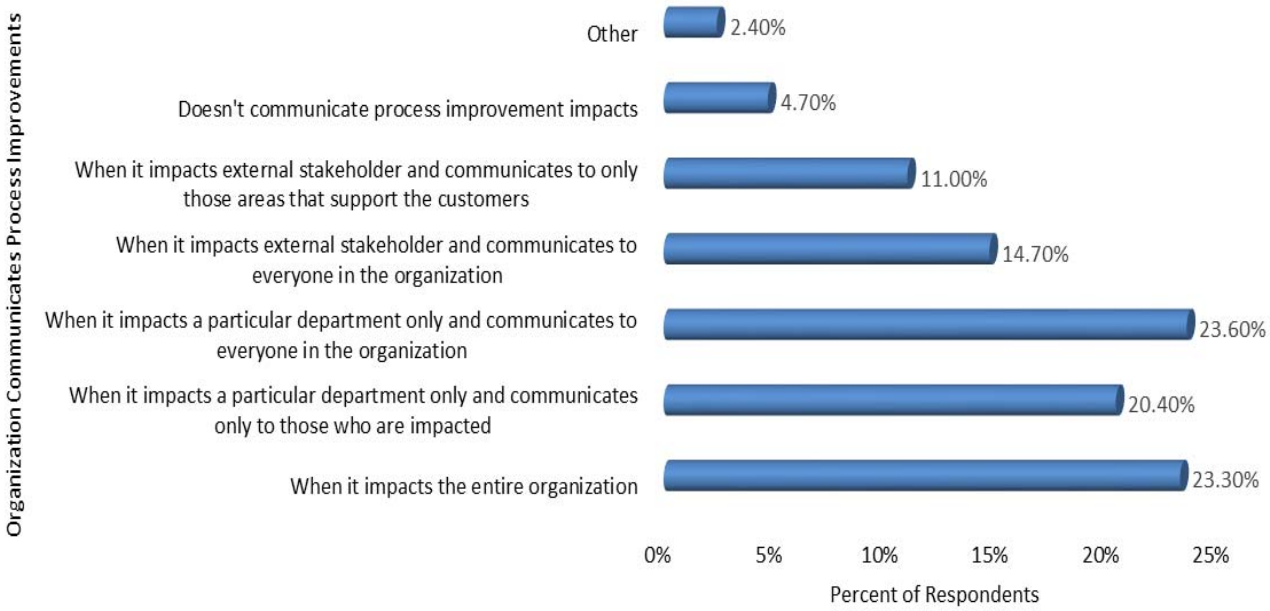

Figure 29. My organization communicates process improvement programs.

Supplementing the investigation and learn more about the area in which the participant's organization communicates when their organization has a process improvement program,

participants were provided with an opportunity to write-in their responses. This identified five other types of response outcomes. These five response outcomes were grouped into categories, coded, and counted. The most noticeable response respondents reported was that their organization communicates every time of their organization's process improvement programs, followed by respondents reported their organization communicates to others of their process improvement programs. Table 30 lists the additional responses cited by the respondents, along with their frequencies and percentages.

Table 30

Other, My Organization Communicates Process Improvement Programs. (N=9)

	Frequency	%
Organization communicates every time	4	2.50%
Organization frequently communicates	1	0.60%
Not applicable	1	0.60%
Does not communicate	1	0.60%
Organization communicates to others	2	1.30%

Table 88, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization communicates process improvement programs. Of the participants, 48.6% (n = 90) of 185 respondents reported their organization communicates process improvement programs when it affects a particular department only and communicates to everyone in the organization. Of the participants, 16.8% (n = 31) of 185 reported their organization use of Six Sigma is between 2 to 5 years and communicates to everyone in the organization when process improvement impacts a particular department only.

Table 89, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants, 48.4% (n = 90) of 186 participants reported their organization communicates process improvements programs

when it impacts a particular department and they communicate it to everyone. Of the participants who responded, 11.3% (n = 21) respondents reported their organization use integrated method is between 2 to 5 years and communicates process improvement when it affects the entire organization.

Survey item 14a asked respondents to rate the frequency and percentage in which their organization Six Sigma programs included diagramming the entire system, reproducing the problem areas of analysis and conducting test run to measure the outcomes before implementing a new process. Table 31 presents the frequency and percentage distribution. Of the 177 respondents out of 285 participants, 22.0% (n = 63) reported their organization Six Sigma programs sometimes included diagramming the entire system, reproducing the problem areas of analysis and conduct test run to measure the outcomes before implementing a new process.

Table 31

In Your Opinion, Six Sigma Programs in Your Organization Include Diagramming The Entire System, Reproducing The Problem Areas of Analysis and Conduct Test Run to Measure The Outcomes Before Implementing a New Process (N = 177)

	Frequency	%
Always	21	7.3%
Often	40	14.0%
Sometimes	63	22.0%
Rarely	21	7.3%
Never	7	2.4%
I do not know	5	1.7%
Not applicable	20	7.0%
Total	177	61.9%

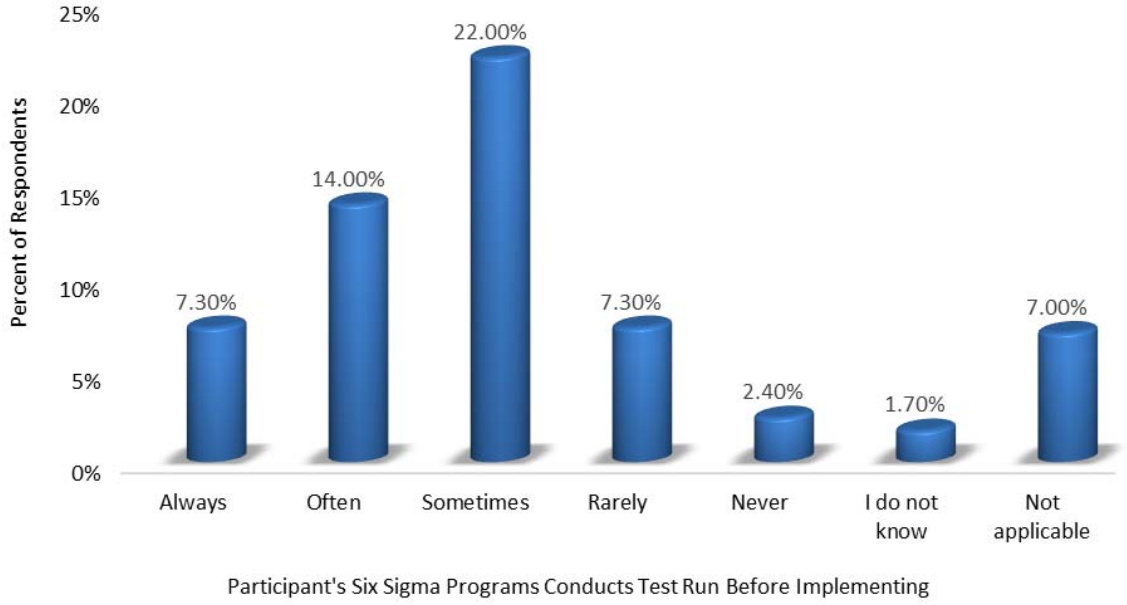

Figure 30. In your opinion, Six Sigma programs in your organization include diagramming the entire system, reproducing the problem areas of analysis and conduct test run to measure the outcomes before implementing a new process.

Cross tab analysis, Table 90 in Appendix F, shows Sigma and participants' organization Six Sigma programs included diagramming the entire system, reproducing the problem areas of analysis and conducting test run to measure the outcomes before implementing a new process. Of the respondents, 35.8% (n = 63) of 176 participants reported their organization sometimes include diagramming the entire system, reproducing the problem areas of analysis and conduct test run to measure the outcomes before implementing a new process for their Six Sigma programs. Of the participants, 12.5% (n = 22) of 176 reported their organization use of Six Sigma was between 2 to 5 years and sometimes included diagramming the entire system, reproducing the problem areas of analysis and conduct test run to measure the outcomes before implementing a new process.

Table 91, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the respondents, 35.6% (n = 63) of

177 participants reported their organization sometimes included diagramming the entire system, reproducing the problem areas of analysis and conducting test run to measure the outcomes before implementing a new process for their Six Sigma programs. Of the participants, 6.2% (n = 11) respondents reported their organization used integrated model between 2 to 5 years often included diagramming the entire system, reproducing the problem areas of analysis and conducting test run to measure the outcomes before implementing a new process.

Survey item 19a asked respondents to rate the frequency and percentage in which participants had an understanding of the work they did contribute to their organizational, including external stakeholders' goals. Table 32 present the frequency and percentage distribution. Of the 162 respondents out of 285 participants, 26.2% (n = 75) reported participants often had an understanding of how the work they did contributed to their organizational, including external stakeholders' goals.

Table 32

In Your Opinion, How Often You Have an Understanding of The Work You Do Contributes to Your Organizational, Including External Stakeholders' Goals? (N = 162)

	Frequency	%
Always	56	19.6%
Often	75	26.2%
Sometimes	27	9.4%
Rarely	2	0.7%
Never	0	0.0%
I do not know	1	0.3%
Not applicable	1	0.3%
Total	162	56.6%

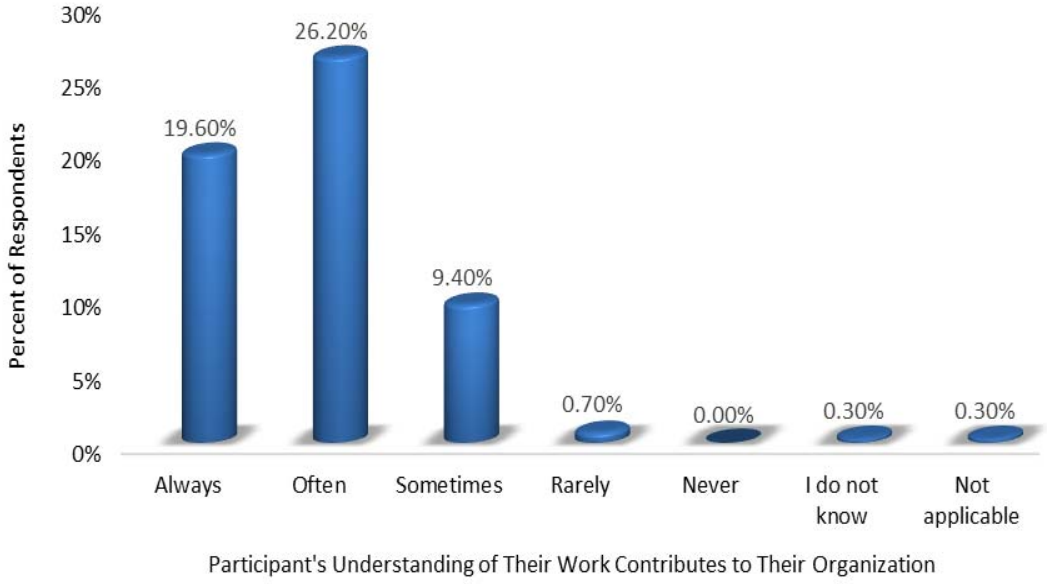

Figure 31. In your opinion, how often you have an understanding of the work you do contributes to your organizational, including external stakeholders' goals?

Table 92, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants had an understanding of how the work they did contributed to their organizational, including external stakeholders' goals. Of the respondents, 46.3% (n = 75) of 162 respondents reported their organization often had an understanding of how the work they did contributed to their organizational, including external stakeholders', goals. Of the participants, 13.6% (n = 22) of 162 respondents reported their organization use of Six Sigma was between 2 to 5 years and participants often had an understanding of how the work they did contributed to their organizational, including external stakeholders' goals.

Table 93, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 46.3% (n = 75) of 162 participants reported participants often had an understanding of how the

work they did contributed to their organizational, including external stakeholders' goals. Of the participants, only 8.6% (n = 14) respondents reported their organization used integrated model

Table 33

Summary Crosstab Ratings with Highest Frequency for Holistic View

Number	Survey Item	Six Sigma Only		Integrated	
8g.	Respondents' organization use a central repository where all organizational processes are available to everyone in your company at any given time.	Sometimes	2-5 years	Always	2-5 years
8h.	Respondents' organization have a governance body that reviews the process repository to identify interrelated and interdependent processes.	Sometimes	6-10 years	Always	2-5 years
9a.	Respondents indicate the frequency of their organization's governance body reviews the process improvement initiatives, including reviews the repository for documented process for internal and external processes.	Sometimes	2-5 years	Always	2-5 years
9b.	Respondents indicate the frequency of their organization uses metrics to monitor organizational patterns to gain a view of the broader perspective of the organizational structure, including events taken within and outside the organization.	Often	2-5 years	Always	2-5 years
11.	Respondents indicate the frequency of their organization communicates process improvement programs.	Particular department only but communicate to everyone	2-5 years	Entire organization	2-5 years
14a.	Respondent's opinion, Six Sigma programs in their organization include diagramming the entire system, reproducing the problem areas of analysis and conduct test run to measure the outcomes before implementing a new process.	Sometimes	2-5 years	Often	2-5 years
19a.	Respondent's opinion, how often they have an understanding of the work they do contributes to your organizational, including external stakeholders' goals.	Often	2-5 years	Always	2-5 years

Note: The table only lists a summary of survey items comprise Feedback. For detailed data, refer to Appendix F.

between 2 to 5 years and participants always had an understanding of how the work they did contributed to their organizational, including external stakeholders' goals.

A summary of crosstab analysis for holistic view is listed in Table 33. For detailed analysis, refer to Appendix F.

Survey items 9c – 9f, 12, and 14b. Survey questions 9c – 9f, 12, and 14b asked questions about participants' organization practice identifying interdependencies and dependencies when using Six Sigma program. Survey item 9c asked respondents to rate the frequency and percentage in which their organization when solving for a problem or examining processes, all parts that made up a sub-system were examined (inputs, outputs, feedback control, etc.). Table 34 presents the frequency and percentage distribution for survey item 9c. Of the 204 respondents out of 285 participants, a little over 37.1% (n = 106) reported all parts that made up a sub-system were examined by their organization when using Six Sigma program.

Table 34

In Your Opinion, When Solving For a Problem or Examining Processes, All Parts That Make Up a Sub-system Must Be Examined (inputs, outputs, feedback control, etc.) (N = 204)

	Frequency	%
Always	106	37.1%
Often	63	22.0%
Sometimes	20	7.0%
Rarely	9	3.1%
Never	0	0.0%
I do not know	2	0.7%
Not applicable	4	1.4%
Total	204	71.3%

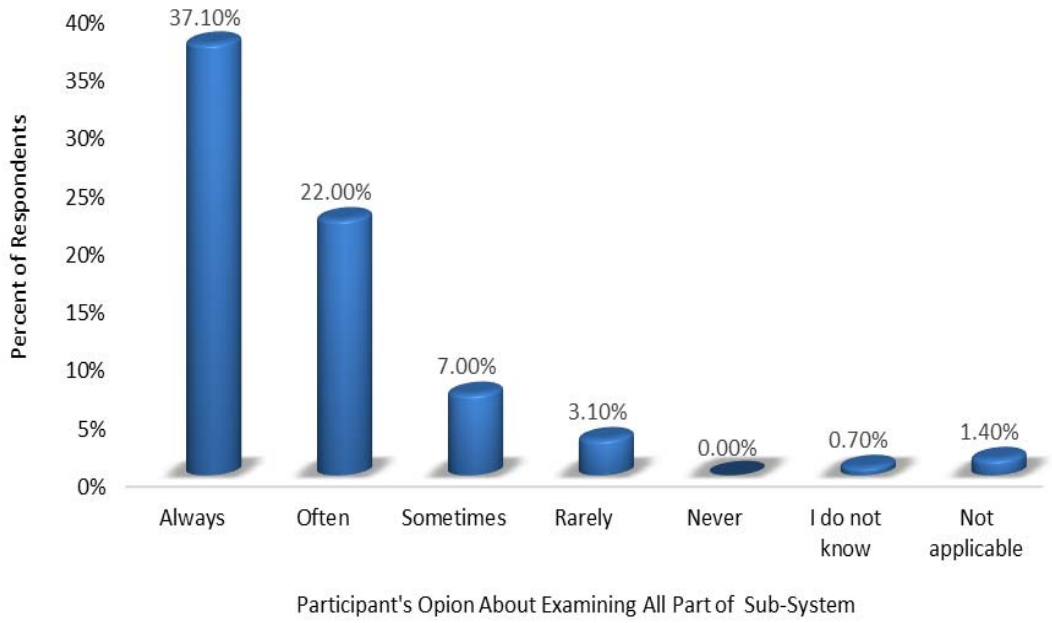

Figure 32. In your opinion, when solving for a problem or examining processes, all parts that make up a sub-system must be examined (inputs, outputs, feedback control, etc.).

Table 94, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization when solving for a problem or examining processes, all parts that made up a sub-system were examined (inputs, outputs, feedback control, etc.). Of the respondents, 51.7% (n = 105) of 203 participants reported when solving for a problem or examining processes, in participants' opinion, all parts that made up a subsystem was always examined. Of the participant, 16.3% (n = 33) of 203 reported their organization use of Six Sigma was between 2 to 5 years and participants' organization always practiced identifying interdependencies and dependencies when using Six Sigma program.

Table 95, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the respondents who participated, 52% (n = 106) of 204 participants reported when solving for a problem or examining processes, in participants' opinion, all parts that made up a subsystem always must be examined. Of the participants, 10.8% (n = 22) respondents reported their organization use of integrated model was between 2 to 5 years and when solving for a problem or examining processes, in participants' opinion, all parts that made up a subsystem always was examined.

Survey item 9d asked respondents to rate their organization's Six Sigma programs identifies and incorporated the interrelationship of the organization's sub-system process when developing a new or revising an existing process. Table 35 presents the frequency and percentage distribution. Of the 203 respondents out of 285 participants, 21% (n = 60) reported participants organization's Six Sigma programs often identified and incorporated the interrelationship of the organization's sub-system process when developing a new or revising an existing process.

Table 35

My Organization's Six Sigma Programs Identifies and Incorporates The Interrelationship of The Organization's Sub-system Process When Developing a New or Revising an Existing Process (N = 203)

	Frequency	%
Always	35	12.2%
Often	60	21.0%
Sometimes	47	16.4%
Rarely	23	8.0%
Never	9	3.1%
I do not know	8	2.8%
Not applicable	21	7.3%
Total	203	71.0%

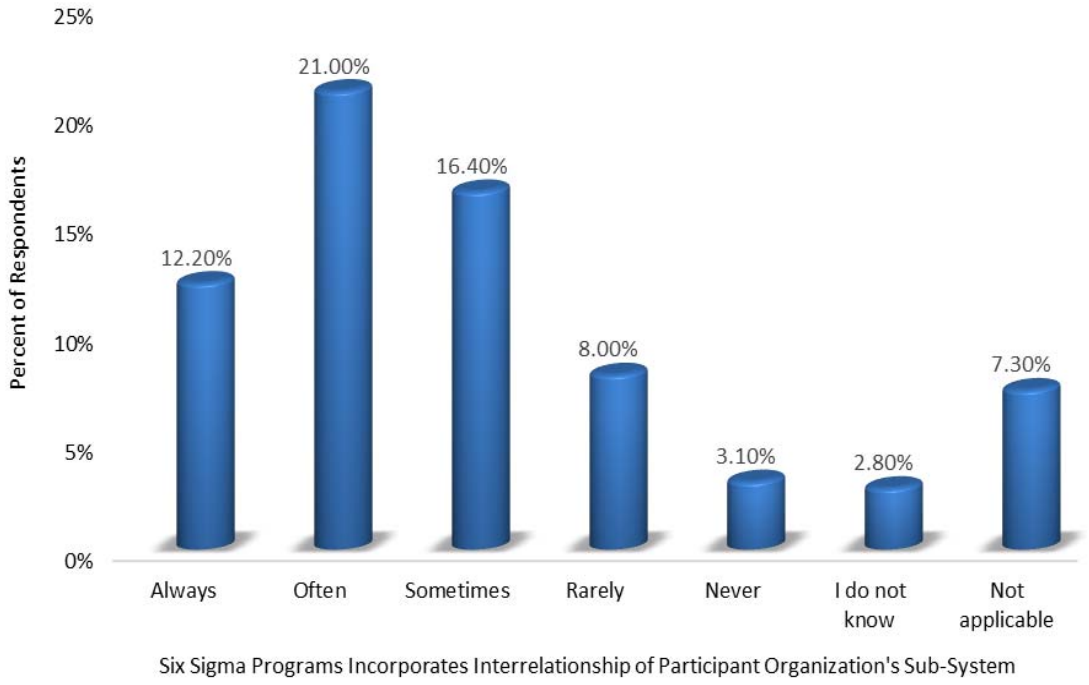

Figure 33. My organization's Six Sigma programs identify and incorporate the interrelationship of the organization's sub-system process when developing a new or revising an existing process.

Table 96, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization Six Sigma programs identified and incorporated the interrelationship of the organization's sub-system process when developing a new or revising an existing process. Of the respondents who participated, 29.7% (n = 60) of 202 participants reported their organization's Six Sigma programs often identified and incorporated the interrelationship of their organization's sub-system process when developing a new or revising an existing process. Of the participants, 11.9% (n = 124) of 202 reported their organization use of Six Sigma was between 6 to 10 years and participants' organization Six Sigma programs often

identified and incorporated the interrelationship of the organization's sub-system process when developing a new or revising an existing process. .

Table 97, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 29.6% (n = 60) of 203 participants reported their organization often identified and incorporated the interrelationship of their organization's sub-system process when developing a new or revising an existing process. Of the participants, 6.4% (n = 13) of 203 participants reported their organization's use of integrated model was between 6 to 10 years and participants' organization Six Sigma programs often identified and incorporated the interrelationship of the organization's sub-system process when developing a new or revising an existing process.

Survey item 9e asked respondents to rate the frequency and percentage in which the Six Sigma team in the participants' organization identified patterns, recurring trends of interconnections, or casual links beyond the isolated events. Table 36 presents the frequency and percentage distribution. Of the 204 respondents out of 285 participants, 20.6% (n = 59) reported the Six Sigma team in their organization sometimes identified patterns, recurring trends of interconnections, or casual links beyond the isolated events.

Table 36

The Six Sigma Team in My Organization Identifies Patterns, Recurring Trends of Interconnections, or Casual Links Beyond The Isolated Events (N = 204)

	Frequency	%
Always	33	11.5%
Often	48	16.8%
Sometimes	59	20.6%
Rarely	23	8.0%
Never	8	2.8%
I do not know	9	3.1%

(table continues)

	Frequency	%
Not applicable	24	8.4%
Total	204	71.3%

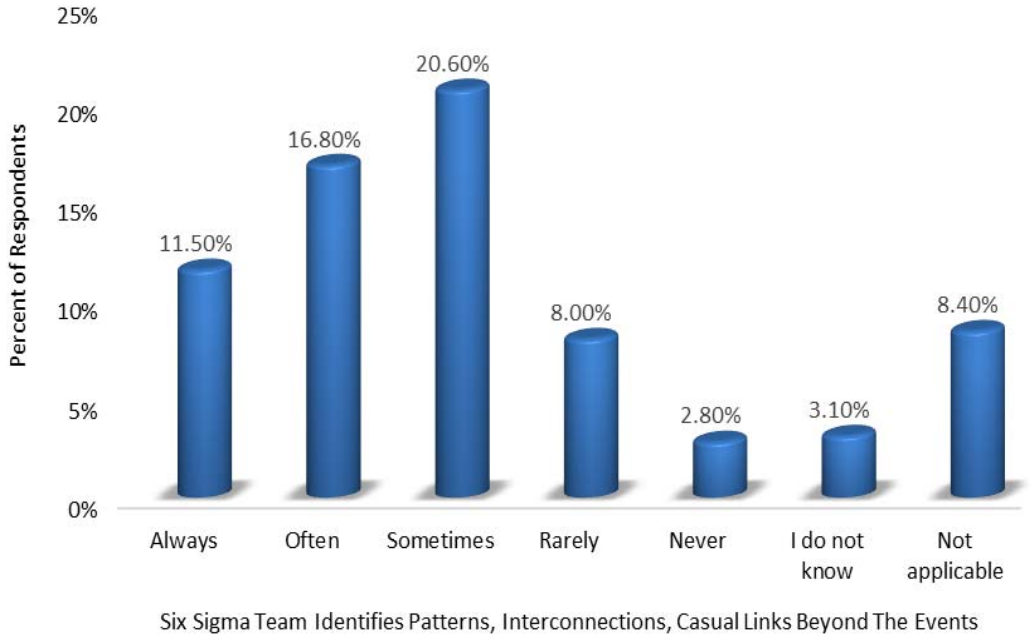

Figure 34. The Six Sigma team in my organization identifies patterns, recurring trends of interconnections, or casual links beyond the isolated events.

Table 98, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization identified patterns, recurring trends of interconnections, or casual links beyond the isolated events. Of the respondents, 28.6% (n = 58) of 203 participants reported their organization sometimes identified patterns, recurring trends of interconnections, or casual links beyond the isolated events. Of the participants, 10.3% (n = 21) of 203 reported their organization use of Six Sigma was between 6 to 10 years and participants

reported that sometimes their organization identified patterns, recurring trends of interconnections, or casual links beyond the isolated events.

Table 99, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 28.9% (*n* = 59) of 204 participants reported their organization sometimes identified patterns, recurring trends of interconnections, or casual links beyond the isolated events. Of the participants, 6.4% (*n* = 13) reported their organization used an integrated model between 2 to 5 years and their organization sometimes identified patterns, recurring trends of interconnections, or casual links beyond the isolated events.

Survey item 9f asked respondents to rate the frequency and percentage in which participants' organization investigated the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental impacts that impacts internal and external stakeholders. Table 37 presents the frequency and percentage distribution. Of the 204 respondents out of 285 participants, 23.1% (*n* = 66) reported participants' organization sometimes investigated the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental impacts that impacts internal and external stakeholders.

Table 37

My Organization Investigates The Root Cause of a Problem by Analyzing All Inputs, Processes and Outputs of a Process by Examining the Inter-departmental Impacts That Impacts Internal and External Stakeholders (N = 204)

	Frequency	%
Always	37	12.9%
Often	65	22.7%
Sometimes	66	23.1%
Rarely	25	8.7%

(table continues)

	Frequency	%
Never	5	1.7%
I do not know	3	1.0%
Not applicable	3	1.0%
Total	204	71.3%

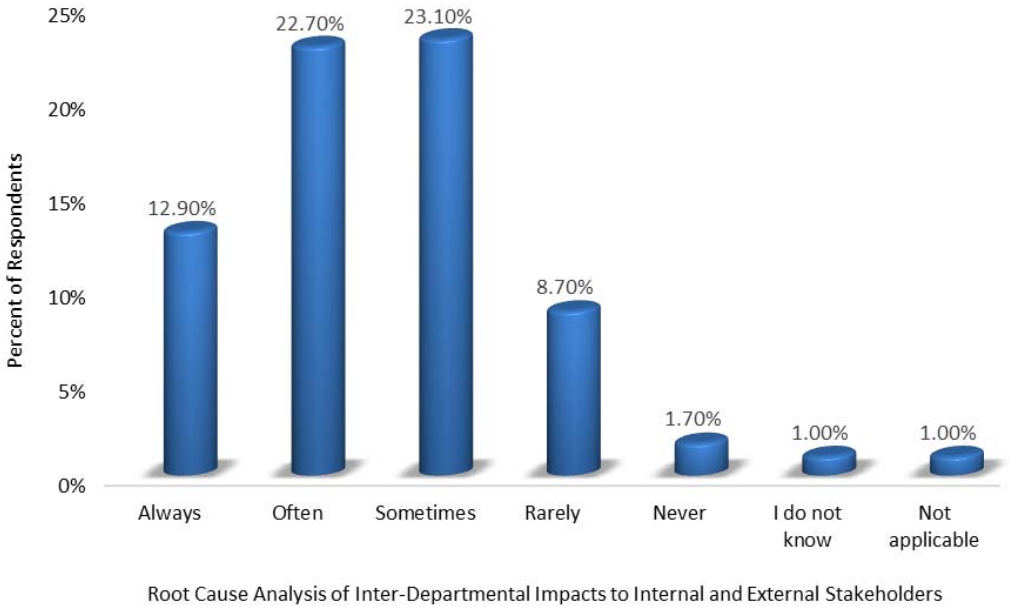

Figure 35. My organization investigates the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental impacts that impacts internal and external stakeholders.

Table 100, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization investigated the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental impacts that impacts internal and external stakeholders. Of the respondents, 32% (n = 65) of 203 participants reported their organization sometimes investigated the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental

impacts that impacts internal and external stakeholders. Equally, the same 32% (*n* = 65) of 203 participants reported their organization often investigated the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental impacts that impacts internal and external stakeholders. Of the participants, 11.8% (*n* = 24) of 203 reported their organization use Six Sigma between 2 to 5 years and their organization sometimes investigated the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental impacts that impacts internal and external stakeholders.

Table 101, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 32.4% (*n* = 66) of 204 participants reported their organization sometimes investigated the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental impacts that impacts internal and external stakeholders. Of the participants, 6.4% (*n* = 13) of 204 respondents reported their organization use integrated model between 2 to 5 years and that participants' organization often investigated the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental impacts that impacts internal and external stakeholders.

Survey item 12 asked respondents to rate the frequency in which key reason(s) participants' organization investigated the interdependencies and interrelationship of the organization's processes. Table 38 presents the frequency and percentage distribution. Of the 196 respondents out of 285 participants, 15.5% (*n* = 135) reported participants rated key reason their organization investigated the interdependencies and interrelationship of the organization's processes was to improve their organization efficiency. Equally, participants 15.5% (*n* = 135)

Table 38

Key Reason(s) My Organization Investigates the Interdependencies and Interrelationship of the Organization's Processes, Select as Many as Applicable (N = 196)

	Responses	
	N	%
Improve organization efficiency	135	15.5%
Improve customer service	126	14.4%
Reduce waste	119	13.6%
Reduce cost	135	15.5%
Improve profitability	93	10.7%
Gain competitive advantage	80	9.2%
Identify root cause of problems	109	12.5%
Influence by senior management	35	4.0%
A number of our competitors are doing it	18	2.1%
My company does not investigate interdependencies or interrelationship of processes throughout the organization unless process improvement impacts the entire organization.	18	2.1%
Other	4	0.5%
Total	196	68.5%

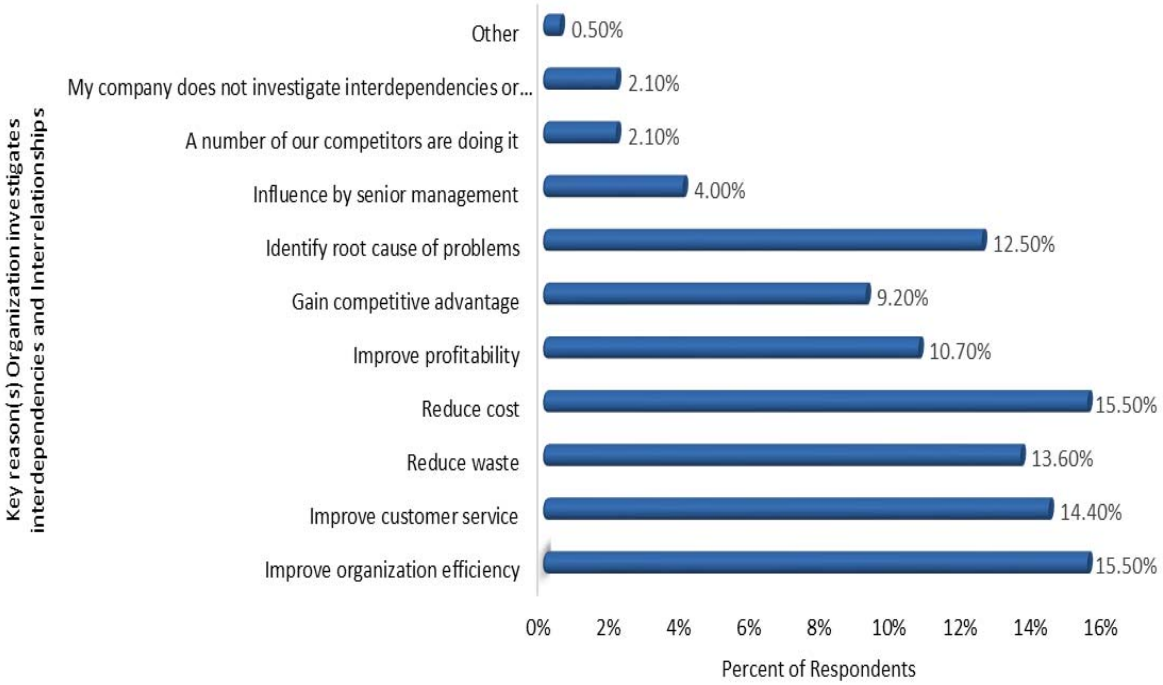

Figure 16. Key reason(s) my organization investigates the interdependencies and interrelationship of the organization's processes, select as many as applicable.

reported they rated key reason their organization investigated the interdependencies and interrelationship of the organization's processes was to reduce cost.

A further attempt to examine survey item 12 to learn more about the key reasons the participant's organization investigates interdependencies and interrelationships of their organization's processes, participants were provided with an opportunity to write-in their responses. Only one participant took the opportunity to write in their response. However, the respondent wrote Not Applicable; no further explanation was provided.

Table 102, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization key reason(s) investigated the interdependencies and interrelationship of the organization's processes. Of the respondents, 69.2% (n = 135) of 195 participants reported the key reason their organization investigated the interdependencies and interrelationships of their organization's process was to improve their organization efficiency. Of the participants who reported their organizations use of Six Sigma was between 2 – 5 years, the top three reasons respondents reported 21% (n = 41) of 195 participants reported organization efficiency, 21% (n = 41) reduce cost, and 17.9% (n = 35) identify root cause were the key reasons their organization investigated the interdependencies and interrelationship of the organization's process. Interesting that as the years of Six Sigma use expanded to 6 – 10 years, a new reasons emerges. Of the participants, 17.9% (n = 35) of the respondents report improve customer services as a reason that supplements to organization efficiency, reduce cost and identify root cause.

Table 103, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 68.9% (n = 135) of 196 participants reported the key reason their organization investigated the

interdependencies and interrelationships of their organization's process was to improve their organization efficiency. Of the participants who reported their organizations use of integrated approach was between 2 – 5 years, the top three reasons respondents reported 14.8% (*n* = 29) of 196 participants reported organization efficiency, 14.8% (*n* = 29) reduce cost, and 14.5% (*n* = 28) identify root cause were the key reasons their organization investigated the interdependencies and interrelationship of the organization's process. As the use of integrated approach expands to 6 – 10 years, a new reason emerges. Of the participants, 10.2% (*n* = 20) of the respondents report reduce waste as a reason that supplements to organization efficiency, reduce cost and identify root cause.

Survey item 14b asked respondents to rate the frequency in which participants' organization Six Sigma team was responsible for soliciting feedback from internal and external resources. Table 39 presents the frequency and percentage distribution. Of the 177 respondents out of 285 participants, 16.4% (*n* = 47) reported participants organization Six Sigma team was often responsible for soliciting feedback from internal and external resources.

