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VITA

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A COMPARATIVE CASE STUDY ANALYSIS OF ADMINISTRATORS PERCEPTIONS ON THE ADAPTATION OF QUALITY AND CONTINUOUS IMPROVEMENT TOOLS TO COMMUNITY COLLEGES IN THE STATE OF MICHIGAN

A Dissertation

Presented to

The College of Graduate and Professional Studies

College of Technology

Indiana State University

Terre Haute, Indiana

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

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by

Ted B. Mattis

December 2011

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Keywords: Analysis, perceptions, quality, continuous improvement tools, community colleges, technology management

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ABSTRACT

The purpose of this study was to determine whether community college administrators in the state of Michigan believe that commonly known quality and continuous improvement tools, prevalent in a manufacturing environment, can be adapted to a community college model. The tools, specifically Six Sigma, benchmarking and process mapping have played a critical role in improving performance in the manufacturing sector.

In 2008, the Obama administration made restoration of America's educational prominence a campaign promise and committed to the development of the American Graduation Initiative, a $12 billion plan to reform U.S. community colleges to be executed over the next decade. The outcome of this research study will help to prove whether administrators believe that continuous improvement and quality tools commonly found in manufacturing can be adapted to Michigan community colleges. The proposed tool for the study of the research problem was a mixed model Delphi study and a Pearson Correlation Coefficient.

The stakes for this research are high for community colleges. The promise of President Obama's American Graduation Initiative put continuous improvement and measures of academic quality in the national spotlight. The results of the study indicate that, in the opinions of administrators, quality and continuous improvement tools that have been proven successful in other industries such as benchmarking, process mapping and Six Sigma can be assimilated into community colleges in the state of Michigan.

ACKNOWLEDGMENTS

I have so many people to thank for the success of this project. It has been a long and arduous journey and I am thankful for those who supported me, those who challenged me, those who stayed on my butt about completion and the close friends that I have made throughout this process.

Socrates is quoted as saying "By all means marry. If you get a good wife you will be happy and if you get a bad one you will become a philosopher." As I finish my Doctor of Philosophy degree I feel that I am beginning to understand and appreciate the wisdom of Socrates. Like many in the 21st century my life has been tumultuous. During the Ph.D. process I've had to change jobs four times. The bottom dropped out of automotive manufacturing in Michigan closing two of the plants in succession where I was working as the Quality Manager. A move to the aerospace industry kept me employed and the bills paid but far from home. I moved again for another position, closer, but still distant. My marriage of 17 years ended in divorce. I moved regionally three times. I bought a foreclosure home and began extensive renovations. Life goes on and, in spite of the stress, I've managed to enjoy a close friendship with some of my classmates—most notably Dr. Nicole Radziwill and Dr. Greg Anderson. To be honest, I really didn't like Nicole when first we met but after the residency seminar I realized how incredibly gifted and brilliant she is and that the short-sightedness was clearly on my part. Nicole is a Type-A personality and me, well, not so much so we clashed a little during our collaboration projects on-line, but I came to really appreciate her brilliance after meeting her in

person at the residency seminar. Dr. Greg Anderson, whom I also met at the residency seminar, not only provided inspiration to me as I went through this process but provided inspiration for my son, Justin, who thinks that Greg is the coolest guy in the world. Greg played host to Justin and me during a visit to Salt Lake City where Greg lives and works. My son, like any 14-year old boy, wants to be in the video game industry when he grows up and Greg gave us an up-close and personal look at that industry—both the good and the bad. Greg is a really nice guy and, with the exception of that milk habit, the world is a better place because Greg is in it. I am blessed to count both of these outstanding people as friends that I have made during this process.

I need to acknowledge the selflessness of my committee members who have been more than simply talking heads during this process. Dr. Suhansa Rodchua and I started the Ph.D. program together many years ago. Her commitment, tenacity, and guidance helped steer me along the path to success and I cannot thank her enough. Dr. Ron Woolsey has a brilliant statistical mind and provided keen insights not only during the dissertation process but throughout the program and I thank him for that. His challenge to excel turned my project into a much better product. Dr. Stephen Spangehl is a deep thinker and an excellent speaker and I could listen to him for hours. His grasp and leadership of quality tools in higher education goes well beyond the theoretical and has clearly influenced the national agenda. He provided a "voice of reason" throughout the dissertation defense process. Dr. M. Affan Badar helped to guide my dissertation into a better product and during one of his classes pointed me towards my first publication. Granted, *School Bus News* is not a peer reviewed "A-List" journal but the publishing credit was my first and you never forget your first. Lastly from my committee was my chair, Dr. John Sinn. Dr. Sinn was a mentor, leader, Sherpa, inspiration and friend through this process. He was a co-collaborator and a publishing partner as well as an advisor and sage. I

can't thank Dr. Sinn enough for his help and guidance. He held my hand when necessary and kicked my butt when required. He was a source of frustration some of the time and an alleviator of frustration most of the time. He was very fond of saying "don't put the cart before the horse here Ted, you can't go maverick on this." I would be remiss if I didn't mention Mary Griffy who helped to move the process along through the myriad of hurdles and listened to my rants on the phone. I appreciate her help navigating through the oft confusing and sometimes turbulent waters of the Ph.D. process. Like Captain Jack Sparrow, Mebby maintained a steady bearing with a sometimes seemingly broken compass. She knew all the while, however, where we were going and how to get there.

I have to thank my parents Richard and Irene Mattis who supported me throughout this process and throughout my life and, although I'm 50 something, still ask if I've finished my homework. Thank you to my son, Justin, who has been an inspiration too. Something that we share together is a dislike of homework and the realization that it must be done. Justin always asked how it was going and whether I was making any progress. His take on it is if I'm not working on my homework then he shouldn't have to work on his. That drove me to continue with the project. In the end it wouldn't be fair if I didn't mention the ex. It takes two to make a marriage work and two to let a marriage fail. Thank you, Jody, for the times that you supported me during this ordeal.

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CHAPTER 1

Introduction

Chapter Overview

The purpose of this chapter was to provide a conceptual foundation for the proposed research. The study reviewed a collection of data derived from the opinions of community college administrators in the state of Michigan to determine whether the results of the data can be used to further quality and continuous improvement methods, similar to those found in manufacturing, in community colleges in the state of Michigan. First, a description of the participants and a background and history of the issue was presented. Next, a review of the research method described the significance of the application to this data set. Finally, the blueprint for the research itself was summarized: the problem statement, the research questions, a justification of why the research was necessary, and the assumptions and limitations underlying the proposed methodology.