Table 39

Six Sigma Team in My Organization is Responsible for Soliciting Feedback from Internal and External Resources (N = 177)

	Frequency	%
Always	31	10.8%
Often	47	16.4%
Sometimes	40	14.0%
Rarely	23	8.0%
Never	7	2.4%
I do not know	8	2.8%
Not applicable	21	7.3%
Total	177	61.9%

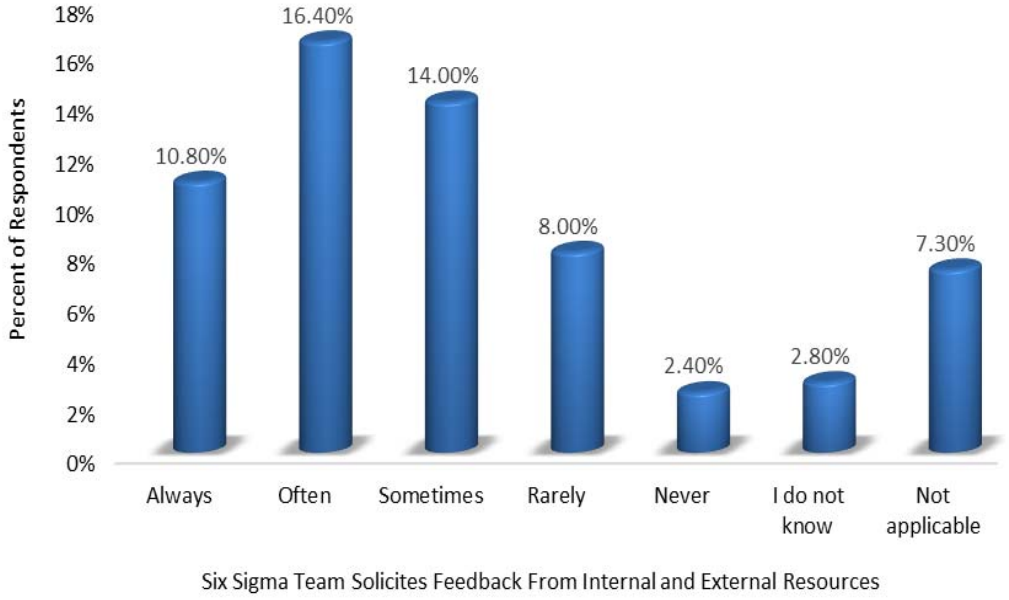

Figure 37. Six Sigma team in my organization is responsible for soliciting feedback from internal and external resources.

Table 104, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and team in respondent's organization is responsible for soliciting feedback from internal and external resources with Six Sigma.

Of the participants, 26.7% (n = 47) of 176 participants reported their organization's Six Sigma team often solicited feedback from internal and external resources. Of the participants, 8.5% (n = 15) of 176 respondents reported their organization use of Six Sigma was between 2 to 5 years and their organization Six Sigma team often solicited feedback from internal and external resources. Similarly, of the participants who responded 8.5% (n = 15) of 176 respondents reported their organization's use of Six Sigma was between 6 to 10 years and their Six Sigma teams often solicited feedback from internal and external resources.

Table 105 shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 26.6% (n = 47) of 177 participants reported their organization's team often solicited feedback from internal

and external resources and of those, 7.3% (n = 13) of use Six Sigma177 respondents reported their organization's use of integrated method was between 2 to 5 years.

A summary of crosstab analysis for interdependencies criteria is listed in Table 40. For detailed analysis, refer to Appendix F.

Table 40

Summary Crosstab Ratings with Highest Frequency for Interdependencies

Number	Survey Item	Six Sigma Only		Integrated	
9c.	Respondent's opinion, when solving for a problem or examining processes, all parts that make up a sub-system must be examined (inputs, outputs, feedback control, etc.).	Always	2-5 years	Always	2-5 years
9d.	Respondent's rate their organization's Six Sigma programs identifies and incorporates the interrelationship of the organization's sub-system process when developing a new or revising an existing process.	Often	6-10 years	Often	6-10 years
9e.	Respondent's rate Six Sigma team in their organization identifies patterns, recurring trends of interconnections, or casual links beyond the isolated events.	Sometimes	6-10 years	Sometimes	2-5 years
9f.	Respondent's rate their organization investigates the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental impacts that impacts internal and external stakeholders.	Sometimes	2-5 years	Sometimes/Often	2-5 years
12.	Respondent's rate key reason(s) their organization investigates the interdependencies and interrelationship of the organization's processes, select as many as applicable.	Improve organization efficiency/ Reduce cost	2-5 year	Improve organization efficiency/ Reduce cost	2-5 years
14b.	Respondent's rate Six Sigma team in their organization is responsible for soliciting feedback from internal and external resources.	Often	2-5 years	Often	2-5 years

Note: A tie in the response rate and frequency when combined Often/Sometimes, Improve organization efficiency/Reduce cost reported together. The table only lists a summary of survey items comprise Feedback. For detailed data, refer to Appendix F.

Survey items 16, 17 – 17b, and 18. Survey questions 16, 17 – 17b, and 18 asked questions about participants' organization overall quality improvement program success when using Six Sigma program. Survey item 16 asked respondents to rate the frequency in which their organization use of systems thinking method with Six Sigma increased the success of the Six Sigma programs. Table 41 presents the frequency and percentage distribution. Of the 173 respondents out of 285 participants, 24.8% (n = 71) reported their organization did not use systems thinking with Six Sigma program. However, of the participants, 10.8% (n = 31) respondents reported they strongly agreed their organization's use of systems thinking method with Six Sigma increased the success of their Six Sigma programs.

Table 41

My Organization Use of Systems Thinking Method with Six Sigma Increased the Success of the Six Sigma Programs (N = 173)

	Frequency	%
Strongly agree	31	10.8%
Somewhat agree	25	8.7%
Agree	18	6.3%
Disagree	9	3.1%
Strongly disagree	3	1.0%
My company does not use systems thinking with Six Sigma program	71	24.8%
Do not know	16	5.6%
Total	173	60.5%

Table 106, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization use of systems thinking method with Six Sigma increased the success of their Six Sigma programs. Of the participants who responded, 18% (n = 31) of 172 participants reported strongly agreed their organization use of systems thinking

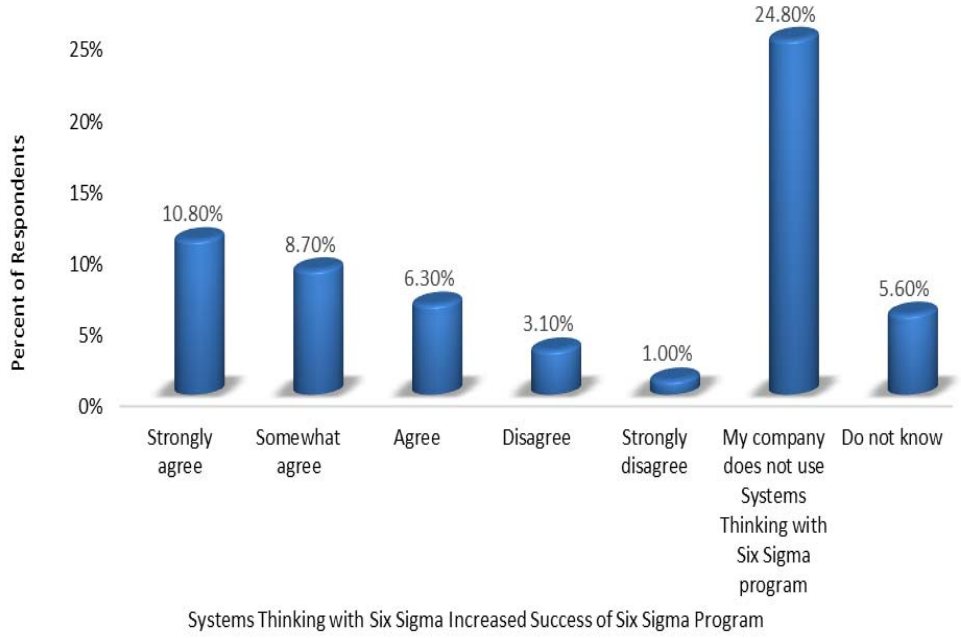

Figure 38. My organization use of systems thinking method with Six Sigma increased the success of the Six Sigma programs.

method with Six Sigma increased the success of their Six Sigma programs. Of the participants, only 7% (n = 12) of 172 respondents reported their organization use of Six Sigma was between 2 to 5 years and agreed their organization use of systems thinking method with Six Sigma increased the success of their Six Sigma programs. Similarly, of the participants who responded, only 7% (n = 12) of 172 respondents reported their organization's use Six Sigma was over 10 years and strongly agreed their organization use of systems thinking method with Six Sigma increased the success of their Six Sigma programs.

Similar crosstab analysis was performed with variable years organization's use of an integrated method and participants' organization use of systems thinking method with Six Sigma increased the success of their Six Sigma programs. Table 107 in Appendix F shows of the participants who responded, 17.9% (n = 31) of 173 participants reported they strongly agree their

organizations use of systems thinking method with Six Sigma increased the success of their Six Sigma programs. Of the participants, only 6.9% (n = 2) of 173 reported their organization's use of an integrated method was between 2 to 5 years and respondents agreed their organization use of systems thinking method with Six Sigma increased the success of their Six Sigma programs.

Survey item 17 asked respondents to rate the frequency in their opinion of their company's Six Sigma program success. Table 42 presents the frequency and percentage distribution. Of the 173 respondents out of 285 participants, 29.4% (n = 84) reported their organization's Six Sigma program was somewhat successful.

Table 42

In Your Opinion, Rate Your Company's Six Sigma Program Success (N = 173)

	Frequency	%
Highly successful	32	11.2%
Somewhat successful	84	29.4%
Indifferent	24	8.4%
Not successful	11	3.8%
Do not know	22	7.7%
Total	173	60.5%

Supplementing the investigation and learn more about participant's opinion why they responded their company's Six Sigma program was successful, participants were provided with an opportunity to write-in their responses. This identified 10 other types of response outcomes refer to Table 43. These 10 response outcomes were grouped into categories, coded and counted. The most noticeable response respondents reported as displayed in Table 41 was that in the respondent's opinion their organization's Six Sigma program was a success because Six Sigma met their organization's goals; it produced return on their investments, increased efficiency, capabilities, and reduced cost. Also indicated was Six Sigma is part of one respondent's

organization culture; the organization recognized and reward employees throughout the organization for using Six Sigma.

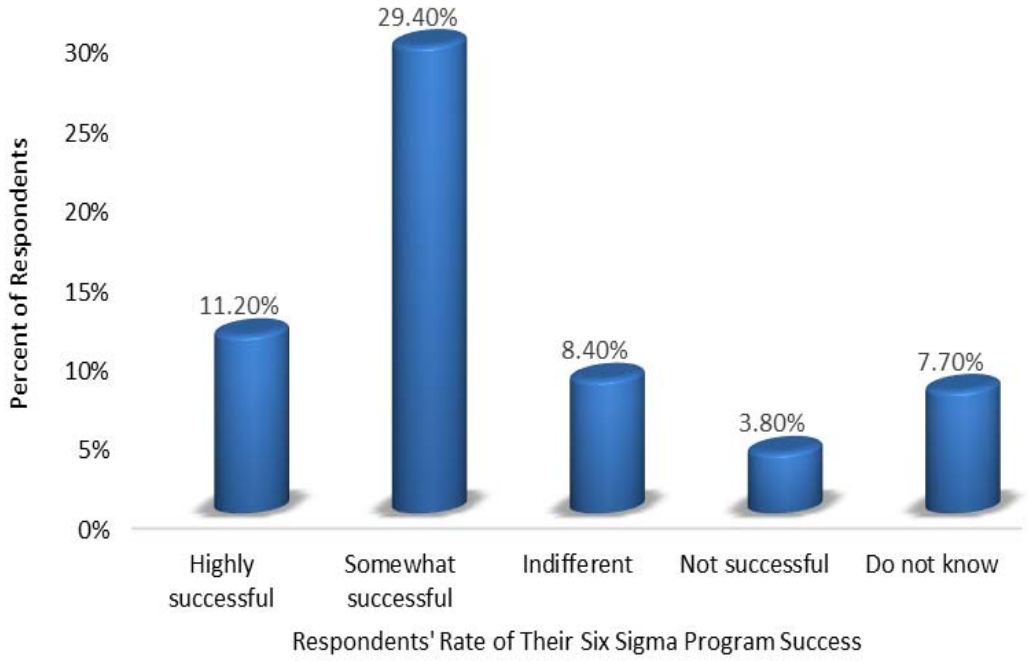

Table 43

Other, in Your Opinion, Rate Your Company's Six Sigma Program Success (N = 133)

	Frequency	%
Definition of success	3	1.0%
Integrated	4	1.4%
Lack of management Support	6	2.1%
Lack of org support	12	4.2%
Leadership support	9	3.1%
Not successful	5	1.7%
Other program	5	1.7%
Some success	29	10.0%
Successful	44	15.3%
Narrow focus	16	5.6%

Respondents also indicated that Six Sigma was somewhat successful. Some of the reasons contributed to some success were the respondent's organization was somewhat successful but in the respondent's opinion their organization needed to look Six Sigma program solutions systematically. Some respondents even further wrote that their organization needed to include systems thinking because Six Sigma alone was not enough. While others wrote their organization's Six Sigma program produced mixed results, over long period success dwindled, and success could be higher.

Similar investigation done to learn more about participant's opinion why they responded their company's Six Sigma program was not successful; participants were provided with an opportunity to write-in their responses. This identified four other types of response outcomes. These four response outcomes were also grouped into categories, coded, and counted. The most noticeable response respondents reported, as seen Table 44, were lack of organizational support, closely followed by lack of management support.

Table 44

Other, in Your Opinion, Rate Your Company's Six Sigma Program Was Not Successful (N = 11)

	Frequency	%
Lack of organizational support	5	1.7%
Not used	1	0.4%
Lack of management support	4	1.4%
Not applicable	1	0.4%

Table 108, Appendix F, shows crosstab analysis between the variables year organization's use of Six Sigma and participants' company Six Sigma program success. Of the participants, 48.8% (n = 84) of 172 participants reported their company's Six Sigma program was somewhat successful. Of the participants, 18% (n = 31) of 172 respondents reported their

organization's use of Six Sigma was between 2 to 5 years and in their opinion their company's Six Sigma program was somewhat successful.

Table 109, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 48.6% (n = 84) of 173 participants reported their company's Six Sigma program success was somewhat successful. Of the participants, 11.6% (n = 20) of 173 respondents reported their organization use of integrated model was between 2 to 5 years and reported their organization's Six Sigma was somewhat successful.

Survey item 18 asked respondents which of the quality methods contributed to their company's success. Table 45 displays the frequency in which each selection the participants selected. Of the 143 respondents out of 285 participants, 18.2% (n = 52) reported their organization's quality management program had been successful because they used systems thinking and Six Sigma methods together.

Table 45

Our Company's Quality Management Program Has Been Successful Because We Use (N = 143)

	Frequency	%
Six Sigma method alone	33	11.5%
Systems thinking method alone	7	2.4%
Systems thinking and Six Sigma methods together	52	18.2%
Do not know	36	12.6%
Other	15	5.2%
Total	143	50.0%

Figure 40. Our company's quality management program has been successful because we use.

Supplementing the investigation to learn more about participants' company success with their quality management program, participants were provided with an opportunity to write-in their responses. This identified eight other types of response outcomes. Table 46 lists the eight response outcomes that were grouped into categories, coded and counted. The most noticeable response respondents reported was that their organization used other programs that contributed to their Six Sigma program's success. This included use of Kaizen, Lean Six Sigma, and System Dynamics. Next highest response outcome reported by the participants was that their organization used an integration approach that contributed to their Six Sigma success. This comprised the company integrating Six Sigma with systems thinking to their quality management approach.

Table 46

Other Factors Our Company's Quality Management Program Has Been Successful Because We Use (N = 45)

	Frequency	%
Lack of management support	3	1.0%
Limited expertise	1	0.4%
Leadership support	3	1.0%
Not successful	3	1.0%
Six Sigma not used	1	0.4%
Other programs	23	8.0%
System Thinking	3	1.0%
Integrated	8	2.8%

Table 110, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' company quality methods contributed to their company's success. Of the participants who responded, 36.6% (n = 52) of 142 participants reported their quality management program had been successful because they used systems thinking and Six Sigma methods together. Of the participants, 12.7% (n = 18) of 142 respondents reported their organization use of Six Sigma was 10 years or more and their company's Six Sigma program success was contributed by the use of systems thinking and Six Sigma methods together . Interesting to note of the participants, who reported the use of Six Sigma only for 2 – 5 years reported success 10.6% (n = 15), while use of Six Sigma only for 6 – 10 years reported success 8.5% (n = 12).

Table 111, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 36.4% (n = 52) of 143 participants reported their company's quality management program had been successful because they used systems thinking and Six sigma methods together. Of the

participants, 14.7% (*n* = 21) of 143 respondents reported their organization use integrated model was between 2 to 5 years and their company's Six Sigma program success was contributed by the use of systems thinking and Six Sigma methods together. Interesting to note of the participants, who reported the use of integrated approach use for 6 – 10 years, 9.1% (*n* = 13), while integrated approach use for 10 years or more reported 7.7% (*n* = 11) success using both Six Sigma and systems thinking.

A summary of crosstab analysis for success criteria is listed in Table 47. For detailed analysis, refer to Appendix F.

Research Question 2

Research question 2 explores factors that contributed to the participants' organization success of the integrated model. The responses to survey items 13, 14c, 14d, 15 and 15a provided information to assist answer Research Question 2, which is: *What are the factors that contribute to the success of the integrated model?*

Survey items 13, 14c, 14d, 15 and 15a. Survey questions 13 asked participants to identify all factors that made their organization's Six Sigma program a success. Table 48 presents the frequency and percentage distribution. Of the 191 respondents out of 285 participants, 14.7% (*n* = 121) reported factor that their organization's Six Sigma program success was training. Closely followed by 14.2% (*n* = 117) of 191 respondents who reported their upper management support was a factor that made their organization's Six Sigma program success. Interesting to note that only 6.9% (*n* = 57) reported their Six Sigma program's success was because their program included a holistic approach; 6.3% (*n* = 52) reported their program included circular feedback from interrelated and interdependent process of the organization as a factor that made their organization's Six Sigma program a success.

Table 47

Summary Crosstab Ratings with Highest Frequency for Success

Number	Survey Item	Six Sigma Only		Integrated	
16.	Respondent's rate their organization use of systems thinking method with Six Sigma increased the success of the Six Sigma programs.	Agree/ Strongly Agree	2-5 years /10 years or more	Agree/ Strongly Agree	2-5 years
17.	Respondents in their opinion, rate their company's Six Sigma program success.	Somewhat Successful	2-5 years	Somewhat Successful	2-5 years
18.	Respondent's rate their company's quality management program has been successful because we use.	Systems thinking and Six Sigma methods together	10 years or more	Systems thinking and Six Sigma methods together	2-5 years

Note: A tie in the response rate and frequency when combined Agree/Strongly Agree or 2-5 years/10 years or more reported together. The table only lists a summary of survey items comprise Feedback. For detailed data, refer to Appendix F.

Table 48

Identify All Factors That Made Your Organization's Six Sigma Program a Success (N = 191)

	Responses	
	N	%
Upper management support	117	14.2%
Training	121	14.7%
Application of statically tools	94	11.4%
Bonuses, rewards are based on quality work	29	3.5%
Program included a holistic approach	57	6.9%
Program identified all stakeholders, including external ones	65	7.9%
Program considered environmental impact	32	3.9%
Program included circular feedback from interrelated and interdependent process of the organization	52	6.3%
Program understood how the overall organization and its sub-systems work	59	7.2%

(table continues)

	Responses	
	N	%
Program traced links of the process and the influences of the others	65	7.9%
Program identified internal and external customer expectations	84	10.2%
Six Sigma program was not a success	25	3.0%
Other	23	2.8%
Total	191	66.8%

Adding to the investigation to learn more about participants responses about factors that made their organization' Six Sigma program success; participants were provided with an opportunity to write-in their responses. This identified four other types of response outcomes. These four response outcomes were grouped into categories, coded and counted. Table 49 shows the most noticeable response respondents reported their organization did not use Six Sigma. A very small percentage, less than one percent, reported success factor included organization's commitment and support of Six Sigma, and inclusion of systems thinking.

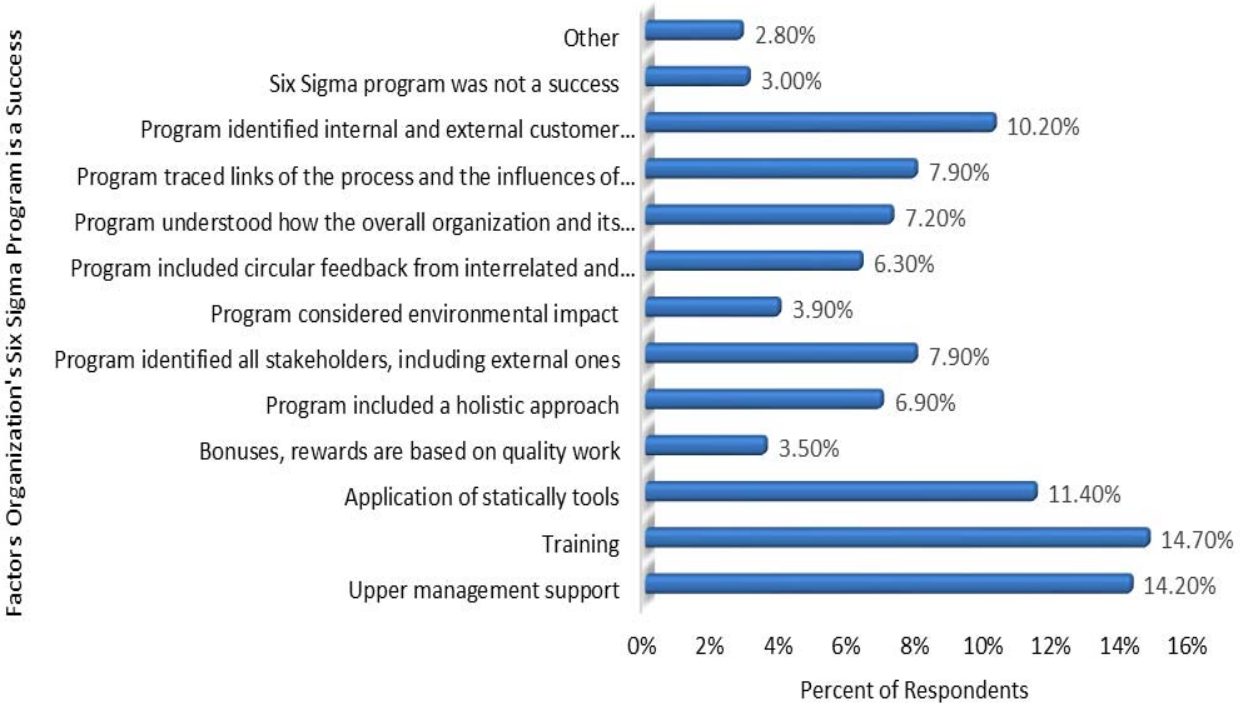

Figure 41. Identify all factors that made your organization's Six Sigma program a success.

Table 49

Other Factors Six Sigma Program Was a Success (N = 22)

	Frequency	%
Success	2	0.7%
Do not know	2	0.7%
Not applicable	4	1.4%
Not used	14	4.9%

Respondents were also provided with an opportunity to elaborate further on factors that contributed to their organization's Six Sigma program not succeed. This included Six Sigma program is too expensive to maintain, too many changes were required, Six Sigma presented organizational culture clash, and poor leadership, see Table 50.

Table 50

Other Factors Six Sigma Program Was Not a Success (N = 20)

	Frequency	%
Culture clash	3	1.0%
Success	1	0.4%
Lack of organization commitment	3	1.0%
Lack of management support	9	3.1%
Not applicable	1	0.4%
Not successful	1	0.4%
Do not use	2	0.7%

Table 112, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants identify all factors that made their organization's Six Sigma program a success. Of the participants who responded, 63.8% (n = 118) of 185 participants reported training was a factor that made their organization's Six Sigma program a success. Of the participants, 21.1% (n = 39) of 185 respondents reported their organization use of Six Sigma

was between 6 to 10 years and reported their company's Six Sigma program success factor was training.

Table 113, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 61.3% (*n* = 117) of 191 participants reported upper management support was a factor that made their organization's Six Sigma program a success. Of the participants, 14.1% (*n* = 27) of 191 respondents reported their organization use integrated model between 2 to 5 years and reported their company's Six Sigma program success factor was training.

Survey questions 14c asked participants to rate the frequency in which their organization holds everyone accountable for holistic approach to process improvement. Table 51 presents the frequency and percentage distribution. Of the 177 respondents out of 285 participants, 12.9% (*n* = 37) reported their organization sometimes holds everyone accountable for holistic approach to process improvement. Followed by 11.5% (*n* = 33) of 177 respondents reported their organization often holds everyone accountable for holistic approach to process improvement.

Table 51

Everyone in My Company is Accountable For Holistic Approach to Process Improvement (N = 177)

	Frequency	%
Always	21	7.3%
Often	33	11.5%
Sometimes	37	12.9%
Rarely	44	15.4%
Never	27	9.4%
I do not know	6	2.1%
Not applicable	9	3.1%
Total	177	61.9%

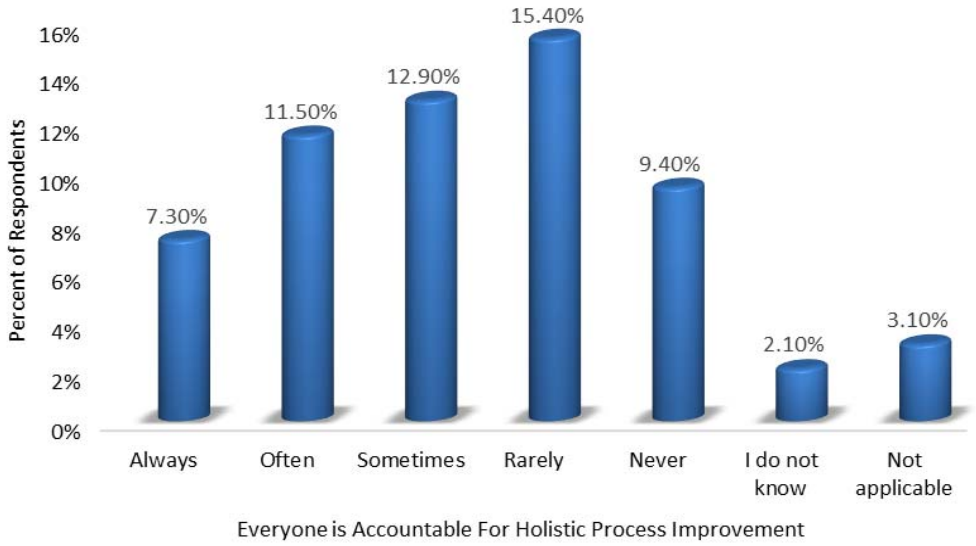

Figure 42. Everyone in my company is accountable for holistic approach to process improvement.

Table 114, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization holds everyone in their company accountable for holistic approach to process improvement. Of the participants who responded, 26.1% (n = 41) of 157 participants reported their company rarely holds everyone accountable for holistic approach to process improvement. Of the participants, only 8.9% (n = 14) of 157 respondents reported their organization use of Six Sigma was between 2 to 5 years and reported their organization rarely holds everyone accountable for holistic approach to process improvement.

Table 115, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 27.2% (n = 44) of 145 participants reported their company rarely holds everyone accountable for holistic approach to process improvement. Of the participants, only 6.2% (n = 10) of 162 respondents reported their organization uses integrated model was between 6 to 10 years and

reported their company often holds everyone accountable for holistic approach for process improvement.

Survey questions 14d asked participants to rate the frequency in which their organization had few dedicated individuals who led quality improvement. Table 52 presents the frequency and percentage distribution. Of the 177 respondents out of 285 participants, 24.5% (n = 70) reported their organization often had few dedicated individuals who led quality improvement in their organization.

Table 116, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization use of few dedicated individuals who led quality improvement. Of the participants who responded, 44% (*n* = 70) of 159 participants reported their organization often had a few dedicated individuals who led quality improvement. Of the participants, only 15.1% (*n* = 24) of 159 respondents reported their organization use of Six Sigma was between 6 to 10 years and reported their organization often had a few dedicated individuals who led quality improvement.

Table 52

In My Organization, a Few Dedicated Individuals Lead Quality Improvement (N =177)

	Frequency	%
Always	33	11.5%
Often	70	24.5%
Sometimes	32	11.2%
Rarely	22	7.7%
Never	6	2.1%
I do not know	5	1.7%
Not applicable	9	3.1%
Total	177	61.9%

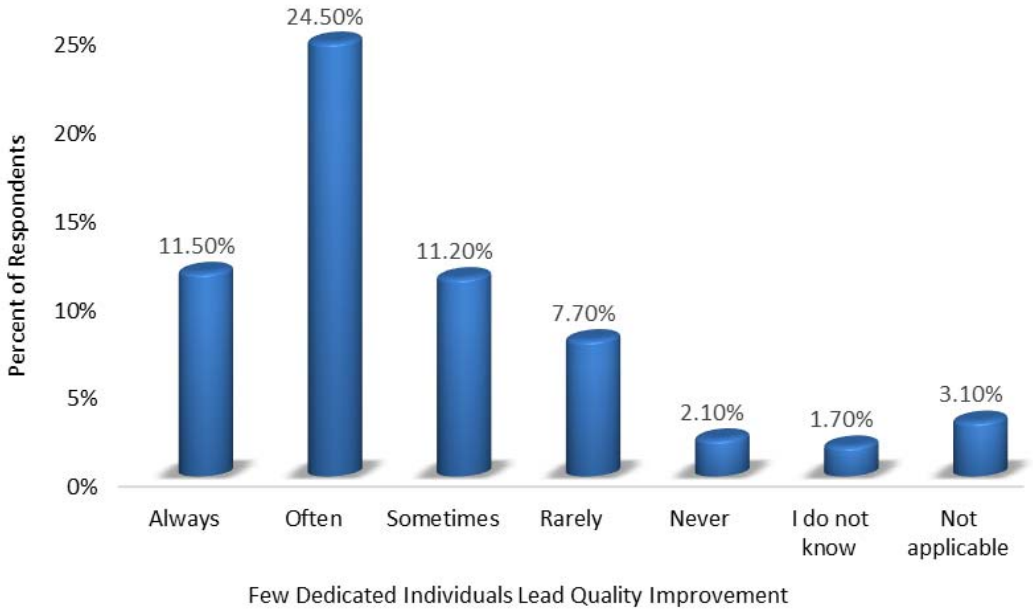

Figure 43. In my organization, a few dedicated individuals lead quality improvement.

Table 117, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 42.9% (*n* = 70) of 163 participants reported their organization often had a few dedicated individuals who led quality improvement. Of the participants, only 9.2% (*n* = 15) of 163 respondents reported their organization uses integrated model between 2 to 5 years and reported their organization often used few dedicated individuals who led quality improvement.

The researcher explored if the participants' organizations used Six Sigma organizational wide. Survey question 15 asked participants the extent to which Six Sigma played a role in their organization. Table 53 presents the frequency and percentage distribution. Of the 177 respondents out of 285 participants, 30.8% (*n* = 88) reported their organization used Six Sigma in some parts of their organization. Only 19.9% (*n* = 57) respondents out of 285 participants reported their organization used Six Sigma throughout their organization and 1% (*n* = 3) of

respondents reported their organization planned to use Six Sigma. An interesting finding was that only 2.1% (n = 6) of respondents reported their organization did not use Six Sigma anymore.

Table 53

Select the Extent to Which Six Sigma Plays a Role in Your Organization (N = 177)

	Frequency	%
Used organization-wide	57	19.9%
Used in some parts of the organization	88	30.8%
Not used anymore	6	2.1%
Not yet used but plan to start	3	1.0%
Six Sigma is not used	21	7.3%
Do not know	2	0.7%
Total	177	61.9%

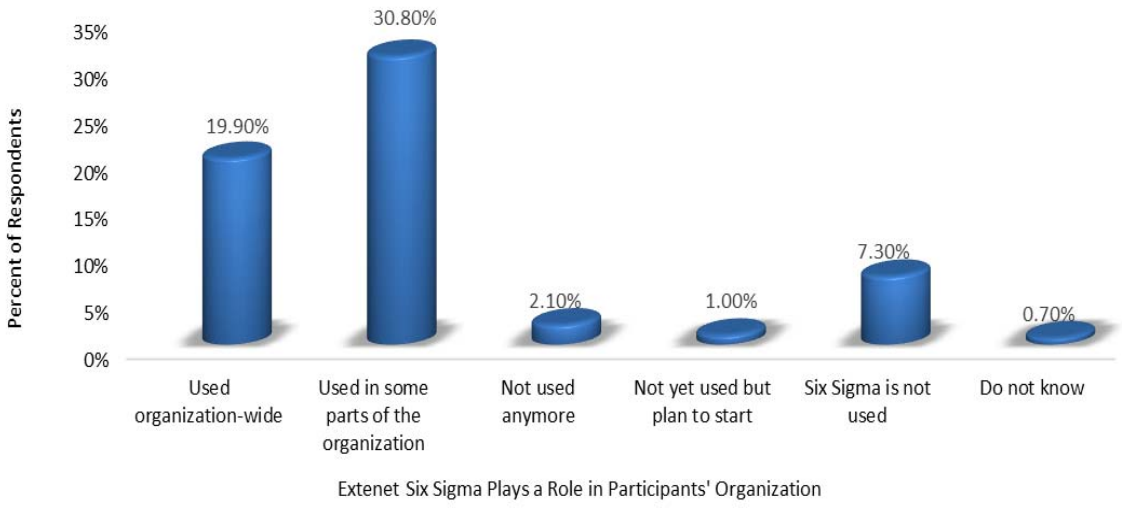

Figure 44. Select the extent to which Six Sigma plays a role in your organization.

The researcher attempted an investigation to learn more about participants' responses the extent to which Six Sigma played a role in their organization. Specifically, further investigation

was attempted to learn more why a participant responded their organization no longer uses Six Sigma. This identified one other type of response outcome. One respondent reported their organization used another program but no further detail was provided. This response outcome was grouped into categories, coded and counted. Table 54 shows the most noticeable response respondents reported their organization no longer use Six Sigma because their organization used other programs.

Table 54

Other Factors That Contributed For Your Organization to Abandon the Use of Six Sigma (N = 1)

	Frequency	%
Other program	1	0.63%

Table 118, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization extent to which Six Sigma played a role in the participants' organization. Of the participants who responded, 49.4% (n = 87) of 176 participants reported their organization used Six Sigma in some parts of their organization. Of the participants, only 18.8% (n = 33) of 176 respondents reported their organization use of Six Sigma was between 2 to 5 years and reported their organization used Six Sigma in some parts of their organization.

Table 119, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 49.7% (n = 88) of 177 participants reported their organization used Six Sigma in some parts of their organization. Of the participants, only 9.6% (n = 17) of 177 respondents reported their

organization used integrated model between 2 to 5 years and reported their organization used Six Sigma in some parts of their organization.

Survey questions 15a asked participants to rate the frequency in which factors contributed to their organization abandon the use of Six Sigma. Table 55 presents the frequency and percentage distribution. Of the 19 respondents out of 285 participants, 26.3% (n = 5) reported their organization abandoned the use of Six Sigma was because lack of upper management support. Followed by 15.8% (n = 3) respondents reported the program focused on the selected project only and did not focused on the dependent sub-system processes; the Six sigma method was not part of the respondents' organization overall daily work; and that only the few who were trained in Six Sigma were responsible for quality management.