Participants in the Study

This study targeted a collection of the community colleges in the state of Michigan. There are 28 community colleges in the state of Michigan that currently belong to the Michigan Community College Association (Hansen, 2009). Of those 28, 10 participate in the National Community College Benchmarking Project (NCCBP) all are accredited through the Higher Learning Commission – North Central Accreditation (HLC-NCA) with 14 institutions accredited

through the Program to Evaluate and Advance Quality (PEAQ), a more traditional approach to accreditation, and 14 who have elected to achieve accreditation through the Academic Quality Improvement Process (AQIP) which is an alternate and innovative method of accreditation offered through the HLC-NCA. HLC-NCA is the accreditation authority for all colleges, universities, and institutions of higher learning in the state of Michigan and the Midwest. AQIP is a method of accreditation by a participating institution which requires the college or university to follow an accreditation path which uses a structured set of continuous improvement principles but designed to meet the requirements outlined for accreditation by the HLC-NCA and the U.S. Department of Education. AQIP requires documented improvement processes to improve key criteria within the institution (Higher Education Learning Commission, 2011). The study worked with 26 of the 28 community colleges that belong to Michigan Community College Association (MCCA). Two colleges opted not to participate in the project.

Background and History of the Issue

Community colleges are designed to fill a specific niche in the higher education and training process in the United States. Community colleges are a uniquely American institution whose roots can be traced back to Joliet, Illinois, over 100 years ago (Vaughan, 1995). The mission of the community college is generalized to provide education for individuals, many of whom are adults, in its service region (Vaughan, 1995). Most community college mission statements are also committed to:

- Serve all segments of society through an open access admission policy that offers equal and fair treatment to all students
- A comprehensive educational program
- Serve its community as a community-based institution of higher education

- Teaching
- Lifelong learning (Vaughan, 1995)

According to archival data kept by the American Association of Community Colleges (AACC), there are 1,173 public, tribal, and independent community colleges in the United States (AACC, 2009). For comparison that is roughly the same number as Long John Silver franchises (1,156), Chili's franchises (1,275) and Quality Inns and Suites (1,128) in the United States (Franchise Times, 2007). Table 1 illustrates this comparison.

Community colleges serve almost half of the undergraduate students in the United States (AACC, 2009) providing open access to post-secondary education, preparing students for transfer to four-year institutions, providing vital workforce development and skills training/retraining and offering not-for-credit programs from English as a second language to community, cultural, and local enrichment opportunities. Community colleges have trained nearly 80% of the nation's first responders (McGrath, 2008). Community colleges currently support a combined enrollment of approximately 11.7 million students and often serve as the cultural and educational portal for a region as well as a catalyst for economic development.

Table 1

Community Colleges vs. Selected Franchise Comparison

	# of Units	Annual Revenue/Sales	# of Employees	$/per Employee
Community Colleges	1,173	$43.6B	620,784	$70,234.00
Long John Silvers	1,156	$300.0M	14,000	$21,429.00
Chili's	1,361	$4.2B	113,900	$36,874.00
Quality Inns and Suites	1,128	$564.0M	NA	NA

The importance of community colleges to the American economic system is emphasized by Jill Biden, community college advocate and wife of Vice-President Joe Biden. According to Biden (2010),

> Community colleges are the way to the future. Community colleges are more vital to our higher education system than ever before. They are at the center of America's efforts to educate our way to a better economy. I have seen first-hand the power of community colleges to change lives. At the same time we are working to improve access to higher education we are also working to improve quality.

Community colleges are semiautonomous entities. They have no formal alliances with other community colleges nor are they required to be aligned together. They are autonomous within their tax districts but bound by their governing board and state and federal Department of Education requirements. Although some formal and informal partnerships, consortiums and linkages exist between community colleges they remain largely independent—by design—governed by their individual board of trustees. Community colleges in Michigan are said to work more like a loose confederacy than a tight knit union (Hansen, 2009). Many community colleges in Michigan are members of the MCCA. MCCA is an advocacy group, think tank, and repository for ideas and training for community college leaders and trustees as well as a lobbying organization for community colleges in the state of Michigan. Community college trustees are elected or appointed to serve on the board of trustees for a college. In Michigan, the board of trustees is responsible to elect the president of the college, serve as the community advocate to the college and the college advocate to the community (Vaughan & Weisman, 1997). Boards of trustees are made up of elected or appointed citizens from the individual community college service region or taxing district. In the state of Michigan boards of trustees for community

colleges are made up of elected officials unless an appointment is required to fill a position until the next scheduled election (MCCA, 2009).

Community colleges are responsible to the communities that they serve and, to some degree, to the legislatures by whom they are governed. Communities hold these institutions responsible though the election of their respective board members and through donations and funding and millage proposals. Communities truly *vote their support* for their community colleges through millage and board member elections. Legislators hold community colleges responsible by voting on community college funding, special legislation designed to control certain collegiate activities and by establishing a personal relationship with the college that provides a personal connection to the college and, by extension, the community (Vaughn & Weisman, 1997). Legislators may provide personal appearances on behalf of a college, use the college as a backdrop in announcing important legislation, or use the college as a venue for community outreach.

Community college websites contain a plethora of data related to the overall performance of that institution. This data is relatively consistent and usually includes metrics in the form of graduate and enrollment count, financial aid, full- and part-time student ratio, age and gender distribution, etc. Community support and involvement is paramount and evident on the community college website (Northwestern Michigan College, 2010). Many sites talk about the *quality* of a community college education but do not define what is meant by *quality*. Community colleges have transfer agreements with many four-year institutions which means that the credits earned in community colleges transfer to those four-year institutions making the credits equal to or of the same quality as credits earned at those institutions (Cohen & Brower, 2008). Employers often approach community colleges first for job training for their employees

emphasizing the quality and value of those curricula (McGrath, 2008). Many employers are interested in their employees obtaining a credential rather than a degree (Jordan, 2010). Community colleges are uniquely structured to provide that credential. Legislation has been proposed to use graduation rates as one measure of quality performance for higher education in the state of Michigan. Graduation rates are not viewed as quality metrics by community college administrators due to the unique mission of the community college (Vaughan, 1995). The mission of the community college goes far beyond graduation and success cannot be measured for community colleges by graduation rates alone (Townsend & Dougherty, 2006). Quality in education is difficult to define and, as such, difficult to ensure. Because quality in higher education is difficult to define, it is by association, difficult to measure and difficult to ensure. Because quality in higher education is difficult to define it becomes easy to dismiss the quality tools and practices that were proven to be successful in similar and dissimilar industries as useful to higher education.

Community colleges are reluctant to see themselves in a like context with other educational institutions including other community colleges due to the individual economic and demographic nature of the regional taxing district in which they operate (Vaughan, 1995). Community colleges, like school districts, characterize themselves as representative of the community that they serve. Due to this individual identity community colleges may be reluctant to benchmark themselves with other like institutions even though many of their practices are similar (Hansen, 2009). Community colleges have been reluctant to define their product delivery stream as a process. Community colleges recognize administrative processes and the need to standardize and improve upon them but seldom define course delivery and teaching as a process in need of improvement and control (Ewy & Gmitro, 2010). Colleges in the past have been

reluctant to define their work in terms of processes even though much of the work follows strict procedures and guidelines. Deming (n.d.) said, "If you can't describe your work as a process, then you don't know what you're doing."

Beyond the facilities, community colleges are made up of a collection of processes and people including administrative, accreditation, accounting and academics (Ewy & Gmitro, 2010). The majority of community college employees are academics. While administrative, accreditation and accounting activities can be described as processes many colleges are having *conversations* about defining academic activity in terms of process. The faculty pushback with regard to academic activity as process centers around two main points; teaching as an art and academic freedom.

The belief that teaching is an art dates back to the time of Socrates and Aristotle who defined teaching as a *cooperative art* due to the cooperation required between the teacher and the student (Adler, 1977). *Teaching is an art* has become a foundational argument by those opposed to the idea that teaching is a process. Opposing the idea that teaching is a process sets the act of teaching on a higher plane than an assembly line operation that can be dissected and defined in a series of operational steps. Art is generally accepted to be a creative process. The act of painting is a manual process and a medium by which art takes form. To some, teaching is a creative process that cannot be broken down and defined in a series of operational steps.

While teaching is thought to be an art by the some practitioners, learning is said to be a process (Smith, 1996). This gives the higher level creative component to the teacher while learning as a process suggests that it is the job, the task, of the student to learn. Learning, once believed to be a *cooperative art* in ancient times (Adler, 1977), is now believed to be a process in modern times (Smith, 1996). While the thinking has changed for the student and learning is a

process, there are those who still hold on to the notion that teaching is an art and cannot be controlled or measured any more than art can be controlled or measured.

The second foundational argument used by forces opposed to *teaching as process* is the belief that *teaching as process* stifles academic freedom. The concept of academic freedom was first formalized in the United States in a paper co-written by the American Association of University Professors (AAUP) and the Association of American Colleges (AAC) now the Association of American Colleges and Universities (AACU). The paper, *1940 Statement on Principles of Academic Freedom and Tenure,* is a position paper that suggests that faculty is entitled to freedom in the classroom in discussing their subject (AAUP, 1940). While the notion of academic freedom is important in stimulating discussion and learning, a U.S. Supreme Court opinion said that academic freedom means that the university can determine for itself on academic grounds: who may teach, what may be taught, how it shall be taught, and who may be admitted to study. Clearly, defining the *process of teaching* does not stifle the legal notion of academic freedom.

With the foundational arguments addressed the idea of *quality* in higher education becomes one of definition and accountability. Two questions that drive the on-going debate are: What is meant by *quality* in higher education; and who is accountable for quality in higher education? Quality in higher education means different things to different stakeholders. *U.S. News and World Reports* (USNWR) publishes an annual edition dedicated to their ranking of the "Best Colleges in the United States." USNWR uses seven broad categories to determine their list of best colleges and universities and is very careful not to use the term *quality*. Table 3 lists the USNWR "Best College" categories and their relative weight in their determination of the Nation's best colleges and universities and is very careful not to use the term "quality". Table 2

lists the USNWR "Best College" categories and their relative weight in their determination of the Nation's best colleges and universities.

Table 2

U.S. News and World Reports Best College Categories

USNWR Best College Category	Weight	
	National Colleges	Regional Colleges
Undergraduate Academic Reputation	22.50%	25%
Student Selectivity for Fall 2009	15.0%	15%
Faculty Resources for 2009-2010	20.0%	20%
Graduation and Retention Rates	20.0%	25%
Financial Resources	10.0%	10%
Alumni Giving	5.0%	5%
Graduation Rate Performance	7.50%	0%

Of the seven categories listed by USNWR only three are significant to the community college society. Faculty Resources, Financial Resources, and to some extent Alumni Giving are important categories for community colleges. Many community colleges have foundations to work with alumni and other philanthropists to secure donations and gifts. Student Selectivity is in direct conflict to the open access mission of the community college. Undergraduate Academic Reputation is not as important for the community college as most community colleges are commuter colleges and location and access are more important than reputation in many cases. Graduation and Retention Rates and Graduation Rate Performance are only part of the community college mission which is also focused on professional training, credentials and

transfer credit. Graduation is important for the community college for those students who elect to graduate but it isn't the sole mission of the community college (Townsend & Dougherty, 2006). So different is the mission of the community college from four-year colleges and universities that USNWR does not include community colleges in its ranking. How, then, is quality determined in community colleges?

Quality in community colleges is currently measured primarily through the use of surveys. Surveys like the *Community College Survey of Student Engagement* (CCSSE) provide information to community colleges related directly to student learning (University of Texas at Austin, 2011). Student learning is not an identified area in the USNWR study. Kuh and Hayek (2004), said that quality, at least in terms of undergraduate education, should be defined in terms of the student's educational experience—in particular—the student's active engagement in his or her own learning at the institution (Kuh & Hayek, 2004). McClenney (2004) suggests, "It is this view of quality that makes the most sense for America's community colleges" which supports Kuh's description of consensual quality. McClenney writes about the challenges facing community colleges. Goldrick-Rab, Harris, Mazzeo, and Keinzl (2009) support the idea that quality in a community college environment should be defined in terms of student learning. Half of the Obama administration's pledge of $12 billion to improve quality in higher education, known as the American Graduation Initiative (AGI), is committed to the improvement and evaluation of practices that enhance sub-baccalaureate education.

In a search of *Quality Tools in Higher Education,* surveys were the overwhelming tool of choice. Benchmarking was also represented in the search to a much lesser degree but surveys were the primary quality tool defined in higher education. In many cases surveys are completed at regular intervals throughout the community college experience. Surveys give a post-

experiential view of the student's community college experience. Improvements to the student learning process based on survey responses may lag the actual experience by a semester or several semesters.

Who is accountable for quality in higher education? If quality is defined in terms of student learning then faculty has direct accountability in the student learning process. Students, too, are direct contributors to the learning process and share accountability. Facilities and resources directly affect student learning (Vaughn, 1995). The chain of accountability leads to administration, legislators, and board members who are responsible for funding and allocation as well as the community-at-large for funding and general support of the institution. Everyone associated with the institution either directly or indirectly is responsible for the quality of the student learning process (Europa, 2010).

Deming (1982) points out that there are several similarities between service organizations, such as a community college, and a manufacturing organization. Those similarities include the cost of poor quality, mistakes from human error, absence of defined procedures, contact with the customer, differing definitions of quality, differing visions of what is meant by good quality along with several other similarities (Deming, 1982).