Table 55

Select All Applicable Factors That Contributed For Your Organization to Abandon the Use of Six Sigma (N = 19)

	Responses	
	N	%
Lack of upper management support	5	26.3%
The program focuses on the selected project only and does not focus on the dependent sub-system processes	3	15.8%
Six Sigma program is too complicated	2	10.5%
The program is weak in identifying all the stakeholders and impacts to their processes.	1	5.3%
The program lacks understanding of the entire system	1	5.3%
The Six Sigma method is not part of the overall daily work	3	15.8%
Only the few who are trained in Six Sigma lead and are responsible for quality management	3	15.8%
My organization continues to use Six Sigma	1	5.3%
Other	1	5.3%
Total	19	100.0%

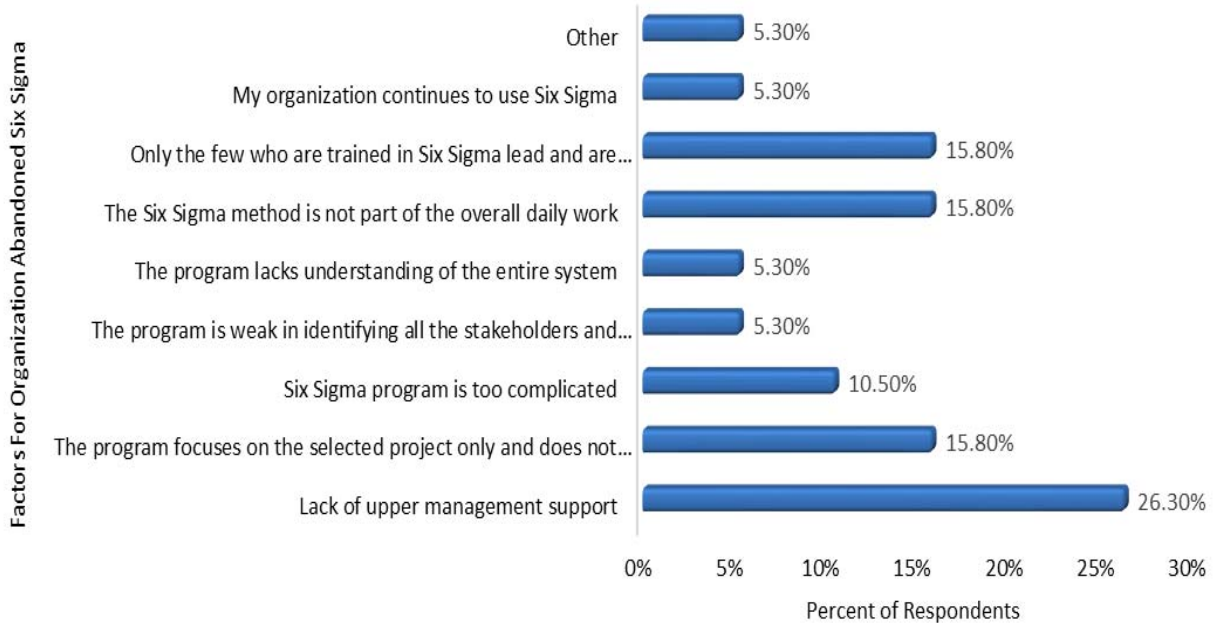

Figure 45. Select all applicable factors that contributed for your organization to abandon the use of Six Sigma.

Table 120, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and factors of the participants' organization contributed to their organization to abandon the use of Six Sigma. Of the participants who responded, 71.4% (n = 5) of 7 participants reported no management support contributed to their organization abandon Six Sigma. Of the participants, 42.9% (n = 3) of 7 participants reported their organization's use of Six Sigma was between 2 to 5 years and reported no management support contributed to their organization abandon Six Sigma.

Table 121, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Of the participants who responded, 71.4% (n = 5) of 7 participants reported no management support contributed to their organization abandon Six Sigma. Of the participants, 14.3% (n = 1) of 7 participants reported

their organization's use of integrated was between 2 to 5 years and reported no management support contributed to their organization abandon the use of Six Sigma.

A summary of crosstab analysis for success factors is listed in Table 56. For detailed analysis, refer to Appendix F.

Research Question 3

Research question 3 explores the extent to which organizational leadership support for an integrated model differs from support of Six Sigma as a standalone method. The responses to survey items 9g and 19b – 19d provides information to assist answer

Research Question 3, which is: *To what extent does organizational leadership support for an integrated model differ from support of Six Sigma as a standalone method?*

Table 56

Summary Crosstab Ratings with Highest Frequency for Success Factors

Number	Survey Item	Six Sigma Only		Integrated	
13.	Respondent's rate identify all factors that made their organization's Six Sigma program a success.	Training	6-10 years	Training	2-5 years
14c.	Respondent's rate everyone in his or her company is accountable for holistic approach to process improvement.	Rarely	2-5 years	Often	6-10 years
14d.	Respondent's rate in their organization, a few dedicated individuals lead quality improvement.	Often	6-10 years	Often	2-5 years
15.	The extent to which Six Sigma plays a role in your organization.	Used in some parts of the organization	2-5 years	Used in some parts of the organization	2-5 years

(table continues)

Number	Survey Item	Six Sigma Only		Integrated	
		Used organization wide	6-10 years /10 years or more	Used organization wide	2-5 years

Note: A tie in the response rate and frequency when combined 6-10 years/10 years or more reported together. The table only lists a summary of survey items comprise Feedback. For detailed data, refer to Appendix F.

Survey items 9g. Survey questions 9g asked whether participants' organization leaders recognized and rewarded those individuals who used holistic approach for long-term solutions. Table 57 presents the frequency and percentage distribution. Of the 204 respondents out of 285 participants, 22.7% (n = 65) respondents reported their organization's leaders sometimes recognized and rewarded those individuals who used holistic approach for long-term solutions. Only 9.8% (n = 28) respondents reported their organization's leaders always recognized and rewarded individuals who used holistic approach for long-term solutions.

Table 57

My Organization's Leaders Recognize and Reward Those Individuals Who Use Holistic Approach For Long Term Solutions (N = 204)

	Frequency	%
Always	28	9.8%
Often	31	10.8%
Sometimes	65	22.7%
Rarely	42	14.7%
Never	19	6.6%
I do not know	12	4.2%
Not applicable	7	2.4%
Total	204	71.3%

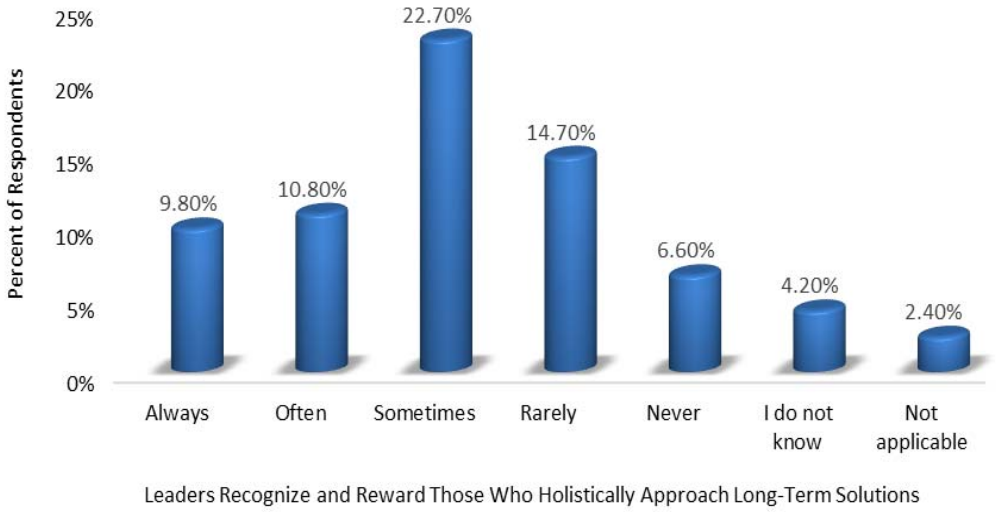

Figure 46. My organization's leaders recognize and reward those individuals who use holistic approach for long-term solutions.

Table 122 shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization leaders recognized and rewarded those individuals who used holistic approach for long-term solutions. Overall participants, 32% (*n* = 65) of 203 respondents reported their organization leaders sometimes recognized and rewarded those individuals who used holistic approach for long-term solutions. Of the participants 11.8% (*n* = 24) of 203 respondents reported their organization use of Six Sigma was between 6 to 10 years and that their organization leaders sometimes recognized and rewarded individuals who used holistic approach for long-term solutions.

Table 123, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Overall participants, 31.9% (*n* = 65) of 204 respondents reported their organization leaders sometimes recognized and rewarded those individuals who used holistic approach for long-term solutions. Of the participants 6.9% (*n* = 14) of 204 respondents reported their organization use of integrated was between 2 to 5 years and

their organization leaders sometimes recognized and rewarded individuals who used holistic approach for long-term solutions.

Survey items 19b – 19d. Survey question 19b asked whether participants' organization leadership included in the employee's annual performance goals systematic, holistic approach to solving problems. Table 58 presents the frequency and percentage distribution. Of the 162 respondents out of 285 participants, 10.5% (n = 30) respondents reported their organization's leaders often included in the employee's annual performance goals systemic, holistic approach to solving problems. Only 9.1% (n = 26) of 162 respondents reported their organization's leaders always included in the employee's annual performance goals systemic, holistic approach to solving problems.

Table 58

Does Your Organization Leadership Include in the Employee's Annual Performance Goal Systematic, Holistic Approach to Solving Problems (N = 162)

	Frequency	%
Always	26	9.1%
Often	30	10.5%
Sometimes	29	10.1%
Rarely	40	14.0%
Never	27	9.4%
I do not know	3	1.0%
Not applicable	7	2.4%
Total	162	56.6%

Table 124, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization leadership included in the employee's annual performance goals systematic, holistic approach to solving problems. Overall participants 24.7% (n = 40) of 162 respondents reported their organization leadership rarely included in the

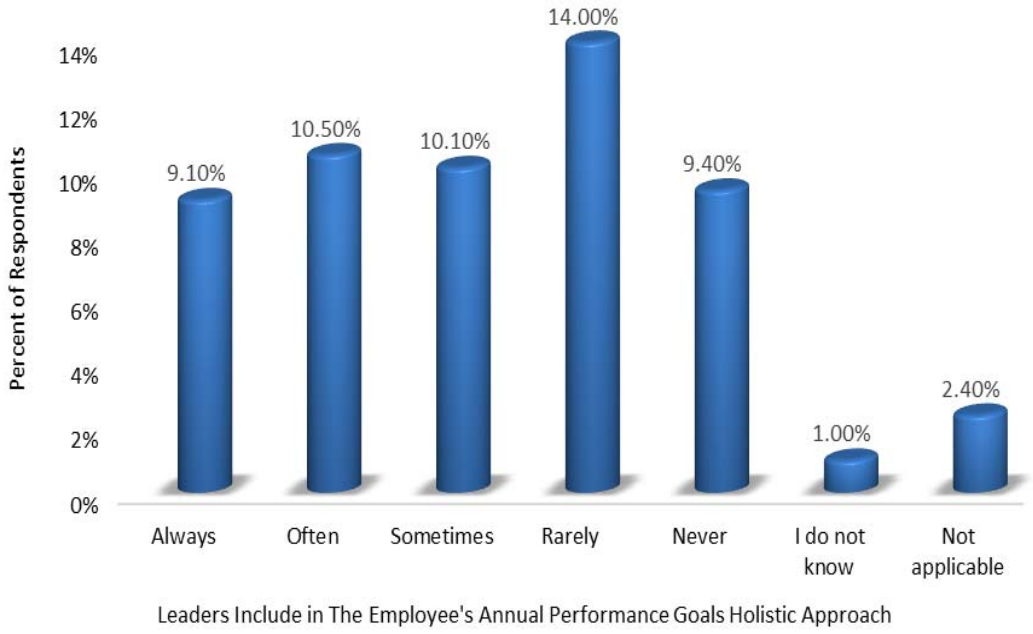

Figure 47. Does your organization leadership includes in the employee's annual performance goal systematic, holistic approach to solving problems?

employee's annual performance goals systematic, holistic approach to solving problems. Of the participants 9.3% (*n* = 15) of 162 respondents reported their organization use of Six Sigma was between 6 to 10 years and their leadership rarely included in the employee's annual performance goals systematic, holistic approach to solving problems.

Table 125, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Overall participants 24.7% (*n* = 40) of 162 respondents reported their organization leadership rarely included in the employee's annual performance goals systemic, holistic approach to solving problems. Of the participants only 4.9% (*n* = 8) of 162 respondents reported their organization's use of an integrated method was between 2 to 5 years and that their organization leadership always included in the employee's annual performance goals systemic, holistic approach to solving problems.

Table 59

In Your Organization, Your Leadership Rewards Solving Problems With a Holistic Approach (N = 162)

	Frequency	%
Always	19	6.6%
Often	29	10.1%
Sometimes	50	17.5%
Rarely	30	10.5%
Never	27	9.4%
I do not know	2	0.7%
Not applicable	5	1.7%
Total	162	56.6%

Survey question 19c asked whether in the participants' opinion their organization leadership rewarded those solving problems with a holistic approach. Table 59 presents the frequency and percentage distribution. Of the 162 respondents out of 285 participants, 17.5% (*n* = 50) respondents reported their organization's leaders sometimes rewarded those solving problems with a holistic approach.

Figure 48. In your organization, your leadership rewards solving problems with a holistic approach.

Table 126, Appendix F, shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization leadership rewarded those solving problems with a holistic approach. Overall, 30.9% (n = 50) of 162 respondents reported their organization leadership sometimes rewarded those solving problems with a holistic approach. Of the participants, 11.7% (n = 19) of 162 respondents reported their organization use of Six Sigma was between 6 to 10 years and that their leadership sometimes rewarded those solving problems with a holistic approach.

Table 127, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Overall participants 30.9% (n = 50) of 162 respondents reported their organization leadership sometimes rewarded solving problems with a holistic approach. Of the participants only 5.6% (n = 9) of 162 respondents reported their organization's use of an integrated method was between 6 to 10 years and that their organization leadership sometimes rewarded hose solving problems with a holistic approach.

Survey question 19d asked whether in the participants' organization the sponsoring management of Six Sigma programs holds the Six Sigma team accountable for holistic approach to process improvement. Table 60 presents the frequency and percentage distribution. Of the 162 respondents out of 285 participants, 12.6% (n = 36) respondents reported in their organization's the sponsoring management of Six Sigma programs held the Six Sigma team accountable for holistic approach to process improvement

Table 128 shows crosstab analysis between the variables year organizations use of Six Sigma and participants' organization the sponsoring management of Six Sigma programs holds the Six Sigma team accountable for holistic approach to process improvement. Overall

participants 22.2% (*n* = 36) of 162 respondents reported in their organization the sponsoring management of Six Sigma programs sometimes held the Six Sigma team accountable for holistic approach to process improvement. Of the participants only 8% (*n* = 13) of 162 respondents reported their organization use of Six Sigma was over 10 years and that in their organization the sponsoring management of Six Sigma programs sometimes held the Six Sigma team accountable for holistic approach to process improvement

Table 129, Appendix F, shows a crosstab analysis for this question that was performed with the variable of organization use of integrated model. Overall participants 22.2% (*n* = 36) of 162 respondents reported in their organization the sponsoring management of Six Sigma programs sometimes held the Six Sigma team accountable for holistic approach to process improvement. Of the participants only 5.6% (*n* = 9) of 162 respondents reported their organization's use of an integrated method was between 2 to 5 years and that in their organization the sponsoring management of Six Sigma programs always held the Six Sigma team accountable for holistic approach to process improvement.

Table 60

The Sponsoring Management of Six Sigma Programs Holds the Six Sigma Team Accountable For Holistic Approach to Process Improvement (N = 162)

	Frequency	%
Always	21	7.3%
Often	27	9.4%
Sometimes	36	12.6%
Rarely	30	10.5%
Never	18	6.3%
I do not know	5	1.7%
Not applicable	25	8.7%
Total	162	56.6%

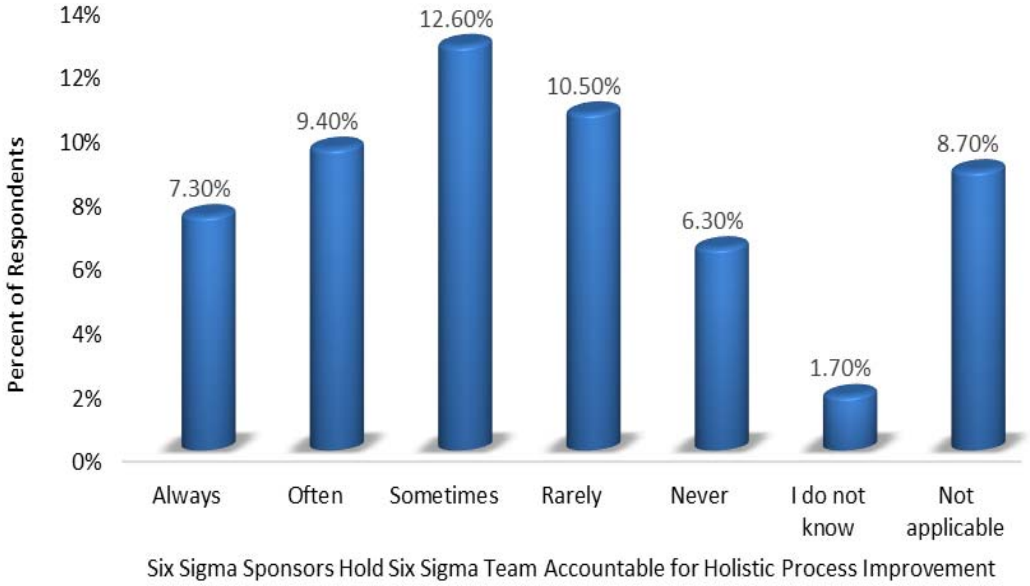

Figure 49. The sponsoring management of Six Sigma programs holds the Six Sigma team accountable for holistic approach to process improvement.

A summary of crosstab analysis for leadership criteria is listed in Table 61. For detailed analysis, refer to Appendix F.

Table 61

Summary Crosstab Ratings with Highest Frequency for Leadership

Number	Survey Item	Six Sigma Only		Integrated	
9g.	Respondent's rate their organization's leaders recognize and reward those individuals who use holistic approach for long-term solutions.	Sometimes	6-10 years	Sometimes	2-5 years
19b.	Respondent's rate their organization leadership include in the employee's annual performance goal systematic, holistic approach to solving problems.	Rarely	6-10 years	Always/ Often	2-5 years
19c.	Respondent's rate their organization leadership rewards	Sometimes	6-10 years	Often	2-5 years

(table continues)

Number	Survey Item	Six Sigma Only		Integrated	
	solving problems with a holistic approach.				
19d.	Respondent's rate the sponsoring management of Six Sigma programs holds the Six Sigma team accountable for holistic approach to process improvement.	Sometimes	10 years or more	Always	2-5 years

Note: The table only lists a summary of survey items comprise Feedback. For detailed data, refer to Appendix F.

Summary

Two hundred eighty nine participants responded to an electronic survey. The participants were from those organizations the researcher had gained approval to invite volunteers to complete the survey. The participants were asked a series of questions that included Likert scale and open-ended questions to investigate the research questions. The participants responded to a series of questions further investigate the research questions:

1. To what extent do organizations that implement Six Sigma with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma programs, as compared to those that implement Six Sigma as a standalone method? To what extent do organizations that implement Six Sigma with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma programs, as compared to those that implement Six Sigma as a standalone method?
2. What are the factors that contribute to the success of the integrated model?
3. To what extent does organizational leadership support for an integrated model differ from support of Six Sigma as a standalone method?

For each survey question, a frequency and cross tab analysis was performed. A summarized analysis was performed; the focus was drawn on the most frequent response. A frequency table followed by Pareto chart to display data visually exhibited the answers to the Likert scale questions. Further analysis included crosstab analysis comparing each of the questions with organization's use of either Six Sigma or an integrated approach. Lastly, answers to open ended questions were coded and the results were displayed in a frequency table.

Chapter 5: Summary, Conclusions, and Recommendations

Sources of products and services available to consumers are expanding around the globe. Companies are listening and submitting to consumer demands for reliable, high quality goods and services, creating fierce competition (Beckford, 1998). One of the ways organizations are keeping themselves competitive is by providing quality products and services at comparable prices using quality improvement methods and carrying out cost reductions as necessary (Stamatis, 1997).

Organizations turn to various quality methods available, one of which is Six Sigma. Six Sigma is a business strategy based on statistical methods. It looks to identify problems and remove the cause of errors, defects, or failures in any processes by focusing on outputs that deliver value from a customer's perspective (Antony, 2004; Velocci, 2002). Six Sigma also strives to remove activities that do not have a value-add for each product or service an organization offers (Basu, 2001). An increasing number of organizations have been using Six Sigma, many of which have identified significant successes (Antony & Banuelas, 2002). However, critics have outlined several causes contributing to the failure of Six Sigma (Basu, 2001) and recommend practitioners to complement quality improvement programs such as Six Sigma with systems thinking method.

The purpose of this study was to explore the extent to which organizations that integrate systems thinking with the use of Six Sigma as an integrated quality management method differ in the success and duration of their Six Sigma programs, compared with those that use Six Sigma as a standalone method. The study also examined factors that contributed to the success of integrating Six Sigma with systems thinking, and explored the extent to which organizational leadership support for an integrated model differed from their support for a standalone method.

Conceptual Support for the Study

The literature review identified several organizations, including General Electric (Bane, 2002; Ettinger, 2001) and Motorola (Anonymous, 2002, Association, n.d.) have adopted Six Sigma to improve their processes and have achieved substantial financial gains as a result. Proponents of Six Sigma have identified important success factors that include upper management support, training, and a link to human resources-based actions (Antony & Banuelas, 2002).

Critics, though, have identified factors that contributed to the failure of Six Sigma. These include a narrow focus on individual process rather overall systems of processes that affect the entire organization (Basu, 2001) and organizations experiencing difficulty continuing the programs (Dusharme, 2004). Critics suggest that organizations are a system made up of interrelated functions and therefore to solve problems or improve processes, it is critical to understand the overall organizational operations and structures that cause the problem to occur first (McNamara, 2004). Further, once organizations reap the immediate benefits of Six Sigma programs, companies most likely abandon the program (Dusharme, 2004), and therefore, organizations must expand to the rest of the organization to sustain the benefits of their quality programs. According to Conti (2005), quality management models praise the systems view of organizations, but the analytical perspective, with cause-effect two-way relations, are characteristics of a holistic view that is lacking.

Systems thinking is a process of discovery and diagnosis how the whole system works rather than focusing on a single cause-and-effect. A unilateral process is needed to be integrated for quality improvement. As stated by Beckford (1998), organizations must approach quality systematically. He further states that quality improvement requires examination how each of the

parts of the organization interacts with each other to produce goods or services to meet customer's needs. Forrester (1998) states, to make Six Sigma relevant and useful in the long-term, organizations need to integrate system analysis into the Six Sigma model.

Much of the present research through literature review identifies references to the successes and limits of Six Sigma program. Literature review about the success of an integrated model using both Six Sigma and systems thinking yielded references to experts offering an insight to the possibility of success that an integrated approach would provide to organizations. The literature review, however, could not generate empirical research data that describes the specific successes and limitations of an integrated approach to quality improvement. Therefore, the researcher supplemented current literature review and included identifying success factors of systems thinking. Then a survey instrument was developed that included questions related to Six Sigma as well as a series of questions with key systems thinking elements for participants. From the responses received, this researcher was able to explore the results of those organizations that reported the use of Six Sigma and systems thinking and infer a comparison between Six Sigma and an integrated approach.

Methods

The design of the study was a descriptive study of Six Sigma and systems thinking practitioners from professional organizations, such as members of International Society for the Systems Science, System Dynamic Society, iSix Sigma, International Society for Performance Improvement, and Project Management Institute organizations. An electronic web-based survey using SurveyGizmo^{TM} was used to gather data about the use of Six Sigma, systems thinking and an integrated method from survey participants by their organization. A survey questionnaire instrument was developed. The validity of the survey content and its relevance to the study's

research questions was determined by a judge panel consisting of two individuals. These individuals were provided with the research questions and early draft of the survey questions. Once the survey was revised based on the feedback of the content experts (Appendix B), the content was used to create the electronic survey for the pilot study.

After the survey was determined to be valid and reliable, a link to the survey was posted on the professional associations message board web site where the survey participants could participate. Depending on each association, their members were informed of the survey either by an email announcement from their association, a post in their newsletter, or a direct link to the survey web site. Two hundred eighty-nine subjects responded to the invitation to take part and complete the electronic survey created by the researcher.

Findings

Two hundred eighty-nine subjects individuals took part in the survey, of which 23.9% were from manufacturing industry. Fifty eight percent of the participants were from the United States of America. Thirty eight percent of the participants reported they worked in an organization that had 10,000 or more employees. Thirty two percent of participants reported their organization has been using Six Sigma in their quality improvement initiative between 2 to 5 years. Twenty five percent of the participants reported their organization has been using systems thinking between 2 to 5 years. Thirty nine percent of participants reported having Six Sigma experience for 5 years or more, while 30% of participants reported their experience using systems thinking was less than 4 years. When participants were asked the duration of time their organization used an integrated approach to quality improvement, only 20% respondents reported their organization use of integrated model was between 2 to 5 years. The data suggests

the top four industries that used integrated approach were manufacturing, consulting, aerospace and finance/banking/insurance.

Research question 1 asked: *To what extent do organizations that implement Six Sigma with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma programs, compared with those that implement Six Sigma as a standalone method?* Participants were asked several questions to examine research question one. Participants were asked to rate their organization's inclusion of feedback from their internal and external stakeholders as part of their Six Sigma initiative. Of the participants, 26.8% of respondents reported their organization often included feedback from internal and external stakeholders. Respondents who reported their organization used Six Sigma for 2 to 5 years, 9.1% reported sometimes their organization includes feedback from their internal and external stakeholders. While respondents who reported their organization used an integrated model for 6 to 10 years, 6.9% reported their organization often included feedback from their internal and external stakeholders.

Researching if respondents' organizational processes included circular feedback, 29.4% reported their organization includes a circular feedback from internal and external resources. Of those who reported their organization use of Six Sigma to be 6 to 10 years, 12.2% of respondents reported their organization processes sometimes include circular feedback from internal and external resources. However, 7.8% of respondents whose organization use an integrated approach for 2 to 5 years reported their organization processes often include circular feedback.

Survey respondents' understanding of the feedback loop concept was explored by asking their opinion to rate the frequency circular relationships depicted in feedback loops drew connections to the consequences of specific actions taken by their organization. Of the

participants, 39.1% respondents reported circular relationships depicted in feedback loops drew connections to the consequences of specific actions taken, highlighting cause and effect. Of those respondents whose organization used Six Sigma only for 6 to 10 years, 13.5% of respondents reported feedback loops often drew connections to the consequences of specific actions, as did 7.8% of respondents whose organization used an integrated approach for 2 to 5 years.

Of the participants, 35.2% (n = 81) of respondents reported their company invites input and suggestions from their client on how they might improve their performance. Among respondents whose organization used Six Sigma for 2 to 5 years, 9.6% of respondents' company often invited input and suggestions from their clients, and they equally reported sometimes their company invited input from their clients. Among respondents whose organization use of integrated approach for 2 to 5 years, 7.4% reported their organization often invited input from their clients.

When respondents were asked their opinion about systemic loops, 46.1% of respondents reported systemic loops serves as an objective way of analyzing and interpreting balancing and reinforcing forces with Six Sigma. Of the participants who reported their organization use of Six Sigma for 2 to 5 years, 13.1% of respondents reported they think systemic loops often serve as an objective way of analyzing and interpreting balancing and reinforcing forces with Six Sigma. Of those respondents whose organization use of integrated approach for 2 to 5 years, 7.1% respondents reported the same.

Of the participants, 35.2% respondents reported organization continuously examines the feedback from their employees, customers, suppliers, and regulatory agencies and revises their processes regularly. For respondents whose organization reported use of Six Sigma only or

integrated approach for 2 to 5 years, 12.7% those with Six Sigma only and 8.3% with integrated approach reported often their organization continuously examines the feedback from their employees, customers, suppliers, and regulatory agencies and revises their processes regularly.

Participants were asked from which sources their organizations sought feedback when using Six Sigma for their quality improvement, and only 25.4% of respondents reported their organization sought feedback from their internal stakeholders. Among respondents whose organization use Six Sigma only for 2 to 5 years, 26.2% reported their organization sought feedback from internal stakeholders; compared to 16.7% respondents whose organization use of integrated approach for 2 to 5 years, pursued feedback from internal stakeholders.

Participants were asked to rate their organization's use of a central repository where all organizational processes are available to everyone at any given time. Of the respondents, 28.2% reported their organization sometimes used a central repository that housed all their organizational processes. Of the participants who reported their organization use of Six Sigma was between 2 – 5 years, 8.4% reported their organization sometimes used a central repository. For respondents who reported their organization's use of an integrated approach was between 2 - 5 years, 6.6% reported their organization always used central repository.

Of the participants, 20.9% respondents reported their organization had a governance body that reviewed the process repository to identify interrelated and interdependent processes. Among those who reported their organization use of Six Sigma only was 6 to 10 years, 10.5% reported their organization's governance body sometimes reviewed their process repository; and among those who reported their organization use of integrated approach was 2 to 5 years, 6.5% reported their organization's governance body always reviewed the process repository.

Respondents rated the frequency in which their organization's governance body reviewed their process improvement initiatives, including reviewing the repository for documented process for internal and external processes. Of the participants, 21.6% reported their organization's governance body sometimes reviewed their process improvement initiatives for internal and external processes. Among those who reported their organization use Six Sigma only, 7.4% respondents reported sometimes (use 2 to 5 years), rarely (6 to 10 years), and often (10 years or more) their organization's governance body reviewed their process improvement initiatives for internal and external processes. For those who reported their organization use of integrated approach was 2 to 5 years, 7.4% reported their organization's governance body always reviewed their process improvement initiatives for internal and external processes.

Of the participants, 30.9% of respondents reported their organization used metrics to monitor organizational patterns to gain a view of the broader perspective of their organizational structure, including events taken within and outside the organization. Among those who reported their organization's use of Six Sigma only was 2 to 5 years, 10.8% reported their organization often used metrics to monitor organizational patterns; while among those who reported their organization's use of integrated approach was 2 to 5 years, 7.8% reported their organization always used metrics to monitor organizational patterns to gain a broader perspective of their structure.

The survey also explored communication by the participants' organization. Participants were asked to rate the frequency and percentage in which their organization communicated process improvement programs. Of the participants, 23.6% of the respondents reported their organization communicated when process improvements programs impact a particular department only and communicates to everyone in the organization. Among those who reported

their organization use of Six Sigma only was 2 to 5 years, 16.8% reported their organization communicated when process improvement programs impacts a particular department only they communicate to everyone. For those respondents whose organization use integrated approach was 2 to 5 years, 11.3% reported their organization communicated to the entire organization of process improvement programs.

Participants rated the frequency and percentage in which their organization Six Sigma programs included diagramming the entire system, reproducing the problem areas of analysis and conducting test run to measure the results before implementing a new process. Of the participants, 22% of the respondents reported their organization's Six Sigma program sometimes included diagramming the entire system, reproducing the problem areas and conducting test run of new the process. Among those who reported their organization's use of Six Sigma only was 2 to 5 years, 12.5% reported their organization's Six Sigma program sometimes included diagramming the system, reproducing problem areas, and conducting a test run. For those who reported their organization's use of integrated approach was 2 to 5 years, 6.2% said their organization often included diagramming the system, reproducing problem areas, and conducting test run.

When asked to rate the frequency in which participants had an understanding of the work they did contribute to their organizational, including external stakeholders' goals, 26.2% of the respondents reported often they did. For those who reported their organization's use of Six Sigma only was 2 to 5 years, 13.6% reported they often had an understanding of their work contributed to their organizational and external stakeholders' goal. Among those who reported their organization's use of integrated approach 2 to 5 years, 8.6% reported they always do.

The survey explored participants' organization practice identifying interdependencies and dependencies when using Six Sigma program. Participants were asked to rate the frequency and percentage in which their organization examined all parts that made up a sub-system when solving for a problem or examining processes. Of the participants, 37.1% of respondents reported in their opinion their organization always reviewed the sub-system. For those who reported their organization's use of Six Sigma only was 2 to 5 years, 16.3% reported their organization always reviewed the sub-system. Among those who reported their organization's use of integrated approach was 2 to 5 years, 10.8% reported their organization always reviewed the sub-system.

Of the participants, 21% of respondents reported their Six Sigma program often identified and incorporated the interrelationship of their organization's sub-system processes when developing or revising an existing process. Among those respondents whose organization use of Six Sigma only was 6 to 10 years, 11.9% reported their program often identified and incorporated the interrelationship of their organization's sub-system. For those using integrated approach for 6 to 10 years, 6.4% reported their organization often does.

Participants' organization identified patterns, recurring trends of interconnections, or casual links beyond the isolated events 20.6% reported they sometimes do it. Of those whose organization use Six Sigma only was 6 to 10 years, 10.3% reported sometimes they did. Among those who reported their organization's use of integrated approach was 2 to 5 years, 6.4% reported their organization sometimes identified patterns and recurring trends.

The questionnaire also asked participants' organization investigation of root causes of a problem by analyzing all inputs, processes and outputs of a process included examining the inter-departmental impacts that impacts internal and external stakeholders. Of the participants, 23.1%

of respondents reported their organization sometimes included inter-departmental impacts and external stakeholders when analyzing root cause of a problem. Of the respondents who reported their organization's 2 to 5 years, 11.8% of respondents reported sometimes their organization practices this approach. Among those who reported their organization's use of integrated approach was 2 to 5 years, equally was reported, 6.4%, their organization sometimes and often include this approach.

The survey examined key reason(s) participants' organization explored the interdependencies and interrelationship of their organization's processes. Of the participants, 15.5% responded. The reasons included; improve organization efficiency, improve customer service, reduce waste, reduce cost, improve profitability, gain competitive advantage, identify root cause problems, influence senior management, competitors are doing, not examine interdependencies unless impacts organization, or other. Among participants who reported their organization's use of Six Sigma only was 2 to 5 years, 21% reported improve organization efficiency, 21% reported reduce cost, 21% reported identify root cause. A new reason emerged when looking at those who uses Six Sigma only for 6 to 10 years- 17.9% reported improve customer service. Of those participants who reported their organization's use of integrated approach was 2 to 5 years 14.8% reported improve organization efficiency, 14.8% reported reduce cost, 14.8% reported reduce cost. A new reason emerged when looking at those who uses integrated approach for 6 to 10 years- 10.2% reported reducing waste.

Participants were asked if their organization's Six Sigma team was responsible for soliciting feedback from internal and external resources. Of the participants, 16.4% of respondents reported their Six Sigma team often was responsible for soliciting feedback. Those who reported their organization's use of Six Sigma only was 2 to 5 years, 8.5% reported their Six

Sigma team often solicited feedback; while of those organizations that use of Six Sigma only was 6 to 10 years, 8.5% reported their Six Sigma team sometimes sought feedback. Among those who reported their organization's use of integrated approach was 2 to 5 years, 7.3% reported their Six Sigma team often sought feedback.

Participants were asked to rate the frequency in which their organization use of systems thinking method with Six Sigma increased the success of the Six Sigma programs. While 24.8% of respondents reported their organization did not use systems thinking with Six Sigma program, 10.8% of respondents reported they strongly agree their organization's Six Sigma program was a success because their Six Sigma program used systems thinking. Of those who reported their organization's use of Six Sigma only for 2 to 5 years, 7% agree their using systems thinking with Six Sigma increased the success of their Six Sigma programs. As the use of Six Sigma only increased to 10 years or more, 7% of respondents reported they strongly agree, the use of systems thinking with Six Sigma increased their Six Sigma program's success. For those who reported their organization's use of integrated approach was 2 to 5 years, 6.9% of respondents reported they equally agree and strongly agree the use of systems thinking with Six Sigma increased their Six Sigma program's success. As the duration of integrated approach expanded to 10 years or more, 5.8% of respondents reported they strongly agree.