In addition to the similarities outlined by Deming the path to continuous improvement seems eerily similar between manufacturing in the past and higher education in the present. From a quality and continuous improvement standpoint, manufacturing in America was where higher education and community colleges are, some 60 years ago. Much of the same opposition to a standardized approach to quality and continuous improvement and the use of data driven tools has been allayed in manufacturing through the use of clear communication and data results reporting but exists in some service industries and institutions of higher education today (Pexton,

2010). The opposition to the use of standard practices and quality tools by manufacturers some 60 years ago included hubris on the part of manufacturers who believed that they didn't need standard practices and capable processes. They believed that what they did and how they did it was unique to their organization (Juran, 1995). They believed that what they did could not be *commoditized* into a standard practice. They felt that their work was more of an art than a process. Deming and Juran faced the same opposition in Japan after World War II when they introduced quality tools and continuous improvement in an effort to rebuild Japan's postwar economy (Juran, 1995). In Japan, Juran, Deming, and Feigenbaum showed Japanese manufacturers the value of standard practices, quality and continuous improvement tools. The adoption of these principles and tools permeated all aspects of the Japanese transportation industry and great strides were made in quality and continuous improvement (Juran, 1995). Vaughn Beals, CEO of Harley Davidson in the early 1980s said, "The Japanese came to our shores with a superior product of contemporary styling and uncompromising quality" (as cited in Peters & Waterman, 1982). As a result of the high quality of their products Japanese automobile manufacturers began to erode the market share of the American automobile manufacturers. In 1980, Detroit's Big Three (General Motors, Ford, and Chrysler) had 71.3% of the American automobile market; by 1991 their share of the American automobile market declined to 62.5% (Flexstudy, 2011).

A 1980 NBC broadcast of *If Japan Can, Why Can't We?* introduced America to Dr. W. Edwards Deming (as cited in Dobyns & Crawford-Mason, 1993). Ford Motor Company invited Deming to help transform their company through the use of quality and continuous improvement tools and methodologies. Within a few years Ford's earning were the highest for any company in automotive history (Flexstudy, 2011). It was during this time when most major companies

would embark on their own continuous improvement journey and adopt quality and continuous improvement tools and methods. As manufacturers began to improve their quality and practices they began to demand the same from their suppliers. GM would launch a program called *Targets for Excellence* which would require suppliers to adhere to a set of standards for quality performance of their products. Ford would institute a quality program for their suppliers called Q1 which would require suppliers to comply with Ford's requirements and standards. The International Organization for Standards would create a set of requirements which would include the minimum set of requirements for an acceptable quality system based on British quality standard BS 5750 which provided the foundation for ISO-9000 (British Standards Institute, 2011). The automotive industry adopted a set of quality standards based on ISO-9000 and required the entire supply base to comply and ultimately register to the QS-9000 standard as defined by the Automotive Industry Action Group (AIAG, 2011). QS-9000 evolved into TS-16949 which serves as the current standard of the automotive industry and includes provisions for continual improvement and the use of quality tools (AIAG, 2011).

Quality tools, standardization, accreditation, and continuous improvement were only one part of the transition from America's complacent manufacturing base to one of high quality—albeit a critical part. During this time manufacturing technology improved, training and education of the workforce improved too largely due to an increase in enrollment in community colleges (McGrath, 2008). Data on which to make decisions improved dramatically. The market demanded more and better products and manufacturers rose to the challenge (Flexstudy, 2011). Quality tools, standardization and continuous improvement played a significant role in improving American manufacturing (Juran, 1995).

Statement of the Problem

The problem for this study was to answer this question: In the opinion of administrators, can quality tools, used to improve the quality of manufacturing processes, be generalized to the community college model in the state of Michigan?

Statement of the Research Questions

Creswell (2009) suggests that a mixed model approach to research provides a thorough framework for a case study approach such as this which requires both qualitative and quantitative analysis. Through the use of a mixed model modified Delphi study research approach this project is designed to answer the following questions based on the opinions of community college administrators in the state of Michigan:

RQ1. Can quality and continuous improvement technology play a role in academic improvement?

RQ2. Can the course delivery value stream of a community college be defined as a process?

RQ3. If course delivery can be described as a process, can this process be controlled and improved by applying traditionally defined manufacturing quality and continuous improvement tools?

RQ4. Can manufacturing quality and continuous improvement tools – specifically process mapping, benchmarking and Six Sigma methods – be applied to the community college model?

RQ5. Can accreditation, specifically an AQIP approach, be used as a continuous improvement tool in a community college model?

RQ6. Are there significant differences in the mean perception between utilizing quality tools and accreditation to improve quality in a community college?

RQ7. Are there significant differences in the mean perception between utilizing AQIP and accreditation to improve quality in a community college?

The first research question, RQ1, sought to discover whether administrators at community colleges in the state of Michigan believed that quality methodology and continuous improvement technology could be applied to the community college model in the state of Michigan. The answer to RQ1 was found in the responses of a mixed model research approach driven primarily through a Delphi survey.

The second research question RQ2 sought to establish administrator's views on foundational processes in order to define a value stream for the target institutions. The answer to RQ2 was derived from a thorough forensic review of the literature surrounding the question and the responses to the Delphi questionnaire.

The third research question, RQ3, sought to understand administrator's opinions as to whether quality and continuous improvement tools used in manufacturing processes could be applied to the value streams in the Michigan community college model. Based upon the outcome of RQ2, RQ3 sought to further define process control and its application in the value stream of the community college model.

Research Question 4, was exploratory and sought to determine through the opinions of administrators whether specific quality tools, proven to be successful in manufacturing, could be generalized to a community college application. RQ4 looked specifically at whether the application of process mapping, Six Sigma methods and benchmarking could be used in the community college model.

Research Question 5 looked at the role that accreditation, specifically AQIP, might play in continuous improvement within a community college based on the opinions of administrators. Accreditation may be seen by some community colleges as intrusive and a *once every 10 years ordeal* rather than a support mechanism which could lead to continuous improvement.

Research Question 6 explored the opinions of administrators in Michigan community colleges related to the use of quality tools and accreditation to improve quality in community colleges. The results of RQ6 may offer community colleges in the state of Michigan insight into how continuous improvement can be executed in their institution. A hypothesis was developed for RQ6 that required testing. Hypothesis testing by means of a *t*-test provided the mechanism by which to accept or reject the null hypothesis.

Research Question 7 further explored the use of AQIP and accreditation as a tool to improve quality in a community college model. Based on the opinions of administrators, the results of RQ7 offered a tool to improve quality in community colleges in the state of Michigan. A hypothesis was developed for RQ7 that required testing. Hypothesis testing by means of a *t*-test provided the mechanism by which to accept or reject the null hypothesis.

Statement of the Hypotheses

Two hypotheses were developed to determine whether significant differences existed in the mean perception between administrator's opinions as to what methods would better improve quality in Michigan community colleges. Those hypotheses were related to RQ6 and RQ7.

RQ6. Are there significant differences in the mean perception between utilizing quality tools and accreditation to improve quality in a community college?

$H_0 1$: $\mu 1 = \mu 2$. There is no statistically significant difference in the mean perception between utilizing quality tools and accreditation to improve quality in community college.

Ha1: $\mu 1 \neq \mu 2$. There is a statistically significant difference in the mean perception between utilizing quality tools and accreditation to improve quality in community college.

RQ7. Are there significant differences in the mean perception between utilizing AQIP and accreditation to improve quality in a community college?

$H_0 2$: $\mu 1 = \mu 2$. There is no statistically significant difference in the mean perception between utilizing AQIP and accreditation to improve quality in community college.

Ha2: $\mu 1 \neq \mu 2$. There is a statistically significant difference in the mean perception between utilizing AQIP and accreditation to improve quality in community college.

Statement of the Purpose

The purpose of this study was to examine the current research in the field of quality, process control and continuous improvement and determine if community college administrators believe that the tools prevalent in manufacturing and service organizations can be applied to a community college model in the state of Michigan. Using data collected in a case study approach to a mixed model modified Delphi study of participating community colleges in the state of Michigan the research sought to determine whether these tools, which have been found to add value to other industries, could be generalized to add value to community colleges in the state of Michigan in the opinions of the community college administrators. This study contributes to the academic literature in the quality field through the documentation of a scientific method of generalizing existing manufacturing quality tools to the education industry. Results of this study may help participating institutions reduce variability in their administrative processes and value streams as well as provide a path to continuous organizational improvement.

Statement of the Need

There is a compelling need to understand process control, continuous improvement and quality in higher education—specifically in a community college model. Process consistency, continuous improvement and institutional efficiency are paramount in higher education due to the volatility and turnover of leaders and stakeholders. College presidents and deans leave for various reasons (Vaughan & Weisman, 1997). Elected trustees and other officials are voted out of office or choose to leave for various reasons. Through this leadership turmoil it is imperative that the college continue to operate in spite of organizational turnover. To do this, processes must be understood to ensure that waste is removed and value optimized in both administrative and academic processes and that processes are documented and yield consistent results. Spellings pointed out the need for quality, consistency, and transparency in American institutions of higher education (Spellings, 2006). Based on the Spellings Report, legislators scrambled to write legislation to try to control the quality of higher education. Unfunded mandates and calls for accountability came from Washington with no definition, direction or guidance as to how to improve. The sense of urgency exists for community colleges to take the reins and show how they are improving through the use of sound quality tools and methodologies rather than wait to be impaled by a Washington or Lansing mandated improvement process that may not fit the mission of the community college.

The political landscape in the state of Michigan and nationally is changing and evolving. Legislators, who control and distribute funds to community colleges, are term-limited and may not have had enough experience to understand the mission of the community college to the people of Michigan. Legislators may myopically see higher education funding as a single entity, a single funding bucket, without understanding the nuances and differences between the funding

requirements of community colleges and other institutions of higher education. Legislators may have also made promises to their constituency or their movement to cut spending regardless of the overall impact on the citizenry. The need to document the case for process control and waste reduction will help to ensure that funding isn't arbitrarily cut off for political reasons. There is also much fervor surrounding the use of metrics in higher education in an effort to try to understand value and quality in higher education. From the Bush No Child Left Behind Act (NCLB) to the Obama American Graduation Initiative (AGI) performance metrics are the feedback mechanisms to understand improvement (Brandon, 2009). While many people agree that metrics are required to measure performance and performance gaps, few agree on what those metrics should be. Metrics for community colleges are not the same as those for other degree granting institutions due to their differing missions or their *raison d'être*. In addition to using quality tools, continuous improvement methods and metrics to secure funding, the tools can be used to ensure the effective use of current funding dollars which can be wasted by an organization simply through wasteful processes, hidden factories and rework loops that they simply do not understand or they are not aware exist. Processes need to be identified and waste in the process needs to be identified and eliminated thereby optimizing the process (Breyfogel, 2003). Those organizational dollars are there to be had simply by identifying and eliminating wasteful practices and processes and could be used to support the organization or supplant taxpayer contributions.

Lastly the need for continual improvement and process control is becoming an avenue to accreditation. In the state of Michigan community colleges may choose to continue their accreditation through the AQIP process which uses a structured set of continuous improvement principles for accreditation and requires documented improvement processes to improve key

criteria within the institution (Higher Education Learning Commission, 2011). This path to accreditation is predicated on process identification and improvement making the use of known quality and continuous improvement tools and methods a valuable addition to a community college's value arsenal.

Statement of the Assumptions

The following assumptions were made in pursuit of this project. The colleges chosen for this study represent a subset of all of the community colleges in the state of Michigan. Other colleges represent specific regions in the state but the cross section of institutions chosen represent the diversity of the economy and the demographics of the state of Michigan.

It is assumed that the mixed model modified Delphi study provides data that can be analyzed and conclusions drawn or inferred. The Delphi result will yield data that can be quantified during the second round through a Likert scale scoring. Bias is not a statistical concern due to the mixed model approach to the research (Lang, 1998). The study used a limited number of questions to generate responses. This may affect stability.

Statement of the Limitations

A limitation of this study is that the research is being compiled on a subset of community colleges in the state of Michigan. A study of all community colleges nationally albeit comprehensive, would be exhaustive and would not fit within the time constraints of this project. Further limitations are that the data is self reported and although every effort will be made to ensure that the study is clear; there may be some bias on the part of some participants to skew the data in favor of their institution. Limitations of the methodology include an understanding of the sample size and its effects on the reliability of the data. While the cross-section of institutions is reflective of the state, it is still a sampling of institutions and not the entire population of all

Michigan community colleges. The sample size or number of respondents may serve as a limitation to the project.

Statement of the Methodology Subjects

The study required input from several different community college administrators associated with the MCCA. While every community college has a unique personality reflective of the region's population and values, the overall mission of the community college is similar. Administrators were chosen to complete this project due to their unique perspective on the organization. Department heads were also included in the study.

Research Design

The proposed research utilized a mixed method modified Delphi case study approach consisting of both a quantitative and qualitative component to data gathering and analysis as well as a deep dive into the literature surrounding quality and continuous improvement application in community colleges to gain clarity and further the knowledge in this field. The mixed method approach is thought by some scholars to further the overall strength of a study beyond that of either qualitative or quantitative research alone (Creswell 2007). Creswell talks about a philosophical worldview and the influence that such a paradigm has on a body of research. For this project the research follows three distinct paths.

The first path was the modified Delphi study used to gather data on the current understanding of quality and continuous improvement methodologies as they exist in the subject populations. The purpose of the Delphi study was to explore ideas and focus on decision making utilizing the collective opinions of experts (Linstone & Turoff, 1975). The Delphi technique was said to be more effective in qualitative studies than traditional discussion groups due to the anonymity of the participants and the separation by distance (Delbecq, Van de Ven & Gustafson,

1974). The Delphi technique includes several rounds of questions designed to dig deeper into an organization's view and approach to the study at hand. The Delphi study has been proven to be effective when a researcher wants to gather important data and the subjects are separated by geography or wish to remain anonymous (Skulmoski, Hartman, & Krahn, 2007). A thorough review of the Delphi process and its intent as well as the mixed-method approach is found in Chapter 3.