Participants were asked about their opinion of their company's Six Sigma program success. Of the participants, 29.4% of respondents reported their company's Six Sigma program was somewhat successful. Among those who reported their organization's use of Six Sigma only was 2 to 5 years, 18% of respondents reported their Six Sigma program was somewhat successful. Of those who reported their organization's use of integrated approach was 2 to 5 years, 11.6% of respondents reported their organization's Six Sigma program was somewhat

successful. Supplementing the investigation and learn more about participant's opinion why they responded their company's Six Sigma program was somewhat successful, participants were provided with an opportunity to write-in their responses. Respondents indicated the reasons contributed to some success were the respondent's organization was somewhat successful but in the respondent's opinion, their organization needed to look Six Sigma program solutions systematically. Some respondents even further wrote that their organization needed to include systems thinking because Six Sigma alone was not enough. While others wrote their organization's Six Sigma program produced mixed results, overlong period success dwindled, and success could be higher.

The survey asked participants which of the quality methods contributed to their company's Six Sigma success. Of the participants, 18.2% of the respondents reported their company's quality management program had been successful because their company uses systems thinking and Six Sigma methods together. Of those respondents who reported their organization's use of Six Sigma only, 12.7% of respondents use of Six Sigma only was 10 years or more reported their program was successful because their company used both systems thinking and Six Sigma methods together. Among those who reported their organization's use of integrated approach was 2 to 5 years, 14.6% of respondents reported their program was successful because their company used both systems thinking and Six Sigma methods together.

Research question 2 asked: *What are the factors that contribute to the success of the integrated model?* Here are some of the major findings. Participants were asked to identify all factors that made their organization's Six Sigma program a success; 14.7% of respondents who reported their organization use Six Sigma only reported training, followed by 14.2% of respondents reported upper management support, were factors that contributed to their Six Sigma

program success. Those who responded their organization use of integrated approach was 2 to 5 years also reported training to be a success factor. Other items that were identified by respondents included holistic approach, circular feedback and examining interdependencies listed in the order of the response rate. A small percent of respondents, 3% reported their company's Six Sigma program was not a success. These respondents were provided an opportunity to provide more information why their organization's Six Sigma was not a success. Three percent of these respondents reported lack of upper management support and one percent reported lack of organizational commitment to be key factors contributed why their Six Sigma program was not a success.

Participants were asked to rate the frequency in which their organization held everyone accountable for holistic approach to process improvement. Of those respondents who reported their organization used Six Sigma only, 15.4% of the respondents reported that their organization rarely held everyone accountable for holistic approach to process improvement. Of respondents who reported their organization use of integrated approach for 6 to 10 years, 6.2% reported their organization often held everyone accountable for holistic approach to process improvement.

Participants were asked to rate the frequency their organization had few dedicated individuals who led quality improvement; 24.5% reported their organization often had few dedicated individuals lead quality improvement. Respondents who reported their organization use of Six Sigma only was between 6 to 10 years, 15.1% reported their organization often had few dedicated individuals leading it. Of respondents who identified their organization's use of integrated approach to between 2 to 5 years, 9.2% reported their organization often had dedicated individuals leading quality improvement.

The research explored if participants' organization used Six Sigma organizational wide. Of the participants, 30.8% reported their organization use of Six Sigma was in some part of the organization. Among respondents who reported their organization use of Six Sigma only between 2 to 5 years, 18.8% reported their organization used Six Sigma in some parts of their organization. While those who reported their organizations use of integrated approach was 2 to 5 years, 9.6% reported their organization use Six Sigma in some parts of their organization closely followed by those who reported 8.5%, 2 to 5 years, use enterprise wide.

Finally, for research question 2, participants were asked to rate the frequency in which factors contributed to their organization abandon the use of Six Sigma. Of the participants, 26.3% of respondents reported lack of management support was a top factor for their organization to abandon the use of Six Sigma. Among those respondents who reported their organizations use of Six Sigma only 2 to 5 years, 42.9% reported lack of management support as the factor for abandoning the use of Six Sigma. Further, 14.3% of the respondents who reported integrated approach use of 2 to 5 years reported Six Sigma was too complicated.

Research question 3 examined: *To what extent does organizational leadership support for an integrated model differ from support of Six Sigma as a standalone method?* Participants were asked whether their organization's leaders recognized and rewarded those individuals who used holistic approach for long-term solutions. Of the participants, 22.7% of respondents reported their organization's leaders sometimes recognized and rewarded individuals who used holistic approach for long-term solutions. Of those respondents who reported their organization's use of Six Sigma only, 11.8% reported the use to be between 6 – 10 years and their organizational leadership sometimes recognized and rewarded individuals who used holistic approach. Respondents who reported their organization use of integrated approach 2 to 5 years,

6.9% reported their leadership sometimes recognized and rewarded individuals who use a holistic approach.

Participants were asked if their organization's leadership included in the employees' annual performance goals systematic, holistic approach to solving problems. Of respondents who reported their organization's use of Six Sigma, only 9.3% reported their organization's leadership rarely includes systematic, holistic criteria in their employees' annual performance goals, also reported the use of Six Sigma was 2 to 5 years. Among respondents who reported their organization's use of integrated approach for 2 to 5 years, 4.9% reported their organization's leadership always includes systematic, holistic approach to solving problems in their employees' annual performance goals.

Participants were asked their opinion if their organization leadership rewarded those solving problems with a holistic approach. Of the participants, 17.5% of respondents reported their leadership sometimes rewarded individuals for solving problems holistically. Of the respondents who reported their organizations use of Six Sigma only use for 6 to 10 years, 11.7% reported their leadership sometimes rewarded individuals for solving problems holistically. Respondents who reported their organizations use of integrated approach, use for 2 to 5 years, 5.6% reported often but those whose use of integrated approach was 6 to 10 years, 5.6% reported sometimes their leadership rewards individuals for solving problems holistically.

Finally, participants were asked if the sponsoring management of Six Sigma programs held the Six Sigma team accountable for holistic approach to process improvement. Of the participants, 12.6% of respondents reported sponsoring management of Six Sigma sometimes held Six Sigma team accountable for holistic process improvement. Of respondents who reported their organization use Six Sigma, only 8.0% of respondents reported the sponsoring

management of Six Sigma programs sometimes held the Six Sigma team accountable. Among respondents who reported their organization's use of integrated approach 2 to 5 years, 5.6% reported their sponsoring management of Six Sigma programs always held the Six Sigma team accountable for holistic process improvement approach.

Conclusions

Conclusions drawn from the results are organized and presented according to the three research questions. The first question focused on the extent of organizations that implemented an integrated approach, Six Sigma and systems thinking, as part of their quality improvement differ in the success and duration of their Six Sigma programs compared with those organizations that used Six Sigma method only. The second research question focused on factors that contributed to participants' organization Six Sigma program success using the integrated model. The third research question focused on the extent of the participants' organizational leadership support for an integrated model differed from support for Six Sigma model as a standalone method. A list of specific research questions are in Table 129.

Table 129

Research Questions for the Study

Research Questions
1. To what extent do organizations that implement Six Sigma with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma programs, compared to those that implement Six Sigma as a standalone method?
2. What are the factors that contribute to the success of the integrated model?
3. To what extent does organizational leadership support for an integrated model differ from support of Six Sigma as a standalone method?

Demographics. The following describes the conclusions and recommendations pertaining to the demographics of the participants.

Conclusion. From the number of participants there were a higher number of respondents representing the manufacturing industry. Although respondents from other industries responded, the response rate was low. These industries included Aerospace, Biotechnology, Pharmaceutical, and health care to name a few. The majority of respondents were from the United States of America. Organizations that employ 10,000 or more employees had higher respondents; followed by organization that employed 500 to 4,999 employees. Higher response rate was reported (32%) by respondents whose organization had been using Six Sigma in their quality improvement initiative between 2 to 5 years. Only 22% of respondents reported their organization use systems thinking between 2 to 5 years. While examining those participants whose company had been using an integrated method, a higher number of respondents 35% reported, their organization did not use an integrated approach. Of those who reported their organization used an integrated approach, only 20% reported their organization use of integrated model was between 2 to 5 years. Overall, this was an expected result. Six Sigma's start came from manufacturing and as the literature review identified systems thinking is not used widely as part of quality improvement method; therefore, it is not surprising a lesser number of respondents reporting integrated approach by their organization.

Recommendation. The survey population was through the quality management professional association, most of them based in the United States. To enhance the participants, it is recommended to identify organizations that use Six Sigma or integrated approach and conduct survey with these organizations directly rather than through professional associations. Additionally, inclusion of organizations that are outside the United States would be beneficial.

This may include contacting the organizations directly and coordinating the survey. For future study that includes more participants, it will be beneficial to have the capability to send direct communications such as reminders for the survey directly rather than depend on the professional associations' way of communication.

The first research question includes a comparison of organizations that use Six Sigma and integrated approach. Since there were no empirical research studies identified by the researcher on an integrated approach, the researcher first needed to investigate some of the systems thinking characteristics that were identified in the literature review. These included feedback loops, holistic view, and interdependencies and dependencies. Then the survey would investigate if participants report these characteristics in their organization's quality management practices. In doing so, integrated approach references could be suggested from those respondents whose organization's quality management method included Six Sigma and characteristics of systems thinking.

Key characteristics examined were feedback loops, holistic approach, and interdependencies and dependencies.

Feedback Loops. The following section details conclusions and recommendations pertaining to use of feedback loops.

Conclusion. Respondents who reported their organization used Six Sigma only sometimes included feedback from their internal and external resources. Respondents who reported their organization used integrated approach reported they often include feedback from their internal and external resources. Senge (1994) stated that to understand better an organization structure, feedback loops used by systems thinking provides a view to the dynamic interrelationships of a system. Since feedback loops connects an organization with its interrelated

processes, including internal and external stakeholders, it gives an insight to changing one variable in a system and its impact on other variables in that system and other systems (Jackson, 2003). Based on the respondents' answers, there is remarkable evidence that organizations that use integrated approach often view their organization's system behavior because of the feedback loop.

Recommendation. Questions asked participants to respond about their organization's inclusion of feedback from their internal and external stakeholders. Four questions explored this however; each of the questions was worded differently. For example, wording of questions included if the organization included feedback from their internal stakeholders, internal resources, and employees. Similarly, questions were asked of external resources that included external stakeholders, organization's clients, customers, suppliers, and regulatory agencies. All of these questions' intent was the same- to seek from which areas the respondents' organization sought information. Therefore, it was not necessary to have asked the same question four times stated differently. A single question that clearly defined areas from which the organization included feedback would have been sufficient. In addition, words such as stakeholders could be inclusive of internal and external resources and when listed as one of the answers along with internal or external, a respondent might be unclear which answer to select. Therefore, it is recommended to be specific in the response options to minimize misunderstanding.

Holistic Approach. The following section details the conclusions and recommendations related to use of a holistic approach.

Conclusion. Respondents from organizations that used Six Sigma reported they sometimes used a central repository for their organizational processes; and their governance body sometimes reviewed the repository to identify interrelated and interdependent processes,

including for internal and external processes. In comparison, respondents whose organization used an integrated approach their organization always used a central repository and their governance body always reviewed the repository to identify interrelated processes.

Organizations that used Six Sigma only sometimes included diagramming their entire system, reproducing the problem, conducting a test run to measure the outcomes before implementing a new process, and communicating to everyone when a particular area is impacted. Organizations that used an integrated approach always did. Individuals from organizations that used Six Sigma only often have an understanding of the work they do that contributes to their organizational and external stakeholders' goals. In comparison, organizations that used an integrated approach, they always did.

Overall, organizations that used Six Sigma only often approached with a holistic view of their process improvement initiatives, while those who used an integrated approach always did.

Recommendation. No recommendation is offered.

Interdependencies and dependencies. The following section details the conclusions and recommendations related to interdependencies and dependencies.

Conclusion. The data suggested similar results for respondents who reported their organization used of Six Sigma only and for those whose organization used integrated approach. Both reported their organization when solving for a problem or examining processes, all parts that make up a sub-system is always examined. This includes all inputs, outputs and feedback loops. Often their organization's Six Sigma programs identified and incorporated the interrelationship of their organization's sub-system processed when developing a new or revising an existing process. Both organizations sometimes identified patterns, recurring trends of interconnections, or casual links beyond the isolated events with Six Sigma.

There is evidence of a slight difference between organizations that used only Six Sigma and those that used integrated approach when investigating root cause of a problem by analyzing all inputs, processes and outputs of their processed and examining the inter-departmental impacts of their internal and external stakeholders. Those who used Six Sigma only sometimes investigated the root cause. Those who used an integrated approach often did. Both organizations investigated the interdependencies and interrelationship of their processes to improve their organizational efficiency. When the use of their method was longer, 6 to 10 years, the organizations that used Six Sigma investigated root cause of a problem to improve customer services; those that used integrated approach did so to reduce waste.

Recommendation. No additional recommendation is identified.

Success. The following section details the conclusions and recommendations related to success of their programs.

Conclusion. Both respondents strongly agreed their organization's use of systems thinking method with Six Sigma increased the success of their Six Sigma programs. In the respondents' opinion, their Six Sigma programs were somewhat successful. Overall, respondents reported their company's quality management program has been successful because they use Six Sigma and systems thinking together no matter how long the duration of Six Sigma only or integration approach was used by their organization.

Recommendation. There is indication that there is a decline in the number of respondents who in their opinion reported their organization use of Six Sigma only for 6 to 10 years, yet it increased when used 10 years or more their quality management program's success. In comparison, those who reported their organization's use of an integrated approach show a decline when investigating the duration of use from 2 to 5 years, 6 to 10 years, and 10 years or

more. Additional explorative investigation is recommended to determine why those with Six Sigma only dipped when the method is used for 6 to 10 years and increased when the use of the method is 10 years or more. Equally of interest to investigate further is why those organizations that used an integrated approach show a decline in respondents answer when the method is used 2 to 5 years, 6 to 10 years, and 10 years or more.

Also, recommend for future study to explore culture change. Could culture change be a contributor as the method's use is matured by those organizations that used Six Sigma only? Could these organizations be including some of the systems thinking behaviors or is there another reason?

Duration and Success. The following section details the conclusions and recommendations related to the duration and success of a Six Sigma program.

Conclusion: The data supports that there appears to be a difference between respondents whose organization used Six Sigma only between 2 to 5 years and those who used integrated approach between 2 – 5 years. Those who used Six Sigma reported their organization's use of feedback loops sometimes included internal and external stakeholders. While those organizations used integrated approach reported, their organization often used feedback loops to gather feedback from their internal and external stakeholders.

There is evidence that organizations that used Six Sigma only for 2 to 5 years sometimes viewed their Six Sigma initiative with a holistic approach, whereas those organizations use of integrated approach for 2 to 5 years reported their organization always approach their Six Sigma initiative with a holistic approach.

Interesting to note, there is evidence that reviews of the repository for documented process for internal and external processes frequency increased as the organizations matured in

the use of Six Sigma only method. Respondents who reported the use of Six Sigma between 2 to 5 years and 6 to 10 years reported their governance body rarely or often reviews their processes, while those who reported 10 years or more reported they often review their processes. Data also suggests that those who used Six Sigma only tend to communicate impact to a particular department and some reported to communicating to everyone, whereas those with integrated approach communicated to the entire organization.

In comparison to participants' organization examination of their system interdependencies including of their sub-system, the data showed respondents answers did not differ between those who reported Six Sigma only use versus those with integrated approach. However, when participants were asked about key reasons their organization investigated the interdependencies and interrelationship of their processes, those with Six Sigma only and integrated approach with 2 to 5 years of use reported the same reasons, improve efficiency, reduce cost, and identify root cause. When the number of years increased from 2 to 5 years to 6 to 10 years, those with Six Sigma only reported key reason includes improve customer service and those with integrated approach reported reduce waste.

The data suggests that respondents of both Six Sigma only and integrated approach users for 2 to 5 years, 6 to 10 years, or 10 years or more reported that Six Sigma and integrated approach contributed to the success of their quality management effort and to the success of their Six Sigma programs.

In summary, there is evidence that organizations that used integrated approach reported increased frequency use in feedback loops, holistic view and interdependencies, compared to those who used Six Sigma only. Both report success of their method. There is remarkable

difference between organizations that used Six Sigma only and those used an integrated approach.

The data also suggests that there is evidence that as the duration of the organization's use of Six Sigma matured so did respondents' support for factors of systems thinking concept increased. Included was support that integrated approach contributed to the success of their Six Sigma program. There is indication that most success reported by organizations use by either methods appeared to be methods used between 2 – 5 years. As the duration matured so did respondents' reporting the success of their quality management, regardless of the method used. One may deduce that regardless of the method, implementing quality improvement requires a change in culture for programs to be successful. This includes support of the leadership, training and tools, rewards, reinforcement, etc. Culture change needs to continue even after the short term goals are met because behavior change is not an overnight accomplishment.

Recommendation. Participants were asked to state the reason for their company's quality management program successful. Those who reported their organization's use of integrated approach stated that using Six Sigma with systems thinking was the reason that contributed to their success. A closer examination of maturing the integrated use showed an interesting result. More respondents supported this when their organization's use is 2 to 5 years then those who reported the use between 6 to 10 years and even more compared to those who reported the use for 10 years or more. Further research is recommended to identify the reason of the decline.

The second question investigated factors that contribute to the success of an integrated model.

Success factors. The following section details the conclusions and recommendations related success factors of Six Sigma programs.

Conclusion. Data indicates that training is the top factor for Six Sigma program success by either those who use Six Sigma only or an integrated approach, followed by management support. Other factors also contributed to the success of a Six Sigma program including circular feedback and examining interdependencies. Organizations that used Six Sigma only rarely held their organizations accountable for holistic approach to process improvement. Not so is the case with organizations that used integrated approach. These organizations often held their company accountable for holistic approach to process improvement and quality management. There are those few dedicated trained individuals in parts of their organization leading Six Sigma effort by those who use Six Sigma only or an integrated approach. As organizations mature in the use of their method, either Six Sigma only or an integrated approach, the methods are expanded organization wide. Management support, regardless if an organization uses Six Sigma only or an integrated approach to process improvement or quality management continues to be an important reason for program's success.

Recommendation. The result of the success factors as reported by the respondents appears to be little difference between those whose organization uses Six Sigma only or an integrated approach. Therefore, it is recommended to further this research to expand the number of participants responding to the survey, particularly those respondents whose organization use an integrated approach to provide a better examination of comparison between those who use Six Sigma only and those who use integrated approach.

The final research questions explored the extent to which organizational leadership support for an integrated model differs from support of Six Sigma as a standalone method

Leadership. The following section details the conclusions and recommendations related to leadership and its relationship to Six Sigma.

Conclusion. Both methods include organization leaders who sometimes recognized and rewarded those individuals who use holistic approach for long-term solutions. The leadership of organizations that used Six Sigma only rarely included in the employee's annual performance goal systematic, holistic approach to solving problems. However, more emphasis was placed on employees' approach to solving problems by those organizations who used an integrated approach. These organizations' leaders always included systematic, holistic approach to solving problems in their annul employee performance goals. Six Sigma program sponsors at organizations that use Six Sigma only, sometimes held their Six Sigma team accountable for holistic approach to process improvement. There is a remarkable indication that there is more accountability placed on Six Sigma teams at organizations that used an integrated approach. The sponsors from organizations that use an integrated approach always hold the Six Sigma team accountable for holistic approach to process improvement.

Recommendation. Further exploration would be valuable to investigate organizations that used an integrated approach the types of reward the leadership gave to their associates. It would also be of interest to learn if there was a variation with the rewards given to associates who demonstrated holistic approach for long-term solutions at each level of the organization. Further exploration would be valuable to learn the reason between organizations that used an integrated approach for 2 to 5 years and reported their leadership always includes systematic, holistic approach to solving problems in their employee's annual performance goals to those who reported sometimes they do that had been using this method for 6 to 10 years.

Limits to the Study

The design of the study was explorative and not experimental; therefore, attempts to control for variables to which group differences could attributed was not available.

This study gathered responses from volunteers who were members of professional associations. Access to the volunteer participants relied on the associations' communication level of effectiveness that included posting on their bulletins boards, a one-time email distribution, and use of social media by the associations. Although the opportunity to access a larger group that included global membership was offered by some of these associations, there was no direct access to the volunteers for follow-up reminders to participate in the survey.

For some of the questions on the electronic survey, some respondents selected "Other", yet the field that allowed the respondent to provide a brief description were left blank. Therefore, understandings of respondents' perception or thoughts were limited. An opportunity to interview participants would minimize these incidental blank responses. Multiple-choice questions may have limited the participants' choices answering the question. The open-ended questionnaire items may have included perceptions by the respondents and may not have reflected reality.

Future Research

This research provided an explorative foundation for understanding the extent to which organizations that implement Six Sigma with systems thinking as an integrated approach to quality improvement, differ in the success and duration of their Six Sigma programs, compared to those that implement Six Sigma as a standalone method. Further research on a larger scale working directly with organizations that use integrated approach and those who use Six Sigma only would be valuable. A case study comparison of an organization that used Six Sigma then integrated approach could provide a better insight on the level of success, success factors, and the role of their leadership. In addition, it is recommended that the study be broadened to include an experimental study with organizations where one department or unit be introduced

with an integrated method while the other department or unit is the control group would provide closer understanding of the outcome.

The researcher, through literature review, determined an integrated survey instrument did not exist that met the purpose of the proposed study. The researcher designed the survey instrument and integrated feedback from expert judges for content validity before executing the survey to the larger study population. The expert panel consisted of two individuals. It is recommended additional experts be identified; and experts further substantiate the content validity to put the survey instrument to rigorous analysis. Further refinement of the survey instrument be performed is recommended.

For future research, it is recommend to include a larger survey participants to allow for *t*-test an ANOVA analysis, which would be valuable to determine the degree of difference among success measures by industry type, by size, by maturity level (how long it has been implementing the program).

Additional investigation of quality program success using integrated approach would supplement this study presenting the effects of culture change as organization's use of integrated approach matures.

Contribution of This Study

This research provided the foundation to explore further our understanding of Six Sigma programs by those organizations that use Six Sigma only and by those that use an integrated approach. This study provided preliminary explorative information that showed evidence some variations between those organizations that used Six Sigma only and those that used integrated approach. The sample used in this study was not randomly selected. As such, informational

analysis of data was not conducted. The results, while insightful and consistent with an explorative study, should be generalized with caution.

Furthermore, this study necessitated the creation of a survey instrument that asks a series of questions on organizations' behaviors based on systems thinking key factors combined with Six Sigma to enable investigation of an integrated approach. Finally, this study will provide an opportunity for future researchers to improve the survey instrument and an opportunity to conduct future research on integrated approach to quality management and process improvement using Six Sigma.

Lastly, although additional validity and reliability tests should be conducted, with this study, the first integrated survey tool was developed by the researcher for other researchers and practitioners to use for future research.

Closing Comments

Six Sigma and systems thinking concepts are not new. Both of their foundations based on historical concepts have been evolved for use in current times. Six Sigma is focused on a specific project led by those who are trained in the method. It uses deductive logic that breaks problems into smaller manageable pieces to identify root causes of defects. Systems thinking also focuses on a specific problem led by those who practice looking at an organization as a system. Yet, each sub-system is investigated to identify root cause and solutions that includes circular feedback from internal and external stakeholders.

In a world in which organizations operate to succeed and remain competitive, organizations must continuously understand their internal processes and their customers' demands. They must focus on identifying the root causes of defects and adjust their processes to meet those demands. In a global economy, these organizations must understand their

consumers' demands and the market in which they compete; they must also view their organizations as a system. This system must be viewed as one that has interdependencies and interrelationships within its organization and with external its organizations; where a change in one process affects a change in others. Without such understanding, companies that use Six Sigma only will see immediate results for their particular project, yet may see limited to no success with their overall organization meeting the needs of their customers.

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APPENDIX A

Survey Instrument

- Survey Introduction and Altered Informed Consent
- Survey Questionnaire

Survey Introduction and Altered Informed Consent

March 2011

Greetings,

My name is Marlene Derian Robertson. I am a graduate student in Organizational Leadership in the Graduate School of Education and Psychology at Pepperdine University in Los Angeles, California. I am conducting a survey on Six Sigma and systems thinking, an integrated approach to quality improvement for my dissertation. This study is being conducted in partial fulfillment of the requirements for the degree of Doctor of Education in Organizational Leadership under the supervision of June Schmieder-Ramirez, Ph.D.

Your participation in this research project is voluntary and it will contribute furthering the knowledge of quality management. You will be asked to share your experience with quality management programs, specifically Six Sigma programs, in your organization. The survey is open from MM/DD/YY – MM/DD/YY. It will be administered online using SurveyGizmo™ and should only take about 20 – 30 minutes of your time. You can discontinue your participation at any time without any penalty or prejudice.

Your survey responses will be strictly confidential. To safeguard confidentiality, the survey tool settings, offered by SurveyGizmo™, are adjusted to ensure your responses cannot be tracked to the source, including your IP address. All answers will be kept confidential. The results of this survey will be presented publicly at Pepperdine University. Only aggregate (group) results will be presented or documented, not individual answers. Once the final defense is completed, the survey responses will be downloaded from the SurveyGizmo™ server and will be kept in a secure, locked file cabinet and will be permanently deleted from the SurveyGizmo™ server.

By completing the survey, you will have an opportunity to obtain a copy of the summary survey reported by clicking on the link at the end of the survey. The results of the reported will be on the date you take the survey. You will also have an opportunity to enter into a drawing for a $50 (USD) gift card from Amazon.com. Participation in the drawing is voluntary. Should you choose to participate, your contact information for the drawing will be collected and kept independently from your answers. The sole purpose of your email address will be used to inform you if you are the recipient of the gift card. Upon the final defense is completed, your email address will be permanently deleted from the researcher's data collection.

This study does not present more than a minimal risk to participants. The potential risks foreseen by the researcher may include mild fatigue due to completion of the survey tool or discomfort on reflecting on your knowledge, the application, or implementation of Six Sigma programs.

This study is directed towards benefiting scholars and practitioners of quality management. Your willingness to share your experiences is greatly appreciated. If you have any questions, please feel free to email me at Marlene.Derian@Pepperdine.edu. You may also contact Dr. June Schmieder-Ramirez, Professor of Education, at [redacted], or June.Schmieder@Pepperdine.edu if you have other questions or concerns about this research. If

you have questions about your rights as a research participant, you may contact Yuying Tsong, Ph.D. Interim GPS IRB Chair, at [redacted] or yuying.tsong@pepperdine.edu. You may also contact Jean Kang, Manager, GPS IRB and Dissertation support, Graduate and Professional Institutional Review Board at [redacted], or gpsirb@pepperdine.edu.

Please start the survey now by clicking on the "**Next"** button below. By clicking the "**Next**" button you are acknowledging that you have read and understand the procedures described and that you are agreeing to participate in this study. You further understand that your participation is voluntary and that you can discontinue participation at any time.

If at any time, you wish to stop and continue later, please click on the link "**Save and Continue with Survey Later**" located at the top of each page. Once you click on it, please follow the instructions to save your work.

Thank you for your time and consideration.

Sincerely,

Marlene Derian Robertson
Doctoral Candidate, Doctor of Education in Organizational Leadership, Pepperdine University

Survey Questionnaire

Which of the following industry categories best describes your organization?
( ) Accounting
( ) Advertising / Media / Printing / Publishing
( ) Aerospace / Aviation / Automotive
( ) Agriculture / Forestry / Fishing / Hunting
( ) Arts / Entertainment / Recreation
( ) Biotechnology
( ) Business / Professional Services
( ) Business Services (Hotels, Lodging Places)
( ) Computers (Hardware, Desktop Software)
( ) Communications
( ) Construction / Home Improvement
( ) Consulting
( ) Education
( ) Engineering / Architecture
( ) Finance / Banking / Insurance
( ) Food Service
( ) Government / Military
( ) Healthcare / Medical
( ) Internet
( ) Legal
( ) Manufacturing
( ) Marketing / Market Research / Public Relations
( ) Mining / Quarrying / Oil and Gas Extraction
( ) Non-Profit
( ) Pharmaceutical / Chemical
( ) Research / Science
( ) Real Estate
( ) Retail
( ) Telecommunications
( ) Transportation / Distribution
( ) Utilities
( ) Wholesale
( ) Other

Identify the country in which your organization's headquarters are located.
( ) Afghanistan
( ) Albania
( ) Algeria
( ) Andorra
( ) Angola
( ) Antigua
( ) Argentina

( ) Armenia
( ) Australia
( ) Austria
( ) Azerbaijan
( ) Bahamas
( ) Bahrain
( ) Bangladesh
( ) Barbados
( ) Barbuda
( ) Belarus
( ) Belgium
( ) Belize
( ) Benin
( ) Bhutan
( ) Bolivia
( ) Bosnia and Herzegovina
( ) Botswana
( ) Brazil
( ) Brunei
( ) Bulgaria
( ) Burkina Faso
( ) Burma
( ) Burundi
( ) Cambodia
( ) Cameroon
( ) Canada
( ) Cape Verde
( ) Central African Republic
( ) Chad
( ) Chile
( ) China
( ) Colombia
( ) Comoros
( ) Congo (Brazzaville)
( ) Congo (Kinshasa)
( ) Costa Rica
( ) Cote d'Ivoire
( ) Croatia
( ) Cuba
( ) Cyprus
( ) Czech Republic
( ) Denmark
( ) Djibouti
( ) Dominica
( ) Dominican Republic
( ) Ecuador

( ) Egypt
( ) El Salvador
( ) Equatorial Guinea
( ) Eritrea
( ) Estonia
( ) Ethiopia
( ) Fiji
( ) Finland
( ) France
( ) Gabon
( ) Gambia
( ) Georgia
( ) Germany
( ) Ghana
( ) Greece
( ) Grenada
( ) Guatemala
( ) Guinea
( ) Guinea-Bissau
( ) Guyana
( ) Haiti
( ) Herzegovina
( ) Holy See
( ) Honduras
( ) Hungary
( ) Iceland
( ) India
( ) Indonesia
( ) Iran
( ) Iraq
( ) Ireland
( ) Israel
( ) Italy
( ) Jamaica
( ) Japan
( ) Jordan
( ) Kazakhstan
( ) Kenya
( ) Kiribati
( ) Kosovo
( ) Kuwait
( ) Kyrgyzstan
( ) Lao
( ) Latvia
( ) Lebanon
( ) Lesotho

( ) Liberia
( ) Libya
( ) Liechtenstein
( ) Lithuania
( ) Luxembourg
( ) Macedonia
( ) Madagascar
( ) Malawi
( ) Malaysia
( ) Maldives
( ) Mali
( ) Malta
( ) Marshall Islands
( ) Mauritania
( ) Mauritius
( ) Mexico
( ) Micronesia
( ) Moldova
( ) Monaco
( ) Mongolia
( ) Montenegro
( ) Morocco
( ) Mozambique
( ) Myanmar
( ) Namibia
( ) Nauru
( ) Nepal
( ) Netherlands
( ) Netherlands Antilles
( ) New Zealand
( ) Nicaragua
( ) Niger
( ) Nigeria
( ) North Korea
( ) Northern Ireland
( ) Norway
( ) Oman
( ) Pakistan
( ) Palau
( ) Palestine
( ) Panama
( ) Papua New Guinea
( ) Paraguay
( ) Peru
( ) Philippines
( ) Poland

( ) Portugal
( ) Qatar
( ) Romania
( ) Russia
( ) Rwanda
( ) Saint Kitts and Nevis
( ) Saint Lucia
( ) Saint Vincent and the Grenadines
( ) Samoa
( ) San Marino
( ) Sao Tome and Principe
( ) Saudi Arabia
( ) Senegal
( ) Serbia
( ) Seychelles
( ) Sierra Leone
( ) Singapore
( ) Slovakia
( ) Slovenia
( ) Solomon Islands
( ) Somalia
( ) South Africa
( ) South Korea
( ) Spain
( ) Sri Lanka
( ) Sudan
( ) Suriname
( ) Swaziland
( ) Sweden
( ) Switzerland
( ) Syria
( ) Taiwan
( ) Tajikistan
( ) Tanzania
( ) Thailand
( ) Tibet
( ) Timor-Leste
( ) Togo
( ) Tonga
( ) Trinidad and Tobago
( ) Tunisia
( ) Turkey
( ) Turkmenistan
( ) Tuvalu
( ) Uganda
( ) Ukraine

( ) United Arab Emirates
( ) United Kingdom of Great Britain
( ) United States of America
( ) Uruguay
( ) Uzbekistan
( ) Vanuatu
( ) Venezuela
( ) Vietnam
( ) Yemen
( ) Zambia
( ) Zimbabwe

Select the number of employees in your organization.

( ) 1 - 499
( ) 500 - 4,999
( ) 5,000 - 9,999
( ) 10,000 or more

How many years has your organization used Six Sigma as a method for measuring quality?

Definition:
Six Sigma is a business quality improvement method that tries to achieve near perfection using statistical methods to identify problems and remove causes of errors, defects, or failures in any process.

( ) 1 year or less
( ) 2 - 5 years
( ) 6 - 10 years
( ) Over 10 years or more
( ) My organization does not use Six Sigma
( ) I do not know if my organization uses Six Sigma

How many years have your organization used systems thinking method as a holistic approach to solving problems or for process improvement?

Definition:
Systems thinking is a holistic approach to problem solving by viewing problems as part of an overall system and looking at the way system's parts connect; the relationship and dependencies these parts have on each other within the context of a larger system that is in constant interaction with its environment.

( ) 1 year or less
( ) 2 - 5 years
( ) 6 - 10 years
( ) Over 10 years or more
( ) My organization does not use systems thinking
( ) I do not know if my organization uses systems thinking

Does your organization use an integrated model for solving problems or for process improvement? If yes, please indicate the length of time.

Definition:

An integrated model is using both Six Sigma and systems thinking methods for quality improvement.

( ) 1 year or less
( ) 2 - 5 years
( ) 6 - 10 years
( ) Over 10 years or more
( ) Not applicable, my organization doesn't use an integrated model
( ) I do not know if my organization uses an integrated model

How would you rate your level of expertise with the following concepts?