The second path was a thorough review of the literature surrounding quality and continuous improvement in higher education—specifically community colleges. A cursory review of the data suggests that there was a brief push to apply Total Quality Management (TQM) to higher education in the late 1990s when TQM was in vogue. There were a scant handful of doctoral dissertation studies written about the theory of TQM and its application to higher education. Further investigation revealed whether the application of TQM tools and/or quality and continuous improvement tools manifested themselves on campus. There is much written on the call for quality in higher education from a regional, national and international viewpoint. Even local newspaper editors write about the quality of local schools (Fields, 1993). The literature suggests that quality in higher education is a global concern (Center for Higher Education Policy Studies [CHEP], 2010). There is much to be learned from the literature about applying best practice methods across industry boundaries. A thorough review of the current literature helped to support the conclusions of this study.

The third path consisted of a thorough review of the current practices in the quality field. Many of the quality and continuous improvement tools originally created to eliminate variation (waste) in manufacturing have been successfully generalized into other transactional industries such as hospitals, insurance, and banking (iSixSigma, 2010). A review of the practices and tools

that have been successfully assimilated into other industries articulates the gap between the application of quality and continuous improvement methodologies in manufacturing and higher education.

An inferential analysis of the information accrued by walking the project down these three paths provides the resultant data required to answer the research questions through a mixed method modified Delphi case study approach. A deeper discussion of the research methodology and procedures to carry out this project is found in Chapter 3.

Definition of Key Terms

Academic Freedom—Supported by the American Association of University Professors, Academic Freedom is described as:

1. Teachers are entitled to full freedom in research and in the publication of the results, subject to the adequate performance of their other academic duties; but research for pecuniary return should be based upon an understanding with the authorities of the institution.
2. Teachers are entitled to freedom in the classroom in discussing their subject, but they should be careful not to introduce into their teaching controversial matter which has no relation to their subject.[**2**] Limitations of academic freedom because of religious or other aims of the institution should be clearly stated in writing at the time of the appointment.[**3**]
3. College and university teachers are citizens, members of a learned profession, and officers of an educational institution. When they speak or write as citizens, they should be free from institutional censorship or discipline, but their special position in the community imposes special obligations. As scholars and educational officers, they

> should remember that the public may judge their profession and their institution by their utterances. Hence they should at all times be accurate, should exercise appropriate restraint, should show respect for the opinions of others, and should make every effort to indicate that they are not speaking for the institution

American Graduation Initiative (AGI):

> Fifty years ago, President Harry Truman called for a national network of community colleges to dramatically expand opportunities for veterans returning from World War II. Today, faced with rapid technological change and global competition, community colleges are needed more than ever to raise American skills and education levels and keep American businesses competitive. President Barack Obama called for an additional 5 million community college degrees and certificates by 2020 and new steps to ensure that those credentials will help graduates get ahead in their careers. Together, these steps will cost $12 billion over the next decade. The administration will pay for them as part of a package that cuts waste out of the student loan program, increases Pell Grant scholarships, and reduces the deficit. (Obama, 2009)

Academic Quality Improvement Process—The Academic Quality Improvement Program (AQIP) provides an alternative evaluation process for organizations already accredited by the Commission. AQIP is structured around quality improvement principles and processes and involves a structured set of goal-setting, networking, and accountability activities. AQIP uses direct, cost-effective processes including AQIP's Strategy Forums, Systems Appraisals, and various other services.

Lower Peninsula is the Michigan State land mass from The Mackinac Bridge south to the Ohio/Indiana State lines.

Process mapping is the graphical presentation of the process. It is especially helpful in visualizing and quantifying the amount of time spent on each activity during the entire process.

Six Sigma: The objective of Six Sigma Quality is to reduce process output variation so that on a long term basis, which is the customer's aggregate experience with our process over time, this will result in no more than 3.4 defect parts per million (PPM) opportunities (or 3.4 defects per million opportunities (DPMO).

Total Quality Management (TQM) is a set of management practices throughout the organization, geared to ensure the organization consistently meets or exceeds customer requirements. TQM places strong focus on process measurement and controls as means of continuous improvement.

Upper Peninsula is The Michigan State land mass north of the Mackinac Bridge from Canada to the Wisconsin State.

Value Stream Map (VSM) is a visualization tool which helps to understand and streamline work processes.

Summary

The purpose of this chapter was to provide a conceptual foundation for the proposed research. The study reviewed a collection of data derived from a subset of community colleges in the state of Michigan to determine whether the results of the data can be used to further quality and continuous improvement methods, similar to those found in manufacturing, for the participants of the study based on the opinions of administrators. First, a description of the participants and a background and history of the issue was presented. Next, a review of the research method described the significance of the application to this data set. Finally, the blueprint for the research itself was summarized: the problem statement, the research questions

and a justification of why the research is necessary, and the assumptions and limitations underlying the proposed methodology.

CHAPTER 2

Review of Literature

Chapter Overview

The purpose of this chapter was to provide a review of the literature specific to quality and continuous improvement tools in industry, the application of quality and continuous improvement tools in higher education with an emphasis on quality and continuous improvement tools in a community college model. This chapter reviewed the current literature and research in this area and sought to identify and bridge the gap between the current body of knowledge and the research questions posed in this project.

There is a plethora of literature available specific to quality and continuous improvement tools in manufacturing. A cursory look at the ASQ website lists 43 books on quality tools and 71 articles with quality tools in the title. ASQ lists 66 books on continuous improvement and 132 articles with continuous improvement in the title. An Amazon quick search yields 784 books on quality tools and 60 books on continuous improvement. Literature specific to quality tools and continuous improvement in higher education is more limited than a search of quality tools and continuous improvement yet the material available is rich in size, scope and diversity with writing to support both the pros and cons of systemic improvement in higher education. Literature specific to the application of quality and continuous improvement tools in community colleges is, however, limited. In a sea of scholarly research very few doctoral dissertations focus

on the use of quality and continuous improvement tools in higher education and even less on quality and continuous improvement tool usage in community colleges. However, a range of literature including current periodicals, research articles, dissertations and government reports was reviewed to support the project.

Evolution and Use of Quality and Continuous Improvement Tools

English art critic, essayist and social thinker John Ruskin said, "Quality is never an accident; it is always the result of intelligent effort" (Ruskin, 1819-1900). Ruskin lived at a time when the world was moving from craft to guild to trade to industrialization and had the foresight to realize that *quality is the result of intelligent effort*. Shortly after Ruskin's death Dr. Walter A. Shewhart published *Economic Control of Quality of Manufactured Product* in 1931, which was the result of intelligent effort and became a foundational work in the study and practice of quality control earning Dr. Shewhart the title of *father of modern statistical quality control*. It was Shewhart who pioneered the use of control charts which would arguably be the foundation upon which all other quality control and quality engineering methodologies were built. Beyond control charts, Shewhart's work examined all aspects of quality control and, according to Dr. W. Edwards Deming a statistician and quality guru with a close association to Shewhart, included in chapters 4 and 18 *a masterpiece on the meaning of quality* (Deming, 1980). In Chapter 4 Shewhart defines quality as having both objective and subjective components. The objective components are constant and measureable. Shewhart also mentions the subjective components of quality in terms of conceptual value including use, cost, esteem and exchange (Shewhart, 1931). Shewhart believed that quality in manufacturing necessitates the establishment of standards in a quantitative manner and that the subjective component of quality is where the commercial value lies. In Chapter 18 Shewhart begins to model quality in terms of mathematical

standards and distribution functions. Shewhart theorized that observation and control of variation in manufacturing processes will provide a more consistent product and therefore a higher quality product as the expectation for value is realized (Shewhart, 1931).