	No Experience	**Some Experience (less than 4 years)**	**Extensive Experience (5 years or more)**	**Expert (10 years or more)**
Six Sigma	( )	( )	( )	( )
Systems thinking	( )	( )	( )	( )

Please indicate the frequency in which you organization engages in the following practices, using the scale below:

	Always	**Often**	**Some-times**	**Rarely**	**Never**	**I do not know**	**Not applicable**
My organization includes feedback from internal and external stakeholders as part of the Six Sigma initiative.	( )	( )	( )	( )	( )	( )	( )
Processes in my organization include a circular feedback from internal resources and external resources.	( )	( )	( )	( )	( )	( )	( )
In your opinion, the circular relationships depicted in feedback loops draws connections to the consequences of specific actions taken, highlighting cause and effect.	( )	( )	( )	( )	( )	( )	( )
My company invites input and suggestions from our client on how we might improve our performance.	( )	( )	( )	( )	( )	( )	( )
In your opinion, systemic loops can serve as an objective way of analyzing, balancing and reinforcing forces.	( )	( )	( )	( )	( )	( )	( )
My organization continuously examines the feedback from its	( )	( )	( )	( )	( )	( )	( )

(table continues)

	Always	**Often**	**Some-times**	**Rarely**	**Never**	**I do not know**	**Not applicable**
employees, customers, suppliers, and regulatory agencies and revises its processes regularly.							
My organization uses a central repository where all organizational processes are available to everyone in your company at any given time.	( )	( )	( )	( )	( )	( )	( )
My organization has a governance body that reviews the process repository to identify interrelated and interdependent processes.	( )	( )	( )	( )	( )	( )	( )

Please indicate the frequency in which you organization engages in the following practices, using the scale below:

	Always	**Often**	**Some-times**	**Rarely**	**Never**	**I do not know**	**Not applicable**
The governance body of my organization reviews the process improvement initiative repository for documentation of both internal and external processes.	( )	( )	( )	( )	( )	( )	( )
My organization uses metrics to monitor organizational patterns to gain a view of the broader perspective of the organizational structure, including events taken within and	( )	( )	( )	( )	( )	( )	( )

(table continues)

	Always	**Often**	**Some-times**	**Rarely**	**Never**	**I do not know**	**Not applicable**
outside the organization.							
My organization when solving for a problem or examining process, examines all parts that make up a sub-system (inputs, outputs, feedback control, etc.).	( )	( )	( )	( )	( )	( )	( )
My organization's Six Sigma program identifies and incorporates the interrelationship of the organization's sub-system process when developing a new or revising an existing process.	( )	( )	( )	( )	( )	( )	( )
The Six Sigma team in my organization identifies patterns, recurring trends of interconnections, or casual links beyond the isolated events.	( )	( )	( )	( )	( )	( )	( )
My organization investigates the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental impacts that affects internal and external stakeholders.	( )	( )	( )	( )	( )	( )	( )
My organization's leaders recognize and reward those individuals who use a holistic approach for long-term solutions.	( )	( )	( )	( )	( )	( )	( )

Please select which constituents your organization seeks feedback from as part of your Six Sigma program. (Select all that apply)
[ ] Employees of the organization
[ ] Internal stakeholders
[ ] Consumers
[ ] External stakeholders
[ ] Suppliers
[ ] Government
[ ] None, the project team members are the SMEs and do not need to obtain feedback from others outside of the Six Sigma team members.
[ ] Other

Please complete the following as it applies to your organization, my organization communicates process improvement programs:
( ) When it impacts the entire organization.
( ) When it impacts a particular department only and communicates only to those who are impacted.
( ) When it impacts a particular department only and communicates to everyone in the organization.
( ) When it impacts external stakeholder and communicates to everyone in the organization.
( ) When it impacts external stakeholder and communicates to only those areas that support the customers.
( ) Does not communicate process improvement impacts.
( ) Other

Please select the key reason(s) your organization investigates the interdependencies and interrelationship of the organization's processes. (Select all that apply)
[ ] Improve organization efficiency
[ ] Improve customer service
[ ] Reduce waste
[ ] Reduce cost
[ ] Improve profitability
[ ] Gain competitive advantage
[ ] Identify root cause of problems
[ ] Influence by senior management
[ ] A number of our competitors are doing it
[ ] My organization does not investigate inter dependencies or interrelationship of processes throughout the organization unless process improvement impacts the entire organization.
[ ] Other

Identify all factors that made your organization's Six Sigma program a success. (Select all that apply)
[ ] Upper management support
[ ] Training
[ ] Application of statically tools
[ ] Bonuses, rewards are based on quality work

[ ] Program included a holistic approach
[ ] Program identified all stakeholders, including external ones
[ ] Program considered environmental impact
[ ] Program included circular feedback from interrelated and interdependent process of the organization
[ ] Program understood how the overall organization and its sub-systems work
[ ] Program traced links of the process and the influences of the others
[ ] Program identified internal and external customer expectations
[ ] Six Sigma program was not a success
[ ] Other

Please respond to the following statements using the scale below:
Definition:
Holistic – Looking at the whole picture of something and the interconnection of its parts rather than looking at the components of something. A view that the parts cannot exist independently, or cannot be understood without reference to the whole.

	Always	**Often**	**Some-times**	**Rarely**	**Never**	**I do not know**	**Not appli-cable**
Six Sigma programs in my organization include diagramming the entire system, reproducing the problem areas of analysis and conducting a test run to measure the outcomes before implementing a new process.	( )	( )	( )	( )	( )	( )	( )
The Six Sigma team in my organization is responsible for soliciting feedback from internal and external resources.	( )	( )	( )	( )	( )	( )	( )
Everyone in my organization is accountable for the holistic approach to process improvement.	( )	( )	( )	( )	( )	( )	( )
In my organization, a few dedicated individuals lead quality improvement.	( )	( )	( )	( )	( )	( )	( )

Select the extent to which Six Sigma plays a role in your organization.
( ) Used organization-wide
( ) Used in some parts of the organization
( ) Not used anymore
( ) Not yet used but plan to start
( ) Six Sigma is not used
( ) Do not know

15. a If selected "Not used anymore," please select all applicable factors that contributed for your organization to abandon the use of Six Sigma.

[ ] Lack of upper management support
[ ] The program focuses on the selected project only and does not focus on the dependent sub-system processes
[ ] Six Sigma program is too complicated
[ ] The program is weak in identifying all the stakeholders and impacts to their processes.
[ ] The program lacks understanding of the entire system
[ ] The Six Sigma method is not part of the overall daily work
[ ] Only the few who are trained in Six Sigma lead and are responsible for quality management
[ ] My organization continues to use Six Sigma
[ ] Other

My organization's use of systems thinking method with Six Sigma increased the success of the Six Sigma programs.
( ) Strongly agree
( ) Somewhat agree
( ) Agree
( ) Disagree
( ) Strongly disagree
( ) My company does not use systems thinking with Six Sigma
( ) Do not know

In your opinion, rate your company's Six Sigma program success.
( ) Highly successful
( ) Somewhat successful
( ) Indifferent
( ) Not successful
( ) Do not know
Complete the following statement: My Company's quality management program has been successful because we use...
( ) Six Sigma method alone
( ) Systems thinking method alone
( ) Systems thinking and Six Sigma methods together
( ) Do not know
( ) Other

Please respond to the following questions as they apply to your organization using the scale below:

	Always	**Often**	**Some-times**	**Rarely**	**Never**	**I do not know**	**Not appli-cable**
In your opinion, identify how often you believe that your work contributes to your organization and to the goals of your internal and external stakeholders.	( )	**( )**	**( )**	**( )**	( )	( )	( )
The leadership of my organization requires that all employees' annual performance evaluation include a systematic, holistic approach to solving problems as a goal.	( )	**( )**	**( )**	**( )**	( )	( )	( )
In my organization, my leadership rewards solving problems with a holistic approach.	( )	**( )**	**( )**	**( )**	( )	( )	( )
The sponsoring management of Six Sigma programs holds the Six Sigma team accountable for a holistic approach to process improvement.	( )	**( )**	**( )**	**( )**	( )	( )	( )

Indicate key reason(s) your organization has adopted Six Sigma method.
[ ] Improve organizational efficiency
[ ] Improve customer service
[ ] Reduce waste of resources
[ ] Reduce costs
[ ] Improve profitability
[ ] Gain competitive advantage
[ ] Identify root cause of problems
[ ] Influence by senior management
[ ] A number of our competitors are using Six Sigma
[ ] My company has not adopted Six Sigma
[ ] Other

Please check one of the following to enter the drawing for $50.00 Amazon.com gift certificate.
( ) Thanks but I do not wish to enter the drawing.
( ) Use the following e-mail address to enter me into the drawing.

Thank you for your time and participation. If you wish to receive a copy of a summary survey reported, please click on the link (insert reported URL address).

APPENDIX B

Survey Validation Form for Expert Reviewers

November 22, 2010

Dear [Insert Name of Expert Reviewer].

Thank you for agreeing to be an expert reviewer for the validation process of the "An Integrated Model of Six Sigma and systems thinking method to Quality Improvement" questionnaire. The following pages include the survey items that I believe necessary to answer my research questions. The research questions are as follows:

1. To what extent do organizations that implement Six Sigma with systems thinking as an integrated quality improvement method differ in the success and duration of their Six Sigma programs, as compared to those that implement Six Sigma as a standalone method?

2. What are the factors that contribute to the success of the integration of Six Sigma with systems thinking as an integrated organizational management method?

3. To what extent does organizational leadership support for an integrated model differ from support of Six Sigma as a standalone method?

The study includes both descriptive and quantitative and surveys practitioners of both Six Sigma and systems thinking across the world.

Please provide your comments in the spaces marked in the attached Word document. The Word document list survey items, instructions, and my research questions. At the end of each section, please mark whether you believe the items(s) for the section are sufficient to provide information to help answer the research question. If you believe that any of the survey items are irrelevant or inappropriate, please mark after the item(s). If you believe any of the item(s) are misleading or not worded properly, please offer any suggestions how the wording can be improved, as well as suggestions to improve the survey questionnaire ordering (successive questions that lead to an answer or a specific line of thinking).

Once you have completed this evaluation form, please e-mail it back to me as a Word document attachment as soon as possible. This survey will be formatted as an electronic survey and available for completion online once the content validity has been established. Therefore, the format of the survey will change once I have incorporated your feedback into the items themselves.

Again, thank you for your willingness to assist me in my research. If you have any questions or should you need any clarification, please contact me by e-mail at Marlene.Derian@Pepperdine.edu or by phone at [redacted].

Marlene Derian Robertson

Demographic Questions

1. Which of the following industry categories best describes your organization? (Please select one answer).
   (This will be a drop down list).

   a) Agriculture, Forestry, Fishing and Hunting
   b) Mining, Quarrying, and Oil and Gas Extraction
   c) Utilities
   d) Construction
   e) Manufacturing
   f) Wholesale Trade
   g) Retail Trade
   h) Transportation and Warehousing
   i) Information
   j) Finance and Insurance
   k) Real Estate and Rental and Leasing
   l) Professional, Scientific, and Technical Services
   m) Management of Companies and Enterprises
   n) Administrative and Support and Waste Management and Remediation Services
   o) Educational Services
   p) Health Care and Social Assistance
   q) Arts, Entertainment, and Recreation

Demographic Questions

   r) Accommodation and Food Services
   s) Public Administration
   t) Other Services – please complete

      1) Is this item worded correctly? ☐Yes ☐ No

      2) Have all the major industries been included? ☐Yes ☐ No

      3) If no, please provide missing industry or industries.

      4) Any other comments or suggestions?

2. Identify the country in which your organization headquarter is located.

Demographic Questions

(This will be a drop down list).

Afghanistan
Albania
Algeria
Andorra
Angola
Antigua and Barbuda
Argentina
Armenia
Australia
Austria
Azerbaijan
Bahamas, The
Bahrain
Bangladesh
Barbados
Belarus
Belgium
Belize
Benin
Bhutan
Bolivia
Bosnia and Herzegovina
Botswana
Brazil
Brunei
Bulgaria
Burkina Faso
Burma
Burundi
Cambodia
Cameroon
Canada
Cape Verde
Central African Republic
Chad
Chile
China
Colombia
Comoros
Congo (Brazzaville)
Congo (Kinshasa)
Costa Rica

Demographic Questions

Cote d'Ivoire
Croatia
Cuba
Cyprus
Czech Republic
Denmark
Djibouti
Dominica
Dominican Republic
East Timor (see Timor-Leste)
Ecuador
Egypt
El Salvador
Equatorial Guinea
Eritrea
Estonia
Ethiopia
Fiji
Finland
France
Gabon
Gambia, The
Georgia
Germany
Ghana
Greece
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Holy See
Honduras
Hong Kong
Hungary
Iceland
India
Indonesia
Iran
Iraq
Ireland
Israel
Italy

Jamaica
Japan
Jordan
Kazakhstan
Kenya
Kiribati
Korea, North
Korea, South
Kosovo
Kuwait
Kyrgyzstan
Laos
Latvia
Lebanon
Lesotho
Liberia
Libya
Liechtenstein
Lithuania
Luxembourg
Macau
Macedonia
Madagascar
Malawi
Malaysia
Maldives
Mali
Malta
Marshall Islands
Mauritania
Mauritius
Mexico
Micronesia
Moldova
Monaco
Mongolia
Montenegro
Morocco
Mozambique
Namibia
Nauru
Nepal
Netherlands
Netherlands Antilles

New Zealand
Nicaragua
Niger
Nigeria
North Korea
Norway
Oman
Pakistan
Palau
Palestinian Territories
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Portugal
Qatar
Romania
Russia
Rwanda
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Samoa
San Marino
Sao Tome and Principe
Saudi Arabia
Senegal
Serbia
Seychelles
Sierra Leone
Singapore
Slovakia
Slovenia
Solomon Islands
Somalia
South Africa
South Korea
Spain
Sri Lanka
Sudan
Suriname
Swaziland

Sweden
Switzerland
Syria
Taiwan
Tajikistan
Tanzania
Thailand
Timor-Leste
Togo
Tonga
Trinidad and Tobago
Tunisia
Turkey
Turkmenistan
Tuvalu
Uganda
Ukraine
United Arab Emirates
United Kingdom
United States of America
Uruguay
Uzbekistan
Vanuatu
Venezuela
Vietnam
Yemen
Zambia
Zimbabwe

1) Is this item worded correctly? ☐Yes ☐ No

2) Does this list provide the necessary list of countries? ☐Yes ☐ No

3) If no, please provide missing country or countries.

4) Any other comments or suggestions?

3. Select the number of employees in your organization.
   (This will be a drop down list from which respondent selects the number of employees in their organization).

   a) 1 – 500
   b) 501 - 999
   c) 1,000 -4,999
   d) 5,000 -9,999
   e) 10,000 or more

   1) Is this item worded correctly? ☐Yes ☐ No

   2) Is the number of employees in an organization range appropriate? ☐Yes ☐ No

   3) If no, please provide your recommendation.

   4) Any other comments or suggestions?

Demographic Questions

4. How many years has your organization used Six Sigma as a quality method?
   (This will be a drop down list).

   a) 1 year or less
   b) 2 - 5 years
   c) 6 - 10 years
   d) 10 years or more
   e) My organization does not use Six Sigma

   1) Is this item worded correctly? ☐Yes ☐ No

   2) Are the ranges for level of experience appropriate? ☐Yes ☐ No

   3) If not, please provide your recommendation.

4) Any other comments or suggestions?

5. How many years has your organization used systems thinking method as a holistic approach to solving problems or for process improvement?
   (This will be a drop down list).

   a) 1 year or less
   b) 2 - 5 years
   c) 6 - 10 years
   d) 10 years or more
   e) My organization does not use systems thinking

   1) Is this item worded correctly? ☐Yes ☐ No

   2) Does the range of years to indicate level of experience appropriate? ☐Yes ☐ No

   3) If no, please provide your recommendation.

   4) Any other comments or suggestions?

Demographic Questions

---

6. Does your organization use an integrated model (Integrated model is defined as combining Six Sigma and systems thinking methods) for solving problems or for process improvement? If yes, indicate the length of time.
   (This will be a drop down list).

   a) 1 year or less
   b) 2 - 5 years
   c) 6 - 10 years
   d) 10 years or more
   e) Not applicable, my organization does not use an integrated model.

   1) Is this question worded correctly? ☐Yes ☐ No

   2) Are the ranges appropriate? ☐Yes ☐ No

3) If no, please provide your recommendation.

4) Any other comments or suggestions?

Demographic Section Comments

Do you believe items 1 through 7 adequately provide information on the respondent's background to establish respondent's level of exposure to Six Sigma and systems thinking methods? ☐Yes ☐ No

If no, please comment on other questions that you believe will be necessary to obtain data sufficiently establish respondent's the level of exposure to Six Sigma and systems thinking.

Please provide other comments or suggestions regarding this section.

ITEMS RELATING TO RESEARCH QUESTION 1

1. *To what extent do organizations that implement Six Sigma with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma programs, as compared to those that implement Six Sigma as a standalone method?*
   a) = Always
   b) = Often
   c) = Sometimes
   d) = Rarely
   e) = Never
   f) = I do not know

#	Question	a) b) c) d) e) f)
8.	Indicate if your organization includes feedback from internal and external stakeholders as part of the Six Sigma initiative.	
9.	Processes in your organization include a circular feedback from internal resources and external resources.	
10.	In your opinion, the circular relationships depicted in feedback loops draws connections to the consequences of specific actions taken, highlighting cause and effect.	
11.	My company's invites input and suggestions from our client on how we might improve our performance.	

12.	In your opinion, systemic loops can serve as an objective way of analyzing, balancing, and reinforcing forces.	
14.	Your organization continuously examines the feedback from its employees, customers, suppliers, and regulatory agencies and revises its processes regularly.	
15.	Does your organization use a central repository where all organizational processes are available to everyone in your company at any given time?	
16.	Does your organization have a governance body that reviews the process repository to identify interrelated and interdependent processes?	
17.	Indicate the frequency your organization's governance body reviews the process improvement initiatives, including reviews the repository for documented process for internal and external processes	
21.	Indicate if your organization uses metrics to monitor organizational patterns to gain a view of the broader perspective of the organizational structure, including events taken within and outside the organization.	
23.	My organization leaders can view the structure and map connections between subsystems and the whole to facilitate a systemic perspective.	

ITEMS RELATING TO RESEARCH QUESTION 1

#	Question	a) b) c) d) e) f)
24.	In your opinion, when solving for a problem or examining process, all parts that make up a sub-system must be examined (inputs, outputs, feedback control, etc.).	
26.	My organization's Six Sigma programs identify and incorporate the interrelationship of the organization's sub-system process when developing a new or revising an existing process.	
28.	The Six Sigma team in my organization identifies patterns, recurring trends of interconnections, or casual links beyond the isolated events.	
29.	My organization investigates the root cause of a problem by analyzing all inputs, processes and outputs of a process by examining the inter-departmental impacts that impacts internal and external stakeholders	
33.	My organization’s leaders recognize and reward those individuals who use holistic approach for long-term solutions.	

1) Are these questions worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

ITEMS RELATING TO RESEARCH QUESTION 1

13. Select as many as applicable, part of the Six Sigma process improvement program, your organization seeks feedback from
(This will be a drop down list).

a) Employees of the organization
b) Internal stakeholders
c) Consumers
d) External stakeholders
e) Suppliers
f) Government
g) None, the project team members are the SMEs and do not need to obtain feedback from others outside of the Six Sigma team members

1) Is this question worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

25. My organization communicates process improvement programs.
(This will be a drop down list).

a) When it impacts the entire organization
b) When it impacts a particular department only and communicates only to those who are impacted
c) When it impacts a particular department only and communicates to everyone in the organization
d) When it impacts external stakeholder and communicates to everyone in the organization
e) When it impacts external stakeholder and communicates to only those areas that support the customers
f) Does not communicate process improvement impacts.

1) Is this question worded correctly? ☐Yes ☐ No

ITEMS RELATING TO RESEARCH QUESTION 1

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

27. Key reason(s) my organization investigates the interdependencies and interrelationship of the organization's processes, select as many as applicable. (This will be a drop down list).

a) Improve organization efficiency
b) Improve customer service
c) Reduce waste
d) Reduce cost
e) Improve profitability
f) Gain competitive advantage
g) Identify root cause of problems
h) Influence by senior management
i) A number of our competitors are doing it
j) None of the above
k) My company does not investigate interdependencies or interrelationship of processes throughout the organization unless process improvement impacts the entire organization.

1) Is this question worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

ITEMS RELATING TO RESEARCH QUESTION 1

43. Identify all factors that made your organization's Six Sigma program a success. (This will be a drop down list).

a) Upper management support
b) Training
c) Application of statically tools
d) Bonuses, rewards are based on quality work
e) Program included a holistic approach
f) Program identified all stakeholders, including external ones
g) Program considered environmental impact
h) Program included circular feedback from interrelated and interdependent process of the organization
i) Program understood how the overall organization and its sub-systems work
j) Program traced links of the process and the influences of the others
k) Program identified internal and external customer expectations
l) None of the above
m) Six Sigma program was not a success

1) Is this question worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

Items Relating to Research Question 1 Comment Section

Do you believe that these items adequately provide information to answer research question 1?

If no, please comment on other questions that you believe will be necessary to obtain data sufficiently answer research question 1:

ITEMS RELATING TO RESEARCH QUESTION 2

2. *What are the factors that contribute to the success of the integrated model?*
   a) = Always
   b) = Often
   c) = Sometimes
   d) = Rarely
   e) = Never
   f) = I do not know

#	Question	a) b) c) d) e) f)
30.	Six Sigma team in my organization is responsible for soliciting feedback from internal and external resources	
40.	Everyone in my company is accountable for holistic approach to process improvement.	
41.	In my organization, quality improvement is led by a few dedicated individuals.	

1) Are these questions worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

ITEMS RELATING TO RESEARCH QUESTION 2

34. Select the extent to which Six Sigma plays a role in your organization.
(This will be a drop down list).

a) Used organizational wide
b) Used in some parts of the organization
c) Not used anymore
d) Not yet used but planned to start
e) Not used

1) Is this question worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

35. My organization use of systems thinking method with Six Sigma increased the success of the Six Sigma programs.
(This will be a drop down list).

a) Strongly Agree
b) Somewhat Agree
c) Agree
d) Disagree
e) Strongly Disagree
f) My company does not use systems thinking with Six Sigma as a method

1) Is this question worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

ITEMS RELATING TO RESEARCH QUESTION 2

37. In your opinion, rate your company's Six Sigma program success.
(This will be a drop down list).

a) Highly successful
b) Somewhat successful
c) Indifferent
d) Not Successful

1) Are these questions worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

36. My company's quality management program has been successful because we use select one answer only.
(This will be a drop down list).

a) Six Sigma method alone
b) Systems thinking method alone
c) Systems thinking and Six Sigma methods together
d) None of the above

1) Is this question worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

ITEMS RELATING TO RESEARCH QUESTION 2

38. Briefly describe why your company's Six Sigma program has been successful.
(This will be a free format, open-ended item for participants to comment).

1) Is this question worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

39. If you selected not successful for question number 36, describe why it was not successful.
(This will be a free format, open-ended item for participants to comment).

1) Is this question worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

42. Select all applicable factors that contributed for your organization to abandon the use of Six Sigma.
(This will be a drop down list).

a) Lack of upper management support
b) The program focuses on the selected project only and does not focus on the dependent sub-system processes
c) Six Sigma program is too complicated
d) The program is weak in identifying all the stakeholders and impacts to their processes.

ITEMS RELATING TO RESEARCH QUESTION 2

e) The program lacks understanding of the entire system
f) The Six Sigma method is not part of the overall daily work
g) Only the few who are trained in Six Sigma lead and are responsible for quality management
h) My organization continues to use Six Sigma

1) Is this question worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

43. Select all applicable factors that contributed for your organization to abandon the use of Six Sigma.
(This will be a drop down list).

a) Lack of upper management support
b) The program focuses on the selected project only and does not focus on the dependent sub-system processes
c) Six Sigma program is too complicated
d) The program is weak in identifying all the stakeholders and impacts to their processes
e) The program lacks understanding of the entire system
f) The Six Sigma method is not part of the overall daily work
g) Only the few who are trained in Six Sigma lead and are responsible for quality management
h) My organization continues to use Six Sigma

1) Are these questions worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

Items Relating to Research Question 2 Comment Section

Do you believe that these items adequately provide information to answer research question 2?

If no, please comment on other questions that you believe will be necessary to obtain data sufficiently answer research question 2:

ITEMS RELATING TO RESEARCH QUESTION 3

3. To what extent organizational leadership support for an integrated model differs from support of Six Sigma as a standalone method?

a) = Always
b) = Often
c) = Sometimes
d) = Rarely
e) = Never
f) = I do not know

#	Question	a) b) c) d) e) f)
18.	In your opinion, how often you have an understanding of the work you do contributes to your organizational, including external stakeholders' goals?	
19.	Does your organization leadership include in the employee's annual performance goal systematic, holistic approach to solving problems.	
20.	In your organization, your leadership rewards solving problems with a holistic approach.	
22.	In your opinion, Six Sigma programs in your organization include diagramming the entire system, reproducing the problem areas of analysis and conduct test run to measure the outcomes before implementing a new process.	
32.	The sponsoring management of Six Sigma programs holds the Six Sigma team accountable for holistic approach to process improvement.	

ITEMS RELATING TO RESEARCH QUESTION 3

1) Are these questions worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

31. Indicate key reason(s) your organization has adopted Six Sigma method, select as many as applicable.
(This will be a drop down list).

a) Improve organization efficiency
b) Improve customer service
c) Reduce waste
d) Reduce cost
e) Improve profitability
f) Gain competitive advantage
g) Identify root cause of problems
h) influence by senior management
i) A number of our competitors are using Six Sigma
j) None of the above
k) My company has not adopted Six Sigma

1) Are these questions worded correctly? ☐Yes ☐ No

2) If no, please provide your recommendation.

3) Any other comments or suggestions?

Items Relating to Research Question 3 Comment Section

Do you believe that these items adequately provide information to answer research question 3?

If no, please comment on other questions that you believe will be necessary to obtain data sufficiently answer research question 3:

Appendix C

Letters Sent to Professional Associations

- System Dynamics Society
- International Society for the Systems Science (ISSS)
- International Society of Six Sigma Professionals (ISSSP)
- Systems Thinking World
- Project Management Institute (PMI)
- iSix Sigma

E-Mail Letter to Systems Dynamics Society

Marlene Derian Robertson

November 16, 2010,

Dear Systems Dynamics Society,

I am a graduate student in Organizational Leadership at Pepperdine University conducting a survey on Six Sigma and systems thinking, an integrated approach to quality improvement for my dissertation. The intent of this e-mail is to request permission to distribute my survey questionnaire to your membership.

The purpose of this study is to examine to what extent, if at all, do organizations, which implement Six Sigma with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma programs, as compared to those organizations that implement Six Sigma as a standalone method. I will also be examining factors that contribute to the success of the integrated model and the extent of organizational leadership support for an integrated model differs from support of Six Sigma as a standalone method.

I will be seeking volunteers from your organization to participate in my research and complete a questionnaire. The survey will be an online questionnaire and will be administered by way of Web-based electronic survey software, SurveyGizmo™. Respondents will be assured that their names will not be associated or mentioned in the research results, and that confidentiality of their responses will be maintained. Only aggregate (group) results will be presented or documented, not individual answers. Furthermore, to ensure that no individually identifying information is collected, a setting of the survey tool will be adjusted to ensure responses cannot be tracked to the source. Therefore, neither individuals' names, emails, nor the respondents' IP addresses will note be associated to their answers. The survey will take no more than 30 to 35 minutes to complete. All participants will be offered an opportunity to win an incentive for participating in the study and responding to the e-survey. Contact information for the incentive will be collected and maintained independently from the respondents' answers.

Your organization's participation in this research project is greatly appreciated. Can you please extend your approval to allow me to distribute my survey questionnaire to your membership?

The results of this survey will be presented publicly at Pepperdine University. I will be happy to provide your organization with a summary copy. If you are interested in receiving a copy, please let me know.

Please confirm your approval at your earliest convenience. If you have questions or concerns, please contact me at [redacted], and/or via email at Marlene.Derian@Pepperdine.edu. You may also contact my faculty advisor, Doug Leigh, Ph.D. at [redacted], or DLeigh@Pepperdine.edu. Thank you for your time and consideration.

Sincerely,
Marlene Derian Robertson
Doctoral Student, Doctor of Education in Organizational Leadership, Pepperdine University

Fax Letter Sent to ISSS

Marlene Derian Robertson
[redacted]

November 23, 2010,

Dear ISSS:

I would like to enlist your help. I am a graduate student in Organizational Leadership at Pepperdine University, in California, U.S.A. I am conducting a survey on Six Sigma and systems thinking, an integrated approach to quality improvement for my dissertation.

The purpose of the study is to examine to what extent, if at all, do organizations, which implement Six Sigma with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma programs as compared to those organizations that implement Six Sigma as a standalone method. I will also be examining factors that contribute to the success of the integrated model and the extent of organizational leadership support for an integrated model differs from support of Six Sigma as a standalone method.

I will be seeking volunteers from your organization to participate in my research by completing a survey questionnaire. The survey will be an online questionnaire and will be administered by way of Web-based electronic survey SurveyGizmo™. Respondents will be assured that their names will not be mentioned in the research results and that confidentiality of their responses will be maintained. Only group results will be presented or documented, not individual answers. Furthermore, to ensure that no individually identifying information is collected, the survey tool setting, offered by SurveyGizmo™, will be adjusted to ensure responses cannot be tracked to the source, including respondents' IP address. The survey will take no more than 30-35 minutes to complete. All participants will be offered an incentive for participating in the study and responding to the e-survey.

Your organization's participation in this research project is greatly appreciated. Would you please help me by allowing me to distribute my survey questionnaire to your membership?

The results of this survey will be presented publicly at Pepperdine University. I will be happy to provide your organization with a summary copy. If you are interested in receiving a copy, please let me know.

If you have questions or concerns, please contact me at [redacted] Marlene.Derian@Pepperdine.edu. You may also contact my faculty advisor, Doug Leigh, Ph.D. at [redacted], DLeigh@Pepperdine.edu. Thank you for your time and consideration.

Sincerely,
Marlene Derian Robertson
Doctoral Student, Doctor of Education in Organizational Leadership, Pepperdine University

Fax Letter Sent to ISSSP

Marlene Derian Robertson
[redacted]

November 22, 2010,

Dear ISSSP:

I would like to enlist your help. I am a graduate student in Organizational Leadership at Pepperdine University. I am conducting a survey on Six Sigma and systems thinking, an integrated approach to quality improvement for my dissertation.

The purpose of the study is to examine to what extent, if at all, do organizations, which implement Six Sigma with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma programs as compared to those organizations that implement Six Sigma as a standalone method. I will also be examining factors that contribute to the success of the integrated model and the extent of organizational leadership support for an integrated model differs from support of Six Sigma as a standalone method.

I will be seeking volunteers from your organization to participate in my research by completing a survey questionnaire. The survey will be an online questionnaire and will be administered by way of Web-based electronic survey SurveyGizmo™. Respondents will be assured that their names will not be mentioned in the research results and that confidentiality of their responses will be maintained. Only group results will be presented or documented, not individual answers. Furthermore, to ensure that no individually identifying information is collected, the survey tool setting, offered by SurveyGizmo™, will be adjusted to ensure responses cannot be tracked to the source, including respondents' IP address. The survey will take no more than 30-35 minutes to complete. All participants will be offered an incentive for participating in the study and responding to the e-survey.

Your organization's participation in this research project is greatly appreciated. Would you please help me by allowing me to distribute my survey questionnaire to your membership?

The results of this survey will be presented publicly at Pepperdine University. I will be happy to provide your organization with a summary copy. If you are interested in receiving a copy, please let me know.

If you have questions or concerns, please contact me at [redacted], Marlene.Derian@Pepperdine.edu. You may also contact my faculty advisor, Doug Leigh, Ph.D. at [redacted], DLeigh@Pepperdine.edu. Thank you for your time and consideration.

Sincerely,
Marlene Derian Robertson
Doctoral Student, Doctor of Education in Organizational Leadership, Pepperdine University

E-Mail Letter to Project Management Institute

Marlene Derian Robertson
[redacted]

January 25, 2010

Ms. Deedra Goldsmith
Academic Resources Department
Project Management Institute
14 Campus Boulevard
Newtown Square, PA 19073-3299 USA

Dear Ms. Goldsmith,

I am a graduate student in Organizational Leadership at Pepperdine University conducting a survey on Six Sigma and systems thinking, an integrated approach to quality improvement for my dissertation. The intent of this e-mail is to request permission to distribute my survey questionnaire to your membership.

The purpose of this study is to examine to what extent, if at all, do organizations, which implement Six Sigma projects with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma projects, as compared to those organizations that implement Six Sigma as a standalone method. I will also be examining factors that contribute to the success of the integrated model and the extent of organizational leadership support for an integrated model differs from support of Six Sigma as a standalone method.

I will be seeking volunteers from your organization, Project Management Institute, to participate in my research and complete a questionnaire. The survey will be an online questionnaire. A link to the survey will be distributed to your members by way of Web-based electronic survey software, SurveyGizmo™. Respondents will be assured that their names will not be associated or mentioned in the research results, and that confidentiality of their responses will be maintained. The survey responses will be strictly confidential. To safeguard confidentiality, the survey tool settings, offered by SurveyGizmo™, are adjusted to ensure the responses cannot be tracked to the source, including the IP address. All answers will be kept confidential. Only aggregate (group) results will be presented or documented, not individual answers.

The survey will take no more than 30 to 35 minutes to complete. All participants will be offered an opportunity to win an incentive for participating in the study and responding to the e-survey. Participation in the drawing is voluntary. Should the participant choose to participate; his or her contact information for the drawing will be collected and maintained independently from their answers.

The results of this survey will be presented publicly at Pepperdine University. I will be happy to provide your organization with a summary copy. If you are interested in receiving a copy, please let me know.

Your organization's participation in this research project is greatly appreciated. Would you please consider extend approval to allow me to distribute my survey questionnaire to your membership? Please confirm your approval at your earliest convenience. If you have questions, need additional information, or concerns, please contact me at [redacted], and/or via email at Marlene.Derian@Pepperdine.edu. You may also contact my faculty advisor, Doug Leigh, Ph.D. at [redacted], or DLeigh@Pepperdine.edu. Thank you for your time and consideration.

Sincerely,

Marlene Derian Robertson
Doctoral Candidate, Doctor of Education in Organizational Leadership, Pepperdine University

Marlene Derian Robertson
[redacted]

January 28, 2010

Terry Kirsten, Sr. Editor
iSixSigma

Dear Terry Kirsten,

I am a graduate student in Organizational Leadership at Pepperdine University conducting a survey on Six Sigma and systems thinking, an integrated approach to quality improvement for my dissertation. The intent of this e-mail is to request permission to distribute my survey questionnaire to your membership.

The purpose of this study is to examine to what extent, if at all, do organizations, which implement Six Sigma projects with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma projects, as compared to those organizations that implement Six Sigma as a standalone method. I will also be examining factors that contribute to the success of the integrated model and the extent of organizational leadership support for an integrated model differs from support of Six Sigma as a standalone method.

I will be seeking volunteers from your organization, iSixSigma, to participate in my research and complete a questionnaire. The survey will be an online questionnaire. A link to the survey will be distributed to your members by way of Web-based electronic survey software, SurveyGizmo™. Respondents will be assured that their names will not be associated or mentioned in the research results, and that confidentiality of their responses will be maintained. The survey responses will be strictly confidential. To safeguard confidentiality, the survey tool settings, offered by SurveyGizmo™, are adjusted to ensure the responses cannot be tracked to the source, including the IP address. All answers will be kept confidential. Only aggregate (group) results will be presented or documented, not individual answers.

The survey will take no more than 30 to 35 minutes to complete. All participants will be offered an opportunity to win an incentive for participating in the study and responding to the e-survey. Participation in the drawing is voluntary. Should the participant choose to participate; his or her contact information for the drawing will be collected and maintained independently from their answers.

The results of this survey will be presented publicly at Pepperdine University. I will be happy to provide your organization with a summary copy. If you are interested in receiving a copy, please let me know.

Your organization's participation in this research project is greatly appreciated. Would you please consider extend approval to allow me to distribute my survey questionnaire to your membership? Please confirm your approval at your earliest convenience. If you have questions, need additional information, or concerns, please contact me at [redacted] and/or via email at Marlene.Derian@Pepperdine.edu. You may also contact my faculty advisor, Doug Leigh, Ph.D. at [redacted], or DLeigh@Pepperdine.edu. Thank you for your time and consideration.

Sincerely,

Marlene Derian Robertson
Doctoral Candidate, Doctor of Education in Organizational Leadership, Pepperdine University

Proposed E-mail Letter to Systems Thinking Group for Pilot Study

Marlene Derian Robertson
[redacted]

1/13/2011

Dear Mr. Gene Bellinger,

I am a graduate student in Organizational Leadership at Pepperdine University conducting a survey on Six Sigma and systems thinking, an integrated approach to quality improvement for my dissertation. The intent of this e-mail is to request permission to distribute my survey questionnaire to your membership.

The purpose of this study is to examine to what extent, if at all, do organizations, which implement Six Sigma with systems thinking as an integrated quality improvement, differ in the success and duration of their Six Sigma programs, as compared to those organizations that implement Six Sigma as a standalone method? I will also be examining factors that contribute to the success of the integrated model and the extent of organizational leadership support for an integrated model differs from support of Six Sigma as a standalone method.

I have recently validated the content of my electronic survey and now need to pilot it. I will be seeking volunteers from your group to participate in my pilot study in helping determine the reliability of my survey, as well as survey's ease of use. The survey will be an online questionnaire and will be administered by way of Web-based electronic survey software, SurveyGizmo™. Respondents will be assured that their names will not be associated or mentioned in the research results, and that confidentiality of their responses will be maintained. The survey will take no more than 30 to 35 minutes to complete.

All participants will be offered an opportunity to win an incentive for participating in the study and responding to the e-survey. Contact information for the incentive will be collected and maintained independently from the respondents' answers.

Your group's participation in this pilot study is greatly appreciated. Can you please extend your approval to allow me to distribute my pilot survey questionnaire to your group?

Once the pilot survey is completed and necessary revisions are made to the instrument, the survey will be administered to a larger population. The results of this survey will be presented publicly at Pepperdine University. I will be happy to provide your organization with a summary copy. If you are interested in receiving a copy, please let me know.

Please confirm your approval at your earliest convenience. If you have questions or concerns, please contact me at [redacted], and/or via email at

Marlene.Derian@Pepperdine.edu. You may also contact my faculty advisor, Doug Leigh, Ph.D. at [redacted], or DLeigh@Pepperdine.edu. Thank you for your time and consideration.

Sincerely,
Marlene Derian Robertson
Doctoral Student, Doctor of Education in Organizational Leadership, Pepperdine University

Appendix D

Proposed SurveyGizmo™ Website Invitation Message to Pilot Group Participants

Greetings,

I am a graduate student in Organizational Leadership at Pepperdine University and would like to enlist your help. I am conducting a survey on Six Sigma and systems thinking as an integrated approach to quality improvement for my dissertation, and am seeking your participation to gather data for my study.

I have validated the content of my survey and now need to conduct a pilot test of the electronic version. My target population includes both working and academic professionals who have background in this subject matter. I am seeking volunteers from this group to help determine the reliability of my survey, in addition to the survey's ease of use.

The purpose of the study is to examine to what extent, if at all, do organizations, which implement Six Sigma with systems thinking as an integrated quality improvement method, differ in the success and duration of their Six Sigma program, as compared to those that implement Six Sigma as a standalone method. The study will also examine factors that contribute to the success of this integrated model and the leadership support.

Your survey responses will be strictly confidential. To safeguard confidentiality, the survey tool settings, offered by SurveyGizmo™, are adjusted to ensure your responses cannot be tracked to the source, including your IP address. The responses you provide will be reported only in aggregate; your information will be coded and will remain anonymous and confidential. The pilot survey on average takes about 30 - 35 minutes to complete, and is available for completion until February 2, 2011. You will have an opportunity to enter into a drawing for one of three $50 (USD) gift certificates from Amazon.com after the final survey is closed.

If you have questions at any time about the survey or have difficulty accessing the survey, please contact me at Marlene.Derian@Pepperdine.edu.

Please start with the survey now by clicking on the "**Next"** button below. If at any time, you wish to stop and continue later, please click on the link "**Save and Continue with Survey Later**" located at the top of each page. Once you click on it, please follow the instructions to save your work.

Thank you for participating in this pilot study. I greatly appreciate your time and assistance.

Sincerely,

Marlene Derian Robertson
Doctoral Candidate, Doctor of Education in Organizational Leadership, Pepperdine University

Appendix E

Institutional Review Board (IRB) Approval

PEPPERDINE UNIVERSITY

Graduate & Professional Schools Institutional Review Board

May 25, 2011

Marlene Derian Robertson

[redacted]

Protocol #: E0311D23
Project Title: *Systems Thinking and Six Stigma: Exploring an Integrated Model for Quality Management*

Dear Ms. Robertson:

Thank you for submitting the revisions requested by Pepperdine University's Graduate and Professional Schools IRB (GPS IRB) for your study, *Systems Thinking and Six Stigma: Exploring an Integrated Model for Quality Management*. The IRB has reviewed your revisions and found them acceptable. You may proceed with your study. The IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations 45 CFR 46 - http://www.nihtraining.com/ohsrsite/guidelines/45cfr46.html that govern the protections of human subjects. Specifically, section 45 CFR 46.101(b)(2) states:

> (b) Unless otherwise required by Department or Agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:
>
> **Category (2) of 45 CFR 46.101**, research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: a) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

In addition, your application to waive documentation of consent, as indicated in your **Application for Waiver or Alteration of Informed Consent Procedures** form has been **approved**.

Your research must be conducted according to the proposal that was submitted to the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit a **Request for Modification Form** to the GPS IRB. Because your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the GPS IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the GPS IRB as soon as possible. We will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the GPS IRB and the appropriate form to be used to report this information can be found in the *Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual* (see link to "policy material" at http://www.pepperdine.edu/irb/graduate/).

6100 Center Drive, Los Angeles, California 90045 ▪ 310-568-5600

Please refer to the protocol number denoted above in all further communication or correspondence related to this approval. Should you have additional questions, please contact me. On behalf of the GPS IRB, I wish you success in this scholarly pursuit.

Sincerely,

Jean Kang, CIP
Manager, GPS IRB & Dissertation Support
Pepperdine University
Graduate School of Education & Psychology
6100 Center Dr. 5th Floor
Los Angeles, CA 90045
jean.kang@pepperdine.edu
W: 310-568-5753
F: 310-568-5755

cc: Dr. Lee Kats, Associate Provost for Research & Assistant Dean of Research, Seaver College
Ms. Alexandra Roosa, Director Research and Sponsored Programs
Dr. Yuying Tsong, Interim Chair, Graduate and Professional Schools IRB
Ms. Jean Kang, Manager, Graduate and Professional Schools IRB
Dr. June Schmieder-Ramirez
Ms. Christie Dailo

Appendix F

Cross Tabulation Tables

Table 62

Crosstab for Percentage of Organizations Size and Years Organization Used Six Sigma as a Quality Method (N = 284)

Years Six Sigma Use		Size				Total
		1 - 499	500 - 4,999	5,000 - 9,999	10,000 or more	
1 year or less	Count	7	5	0	4	16
	% of Total	2.5%	1.8%	0.0%	1.4%	5.6%
2 - 5 years	Count	16	33	15	28	92
	% of Total	5.6%	11.6%	5.3%	9.9%	32.4%
6 - 10 years	Count	7	18	8	34	67
	% of Total	2.5%	6.3%	2.8%	12.0%	23.6%
Over 10 years or more	Count	9	9	1	33	52
	% of Total	3.2%	3.2%	0.4%	11.6%	18.3%
My organization does not use Six Sigma	Count	27	11	5	6	49
	% of Total	9.5%	3.9%	1.8%	2.1%	17.3%
I do not know if my organization uses Six Sigma	Count	2	0	3	3	8
	% of Total	0.7%	0.0%	1.1%	1.1%	2.8%
Total	Count	68	76	32	108	284
	% of Total	23.9%	26.8%	11.3%	38.0%	100.0%

Table 63

Crosstab for Percentage of Organizations Size Years Organization Used Integrated Model as a Quality Method (N = 233)

Years Integrated Use		Size				
		1 - 499	500 - 4,999	5,000 - 9,999	10,000 or more	Total
1 year or less	Count	7	5	2	11	25
	% of Total	3.0%	2.1%	0.9%	4.7%	10.7%
2 - 5 years	Count	9	13	6	17	45
	% of Total	3.9%	5.6%	2.6%	7.3%	19.3%
6 - 10 years	Count	4	7	1	12	24
	% of Total	1.7%	3.0%	0.4%	5.2%	10.3%
Over 10 years or more	Count	8	7	2	9	26
	% of Total	3.4%	3.0%	0.9%	3.9%	11.2%
Not applicable, my organization doesn't use an integrated model	Count	20	29	8	25	82
	% of Total	8.6%	12.4%	3.4%	10.7%	35.2%
I do not know if my organization uses an integrated model	Count	4	5	6	16	31
	% of Total	1.7%	2.1%	2.6%	6.9%	13.3%
Total	Count	52	66	25	90	233
	% of Total	22.3%	28.3%	10.7%	38.6%	100.0%

Table 64

Crosstab for Percentage of Years Six Sigma Used by Industry with Six Sigma (N = 284)

Industry		Years Six Sigma Use						Total
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	
Aerospace / Aviation / Automotive	Count	0	7	6	9	0	0	22
	% of Total	0.0%	2.5%	2.1%	3.2%	0.0%	0.0%	7.7%
Biotechnology	Count	0	0	0	1	0	0	1
	% of Total	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.4%
Business / Professional Services	Count	2	3	1	2	1	0	9
	% of Total	0.7%	1.1%	0.4%	0.7%	0.4%	0.0%	3.2%
Business Services (Hotels, Lodging Places)	Count	0	1	0	1	0	0	2
	% of Total	0.0%	0.4%	0.0%	0.4%	0.0%	0.0%	0.7%
Computers (Hardware, Desktop Software)	Count	0	2	2	4	2	1	11
	% of Total	0.0%	0.7%	0.7%	1.4%	0.7%	0.4%	3.9%
Communications	Count	0	1	0	0	0	0	1
	% of Total	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.4%
Construction / Home Improvement	Count	0	1	0	0	1	0	2
	% of Total	0.0%	0.4%	0.0%	0.0%	0.4%	0.0%	0.7%
Consulting	Count	2	3	3	9	5	0	22
	% of Total	0.7%	1.1%	1.1%	3.2%	1.8%	0.0%	7.7%

(table continues)

Industry		Years Six Sigma Use						Total
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	
Education	Count	1	0	1	1	11	4	18
	% of Total	0.4%	0.0%	0.4%	0.4%	3.9%	1.4%	6.3%
Engineering / Architecture	Count	0	2	1	1	1	0	5
	% of Total	0.0%	0.7%	0.4%	0.4%	0.4%	0.0%	1.8%
Finance / Banking / Insurance	Count	1	10	6	3	4	0	24
	% of Total	0.4%	3.5%	2.1%	1.1%	1.4%	0.0%	8.5%
Food Service	Count	0	0	0	1	0	0	1
	% of Total	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.4%
Government / Military	Count	2	4	6	1	4	1	18
	% of Total	0.7%	1.4%	2.1%	0.4%	1.4%	0.4%	6.3%
Healthcare / Medical	Count	2	8	6	4	2	0	22
	% of Total	0.7%	2.8%	2.1%	1.4%	0.7%	0.0%	7.7%
Internet	Count	0	2	0	0	0	0	2
	% of Total	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.7%
Manufacturing	Count	4	27	20	8	9	0	68
	% of Total	1.4%	9.5%	7.0%	2.8%	3.2%	0.0%	23.9%
Marketing / Market Research / Public Relations	Count	0	1	2	0	0	0	3
	% of Total	0.0%	0.4%	0.7%	0.0%	0.0%	0.0%	1.1%
Mining / Quarrying / Oil and Gas Extraction	Count	0	2	1	0	0	0	3
	% of Total	0.0%	0.7%	0.4%	0.0%	0.0%	0.0%	1.1%

(table continues)

Industry		Years Six Sigma Use						Total
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	
Non-Profit	Count	0	0	0	0	3	0	3
	% of Total	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	1.1%
Pharmaceutical / Chemical	Count	0	6	5	2	0	1	14
	% of Total	0.0%	2.1%	1.8%	0.7%	0.0%	0.4%	4.9%
Research / Science	Count	0	0	0	0	3	1	4
	% of Total	0.0%	0.0%	0.0%	0.0%	1.1%	0.4%	1.4%
Retail	Count	0	2	1	2	0	0	5
	% of Total	0.0%	0.7%	0.4%	0.7%	0.0%	0.0%	1.8%
Telecommunications	Count	1	4	1	1	0	0	7
	% of Total	0.4%	1.4%	0.4%	0.4%	0.0%	0.0%	2.5%
Transportation / Distribution	Count	0	2	2	0	2	0	6
	% of Total	0.0%	0.7%	0.7%	0.0%	0.7%	0.0%	2.1%
Utilities	Count	1	1	0	0	1	0	3
	% of Total	0.4%	0.4%	0.0%	0.0%	0.4%	0.0%	1.1%
Other	Count	0	3	3	2	0	0	8
	% of Total	0.0%	1.1%	1.1%	0.7%	0.0%	0.0%	2.8%
Total	Count	16	92	67	52	49	8	284
	% of Total	5.6%	32.4%	23.6%	18.3%	17.3%	2.8%	100.0%

Table 65

Crosstab for Percentage of Years Integrated Used by Industry with Integrated (N = 233)

Industry		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Integrated	I do not know if my organization uses Integrated	Total
Aerospace / Aviation / Automotive	Count	1	4	1	4	7	2	19
	% of Total	0.4%	1.7%	0.4%	1.7%	3.0%	0.9%	8.2%
Biotechnology	Count	0	0	0	0	0	1	1
	% of Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%
Business / Professional Services	Count	3	1	2	0	2	0	8
	% of Total	1.3%	0.4%	0.9%	0.0%	0.9%	0.0%	3.4%
Business Services (Hotels, Lodging Places)	Count	0	0	0	0	0	2	2
	% of Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.9%
Computers (Hardware, Desktop Software)	Count	0	2	1	2	4	1	10
	% of Total	0.0%	0.9%	0.4%	0.9%	1.7%	0.4%	4.3%
Communications	Count	0	1	0	0	0	0	1
	% of Total	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.4%
Construction / Home Improvement	Count	0	0	0	0	1	0	1
	% of Total	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%
Consulting	Count	4	0	2	5	4	1	16
	% of Total	1.7%	0.0%	0.9%	2.1%	1.7%	0.4%	6.9%

(table continues)

Industry		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Integrated	I do not know if my organization uses Integrated	Total
Education	Count	1	3	0	2	7	2	15
	% of Total	0.4%	1.3%	0.0%	0.9%	3.0%	0.9%	6.4%
Engineering / Architecture	Count	0	0	2	0	0	0	2
	% of Total	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.9%
Finance / Banking / Insurance	Count	2	4	0	0	11	3	20
	% of Total	0.9%	1.7%	0.0%	0.0%	4.7%	1.3%	8.6%
Food Service	Count	0	0	0	0	1	0	1
	% of Total	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%
Government / Military	Count	2	3	2	0	6	3	16
	% of Total	0.9%	1.3%	0.9%	0.0%	2.6%	1.3%	6.9%
Healthcare / Medical	Count	2	2	2	1	7	4	18
	% of Total	0.9%	0.9%	0.9%	0.4%	3.0%	1.7%	7.7%
Internet	Count	0	0	0	0	2	0	2
	% of Total	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.9%
Manufacturing	Count	5	18	8	6	13	6	56
	% of Total	2.1%	7.7%	3.4%	2.6%	5.6%	2.6%	24.0%
Marketing / Market Research / Public Relations	Count	0	1	0	0	1	0	2
	% of Total	0.0%	0.4%	0.0%	0.0%	0.4%	0.0%	0.9%
Mining / Quarrying / Oil and Gas Extraction	Count	1	0	1	0	1	0	3
	% of Total	0.4%	0.0%	0.4%	0.0%	0.4%	0.0%	1.3%
Non-Profit	Count	0	0	0	1	2	0	3

Industry		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Integrated	I do not know if my organization uses Integrated	Total
	% of Total	0.0%	0.0%	0.0%	0.4%	0.9%	0.0%	1.3%
Pharmaceutical / Chemical	Count	1	2	0	3	3	3	12
	% of Total	0.4%	0.9%	0.0%	1.3%	1.3%	1.3%	5.2%
Research / Science	Count	0	0	0	1	1	1	3
	% of Total	0.0%	0.0%	0.0%	0.4%	0.4%	0.4%	1.3%
Retail	Count	0	2	0	0	1	1	4
	% of Total	0.0%	0.9%	0.0%	0.0%	0.4%	0.4%	1.7%
Telecommunications	Count	1	2	1	1	0	0	5
	% of Total	0.4%	0.9%	0.4%	0.4%	0.0%	0.0%	2.1%
Transportation / Distribution	Count	1	0	1	0	4	0	6
	% of Total	0.4%	0.0%	0.4%	0.0%	1.7%	0.0%	2.6%
Utilities	Count	1	0	0	0	1	0	2
	% of Total	0.4%	0.0%	0.0%	0.0%	0.4%	0.0%	0.9%
Other	Count	0	0	1	0	3	1	5
	% of Total	0.0%	0.0%	0.4%	0.0%	1.3%	0.4%	2.1%
Total	Count	25	45	24	26	82	31	233
	% of Total	10.7%	19.3%	10.3%	11.2%	35.2%	13.3%	100.0%

Table 66

Crosstab for Percentage Respondents Organization Included Feedback from Internal and External Stakeholders as Part of the Six Sigma Initiative with Six Sigma (N = 230)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	1	18	17	14	0	1	51
	% of Total	0.0%	7.8%	7.4%	6.1%	0.0%	0.0%	22.2%
Often	Count	7	17	17	18	3	0	62
	% of Total	3.0%	7.4%	7.4%	7.8%	1.3%	0.0%	27.0%
Sometimes	Count	2	21	20	9	2	1	55
	% of Total	0.0%	9.1%	8.7%	3.9%	0.9%	0.0%	23.9%
Rarely	Count	2	7	5	3	0	0	17
	% of Total	0.0%	3.0%	2.2%	1.3%	0.0%	0.0%	7.4%
Never	Count	1	3	0	1	4	0	9
	% of Total	0.0%	1.3%	0.0%	0.0%	1.7%	0.0%	3.9%
I do not know	Count	0	3	1	0	2	5	11
	% of Total	0.0%	1.3%	0.0%	0.0%	0.9%	2.2%	4.8%
Not applicable	Count	2	3	0	0	20	0	25
	% of Total	0.0%	1.3%	0.0%	0.0%	8.7%	0.0%	0.9%
Total	Count	15	72	60	45	31	7	230
	% of Total	0.0%	31.3%	26.1%	19.6%	13.5%	3.0%	100.0%

Table 67

Crosstab for Percentage Respondents Organization Included Feedback from Internal and External Stakeholders as Part of the Six Sigma Initiative with Integrated Method (N = 231)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	3	15	4	8	16	5	51
	% of Total	1.3%	6.5%	1.7%	3.5%	6.9%	2.2%	22.1%
Often	Count	9	13	16	10	8	6	62
	% of Total	3.9%	5.6%	6.9%	4.3%	3.5%	2.6%	26.8%
Sometimes	Count	9	9	3	3	22	10	56
	% of Total	3.9%	3.9%	1.3%	1.3%	9.5%	4.3%	24.2%
Rarely	Count	3	3	0	1	9	1	17
	% of Total	1.3%	1.3%	0.0%	0.4%	3.9%	0.4%	7.4%
Never	Count	1	4	0	0	3	1	9
	% of Total	0.4%	1.7%	0.0%	0.0%	1.3%	0.4%	3.9%
I do not know	Count	0	0	1	2	2	6	11
	% of Total	0.0%	0.0%	0.4%	0.9%	0.9%	2.6%	4.8%
Not applicable	Count	0	2	0	2	20	1	25
	% of Total	0.0%	0.9%	0.0%	0.9%	8.7%	0.4%	10.8%
	Count	25	46	24	26	80	30	231
	% of Total	10.8%	19.9%	10.4%	11.3%	34.6%	13.0%	100.0%

Table 68

Crosstab for Percentage Respondents Processes in Your Organization Include a Circular Feedback from Internal Resources and External Resources with Six Sigma (N = 230)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	2	12	8	11	4	0	37
	% of Total	0.9%	5.2%	3.5%	4.8%	1.7%	0.0%	16.1%
Often	Count	4	22	15	16	8	2	67
	% of Total	1.7%	9.6%	6.5%	7.0%	3.5%	0.9%	29.1%
Sometimes	Count	7	18	28	9	5	1	68
	% of Total	3.0%	7.8%	12.2%	3.9%	2.2%	0.4%	29.6%
Rarely	Count	2	11	7	5	5	1	31
	% of Total	0.9%	4.8%	3.0%	2.2%	2.2%	0.4%	13.5%
Never	Count	0	3	2	2	2	0	9
	% of Total	0.0%	1.3%	0.9%	0.9%	0.9%	0.0%	3.9%
I do not know	Count	0	3	0	1	4	3	11
	% of Total	0.0%	1.3%	0.0%	0.4%	1.7%	1.3%	4.8%
Not applicable	Count	0	3	0	1	3	0	7
	% of Total	0.0%	1.3%	0.0%	0.4%	1.3%	0.0%	3.0%
Total	Count	15	72	60	45	31	7	230
	% of Total	6.5%	31.3%	26.1%	19.6%	13.5%	3.0%	100.0%

Table 69

Crosstab for Percentage Respondents Organization Processes in Your Organization Include a Circular Feedback from Internal Resources and External Resources with Integrated (N = 231)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	3	14	6	7	3	4	37
	% of Total	1.3%	6.1%	2.6%	3.0%	1.3%	1.7%	16.0%
Often	Count	4	18	11	10	19	5	67
	% of Total	1.7%	7.8%	4.8%	4.3%	8.2%	2.2%	29.0%
Sometimes	Count	13	8	7	6	25	9	68
	% of Total	5.6%	3.5%	3.0%	2.6%	10.8%	3.9%	29.4%
Rarely	Count	5	5	0	0	16	6	32
	% of Total	2.2%	2.2%	0.0%	0.0%	6.9%	2.6%	13.9%
Never	Count	0	0	0	1	7	1	9
	% of Total	0.0%	0.0%	0.0%	0.4%	3.0%	0.4%	3.9%
I do not know	Count	0	1	0	1	4	5	11
	% of Total	0.0%	0.4%	0.0%	0.4%	1.7%	2.2%	4.8%
Not applicable	Count	0	0	0	1	6	0	7
	% of Total	0.0%	0.0%	0.0%	0.4%	2.6%	0.0%	3.0%
Total	Count	25	46	24	26	80	30	231
	% of Total	10.8%	19.9%	10.4%	11.3%	34.6%	13.0%	100.0%

Table 70

Crosstab for Percentage Respondents Opinion, Circular Relationships Depicted in Feedback Loops Draws Connections to the Consequences of Specific Actions Taken; Highlighting Cause and Effect with Six Sigma (N = 229)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	3	17	4	11	3	1	39
	% of Total	1.3%	7.4%	1.7%	4.8%	1.3%	0.4%	17.0%
Often	Count	5	21	31	18	12	2	89
	% of Total	2.2%	9.2%	13.5%	7.9%	5.2%	0.9%	38.9%
Sometimes	Count	5	15	16	9	3	1	49
	% of Total	2.2%	6.6%	7.0%	3.9%	1.3%	0.4%	21.4%
Rarely	Count	2	6	8	4	2	0	22
	% of Total	0.9%	2.6%	3.5%	1.7%	0.9%	0.0%	9.6%
Never	Count	0	2	0	0	1	0	3
	% of Total	0.0%	0.9%	0.0%	0.0%	0.4%	0.0%	1.3%
I do not know	Count	0	6	1	2	6	3	18
	% of Total	0.0%	2.6%	0.4%	0.9%	2.6%	1.3%	7.9%
Not applicable	Count	0	4	0	1	4	0	9
	% of Total	0.0%	1.7%	0.0%	0.4%	1.7%	0.0%	3.9%
Total	Count	15	71	60	45	31	7	229
	% of Total	6.6%	31.0%	26.2%	19.7%	13.5%	3.1%	100.0%

Table 71

Crosstab for Percentage Respondents Opinion, Circular Relationships Depicted in Feedback Loops Draws Connections to the Consequences of Specific Actions Taken; Highlighting Cause and Effect with Integrated (N = 230)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	6	10	4	7	7	5	39
	% of Total	2.6%	4.3%	1.7%	3.0%	3.0%	2.2%	17.0%
Often	Count	11	18	12	12	31	6	90
	% of Total	4.8%	7.8%	5.2%	5.2%	13.5%	2.6%	39.1%
Sometimes	Count	5	10	8	5	13	8	49
	% of Total	2.2%	4.3%	3.5%	2.2%	5.7%	3.5%	21.3%
Rarely	Count	2	3	0	0	13	4	22
	% of Total	0.9%	1.3%	0.0%	0.0%	5.7%	1.7%	9.6%
Never	Count	0	1	0	0	2	0	3
	% of Total	0.0%	0.4%	0.0%	0.0%	0.9%	0.0%	1.3%
I do not know	Count	0	2	0	1	8	7	18
	% of Total	0.0%	0.9%	0.0%	0.4%	3.5%	3.0%	7.8%
Not applicable	Count	1	1	0	1	6	0	9
	% of Total	0.4%	0.4%	0.0%	0.4%	2.6%	0.0%	3.9%
Total	Count	25	45	24	26	80	30	230
	% of Total	10.9%	19.6%	10.4%	11.3%	34.8%	13.0%	100.0%

Table 72

Crosstab for Percentage Respondents Company's Invites Input and Suggestions from Our Client on How We Might Improve Our Performance with Six Sigma (N = 229)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	2	15	17	12	6	1	53
	% of Total	0.9%	6.6%	7.4%	5.2%	2.6%	0.4%	23.1%
Often	Count	5	22	21	19	10	4	81
	% of Total	2.2%	9.6%	9.2%	8.3%	4.4%	1.7%	35.4%
Sometimes	Count	5	22	12	11	10	1	61
	% of Total	2.2%	9.6%	5.2%	4.8%	4.4%	0.4%	26.6%
Rarely	Count	2	6	9	3	2	0	22
	% of Total	0.9%	2.6%	3.9%	1.3%	0.9%	0.0%	9.6%
Never	Count	0	1	1	0	0	0	2
	% of Total	0.0%	0.4%	0.4%	0.0%	0.0%	0.0%	0.9%
I do not know	Count	1	1	0	0	2	1	5
	% of Total	0.4%	0.4%	0.0%	0.0%	0.9%	0.4%	2.2%
Not applicable	Count	0	4	0	0	1	0	5
	% of Total	0.0%	1.7%	0.0%	0.0%	0.4%	0.0%	2.2%
Total	Count	15	71	60	45	31	7	229
	% of Total	6.6%	31.0%	26.2%	19.7%	13.5%	3.1%	100.0%

Table 73

Crosstab for Percentage Respondents Company's Invites Input and Suggestions from Our Client on How we Might Improve Our Performance with Integrated (N = 230)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	4	12	6	12	15	4	53
	% of Total	1.7%	5.2%	2.6%	5.2%	6.5%	1.7%	23.0%
Often	Count	10	17	13	8	20	13	81
	% of Total	4.3%	7.4%	5.7%	3.5%	8.7%	5.7%	35.2%
Sometimes	Count	6	11	3	6	29	7	62
	% of Total	2.6%	4.8%	1.3%	2.6%	12.6%	3.0%	27.0%
Rarely	Count	5	1	1	0	10	5	22
	% of Total	2.2%	0.4%	0.4%	0.0%	4.3%	2.2%	9.6%
Never	Count	0	1	0	0	1	0	2
	% of Total	0.0%	0.4%	0.0%	0.0%	0.4%	0.0%	0.9%
I do not know	Count	0	1	1	0	2	1	5
	% of Total	0.0%	0.4%	0.4%	0.0%	0.9%	0.4%	2.2%
Not applicable	Count	0	2	0	0	3	0	5
	% of Total	0.0%	0.9%	0.0%	0.0%	1.3%	0.0%	2.2%
Total	Count	25	45	24	26	80	30	230
	% of Total	10.9%	19.6%	10.4%	11.3%	34.8%	13.0%	100.0%

Table 74

Crosstab for Percentage Respondents Opinion Systemic Loops Can Serve as an Objective Way of Analyzing and Interpreting Balancing and Reinforcing Forces with Six Sigma (N = 229)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	1	18	12	8	6	1	46
	% of Total	0.4%	7.9%	5.2%	3.5%	2.6%	0.4%	20.1%
Often	Count	10	30	24	24	13	4	105
	% of Total	4.4%	13.1%	10.5%	10.5%	5.7%	1.7%	45.9%
Sometimes	Count	3	15	16	9	3	1	47
	% of Total	1.3%	6.6%	7.0%	3.9%	1.3%	0.4%	20.5%
Rarely	Count	1	0	3	1	3	0	8
	% of Total	0.4%	0.0%	1.3%	0.4%	1.3%	0.0%	3.5%
I do not know	Count	0	6	5	2	5	1	19
	% of Total	0.0%	2.6%	2.2%	0.9%	2.2%	0.4%	8.3%
Not applicable	Count	0	2	0	1	1	0	4
	% of Total	0.0%	0.9%	0.0%	0.4%	0.4%	0.0%	1.7%
Total	Count	15	71	60	45	31	7	229
	% of Total	6.6%	31.0%	26.2%	19.7%	13.5%	3.1%	100.0%

Table 75

Crosstab for Percentage Respondents Opinion, Systemic Loops Can Serve as an Objective Way of Analyzing and Interpreting Balancing and Reinforcing Forces with Integrated (N = 230)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	6	11	7	5	15	2	46
	% of Total	2.6%	4.8%	3.0%	2.2%	6.5%	0.9%	20.0%
Often	Count	11	19	13	15	32	16	106
	% of Total	4.8%	8.3%	5.7%	6.5%	13.9%	7.0%	46.1%
Sometimes	Count	6	9	2	6	18	6	47
	% of Total	2.6%	3.9%	0.9%	2.6%	7.8%	2.6%	20.4%
Rarely	Count	2	1	1	0	2	2	8
	% of Total	0.9%	0.4%	0.4%	0.0%	0.9%	0.9%	3.5%
I do not know	Count	0	4	1	0	10	4	19
	% of Total	0.0%	1.7%	0.4%	0.0%	4.3%	1.7%	8.3%
Not applicable	Count	0	1	0	0	3	0	4
	% of Total	0.0%	0.4%	0.0%	0.0%	1.3%	0.0%	1.7%
Total	Count	25	45	24	26	80	30	230
	% of Total	10.9%	19.6%	10.4%	11.3%	34.8%	13.0%	100.0%

Table 76

Crosstab for Percentage Respondents' Organization Continuously Examines the Feedback from its Employees, Customers, Suppliers and Regulatory Agencies and Revises its Processes Regularly with Six Sigma (N = 229)

Rating		Years Six Sigma Use						Total
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Six Sigma	I do not know if my organization uses Six Sigma	
Always	Count	3	16	5	13	4	0	41
	% of Total	1.3%	7.0%	2.2%	5.7%	1.7%	0.0%	17.9%
Often	Count	2	29	26	18	5	1	81
	% of Total	0.9%	12.7%	11.4%	7.9%	2.2%	0.4%	35.4%
Sometimes	Count	6	18	23	10	11	4	72
	% of Total	2.6%	7.9%	10.0%	4.4%	4.8%	1.7%	31.4%
Rarely	Count	3	7	4	3	6	1	24
	% of Total	1.3%	3.1%	1.7%	1.3%	2.6%	0.4%	10.5%
Never	Count	0	1	2	0	0	0	3
	% of Total	0.0%	0.4%	0.9%	0.0%	0.0%	0.0%	1.3%
I do not know	Count	1	0	0	0	4	1	6
	% of Total	0.4%	0.0%	0.0%	0.0%	1.7%	0.4%	2.6%
Not applicable	Count	0	0	0	1	1	0	2
	% of Total	0.0%	0.0%	0.0%	0.4%	0.4%	0.0%	0.9%
Total	Count	15	71	60	45	31	7	229
	% of Total	6.6%	31.0%	26.2%	19.7%	13.5%	3.1%	100.0%

Table 77

Crosstab for Percentage Respondents' Organization Continuously Examines The Feedback From its Employees, Customers, Suppliers, and Regulatory Agencies and Revises its Processes Regularly with Integrated (N = 230)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	6	14	4	11	3	4	42
	% of Total	2.6%	6.1%	1.7%	4.8%	1.3%	1.7%	18.3%
Often	Count	6	19	9	8	24	15	81
	% of Total	2.6%	8.3%	3.9%	3.5%	10.4%	6.5%	35.2%
Sometimes	Count	8	11	7	5	35	6	72
	% of Total	3.5%	4.8%	3.0%	2.2%	15.2%	2.6%	31.3%
Rarely	Count	5	0	2	2	11	4	24
	% of Total	2.2%	0.0%	0.9%	0.9%	4.8%	1.7%	10.4%
Never	Count	0	1	1	0	1	0	3
	% of Total	0.0%	0.4%	0.4%	0.0%	0.4%	0.0%	1.3%
I do not know	Count	0	0	1	0	4	1	6
	% of Total	0.0%	0.0%	0.4%	0.0%	1.7%	0.4%	2.6%
Not applicable	Count	0	0	0	0	2	0	2
	% of Total	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.9%
Total	Count	25	45	24	26	80	30	230
	% of Total	10.9%	19.6%	10.4%	11.3%	34.8%	13.0%	100.0%

Table 78

Crosstab for Percentage Part of the Six Sigma Process Improvement Program, Your Organization Seeks Feedback from with Six Sigma (N = 202)

Stakeholder		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Six Sigma	I do not know if my organization uses Six Sigma	Total
Employees of Organization	Count	9	44	45	34	9	3	144
	% of Total	4.5%	21.8%	22.3%	16.8%	4.5%	1.5%	71.3%
Internal Stakeholders	Count	7	53	51	31	10	3	155
	% of Total	3.5%	26.2%	25.2%	15.3%	5.0%	1.5%	76.7%
Consumers	Count	3	26	24	18	5	2	78
	% of Total	1.5%	12.9%	11.9%	8.9%	2.5%	1.0%	38.6%
External Stakeholders	Count	1	32	28	19	4	1	85
	% of Total	0.5%	15.8%	13.9%	9.4%	2.0%	0.5%	42.1%
Suppliers	Count	6	20	20	15	4	1	66
	% of Total	3.0%	9.9%	9.9%	7.4%	2.0%	0.5%	32.7%
Government	Count	4	12	7	10	11	2	46
	% of Total	2.0%	5.9%	3.5%	5.0%	5.4%	1.0%	22.8%
None	Count	2	4	3	2	9	1	21
	% of Total	1.0%	2.0%	1.5%	1.0%	4.5%	0.5%	10.4%
Other	Count	1	1	3	3	8	2	18
	% of Total	0.5%	0.5%	1.5%	1.5%	4.0%	1.0%	8.9%
Total	Count	13	62	55	41	25	6	202
	% of Total	6.4%	30.7%	27.2%	20.3%	12.4%	3.0%	100.0%

Table 79

Crosstab for Percentage Part of the Six Sigma Process Improvement Program, your Organization Seeks Feedback From with Integrated (N = 203)

Stakeholder		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Employees of Organization	Count	16	29	22	14	44	19	144
	% of Total	7.9%	14.3%	10.8%	6.9%	21.7%	9.4%	70.9%
Internal Stakeholders	Count	16	34	20	19	50	17	156
	% of Total	7.9%	16.7%	9.9%	9.4%	24.6%	8.4%	76.8%
Consumers	Count	7	16	12	10	23	10	78
	% of Total	3.4%	7.9%	5.9%	4.9%	11.3%	4.9%	38.4%
External Stakeholders	Count	6	21	9	11	27	11	85
	% of Total	3.0%	10.3%	4.4%	5.4%	13.3%	5.4%	41.9%
Suppliers	Count	9	21	12	9	13	2	66
	% of Total	4.4%	10.3%	5.9%	4.4%	6.4%	1.0%	32.5%
Government	Count	4	9	5	5	17	6	46
	% of Total	2.0%	4.4%	2.5%	2.5%	8.4%	3.0%	22.7%
None	Count	1	4	1	1	12	2	21
	% of Total	0.5%	2.0%	0.5%	0.5%	5.9%	1.0%	10.3%
Other	Count	1	1	2	3	10	1	18
	% of Total	0.5%	0.5%	1.0%	1.5%	4.9%	0.5%	8.9%
Total	Count	21	40	23	23	72	24	203
	% of Total	10.3%	19.7%	11.3%	11.3%	35.5%	11.8%	100.0%