Another recognized quality expert, W. Edwards Deming, began his career as a physics instructor and a mathematical physicist for the U.S. Dept. of Agriculture (Juran, 1995). Deming's interest in statistical sampling took him to Japan after WWII as an advisor to the American War Board (Juran, 1995). Deming gave a series of lectures on statistical quality control (SQC) and the identification and reduction of variability in manufacturing processes (Juran, 1995). According to Juran (1995), Deming's lectures and consultation gave the Japanese manufacturing community a sense of direction and purpose. Deming believed that the time was right for the Japanese manufacturing community to embrace SQC and bring a scientific method and standards to bear in controlling the quality of manufactured goods. "The stage was perfectly set. Had it been even a year or two earlier things would probably not have gone so well but in 1950, Japan was ready for a fresh start" (Deming as cited in Juran, 1995).

Deming gave the same series of lectures to the Japanese Union of Scientists and Engineers (JUSE) that he gave to the U.S. manufacturing congress during WWII. The postwar American economy was booming. The postwar Japanese economy was in shambles. Japan was ready for a fresh start. America was selling all of the goods it could make to a postwar economy. Japan took the lessons of statistical quality control and variation reduction to heart and applied them to their manufacturing processes. America subscribed to an *if it ain't broke don't fix it* mentality and didn't want to retool their manufacturing discipline at a time when the economy was booming (Dobyns & Crawford-Mason, 1993). There was no impetus for change in the American economy.

SQC was not universally embraced in Japan. There was pushback to SQC in the Japanese manufacturing theater. Experienced factory workers had their own way of doing things and did not want or accept new theories or applications from outsiders. The workers complained to management that they were already doing their best and the new practice of charting would slow them down and disrupt their flow (Juran, 1995). They complained that standardization would impede their ability to do their best work. Employees were sent to school to learn the new methods of quality control. The tools and methods were implemented during new launches where they were met with great success. Newer processes were seen as more easily adaptable to SQC and the discipline was written into the process. SQC was slower to take root in existing processes and legacy processes but was eventually implemented in these areas as well. Deming continued to face difficulty with SQC in America until the 1980s when Japanese goods began to erode American market share in the global economy. It was at this point, with the erosion of American market share, that American manufacturing started to take notice (Dobyns & Crawford-Mason, 1993).

Juran (1995) followed much of the same path as Deming and shared similar experiences in the global application of quality control. Juran was an alumnus of the Bell Laboratory during the same period as Shewhart. Juran rose to become quality manager for the Hawthorne complex of Western Electric and became a U.S. government official during WWII. Deming arranged for Juran to meet with the scientists from JUSE during a trip to Japan in the early 1950s. Juran found that top management viewed quality as an inroad to greater market share and that quality control was being practiced dutifully on the shop floor but middle management was not fully engaged in quality control practices or methodologies.

Practitioners to Prophets

What Deming and Juran found in the implementation of quality control was that the tools are a necessary first step in the process but much more was needed (Juran, 1995). Both Deming and Juran started as practitioners of quality control by implementing the tools necessary to identify and address variation in a manufacturing process but would gravitate to a more holistic view of quality control in an organization. Deming would give credit to Shewhart, as well, to see beyond the tools and view quality improvement and control as a system beyond a collection of tools – but relying on the tools as a foundation for improvement. Arguably the holy trinity of quality control among quality professionals includes Shewhart, Deming, and Juran, three practitioners turned prophets, who built holistic quality systems upon a foundation of quality tools. Lesser deities who have made significant contributions to the quality discipline and who would come to a systemic approach to quality from a foundation of tools include Crosby (1979), Feigenbaum (1951), Ishikawa (1982) and Taguchi (1981). Each of these *monsters of quality* came from a perspective of tools first, systems second and each came to the realization that neither tools alone nor philosophies alone would improve the quality of goods produced by an organization. Tools and philosophies must work in concert to improve quality in an organization.

The tools would become the foundation on which to build a quality system. Shewhart (1931) elegantly outlined the tool that would ultimately spawn most of the quality control tools in use today when he first described process capability and the control chart. Shewhart found that all manufacturing processes contained two types of variation 1) random or chance variation and 2) assignable cause variation (as cited in Juran & Gryna, 1988). Random variation is a steady component inherent in the process and cannot economically be controlled (Shewhart,

1931). Assignable cause variation is an intermittent component which can be attributed directly to some influence on the process. Shewhart believed that the intermittent component can be identified and removed economically. Improving consistency by reducing variation in a process yields more consistent products. Shewhart proved that the variation of any quality characteristic can be quantified by sampling the output of the process and estimating the parameters of the statistical distribution (Shewhart, 1931). Deming, Feigenbaum, Juran, Ishikawa, and Taguchi would apply the theory of statistical quality control and variation reduction to the Japanese manufacturing environment which would eventually improve the quality and reduce the cost of poor quality of the goods that they produced through variation reduction (as cited in ASQ, 2010).

Eventually American manufacturing would realize the benefit of statistical quality control and variation reduction as a way to increase quality and decrease costs applying SQC in its own operating environment (Dobyns & Crawford-Mason, 1993). Building on the basis of process capability and control charting methodology, and to support the investigation of variation and the corrective action process, other tools began to emerge to aid in building consistency and eliminating variation in the manufacturing process. Ishikawa's diagram would prompt investigators to delve deep into the general areas that affect a process—Man, Method, Machine, Measurement, Materials and Environment (Ishikawa, 1982). Deming would refine another Shewhart tool the Plan, Do, Check, Act, cycle into an operating and investigation method (Latzko & Saunders, 1995). Taguchi would realize the value of the statistical approach to quality control in the development of the Taguchi Loss Functions. Taguchi would advocate that *poor quality is a cost to society* (as cited in Juran, 1995). All of these tools are in use in manufacturing today due to the work of these quality pioneers who started with the tools first and the philosophies second. One of the newest tools in use in manufacturing is the Six Sigma

methodology which is simply an extension of Shewhart's original process capability work beyond Shewhart's $\pm 3\sigma$ boundaries to new boundaries of $\pm 6\sigma$ (Harry, 2000). The Six Sigma methodology is designed to reduce the target number of defects from $\pm 3\sigma$, which translates into 99.73% acceptable or 2,700 defects per million, to $\pm 6\sigma$ or 99.9966% acceptable or 3.4 defects per million. The Six Sigma methodology uses a DMAIC (Define, Measure, Analyze, Improve, Control) framework to ensure that variation is identified and accurately captured, process improvements are standardized and affect the variation and that the gains can be sustained and controlled.