Table 80

Crosstab for Percentage of Respondents' Organization Use a Central Repository Where All Organizational Processes are Available to Everyone in Your Company at Any Given Time with Six Sigma (N = 226)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	4	14	6	11	3	0	38
	% of Total	1.8%	6.2%	2.7%	4.9%	1.3%	.0%	16.8%
Often	Count	2	12	14	8	4	2	42
	% of Total	.9%	5.3%	6.2%	3.5%	1.8%	.9%	18.6%
Sometimes	Count	4	19	17	16	7	0	63
	% of Total	1.8%	8.4%	7.5%	7.1%	3.1%	.0%	27.9%
Rarely	Count	3	12	12	4	7	3	41
	% of Total	1.3%	5.3%	5.3%	1.8%	3.1%	1.3%	18.1%
Never	Count	2	10	8	1	5	1	27
	% of Total	.9%	4.4%	3.5%	.0%	2.2%	.0%	11.9%
I do not know	Count	0	2	3	3	2	1	11
	% of Total	0.0%	0.9%	1.3%	1.3%	0.9%	0.0%	4.9%
Not applicable	Count	0	1	0	2	1	0	4
	% of Total	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	1.8%
Total	Count	15	70	60	45	29	7	226
	% of Total	6.6%	31.0%	26.5%	19.9%	12.8%	3.1%	100.0%

Table 81

Crosstab for Percentage of Respondents' Use a Central Repository Where All Organizational Processes are Available to Everyone in Your Company at Any Given Time with Integrated (N = 227)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	5	15	5	6	5	2	38
	% of Total	2.2%	6.6%	2.2%	2.6%	2.2%	0.9%	16.7%
Often	Count	2	7	7	5	13	8	42
	% of Total	0.9%	3.1%	3.1%	2.2%	5.7%	3.5%	18.5%
Sometimes	Count	11	10	7	11	19	6	64
	% of Total	4.8%	4.4%	3.1%	4.8%	8.4%	2.6%	28.2%
Rarely	Count	5	6	2	2	19	7	41
	% of Total	2.2%	2.6%	0.9%	0.9%	8.4%	3.1%	18.1%
Never	Count	2	2	1	0	17	5	27
	% of Total	0.9%	0.9%	0.0%	0.0%	7.5%	2.2%	11.9%
I do not know	Count	0	3	2	0	4	2	11
	% of Total	0.0%	1.3%	0.9%	0.0%	1.8%	0.9%	4.8%
Not applicable	Count	0	1	0	2	1	0	4
	% of Total	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	1.8%
Total	Count	25	44	24	26	78	30	227
	% of Total	11.0%	19.4%	10.6%	11.5%	34.4%	13.2%	100.0%

Table 82

Crosstab for Percentage of Respondents' Organization Have a Governance Body That Reviews the Process Repository to Identify Interrelated and Interdependent Processes with Six Sigma (N = 229)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	5	10	6	7	6	1	35
	% of Total	2.2%	4.4%	2.6%	3.1%	2.6%	.0%	15.3%
Often	Count	3	14	6	12	6	1	42
	% of Total	1.3%	6.1%	2.6%	5.2%	2.6%	.0%	18.3%
Sometimes	Count	2	11	24	6	3	1	47
	% of Total	.9%	4.8%	10.5%	2.6%	1.3%	.0%	20.5%
Rarely	Count	3	13	10	11	5	2	44
	% of Total	1.3%	5.7%	4.4%	4.8%	2.2%	.9%	19.2%
Never	Count	1	15	9	4	7	1	37
	% of Total	.0%	6.6%	3.9%	1.7%	3.1%	.0%	16.2%
I do not know	Count	0	5	4	3	2	1	15
	% of Total	0.0%	2.2%	1.7%	1.3%	0.9%	0.0%	6.6%
Not applicable	Count	1	3	1	2	2	0	9
	% of Total	.0%	1.3%	.0%	.9%	.9%	.0%	3.9%
Total	Count	15	71	60	45	31	7	229
	% of Total	6.6%	31.0%	26.2%	19.7%	13.5%	3.1%	100.0%

Table 83

Crosstab for Percentage of Respondents' Organization Have a Governance Body that Reviews the Process Repository to Identify Interrelated and Interdependent Processes with Integrated (N = 230)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	4	15	5	4	5	2	35
	% of Total	1.7%	6.5%	2.2%	1.7%	2.2%	0.9%	15.2%
Often	Count	5	7	8	7	9	6	42
	% of Total	2.2%	3.0%	3.5%	3.0%	3.9%	2.6%	18.3%
Sometimes	Count	8	12	7	5	11	5	48
	% of Total	3.5%	5.2%	3.0%	2.2%	4.8%	2.2%	20.9%
Rarely	Count	7	4	2	4	18	9	44
	% of Total	3.0%	1.7%	0.9%	1.7%	7.8%	3.9%	19.1%
Never	Count	1	3	1	2	27	3	37
	% of Total	0.0%	1.3%	0.0%	0.9%	11.7%	1.3%	16.1%
I do not know	Count	0	3	1	1	6	4	15
	% of Total	0.0%	1.3%	0.0%	0.0%	2.6%	1.7%	6.5%
Not applicable	Count	0	1	0	3	4	1	9
	% of Total	0.0%	0.0%	0.0%	1.3%	1.7%	0.0%	3.9%
Total	Count	25	45	24	26	80	30	230
	% of Total	10.9%	19.6%	10.4%	11.3%	34.8%	13.0%	100.0%

Table 84

Crosstab for Percentage of Respondents Indicate the Frequency of Their Organization's Governance Body Reviews the Process Improvement Initiatives, Including Reviews the Repository for Documented Process for Internal and External Processes with Six Sigma (N = 203)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	3	9	6	5	4	1	28
	% of Total	1.5%	4.4%	3.0%	2.5%	2.0%	.0%	13.8%
Often	Count	1	10	10	15	2	0	38
	% of Total	.0%	4.9%	4.9%	7.4%	1.0%	.0%	18.7%
Sometimes	Count	2	15	11	9	4	2	43
	% of Total	1.0%	7.4%	5.4%	4.4%	2.0%	1.0%	21.2%
Rarely	Count	3	11	15	7	8	1	45
	% of Total	1.5%	5.4%	7.4%	3.4%	3.9%	.0%	22.2%
Never	Count	2	7	5	0	4	0	18
	% of Total	1.0%	3.4%	2.5%	.0%	2.0%	.0%	8.9%
I do not know	Count	0	5	7	2	1	1	16
	% of Total	0.0%	2.5%	3.4%	1.0%	0.0%	0.0%	7.9%
Not applicable	Count	2	5	1	3	3	1	15
	% of Total	1.0%	2.5%	.0%	1.5%	1.5%	.0%	7.4%
Total	Count	13	62	55	41	26	6	203
	% of Total	6.4%	30.5%	27.1%	20.2%	12.8%	3.0%	100.0%

Table 85

Crosstab for Percentage of Respondents Indicate the Frequency of their Governance Body Reviews the Process Improvement Initiatives, Including Reviews the Repository for Documented Process for Internal and External Processes with Integrated (N = 204)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	2	15	3	4	3	1	28
	% of Total	1.0%	7.4%	1.5%	2.0%	1.5%	0.0%	13.7%
Often	Count	4	9	9	6	5	5	38
	% of Total	2.0%	4.4%	4.4%	2.9%	2.5%	2.5%	18.6%
Sometimes	Count	7	9	5	6	13	4	44
	% of Total	3.4%	4.4%	2.5%	2.9%	6.4%	2.0%	21.6%
Rarely	Count	6	3	4	2	21	9	45
	% of Total	2.9%	1.5%	2.0%	1.0%	10.3%	4.4%	22.1%
Never	Count	1	1	1	0	14	1	18
	% of Total	0.0%	0.0%	0.0%	0.0%	6.9%	0.0%	8.8%
I do not know	Count	0	3	1	2	7	3	16
	% of Total	0.0%	1.5%	0.0%	1.0%	3.4%	1.5%	7.8%
Not applicable	Count	1	0	0	4	9	1	15
	% of Total	0.0%	0.0%	0.0%	2.0%	4.4%	0.0%	7.4%
Total	Count	21	40	23	24	72	24	204
	% of Total	10.3%	19.6%	11.3%	11.8%	35.3%	11.8%	100.0%

Table 86

Crosstab for Percentage of Respondents Indicate the Frequency of their Organization Uses Metrics to Monitor Organizational Patterns to Gain a View of the Broader Perspective of the Organizational Structure, Including Events Taken Within and Outside The Organization with Six Sigma (N = 203)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	2	16	9	7	4	0	38
	% of Total	1.0%	7.9%	4.4%	3.4%	2.0%	.0%	18.7%
Often	Count	4	22	13	18	4	2	63
	% of Total	2.0%	10.8%	6.4%	8.9%	2.0%	1.0%	31.0%
Sometimes	Count	3	15	18	9	7	2	54
	% of Total	1.5%	7.4%	8.9%	4.4%	3.4%	1.0%	26.6%
Rarely	Count	3	4	6	4	6	1	24
	% of Total	1.5%	2.0%	3.0%	2.0%	3.0%	.0%	11.8%
Never	Count	1	3	6	0	2	0	12
	% of Total	.0%	1.5%	3.0%	.0%	1.0%	.0%	5.9%
I do not know	Count	0	2	2	1	2	0	7
	% of Total	0.0%	1.0%	1.0%	0.0%	1.0%	0.0%	3.4%
Not applicable	Count	0	0	1	2	1	1	5
	% of Total	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	2.5%
Total	Count	13	62	55	41	26	6	203
	% of Total	6.4%	30.5%	27.1%	20.2%	12.8%	3.0%	100.0%

Table 87

Crosstab for Percentage of Respondents Indicate the Frequency of their Organization Uses Metrics to Monitor Organizational Patterns to Gain a View of the Broader Perspective of the Organizational Structure, Including Events Taken Within and Outside the Organization with Integrated (N = 204)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	2	16	5	6	6	3	38
	% of Total	1.0%	7.8%	2.5%	2.9%	2.9%	1.5%	18.6%
Often	Count	8	15	7	9	18	6	63
	% of Total	3.9%	7.4%	3.4%	4.4%	8.8%	2.9%	30.9%
Sometimes	Count	6	9	8	5	17	10	55
	% of Total	2.9%	4.4%	3.9%	2.5%	8.3%	4.9%	27.0%
Rarely	Count	3	0	1	0	16	4	24
	% of Total	1.5%	0.0%	0.0%	0.0%	7.8%	2.0%	11.8%
Never	Count	1	0	1	0	9	1	12
	% of Total	0.0%	0.0%	0.0%	0.0%	4.4%	0.0%	5.9%
I do not know	Count	1	0	0	2	4	0	7
	% of Total	0.0%	0.0%	0.0%	1.0%	2.0%	0.0%	3.4%
Not applicable	Count	0	0	1	2	2	0	5
	% of Total	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	2.5%
Total	Count	21	40	23	24	72	24	204
	% of Total	10.3%	19.6%	11.3%	11.8%	35.3%	11.8%	100.0%

Table 88

Crosstab for Percentage of Respondents Indicate the Frequency of Their Organization Communicates Process Improvement Programs with Six Sigma (N = 185)

Category		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Entire Organization	Count	4	27	22	18	13	5	89
	% of Total	2.2%	14.6%	11.9%	9.7%	7.0%	2.7%	48.1%
Particular Dept. Only Communicate Impacted Area	Count	4	19	27	17	9	2	78
	% of Total	2.2%	10.3%	14.6%	9.2%	4.9%	1.1%	42.2%
Particular Dept. Only Communicate to Everyone	Count	5	31	27	14	11	2	90
	% of Total	2.7%	16.8%	14.6%	7.6%	5.9%	1.1%	48.6%
External Stakeholder and Everyone in Org	Count	3	17	14	16	4	2	56
	% of Total	1.6%	9.2%	7.6%	8.6%	2.2%	1.1%	30.3%
External Stakeholder and Communicate to Impacted Area	Count	2	13	12	7	7	1	42
	% of Total	1.1%	7.0%	6.5%	3.8%	3.8%	0.5%	22.7%
Does Not Communicate	Count	2	4	4	3	4	0	17
	% of Total	1.1%	2.2%	2.2%	1.6%	2.2%	0.0%	9.2%
Other	Count	0	3	4	1	1	0	9
	% of Total	0.0%	1.6%	2.2%	0.5%	0.5%	0.0%	4.9%
Total	Count	13	56	52	37	22	5	185
	% of Total	7.0%	30.3%	28.1%	20.0%	11.9%	2.7%	100.0%

Table 89

Crosstab for Percentage of Respondents Indicate the Frequency of their Organization Communicates Process Improvement Programs with Integrated (N = 186)

Communication		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Entire Organization	Count	7	21	14	13	24	10	89
	% of Total	3.8%	11.3%	7.5%	7.0%	12.9%	5.4%	47.8%
Particular Dept. Only Communicate Impacted Area	Count	11	16	13	11	22	5	78
	% of Total	5.9%	8.6%	7.0%	5.9%	11.8%	2.7%	41.9%
Particular Dept. Only Communicate to Everyone	Count	5	18	9	8	38	12	90
	% of Total	2.7%	9.7%	4.8%	4.3%	20.4%	6.5%	48.4%
External Stakeholder and Everyone in Org	Count	5	13	12	13	10	3	56
	% of Total	2.7%	7.0%	6.5%	7.0%	5.4%	1.6%	30.1%
External Stakeholder and Communicate to Impacted Area	Count	2	12	6	5	14	3	42
	% of Total	1.1%	6.5%	3.2%	2.7%	7.5%	1.6%	22.6%
Does Not Communicate	Count	2	3	0	2	8	3	18
	% of Total	1.1%	1.6%	0.0%	1.1%	4.3%	1.6%	9.7%
Other	Count	0	3	2	1	2	1	9
	% of Total	0.0%	1.6%	1.1%	0.5%	1.1%	0.5%	4.8%
Total	Count	19	37	22	21	65	22	186
	% of Total	10.2%	19.9%	11.8%	11.3%	34.9%	11.8%	100.0%

Table 90

Crosstab for Percentage of Respondents Opinion, Six Sigma Programs in their Organization Include Diagramming the Entire System, Reproducing the Problem Areas of Analysis and Conduct Test Run to Measure the Outcomes Before Implementing a New Process with Six Sigma (N = 176)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	1	9	3	8	0	0	21
	% of Total	.6%	5.1%	1.7%	4.5%	0.0%	0.0%	11.9%
Often	Count	2	13	17	8	0	0	40
	% of Total	1.1%	7.4%	9.7%	4.5%	0.0%	0.0%	22.7%
Sometimes	Count	4	22	20	15	1	1	63
	% of Total	2.3%	12.5%	11.4%	8.5%	0.6%	0.6%	35.8%
Rarely	Count	4	5	5	4	2	1	21
	% of Total	2.3%	2.8%	2.8%	2.3%	1.1%	0.6%	11.9%
Never	Count	0	1	3	0	2	0	6
	% of Total	0.0%	0.6%	1.7%	0.0%	1.1%	0.0%	3.4%
I do not know	Count	0	0	2	0	1	2	5
	% of Total	0.0%	0.0%	1.1%	0.0%	0.6%	1.1%	2.8%
Not applicable	Count	1	1	0	2	16	0	20
	% of Total	.6%	.6%	.0%	1.1%	9.1%	.0%	11.4%
Total	Count	12	51	50	37	22	4	176
	% of Total	6.8%	29.0%	28.4%	21.0%	12.5%	2.3%	100.0%

Table 91

Crosstab for Percentage of Respondents Opinion, Six Sigma Programs in their Organization Include Diagramming the Entire System, Reproducing the Problem Areas of Analysis and Conduct Test Run to Measure the Outcomes Before Implementing a New Process with Integrated (N = 177)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	0	10	2	8	1	0	21
	% of Total	0.0%	5.6%	1.1%	4.5%	0.6%	0.0%	11.9%
Often	Count	4	11	10	2	11	2	40
	% of Total	2.3%	6.2%	5.6%	1.1%	6.2%	1.1%	22.6%
Sometimes	Count	10	9	9	9	16	10	63
	% of Total	5.6%	5.1%	5.1%	5.1%	9.0%	5.6%	35.6%
Rarely	Count	3	2	1	0	12	3	21
	% of Total	1.7%	1.1%	0.6%	0.0%	6.8%	1.7%	11.9%
Never	Count	0	2	0	0	4	1	7
	% of Total	0.0%	1.1%	0.0%	0.0%	2.3%	0.6%	4.0%
I do not know	Count	0	0	0	2	2	1	5
	% of Total	0.0%	0.0%	0.0%	1.1%	1.1%	0.6%	2.8%
Not applicable	Count	1	1	0	1	16	1	20
	% of Total	0.6%	0.6%	0.0%	0.6%	9.0%	0.6%	11.3%
Total	Count	18	35	22	22	62	18	177
	% of Total	10.2%	19.8%	12.4%	12.4%	35.0%	10.2%	100.0%

Table 92

Crosstab for Percentage of Respondents Opinion, How Often they Have an Understanding of the Work You Do Contributes to Your Organizational, Including External Stakeholders' Goals with Six Sigma (N = 162)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	3	18	13	13	6	3	56
	% of Total	1.9%	11.1%	8.0%	8.0%	3.7%	1.9%	34.6%
Often	Count	7	22	19	15	11	1	75
	% of Total	4.3%	13.6%	11.7%	9.3%	6.8%	0.6%	46.3%
Sometimes	Count	2	5	13	6	1	0	27
	% of Total	1.2%	3.1%	8.0%	3.7%	0.6%	0.0%	16.7%
Rarely	Count	0	0	0	1	1	0	2
	% of Total	0.0%	0.0%	0.0%	0.6%	0.6%	0.0%	1.2%
Never	Count	0	0	0	0	0	0	0
	% of Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
I do not know	Count	0	0	0	1	0	0	1
	% of Total	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.6%
Not applicable	Count	0	0	0	0	1	0	1
	% of Total	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.6%
Total	Count	12	45	45	36	20	4	162
	% of Total	7.4%	27.8%	27.8%	22.2%	12.3%	2.5%	100.0%

Table 93

Crosstab for Percentage of Respondents Opinion, How Often they Have an Understanding of the Work You Do Contributes to Your Organizational, Including External Stakeholders' Goals with Integrated (N = 162)

		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	8	14	8	8	13	5	56
	% of Total	4.9%	8.6%	4.9%	4.9%	8.0%	3.1%	34.6%
Often	Count	7	12	11	9	29	7	75
	% of Total	4.3%	7.4%	6.8%	5.6%	17.9%	4.3%	46.3%
Sometimes	Count	2	5	3	2	13	2	27
	% of Total	1.2%	3.1%	1.9%	1.2%	8.0%	1.2%	16.7%
Rarely	Count	0	0	0	0	1	1	2
	% of Total	0.0%	0.0%	0.0%	0.0%	0.6%	0.6%	1.2%
I do not know	Count	0	0	0	1	0	0	1
	% of Total	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.6%
Not applicable	Count	0	0	0	0	1	0	1
	% of Total	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.6%
Total	Count	17	31	22	20	57	15	162
	% of Total	10.5%	19.1%	13.6%	12.3%	35.2%	9.3%	100.0%

Table 94

Crosstab for Percentage of Respondents Opinion, When Solving for a Problem or Examining Processes, All Parts that Make up a Sub-system Must be Examined (Inputs, Outputs, Feedback Control, etc.) with Six Sigma (N = 203)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an integrated model	I do not know if my organization uses an integrated model	Total
Always	Count	6	33	24	29	10	3	105
	% of Total	3.0%	16.3%	11.8%	14.3%	4.9%	1.5%	51.7%
Often	Count	4	20	24	5	8	2	63
	% of Total	2.0%	9.9%	11.8%	2.5%	3.9%	1.0%	31.0%
Sometimes	Count	1	7	5	4	3	0	20
	% of Total	0.5%	3.4%	2.5%	2.0%	1.5%	0.0%	9.9%
Rarely	Count	2	2	1	2	2	0	9
	% of Total	1.0%	1.0%	0.5%	1.0%	1.0%	0.0%	4.4%
Never	Count	0	0	0	0	0	0	0
	% of Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
I do not know	Count	0	0	1	0	1	0	2
	% of Total	0.0%	0.0%	0.5%	0.0%	0.5%	0.0%	1.0%
Not applicable	Count	0	0	0	1	2	1	4
	% of Total	0.0%	0.0%	0.0%	0.5%	1.0%	0.5%	2.0%
Total	Count	13	62	55	41	26	6	203
	% of Total	6.4%	30.5%	27.1%	20.2%	12.8%	3.0%	100.0%

Table 95

Crosstab for Percentage of Respondents Opinion, When Solving for a Problem or Examining Processes, All Parts that Make up a Sub system Must be Examined (Inputs, Outputs, Feedback Control, etc.) with Integrated (N = 204)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Integrated	I do not know if my organization uses Integrated	Total
Always	Count	12	22	13	13	36	10	106
	% of Total	5.9%	10.8%	6.4%	6.4%	17.6%	4.9%	52.0%
Often	Count	3	15	7	4	23	11	63
	% of Total	1.5%	7.4%	3.4%	2.0%	11.3%	5.4%	30.9%
Sometimes	Count	3	2	3	3	7	2	20
	% of Total	1.5%	1.0%	1.5%	1.5%	3.4%	1.0%	9.8%
Rarely	Count	3	1	0	2	2	1	9
	% of Total	1.5%	0.5%	0.0%	1.0%	1.0%	0.5%	4.4%
Never	Count	0	0	0	0	0	0	0
	% of Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
I do not know	Count	0	0	0	1	1	0	2
	% of Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%
Not applicable	Count	0	0	0	1	3	0	4
	% of Total	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	2.0%
Total	Count	21	40	23	24	72	24	204
	% of Total	10.3%	19.6%	11.3%	11.8%	35.3%	11.8%	100.0%

Table 96

Crosstab for Percentage of Respondents Rate their Organization's Six Sigma Programs Identifies and Incorporates the Interrelationship of the Organization's Sub-system Process When Developing a New or Revising an Existing Process with Six Sigma (N = 202)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an integrated model	I do not know if my organization uses an integrated model	Total
Always	Count	0	13	10	12	0	0	35
	% of Total	0.0%	6.4%	5.0%	5.9%	0.0%	0.0%	17.3%
Often	Count	3	16	24	15	2	0	60
	% of Total	1.5%	7.9%	11.9%	7.4%	1.0%	0.0%	29.7%
Sometimes	Count	3	19	14	10	0	1	47
	% of Total	1.5%	9.4%	6.9%	5.0%	0.0%	0.5%	23.3%
Rarely	Count	3	10	4	3	1	1	22
	% of Total	1.5%	5.0%	2.0%	1.5%	0.5%	0.5%	10.9%
Never	Count	1	4	1	0	3	0	9
	% of Total	0.5%	2.0%	0.5%	0.0%	1.5%	0.0%	4.5%
I do not know	Count	1	0	1	0	3	3	8
	% of Total	0.5%	0.0%	0.5%	0.0%	1.5%	1.5%	4.0%
Not applicable	Count	2	0	0	1	17	1	21
	% of Total	1.0%	0.0%	0.0%	0.5%	8.4%	0.5%	10.4%
Total	Count	13	62	54	41	26	6	202
	% of Total	6.4%	30.7%	26.7%	20.3%	12.9%	3.0%	100.0%

Table 97

Crosstab for Percentage of Respondents Rate their Organization's Six Sigma Programs Identifies and Incorporates the Interrelationship of the Organization's Sub-system Process When Developing a New or Revising an Existing Process with Integrated (N= 203)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Integrated	I do not know if my organization uses Integrated	Total
Always	Count	2	12	7	8	3	3	35
	% of Total	1.0%	5.9%	3.4%	3.9%	1.5%	1.5%	17.2%
Often	Count	7	12	13	9	16	3	60
	% of Total	3.4%	5.9%	6.4%	4.4%	7.9%	1.5%	29.6%
Sometimes	Count	6	10	2	2	16	11	47
	% of Total	3.0%	4.9%	1.0%	1.0%	7.9%	5.4%	23.2%
Rarely	Count	4	4	1	0	11	3	23
	% of Total	2.0%	2.0%	0.0%	0.0%	5.4%	1.5%	11.3%
Never	Count	1	1	0	1	6	0	9
	% of Total	0.0%	0.0%	0.0%	0.0%	3.0%	0.0%	4.4%
I do not know	Count	0	1	0	2	3	2	8
	% of Total	0.0%	0.0%	0.0%	1.0%	1.5%	1.0%	3.9%
Not applicable	Count	1	0	0	2	17	1	21
	% of Total	0.0%	0.0%	0.0%	1.0%	8.4%	0.0%	10.3%
Total	Count	21	40	23	24	72	23	203
	% of Total	10.3%	19.7%	11.3%	11.8%	35.5%	11.3%	100.0%

Table 98

Crosstab for Percentage of Respondents Rate Six Sigma Team in their Organization Identifies Patterns, Recurring Trends of Interconnections, or Casual Links Beyond the Isolated Events with Six Sigma (N = 203)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an integrated model	I do not know if my organization uses an integrated model	Total
Always	Count	0	12	10	11	0	0	33
	% of Total	0.0%	5.9%	4.9%	5.4%	0.0%	0.0%	16.3%
Often	Count	4	16	14	13	1	0	48
	% of Total	2.0%	7.9%	6.9%	6.4%	0.5%	0.0%	23.6%
Sometimes	Count	3	20	21	13	1	0	58
	% of Total	1.5%	9.9%	10.3%	6.4%	0.5%	0.0%	28.6%
Rarely	Count	4	8	7	2	1	1	23
	% of Total	2.0%	3.9%	3.4%	1.0%	0.5%	0.5%	11.3%
Never	Count	1	2	2	0	3	0	8
	% of Total	0.5%	1.0%	1.0%	0.0%	1.5%	0.0%	3.9%
I do not know	Count	0	3	1	0	2	3	9
	% of Total	0.0%	1.5%	0.5%	0.0%	1.0%	1.5%	4.4%
Not applicable	Count	1	1	0	2	18	2	24
	% of Total	0.5%	0.5%	0.0%	1.0%	8.9%	1.0%	11.8%
Total	Count	13	62	55	41	26	6	203
	% of Total	6.4%	30.5%	27.1%	20.2%	12.8%	3.0%	100.0%

Table 99

Crosstab for Percentage of Respondents Rate Six Sigma Team in their Organization Identifies Patterns, Recurring Trends of Interconnections, or Casual Links Beyond the Isolated Events with Integrated (N = 204)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Integrated	I do not know if my organization uses Integrated	Total
Always	Count	3	12	5	7	3	3	33
	% of Total	1.5%	5.9%	2.5%	3.4%	1.5%	1.5%	16.2%
Often	Count	8	9	11	6	10	4	48
	% of Total	3.9%	4.4%	5.4%	2.9%	4.9%	2.0%	23.5%
Sometimes	Count	4	13	5	6	23	8	59
	% of Total	2.0%	6.4%	2.5%	2.9%	11.3%	3.9%	28.9%
Rarely	Count	4	3	2	0	10	4	23
	% of Total	2.0%	1.5%	1.0%	0.0%	4.9%	2.0%	11.3%
Never	Count	1	2	0	0	5	0	8
	% of Total	0.0%	1.0%	0.0%	0.0%	2.5%	0.0%	3.9%
I do not know	Count	0	0	0	3	3	3	9
	% of Total	0.0%	0.0%	0.0%	1.5%	1.5%	1.5%	4.4%
Not applicable	Count	1	1	0	2	18	2	24
	% of Total	0.0%	0.0%	0.0%	1.0%	8.8%	1.0%	11.8%
Total	Count	21	40	23	24	72	24	204
	% of Total	10.3%	19.6%	11.3%	11.8%	35.3%	11.8%	100.0%

Table 100

Crosstab for Percentage of Respondents Rate their Organization Investigates the Root Cause of a Problem by Analyzing All Inputs, Processes and Outputs of a Process by Examining the Inter-departmental Impacts that Impacts Internal and External Stakeholders with Six Sigma (N = 203)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an integrated model	I do not know if my organization uses an integrated model	Total
Always	Count	2	12	8	10	5	0	37
	% of Total	1.0%	5.9%	3.9%	4.9%	2.5%	0.0%	18.2%
Often	Count	3	18	23	14	6	1	65
	% of Total	1.5%	8.9%	11.3%	6.9%	3.0%	0.5%	32.0%
Sometimes	Count	5	24	15	14	6	1	65
	% of Total	2.5%	11.8%	7.4%	6.9%	3.0%	0.5%	32.0%
Rarely	Count	2	8	8	2	3	2	25
	% of Total	1.0%	3.9%	3.9%	1.0%	1.5%	1.0%	12.3%
Never	Count	1	0	0	0	4	0	5
	% of Total	0.5%	0.0%	0.0%	0.0%	2.0%	0.0%	2.5%
I do not know	Count	0	0	1	0	1	1	3
	% of Total	0.0%	0.0%	0.5%	0.0%	0.5%	0.5%	1.5%
Not applicable	Count	0	0	0	1	1	1	3
	% of Total	0.0%	0.0%	0.0%	0.5%	0.5%	0.5%	1.5%
Total	Count	13	62	55	41	26	6	203
	% of Total	6.4%	30.5%	27.1%	20.2%	12.8%	3.0%	100.0%

Table 101

Crosstab for Percentage of Respondents Rate their Organization Investigates the Root Cause of a Problem by Analyzing All Inputs, Processes and Outputs of a Process by Examining the Inter-departmental Impacts that Impacts Internal and External Stakeholders with Integrated (N = 204)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Integrated	I do not know if my organization uses Integrated	Total
Always	Count	1	12	6	8	8	2	37
	% of Total	0.5%	5.9%	2.9%	3.9%	3.9%	1.0%	18.1%
Often	Count	9	13	11	5	20	7	65
	% of Total	4.4%	6.4%	5.4%	2.5%	9.8%	3.4%	31.9%
Sometimes	Count	7	13	6	6	25	9	66
	% of Total	3.4%	6.4%	2.9%	2.9%	12.3%	4.4%	32.4%
Rarely	Count	3	2	0	4	11	5	25
	% of Total	1.5%	1.0%	0.0%	2.0%	5.4%	2.5%	12.3%
Never	Count	1	0	0	0	4	0	5
	% of Total	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	2.5%
I do not know	Count	0	0	0	1	1	1	3
	% of Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%
Not applicable	Count	0	0	0	0	3	0	3
	% of Total	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	1.5%
Total	Count	21	40	23	24	72	24	204
	% of Total	10.3%	19.6%	11.3%	11.8%	35.3%	11.8%	100.0%

Table 102

Crosstab for Percentage of Respondents Rate Key Reason(s) their Organization Investigates the Interdependencies and Interrelationship of the Organization's Processes, Select as Many as Applicable with Six Sigma (N = 195)

Reasons		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an integrated model	I do not know if my organization uses an integrated model	Total
Improve Organization Efficiency	Count	9	41	39	27	16	3	135
	% of Total	4.6%	21.0%	20.0%	13.8%	8.2%	1.5%	69.2%
Improve Customer Service	Count	10	38	35	25	14	4	126
	% of Total	5.1%	19.5%	17.9%	12.8%	7.2%	2.1%	64.6%
Reduce Waste	Count	9	36	34	29	9	2	119
	% of Total	4.6%	18.5%	17.4%	14.9%	4.6%	1.0%	61.0%
Reduce Cost	Count	8	41	39	31	11	4	134
	% of Total	4.1%	21.0%	20.0%	15.9%	5.6%	2.1%	68.7%
Improve Profitability	Count	5	28	26	25	7	2	93
	% of Total	2.6%	14.4%	13.3%	12.8%	3.6%	1.0%	47.7%
Gain Competitive Advantage	Count	4	23	17	23	10	3	80
	% of Total	2.1%	11.8%	8.7%	11.8%	5.1%	1.5%	41.0%
Identify Root Cause Problems	Count	7	35	32	23	10	2	109
	% of Total	3.6%	17.9%	16.4%	11.8%	5.1%	1.0%	55.9%
Influence Senior Management	Count	2	11	7	9	6	0	35
	% of Total	1.0%	5.6%	3.6%	4.6%	3.1%	0.0%	17.9%
Competitors Are Doing	Count	0	4	5	3	5	1	18
	% of Total	0.0%	2.1%	2.6%	1.5%	2.6%	0.5%	9.2%

(table continues)

Reasons		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an integrated model	I do not know if my organization uses an integrated model	Total
Not Investigate Interdependencies Unless Impacts Organization	Count	2	6	3	3	3	1	18
	% of Total	1.0%	3.1%	1.5%	1.5%	1.5%	0.5%	9.2%
Other	Count	0	1	1	1	1	0	4
	% of Total	0.0%	0.5%	0.5%	0.5%	0.5%	0.0%	2.1%
Total	Count	13	58	54	40	25	5	195
	% of Total	6.7%	29.7%	27.7%	20.5%	12.8%	2.6%	100.0%

Table 103

Crosstab for Percentage of Respondents Rate Key Reason(s) their Organization Investigates the Interdependencies and Interrelationship of the Organization's Processes, Select as Many as Applicable with Integrated (N = 196)

Reasons		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Integrated	I do not know if my organization uses Integrated	Total
Improve Organization Efficiency	Count	14	29	19	17	42	14	135
	% of Total	7.1%	14.8%	9.7%	8.7%	21.4%	7.1%	68.9%
Improve Customer Service	Count	15	28	18	16	37	12	126
	% of Total	7.7%	14.3%	9.2%	8.2%	18.9%	6.1%	64.3%
Reduce Waste	Count	13	25	20	17	33	11	119
	% of Total	6.6%	12.8%	10.2%	8.7%	16.8%	5.6%	60.7%
Reduce Cost	Count	13	29	15	19	41	18	135
	% of Total	6.6%	14.8%	7.7%	9.7%	20.9%	9.2%	68.9%
Improve Profitability	Count	9	24	16	15	20	9	93
	% of Total	4.6%	12.2%	8.2%	7.7%	10.2%	4.6%	47.4%
Gain Competitive Advantage	Count	8	17	14	14	20	7	80
	% of Total	4.1%	8.7%	7.1%	7.1%	10.2%	3.6%	40.8%
Identify Root Cause Problems	Count	9	28	15	14	35	8	109
	% of Total	4.6%	14.3%	7.7%	7.1%	17.9%	4.1%	55.6%
Influence Senior Management	Count	3	8	5	7	8	4	35
	% of Total	1.5%	4.1%	2.6%	3.6%	4.1%	2.0%	17.9%
Competitors Are Doing	Count	1	2	3	6	5	1	18
	% of Total	0.5%	1.0%	1.5%	3.1%	2.6%	0.5%	9.2%

(table continues)

Reasons		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Integrated	I do not know if my organization uses Integrated	Total
Not Investigate Interdependencies Unless Impacts Organization	Count	3	1	0	0	9	5	18
	% of Total	1.5%	0.5%	0.0%	0.0%	4.6%	2.6%	9.2%
Other	Count	0	2	1	0	0	1	4
	% of Total	0.0%	1.0%	0.5%	0.0%	0.0%	0.5%	2.0%
Total	Count	20	39	23	23	68	23	196
	% of Total	10.2%	19.9%	11.7%	11.7%	34.7%	11.7%	100.0%

Table 104

Crosstab for Percentage of Respondents Rate Six Sigma Team in their Organization is Responsible for Soliciting Feedback from Internal and External Resources with Six Sigma (N = 176)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an integrated model	I do not know if my organization uses an integrated model	Total
Always	Count	1	10	11	7	0	1	30
	% of Total	0.6%	5.7%	6.3%	4.0%	0.0%	0.6%	17.0%
Often	Count	3	15	15	13	1	0	47
	% of Total	1.7%	8.5%	8.5%	7.4%	0.6%	0.0%	26.7%
Sometimes	Count	3	14	15	7	0	1	40
	% of Total	1.7%	8.0%	8.5%	4.0%	0.0%	0.6%	22.7%
Rarely	Count	4	6	6	4	2	1	23
	% of Total	2.3%	3.4%	3.4%	2.3%	1.1%	0.6%	13.1%
Never	Count	0	3	1	1	2	0	7
	% of Total	0.0%	1.7%	0.6%	0.6%	1.1%	0.0%	4.0%
I do not know	Count	0	2	2	2	1	1	8
	% of Total	0.0%	1.1%	1.1%	1.1%	0.6%	0.6%	4.5%
Not applicable	Count	1	1	0	3	16	0	21
	% of Total	0.6%	0.6%	0.0%	1.7%	9.1%	0.0%	11.9%
Total	Count	12	51	50	37	22	4	176
	% of Total	6.8%	29.0%	28.4%	21.0%	12.5%	2.3%	100.0%

Table 105

Crosstab for Percentage of Respondents Rate Six Sigma Team in their Organization is Responsible for Soliciting Feedback from Internal and External Resources with Integrated (N = 177)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use Integrated	I do not know if my organization uses Integrated	Total
Always	Count	1	11	4	6	6	3	31
	% of Total	0.6%	6.2%	2.3%	3.4%	3.4%	1.7%	17.5%
Often	Count	6	13	7	4	14	3	47
	% of Total	3.4%	7.3%	4.0%	2.3%	7.9%	1.7%	26.6%
Sometimes	Count	4	6	8	4	13	5	40
	% of Total	2.3%	3.4%	4.5%	2.3%	7.3%	2.8%	22.6%
Rarely	Count	5	3	3	0	9	3	23
	% of Total	2.8%	1.7%	1.7%	0.0%	5.1%	1.7%	13.0%
Never	Count	0	1	0	2	3	1	7
	% of Total	0.0%	0.6%	0.0%	1.1%	1.7%	0.6%	4.0%
I do not know	Count	1	0	0	4	2	1	8
	% of Total	0.6%	0.0%	0.0%	2.3%	1.1%	0.6%	4.5%
Not applicable	Count	1	1	0	2	15	2	21
	% of Total	0.6%	0.6%	0.0%	1.1%	8.5%	1.1%	11.9%
Total	Count	18	35	22	22	62	18	177
	% of Total	10.2%	19.8%	12.4%	12.4%	35.0%	10.2%	100.0%

Table 106

Crosstab for Percentage of Respondents Rate their Organization Use of Systems Thinking Method with Six Sigma Increased the Success of the Six Sigma Programs (N = 172)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Strongly agree	Count	3	10	5	12	1	0	31
	% of Total	1.7%	5.8%	2.9%	7.0%	0.6%	0.0%	18.0%
Somewhat agree	Count	4	4	6	9	2	0	25
	% of Total	2.3%	2.3%	3.5%	5.2%	1.2%	0.0%	14.5%
Agree	Count	0	12	3	2	0	1	18
	% of Total	0.0%	7.0%	1.7%	1.2%	0.0%	0.6%	10.5%
Disagree	Count	1	1	1	6	0	0	9
	% of Total	0.6%	0.6%	0.6%	3.5%	0.0%	0.0%	5.2%
Strongly disagree	Count	1	0	1	1	0	0	3
	% of Total	0.6%	0.0%	0.6%	0.6%	0.0%	0.0%	1.7%
My company does not use systems thinking with Six Sigma	Count	3	18	26	6	16	1	70
	% of Total	1.7%	10.5%	15.1%	3.5%	9.3%	0.6%	40.7%
Do not know	Count	0	5	6	1	2	2	16
	% of Total	0.0%	2.9%	3.5%	0.6%	1.2%	1.2%	9.3%
Total	Count	12	50	48	37	21	4	172
	% of Total	7.0%	29.1%	27.9%	21.5%	12.2%	2.3%	100.0%

Table 107

Crosstab for Percentage of Respondents Rate their Organization Use of Systems Thinking Method with Six Sigma Increased the Success of the Six Sigma Programs with Integrated (N = 173)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Strongly agree	Count	2	10	8	10	1	0	31
	% of Total	1.2%	5.8%	4.6%	5.8%	0.6%	0.0%	17.9%
Somewhat agree	Count	6	4	5	7	2	1	25
	% of Total	3.5%	2.3%	2.9%	4.0%	1.2%	0.6%	14.5%
Agree	Count	2	12	1	0	3	0	18
	% of Total	1.2%	6.9%	0.6%	0.0%	1.7%	0.0%	10.4%
Disagree	Count	1	2	0	1	4	1	9
	% of Total	0.6%	1.2%	0.0%	0.6%	2.3%	0.6%	5.2%
Strongly disagree	Count	0	1	0	1	1	0	3
	% of Total	0.0%	0.6%	0.0%	0.6%	0.6%	0.0%	1.7%
My company does not use systems thinking with Six Sigma	Count	5	4	6	1	47	8	71
	% of Total	2.9%	2.3%	3.5%	0.6%	27.2%	4.6%	41.0%
Do not know	Count	1	2	2	2	2	7	16
	% of Total	0.6%	1.2%	1.2%	1.2%	1.2%	4.0%	9.2%
Total	Count	17	35	22	22	60	17	173
	% of Total	9.8%	20.2%	12.7%	12.7%	34.7%	9.8%	100.0%

Table 108

Crosstab for Percentage of Respondents in their Opinion, Rate their Company's Six Sigma Program Success with Six Sigma (N = 172)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Highly successful	Count	2	8	9	13	0	0	32
	% of Total	1.2%	4.7%	5.2%	7.6%	0.0%	0.0%	18.6%
Somewhat successful	Count	7	31	28	16	1	1	84
	% of Total	4.1%	18.0%	16.3%	9.3%	0.6%	0.6%	48.8%
Indifferent	Count	2	9	7	5	1	0	24
	% of Total	1.2%	5.2%	4.1%	2.9%	0.6%	0.0%	14.0%
Not successful	Count	1	2	3	2	2	0	10
	% of Total	0.6%	1.2%	1.7%	1.2%	1.2%	0.0%	5.8%
Do not know	Count	0	0	1	1	17	3	22
	% of Total	0.0%	0.0%	0.6%	0.6%	9.9%	1.7%	12.8%
Total	Count	12	50	48	37	21	4	172
	% of Total	7.0%	29.1%	27.9%	21.5%	12.2%	2.3%	100.0%

Table 109

Crosstab for Percentage of Respondents in their Opinion, Rate their Company's Six Sigma Program Success with Integrated (N = 173)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Highly successful	Count	1	8	7	10	3	3	32
	% of Total	0.6%	4.6%	4.0%	5.8%	1.7%	1.7%	18.5%
Somewhat successful	Count	11	20	14	8	25	6	84
	% of Total	6.4%	11.6%	8.1%	4.6%	14.5%	3.5%	48.6%
Indifferent	Count	4	2	1	1	11	5	24
	% of Total	2.3%	1.2%	0.6%	0.6%	6.4%	2.9%	13.9%
Not successful	Count	0	3	0	0	7	1	11
	% of Total	0.0%	1.7%	0.0%	0.0%	4.0%	0.6%	6.4%
Do not know	Count	1	2	0	3	14	2	22
	% of Total	0.6%	1.2%	0.0%	1.7%	8.1%	1.2%	12.7%
Total	Count	17	35	22	22	60	17	173
	% of Total	9.8%	20.2%	12.7%	12.7%	34.7%	9.8%	100.0%

Table 110

Crosstab for Percentage of Respondents Rate their Company's Quality Management Program Has Been Successful Because we Use with Six Sigma (N = 142)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Six Sigma method alone	Count	1	12	10	8	0	1	32
	% of Total	0.7%	8.5%	7.0%	5.6%	0.0%	0.7%	22.5%
Systems thinking method alone	Count	1	0	0	0	4	2	7
	% of Total	0.7%	0.0%	0.0%	0.0%	2.8%	1.4%	4.9%
Systems thinking and Six Sigma methods together	Count	5	15	12	18	2	0	52
	% of Total	3.5%	10.6%	8.5%	12.7%	1.4%	0.0%	36.6%
Do not know	Count	3	11	10	5	6	1	36
	% of Total	2.1%	7.7%	7.0%	3.5%	4.2%	0.7%	25.4%
Other	Count	0	2	4	4	5	0	15
	% of Total	0.0%	1.4%	2.8%	2.8%	3.5%	0.0%	10.6%
Total	Count	10	40	36	35	17	4	142
	% of Total	7.0%	28.2%	25.4%	24.6%	12.0%	2.8%	100.0%

Table 111

Crosstab for Percentage of Respondents Rate their Company's Quality Management Program Has Been Successful Because we Use with Integrated (N = 143)

Quality Management Program		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Six Sigma method alone	Count	4	5	5	2	12	5	33
	% of Total	2.8%	3.5%	3.5%	1.4%	8.4%	3.5%	23.1%
Systems thinking method alone	Count	0	2	0	3	2	0	7
	% of Total	0.0%	1.4%	0.0%	2.1%	1.4%	0.0%	4.9%
Systems thinking and Six Sigma methods together	Count	6	21	13	11	0	1	52
	% of Total	4.2%	14.7%	9.1%	7.7%	0.0%	0.7%	36.4%
Do not know	Count	2	3	2	1	20	8	36
	% of Total	1.4%	2.1%	1.4%	0.7%	14.0%	5.6%	25.2%
Other	Count	1	0	1	4	8	1	15
	% of Total	0.7%	0.0%	0.7%	2.8%	5.6%	0.7%	10.5%
Total	Count	13	31	21	21	42	15	143
	% of Total	9.1%	21.7%	14.7%	14.7%	29.4%	10.5%	100.0%

Table 112

Crosstab for Percentage of Respondents Rate Identify All Factors that Made their Organization's Six Sigma Program a Success with Six Sigma (N = 185)

Factors		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not Applicable, my organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Upper Management Support	Count	6	35	38	31	4	0	114
	% of Total	3.2%	18.9%	20.5%	16.8%	2.2%	0.0%	61.6%
Training	Count	5	37	39	34	3	0	118
	% of Total	2.7%	20.0%	21.1%	18.4%	1.6%	0.0%	63.8%
Application of Statically Tools	Count	5	27	27	31	2	0	92
	% of Total	2.7%	14.6%	14.6%	16.8%	1.1%	0.0%	49.7%
Bonuses Rewards Are Based On Quality Work	Count	4	6	6	10	3	0	29
	% of Total	2.2%	3.2%	3.2%	5.4%	1.6%	0.0%	15.7%
Holistic Approach	Count	3	16	18	14	4	0	55
	% of Total	1.6%	8.6%	9.7%	7.6%	2.2%	0.0%	29.7%
All Stakeholders Including External	Count	1	20	18	21	3	0	63
	% of Total	0.5%	10.8%	9.7%	11.4%	1.6%	0.0%	34.1%
Program Considered Environmental Impact	Count	4	10	7	8	3	0	32
	% of Total	2.2%	5.4%	3.8%	4.3%	1.6%	0.0%	17.3%
Circular Feedback	Count	5	15	14	15	2	0	51
	% of Total	2.7%	8.1%	7.6%	8.1%	1.1%	0.0%	27.6%
Overall Organization Subsystems	Count	5	20	13	16	3	0	57
	% of Total	2.7%	10.8%	7.0%	8.6%	1.6%	0.0%	30.8%
Links Process Influences Others	Count	1	24	26	10	2	0	63
	% of Total	0.5%	13.0%	14.1%	5.4%	1.1%	0.0%	34.1%

(table continues)

Factors		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not Applicable, my organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Internal External Customer Expectations	Count	4	22	30	21	4	0	81
	% of Total	2.2%	11.9%	16.2%	11.4%	2.2%	0.0%	43.8%
Six Sigma Program Not Success	Count	2	8	5	3	6	0	24
	% of Total	1.1%	4.3%	2.7%	1.6%	3.2%	0.0%	13.0%
Other	Count	1	1	1	1	17	0	21
	% of Total	0.5%	0.5%	0.5%	0.5%	9.2%	0.0%	11.4%
Total	Count	13	55	52	40	25	0	185
	% of Total	7.0%	29.7%	28.1%	21.6%	13.5%	0.0%	100.0%

Table 113

Crosstab for Percentage of Respondents Rate Identify All Factors that Made their Organization's Factors that Made Your Organization's Six Sigma Program a Success with Integrated (N = 191)

Factors		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Upper Management Support	Count	15	21	19	15	32	15	117
	% of Total	7.9%	11.0%	9.9%	7.9%	16.8%	7.9%	61.3%
Training	Count	10	27	19	17	33	15	121
	% of Total	5.2%	14.1%	9.9%	8.9%	17.3%	7.9%	63.4%
Application of Statically Tools	Count	9	21	16	15	21	12	94
	% of Total	4.7%	11.0%	8.4%	7.9%	11.0%	6.3%	49.2%
Bonuses Rewards Are Based On Quality Work	Count	3	6	6	5	7	2	29
	% of Total	1.6%	3.1%	3.1%	2.6%	3.7%	1.0%	15.2%
Holistic Approach	Count	5	18	10	10	8	6	57
	% of Total	2.6%	9.4%	5.2%	5.2%	4.2%	3.1%	29.8%
All Stakeholders Including External	Count	5	15	7	11	18	9	65
	% of Total	2.6%	7.9%	3.7%	5.8%	9.4%	4.7%	34.0%
Program Considered Environmental Impact	Count	2	10	6	5	4	5	32
	% of Total	1.0%	5.2%	3.1%	2.6%	2.1%	2.6%	16.8%
Circular Feedback	Count	4	16	12	8	6	6	52
	% of Total	2.1%	8.4%	6.3%	4.2%	3.1%	3.1%	27.2%
Overall Organization Subsystems	Count	4	14	14	13	8	6	59
	% of Total	2.1%	7.3%	7.3%	6.8%	4.2%	3.1%	30.9%

(table continues)

Factors		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Links Process Influences Others	Count	5	18	13	9	14	6	65
	% of Total	2.6%	9.4%	6.8%	4.7%	7.3%	3.1%	34.0%
Internal External Customer Expectations	Count	7	17	17	14	17	12	84
	% of Total	3.7%	8.9%	8.9%	7.3%	8.9%	6.3%	44.0%
Six Sigma Program Not Success	Count	1	4	1	0	15	4	25
	% of Total	0.5%	2.1%	0.5%	0.0%	7.9%	2.1%	13.1%
Other	Count	2	2	0	2	14	3	23
	% of Total	1.0%	1.0%	0.0%	1.0%	7.3%	1.6%	12.0%
Total	Count	20	36	22	23	67	23	191
	% of Total	10.5%	18.8%	11.5%	12.0%	35.1%	12.0%	100.0%

Table 114

Crosstab for Percentage of Respondents Rate Everyone in their Company is Accountable for Holistic Approach to Process Improvement with Six Sigma (N = 157)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not Applicable, my organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	1	5	4	8	3	0	21
	% of Total	0.6%	3.2%	2.5%	5.1%	1.9%	0.0%	13.4%
Often	Count	4	10	11	4	3	0	32
	% of Total	2.5%	6.4%	7.0%	2.5%	1.9%	0.0%	20.4%
Sometimes	Count	3	8	11	12	3	0	37
	% of Total	1.9%	5.1%	7.0%	7.6%	1.9%	0.0%	23.6%
Rarely	Count	2	14	12	8	5	0	41
	% of Total	1.3%	8.9%	7.6%	5.1%	3.2%	0.0%	26.1%
Never	Count	1	9	7	3	6	0	26
	% of Total	0.6%	5.7%	4.5%	1.9%	3.8%	0.0%	16.6%
Total	Count	11	46	45	35	20	0	157
	% of Total	7.0%	29.3%	28.7%	22.3%	12.7%	0.0%	100.0%

Table 115

Crosstab for Percentage of Respondents Rate Everyone in their Company is Accountable for Holistic Approach to Process Improvement with Integrated (N = 145)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	0	9	2	7	3	0	21
	% of Total	0.0%	5.6%	1.2%	4.3%	1.9%	0.0%	13.0%
Often	Count	4	8	10	3	7	1	33
	% of Total	2.5%	4.9%	6.2%	1.9%	4.3%	0.6%	20.4%
Sometimes	Count	6	6	8	4	9	4	37
	% of Total	3.7%	3.7%	4.9%	2.5%	5.6%	2.5%	22.8%
Rarely	Count	6	7	1	3	19	8	44
	% of Total	3.7%	4.3%	0.6%	1.9%	11.7%	4.9%	27.2%
Never	Count	1	3	1	2	17	3	27
	% of Total	0.6%	1.9%	0.6%	1.2%	10.5%	1.9%	16.7%
Total	Count	17	33	22	19	55	16	162
	% of Total	10.5%	20.4%	13.6%	11.7%	34.0%	9.9%	100.0%

Table 116

Crosstab for Percentage of Respondents Rate in their Organization, a Few Dedicated Individuals Lead Quality Improvement wit Sigma (N =159)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not Applicable, my organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	2	10	8	7	3	0	30
	% of Total	1.3%	6.3%	5.0%	4.4%	1.9%	0.0%	18.9%
Often	Count	5	20	24	13	8	0	70
	% of Total	3.1%	12.6%	15.1%	8.2%	5.0%	0.0%	44.0%
Sometimes	Count	3	7	6	8	7	0	31
	% of Total	1.9%	4.4%	3.8%	5.0%	4.4%	0.0%	19.5%
Rarely	Count	1	8	8	4	1	0	22
	% of Total	0.6%	5.0%	5.0%	2.5%	0.6%	0.0%	13.8%
Never	Count	0	1	2	1	2	0	6
	% of Total	0.0%	0.6%	1.3%	0.6%	1.3%	0.0%	3.8%
Total	Count	11	46	48	33	21	0	159
	% of Total	6.9%	28.9%	30.2%	20.8%	13.2%	0.0%	100.0%

Table 117

Crosstab for Percentage of Respondents Rate in their Organization, a Few Dedicated Individuals Lead Quality Improvement with Integrated (N =163)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
Always	Count	0	9	4	5	14	1	33
	% of Total	0.0%	5.5%	2.5%	3.1%	8.6%	0.6%	20.2%
Often	Count	8	15	7	6	27	7	70
	% of Total	4.9%	9.2%	4.3%	3.7%	16.6%	4.3%	42.9%
Sometimes	Count	6	4	2	4	12	4	32
	% of Total	3.7%	2.5%	1.2%	2.5%	7.4%	2.5%	19.6%
Rarely	Count	3	4	5	2	4	4	22
	% of Total	1.8%	2.5%	3.1%	1.2%	2.5%	2.5%	13.5%
Never	Count	0	0	3	1	2	0	6
	% of Total	0.0%	0.0%	1.8%	0.6%	1.2%	0.0%	3.7%
Total	Count	17	32	21	18	59	16	163
	% of Total	10.4%	19.6%	12.9%	11.0%	36.2%	9.8%	100.0%

Table 118

Select the Extent to Which Six Sigma Plays a Role in Your Organization with Six Sigma (N = 176)

		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Used organization-wide	Count	4	15	19	19	0	0	57
	% of Total	2.3%	8.5%	10.8%	10.8%	0.0%	0.0%	32.4%
Used in some parts of the organization	Count	6	33	27	15	4	2	87
	% of Total	3.4%	18.8%	15.3%	8.5%	2.3%	1.1%	49.4%
Not used anymore	Count	1	3	2	0	0	0	6
	% of Total	0.6%	1.7%	1.1%	0.0%	0.0%	0.0%	3.4%
Not yet used but plan to start	Count	1	0	0	0	1	1	3
	% of Total	0.6%	0.0%	0.0%	0.0%	0.6%	0.6%	1.7%
Six Sigma is not used	Count	0	0	1	3	17	0	21
	% of Total	0.0%	0.0%	0.6%	1.7%	9.7%	0.0%	11.9%
Do not know	Count	0	0	1	0	0	1	2
	% of Total	0.0%	0.0%	0.6%	0.0%	0.0%	0.6%	1.1%
Total	Count	12	51	50	37	22	4	176
	% of Total	6.8%	29.0%	28.4%	21.0%	12.5%	2.3%	100.0%

Table 119

Select the Extent to Which Six Sigma Plays a Role in Your Organization with Integrated (N = 177)

Category		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an integrated model	I do not know if my organization uses an integrated model	Total
Used organization-wide	Count	6	15	11	13	8	4	57
	% of Total	3.4%	8.5%	6.2%	7.3%	4.5%	2.3%	32.2%
Used in some parts of the organization	Count	11	17	10	6	32	12	88
	% of Total	6.2%	9.6%	5.6%	3.4%	18.1%	6.8%	49.7%
Not used anymore	Count	0	1	0	0	5	0	6
	% of Total	0.0%	0.6%	0.0%	0.0%	2.8%	0.0%	3.4%
Not yet used but plan to start	Count	1	1	0	0	1	0	3
	% of Total	0.6%	0.6%	0.0%	0.0%	0.6%	0.0%	1.7%
Six Sigma is not used	Count	0	1	1	2	15	2	21
	% of Total	0.0%	0.6%	0.6%	1.1%	8.5%	1.1%	11.9%
Do not know	Count	0	0	0	1	1	0	2
	% of Total	0.0%	0.0%	0.0%	0.6%	0.6%	0.0%	1.1%
Total	Count	18	35	22	22	62	18	177
	% of Total	10.2%	19.8%	12.4%	12.4%	35.0%	10.2%	100.0%

Table 120

Crosstab for Percentage of Respondents Rate All Applicable Factors that Contributed for their Organization to Abandon the Use of Six Sigma with Six Sigma (N = 7)

Factors		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not Applicable, my organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
No Management Support	Count	0	3	2	0	0	0	5
	% of Total	0.0%	42.9%	28.6%	0.0%	0.0%	0.0%	71.4%
Focus Select Project Not Subsystems	Count	0	1	2	0	0	0	3
	% of Total	0.0%	14.3%	28.6%	0.0%	0.0%	0.0%	42.9%
Six Sigma Too Complicated	Count	0	2	0	0	0	0	2
	% of Total	0.0%	28.6%	0.0%	0.0%	0.0%	0.0%	28.6%
Lacks Understanding Entire System	Count	0	0	1	0	0	0	1
	% of Total	0.0%	0.0%	14.3%	0.0%	0.0%	0.0%	14.3%
Six Sigma Not Part of Daily Work	Count	1	1	1	0	0	0	3
	% of Total	14.3%	14.3%	14.3%	0.0%	0.0%	0.0%	42.9%
Few Trained in Six Sigma Responsible for Quality	Count	0	1	2	0	0	0	3
	% of Total	0.0%	14.3%	28.6%	0.0%	0.0%	0.0%	42.9%
Organization Continues Use of Six Sigma	Count	0	1	0	0	0	0	1
	% of Total	0.0%	14.3%	0.0%	0.0%	0.0%	0.0%	14.3%
Other	Count	0	1	0	0	0	0	1
	% of Total	0.0%	14.3%	0.0%	0.0%	0.0%	0.0%	14.3%
Total	Count	1	4	2	0	0	0	7
	% of Total	14.3%	57.1%	28.6%	0.0%	0.0%	0.0%	100.0%

Table 121

Crosstab for Percentage of Respondents Rate All Applicable Factors that Contributed for their Organization to Abandon the Use of Six Sigma with Integrated (N = 7)

Factors		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	Not applicable, my organization doesn't use an Integrated	I do not know if my organization uses an Integrated	Total
No Management Support	Count	0	1	0	0	4	0	5
	% of Total	0.0%	14.3%	0.0%	0.0%	57.1%	0.0%	71.4%
Focus Select Project Not Subsystems	Count	0	0	0	0	3	0	3
	% of Total	0.0%	0.0%	0.0%	0.0%	42.9%	0.0%	42.9%
Six Sigma Too Complicated	Count	0	1	0	0	1	0	2
	% of Total	0.0%	14.3%	0.0%	0.0%	14.3%	0.0%	28.6%
Lacks Understanding Entire System	Count	0	0	0	0	1	0	1
	% of Total	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%	14.3%
Six Sigma Not Part of Daily Work	Count	0	0	0	0	3	0	3
	% of Total	0.0%	0.0%	0.0%	0.0%	42.9%	0.0%	42.9%
Few Trained in Six Sigma Responsible for Quality	Count	0	0	0	0	3	0	3
	% of Total	0.0%	0.0%	0.0%	0.0%	42.9%	0.0%	42.9%
Organization Continues Use of Six Sigma	Count	0	1	0	0	0	0	1
	% of Total	0.0%	14.3%	0.0%	0.0%	0.0%	0.0%	14.3%
Other	Count	1	0	0	0	0	0	1
	% of Total	14.3%	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%
Total	Count	1	1	0	0	5	0	7
	% of Total	14.3%	14.3%	0.0%	0.0%	71.4%	0.0%	100.0 %

Table 122

Crosstab for Percentage of Respondents' Rate their Organization's Leaders Recognize and Reward those Individuals Who Use Holistic Approach for Long-term Solutions with Six Sigma (N = 203)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	0	10	5	8	5	0	28
	% of Total	0.0%	4.9%	2.5%	3.9%	2.5%	0.0%	13.8%
Often	Count	4	6	6	10	5	0	31
	% of Total	2.0%	3.0%	3.0%	4.9%	2.5%	0.0%	15.3%
Sometimes	Count	5	21	24	10	3	2	65
	% of Total	2.5%	10.3%	11.8%	4.9%	1.5%	1.0%	32.0%
Rarely	Count	3	12	15	7	4	1	42
	% of Total	1.5%	5.9%	7.4%	3.4%	2.0%	0.5%	20.7%
Never	Count	1	6	3	4	4	0	18
	% of Total	0.0%	3.0%	1.5%	2.0%	2.0%	0.0%	8.9%
I do not know	Count	0	5	2	0	3	2	12
	% of Total	0.0%	2.5%	1.0%	0.0%	1.5%	1.0%	5.9%
Not applicable	Count	0	2	0	2	2	1	7
	% of Total	0.0%	1.0%	0.0%	1.0%	1.0%	0.0%	3.4%
Total	Count	13	62	55	41	26	6	203
	% of Total	6.4%	30.5%	27.1%	20.2%	12.8%	3.0%	100.0%

Table 123

Crosstab for Percentage of Respondents' Rate their Organization's Leaders Recognize and Reward those Individuals Who Use Holistic Approach for Long-term Solutions with Integrated (N = 204)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Integrated	I do not know if my organization uses Integrated	Total
Always	Count	1	10	6	5	5	1	28
	% of Total	0.0%	4.9%	2.9%	2.5%	2.5%	0.0%	13.7%
Often	Count	5	7	6	5	7	1	31
	% of Total	2.5%	3.4%	2.9%	2.5%	3.4%	0.0%	15.2%
Sometimes	Count	3	14	8	7	22	11	65
	% of Total	1.5%	6.9%	3.9%	3.4%	10.8%	5.4%	31.9%
Rarely	Count	8	6	2	3	19	4	42
	% of Total	3.9%	2.9%	1.0%	1.5%	9.3%	2.0%	20.6%
Never	Count	2	3	1	2	9	2	19
	% of Total	1.0%	1.5%	0.5%	1.0%	4.4%	1.0%	9.3%
I do not know	Count	2	0	0	1	4	5	12
	% of Total	1.0%	0.0%	0.0%	0.0%	2.0%	2.5%	5.9%
Not applicable	Count	0	0	0	1	6	0	7
	% of Total	0.0%	0.0%	0.0%	0.5%	2.9%	0.0%	3.4%
Total	Count	21	40	23	24	72	24	204
	% of Total	10.3%	19.6%	11.3%	11.8%	35.3%	11.8%	100.0%

Table 124

Crosstab for Percentage of Respondents Rate their Organization Leadership Include in the Employee's Annual Performance Goal Systematic, Holistic Approach to Solving Problems with Six Sigma (N = 162)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	3	5	2	10	6	0	26
	% of Total	1.9%	3.1%	1.2%	6.2%	3.7%	0.0%	16.0%
Often	Count	3	7	9	6	3	2	30
	% of Total	1.9%	4.3%	5.6%	3.7%	1.9%	1.2%	18.5%
Sometimes	Count	1	5	12	10	1	0	29
	% of Total	0.6%	3.1%	7.4%	6.2%	0.6%	0.0%	17.9%
Rarely	Count	4	12	15	5	3	1	40
	% of Total	2.5%	7.4%	9.3%	3.1%	1.9%	0.6%	24.7%
Never	Count	1	11	5	4	6	0	27
	% of Total	0.6%	6.8%	3.1%	2.5%	3.7%	0.0%	16.7%
I do not know	Count	0	2	0	0	0	1	3
	% of Total	0.0%	1.2%	0.0%	0.0%	0.0%	0.6%	1.9%
Not applicable	Count	0	3	2	1	1	0	7
	% of Total	0.0%	1.9%	1.2%	0.6%	0.6%	0.0%	4.3%
Total	Count	12	45	45	36	20	4	162
	% of Total	7.4%	27.8%	27.8%	22.2%	12.3%	2.5%	100.0%

Table 125

Crosstab for Percentage of Respondents Rate their Organization Leadership Include in the Employee's Annual Performance Goal Systematic, Holistic Approach to Solving Problems with Integrated (N = 162)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Integrated	I do not know if my organization uses Integrated	Total
Always	Count	2	8	4	5	6	1	26
	% of Total	1.2%	4.9%	2.5%	3.1%	3.7%	0.6%	16.0%
Often	Count	4	8	6	4	5	3	30
	% of Total	2.5%	4.9%	3.7%	2.5%	3.1%	1.9%	18.5%
Sometimes	Count	4	4	7	6	7	1	29
	% of Total	2.5%	2.5%	4.3%	3.7%	4.3%	0.6%	17.9%
Rarely	Count	5	6	3	2	19	5	40
	% of Total	3.1%	3.7%	1.9%	1.2%	11.7%	3.1%	24.7%
Never	Count	2	3	1	1	17	3	27
	% of Total	1.2%	1.9%	0.6%	0.6%	10.5%	1.9%	16.7%
I do not know	Count	0	0	0	1	0	2	3
	% of Total	0.0%	0.0%	0.0%	0.6%	0.0%	1.2%	1.9%
Not applicable	Count	0	2	1	1	3	0	7
	% of Total	0.0%	1.2%	0.6%	0.6%	1.9%	0.0%	4.3%
Total	Count	17	31	22	20	57	15	162
	% of Total	10.5%	19.1%	13.6%	12.3%	35.2%	9.3%	100.0%

Table 126

Crosstab for Percentage of Respondents Rate their Organization Leadership Rewards Solving Problems with a Holistic Approach with Six Sigma (N = 162)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	2	4	3	6	4	0	19
	% of Total	1.2%	2.5%	1.9%	3.7%	2.5%	0.0%	11.7%
Often	Count	3	9	5	8	4	0	29
	% of Total	1.9%	5.6%	3.1%	4.9%	2.5%	0.0%	17.9%
Sometimes	Count	3	12	19	12	3	1	50
	% of Total	1.9%	7.4%	11.7%	7.4%	1.9%	0.6%	30.9%
Rarely	Count	3	7	10	5	3	2	30
	% of Total	1.9%	4.3%	6.2%	3.1%	1.9%	1.2%	18.5%
Never	Count	1	10	6	4	6	0	27
	% of Total	0.6%	6.2%	3.7%	2.5%	3.7%	0.0%	16.7%
I do not know	Count	0	2	0	0	0	0	2
	% of Total	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	1.2%
Not applicable	Count	0	1	2	1	0	1	5
	% of Total	0.0%	0.6%	1.2%	0.6%	0.0%	0.6%	3.1%
Total	Count	12	45	45	36	20	4	162
	% of Total	7.4%	27.8%	27.8%	22.2%	12.3%	2.5%	100.0%

Table 127

Crosstab for Percentage of Respondents Rate their Organization Leadership Rewards Solving Problems with a Holistic Approach with Integrated (N = 162)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Integrated	I do not know if my organization uses Integrated	Total
Always	Count	1	7	4	5	2	0	19
	% of Total	0.6%	4.3%	2.5%	3.1%	1.2%	0.0%	11.7%
Often	Count	4	9	4	7	4	1	29
	% of Total	2.5%	5.6%	2.5%	4.3%	2.5%	0.6%	17.9%
Sometimes	Count	6	7	9	5	18	5	50
	% of Total	3.7%	4.3%	5.6%	3.1%	11.1%	3.1%	30.9%
Rarely	Count	3	4	4	0	13	6	30
	% of Total	1.9%	2.5%	2.5%	0.0%	8.0%	3.7%	18.5%
Never	Count	2	3	1	3	17	1	27
	% of Total	1.2%	1.9%	0.6%	1.9%	10.5%	0.6%	16.7%
I do not know	Count	1	0	0	0	1	0	2
	% of Total	0.6%	0.0%	0.0%	0.0%	0.6%	0.0%	1.2%
Not applicable	Count	0	1	0	0	2	2	5
	% of Total	0.0%	0.6%	0.0%	0.0%	1.2%	1.2%	3.1%
Total	Count	17	31	22	20	57	15	162
	% of Total	10.5%	19.1%	13.6%	12.3%	35.2%	9.3%	100.0%

Table 128

Crosstab for Percentage of Respondents Rate the Sponsoring Management of Six Sigma Programs Holds the Six Sigma Team Accountable for Holistic Approach to Process Improvement with Six Sigma (N = 162)

Rating		Years Six Sigma Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Six Sigma	I do not know if my organization uses Six Sigma	Total
Always	Count	2	7	4	8	0	0	21
	% of Total	1.2%	4.3%	2.5%	4.9%	0.0%	0.0%	13.0%
Often	Count	2	8	11	6	0	0	27
	% of Total	1.2%	4.9%	6.8%	3.7%	0.0%	0.0%	16.7%
Sometimes	Count	2	10	11	13	0	0	36
	% of Total	1.2%	6.2%	6.8%	8.0%	0.0%	0.0%	22.2%
Rarely	Count	4	7	11	4	2	2	30
	% of Total	2.5%	4.3%	6.8%	2.5%	1.2%	1.2%	18.5%
Never	Count	1	7	5	3	2	0	18
	% of Total	0.6%	4.3%	3.1%	1.9%	1.2%	0.0%	11.1%
I do not know	Count	0	1	2	0	0	2	5
	% of Total	0.0%	0.6%	1.2%	0.0%	0.0%	1.2%	3.1%
Not applicable	Count	1	5	1	2	16	0	25
	% of Total	0.6%	3.1%	0.6%	1.2%	9.9%	0.0%	15.4%
Total	Count	12	45	45	36	20	4	162
	% of Total	7.4%	27.8%	27.8%	22.2%	12.3%	2.5%	100.0%

Table 129

Crosstab for Percentage of Respondents Rate the Sponsoring Management of Six Sigma Programs Holds the Six Sigma Team Accountable for Holistic Approach to Process Improvement with Integrated (N = 162)

Rating		Years Integrated Use						
		1 year or less	2 - 5 years	6 - 10 years	Over 10 years or more	My organization does not use Integrated	I do not know if my organization uses Integrated	Total
Always	Count	1	9	4	5	1	1	21
	% of Total	0.6%	5.6%	2.5%	3.1%	0.6%	0.6%	13.0%
Often	Count	3	7	6	5	5	1	27
	% of Total	1.9%	4.3%	3.7%	3.1%	3.1%	0.6%	16.7%
Sometimes	Count	5	5	5	6	14	1	36
	% of Total	3.1%	3.1%	3.1%	3.7%	8.6%	0.6%	22.2%
Rarely	Count	5	4	6	0	10	5	30
	% of Total	3.1%	2.5%	3.7%	0.0%	6.2%	3.1%	18.5%
Never	Count	2	4	1	0	8	3	18
	% of Total	1.2%	2.5%	0.6%	0.0%	4.9%	1.9%	11.1%
I do not know	Count	0	0	0	1	2	2	5
	% of Total	0.0%	0.0%	0.0%	0.6%	1.2%	1.2%	3.1%
Not applicable	Count	1	2	0	3	17	2	25
	% of Total	0.6%	1.2%	0.0%	1.9%	10.5%	1.2%	15.4%
Total	Count	17	31	22	20	57	15	162
	% of Total	10.5%	19.1%	13.6%	12.3%	35.2%	9.3%	100.0%