Quality improvement in manufacturing is a result of several factors: improvement in tools and methods, improvements in training and education of the workforce and improvement in consistency and variation reduction in tools in primary and secondary manufacturing processes (Latzko & Saunders, 1995). It is this last factor that builds upon the use of quality tools and the understanding of process performance that is of interest to this project. In one example, reported defects from the automotive industry show a decreasing trend.

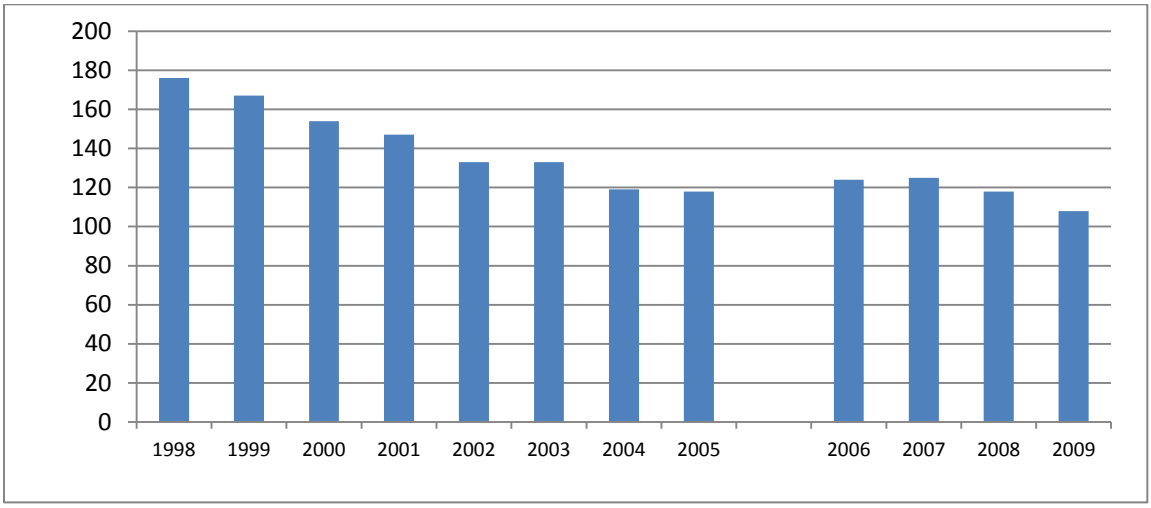


Figure 1. J. D. Powers initial quality survey – problems per 100 vehicles

The J. D. Power's *Initial Quality Survey* (IQS) is an annual survey of new vehicle owners who report on the quality of the new vehicles that they have purchased. The J. D. Power's IQS is regarded as the bellwether for initial vehicle quality in the automotive market (Powers Research 2010). The downward trend shows a reduction in the number of defects reported from a high of 172 defects per 100 vehicles in 1998 to just over 100 defects per 100 vehicles in 2009. The criteria was changed in 2006 to more stringent definition of defects and includes dissatisfaction and inconvenience rather than simply mechanical and/or physical defects as was reported previously. The J. D. Powers Survey is one form of quality analysis identified as competitive benchmarking. Benchmarking is the "search for best practices that will lead to superior performance" (Camp, 1989). Benchmarking can be done internally as in process benchmarking against an internal best practice or externally as in comparison to a sister company or competitor. Either way, the benchmark comparison becomes the new performance goal (Camp, 1989).

Variation reduction in the manufacturing process has supported the improvement of defect reduction in manufactured goods and services as evidenced by the J. D. Powers survey. Once the performance standard is set whether by an arbitrary goal or through the use of benchmarking it is critical to identify where process variation is taking place. A thorough knowledge and understanding of the value stream or work process is required to understand where variation or waste can be identified (Deming, 1982). One of the supporting continuous improvement tools that help to identify a source of waste is called process mapping. Process mapping is a tool which visually depicts the work process steps to further understand and clarify the interactions and bottlenecks related to work tasks and flows (Andersen, Fagerhaug, Henriksen, & Onsøyen, 2008). Work processes are defined as "a logical series of related transactions that convert inputs to results or output" (Andersen et al, 2008). The process map is

used to graphically capture a work process with the intent of identifying value add steps, transactional steps, capture points of interest and possible variation and movement of goods or services to further understand, clarify and improve the process.

Further continuous improvement is facilitated in a manufacturing process through the use of standardization. Standardization is the method by which best practices are institutionalized. Standardization is the compliance to a method or practice (Juran & Gryna, 1988). Standardization is said to have leveled the playing field in manufacturing (Aguayo, 1990) by bringing manufacturers to the same basic minimum standards of operation through certification and/or compliance to ISO-9000 or like manufacturing standards. Compliance to global quality standards means that manufacturers who subscribe to the process have, at least, the minimum required practices in place that constitute a quality system as defined by the international community (International Organization for Standardization [ISO], 2010). Deming believed in standardization so much that he often used his camera and his lighted magnifying glass as props to extol the benefits of standardization. Deming told his audiences that the AA batteries required by his magnifying glass could be found anywhere in the world and would always fit the unit. He would then point to his camera and was confident that he could buy film anywhere in the world and that it would fit his camera. He may question the longevity of the battery life or the expiration date of the film but both would fit the devices due to standardization (Dobyns & Crawford-Mason, 1993).

The ISO-9000 Standard is a family of standards that represent a global consensus on good quality management practices and is administered by the International Organization for Standardization in Geneva Switzerland (ISO, 2010). Certification to the ISO standard is not a legal requirement but compliance to the standard suggests that the basic tenets of a quality

management system as defined by the international community are in place. Following the quality management model outlined by the ISO-9000 family of standards, the Malcolm Baldrige National Quality Award (MBNQA) was originally conceived to celebrate quality and continuous improvement in the American manufacturing community. Named after the late Malcolm Baldrige, Secretary of Commerce under Ronald Reagan, the goal of the MBNQA was to enhance the competitiveness of U.S. businesses (National Institute of Standards and Technology [NIST], 2010). The scope of the MBNQA has been expanded to include healthcare and education in 1999 and nonprofit/government in 2005. MBNQA utilizes benchmarking to determine best in class performance, standardization and process mapping to know and understand work processes, and continuous improvement tools to ensure that processes are optimized for success. Baldrige was committed to quality management practices as a method for improvement (NIST, 2010).

The combination of tools, practices and philosophies laid the groundwork for improvement in the quality or products and practices in American manufacturing. Records indicate that variation reduction and standardization are critical to quality improvement in manufacturing processes. Tools such as process control, process mapping, benchmarking and standardization are critical to quality improvement and success of manufacturing worldwide (ASQ, 2010).

Quality and Continuous Improvement in Business and Service Industries

Seeing the value in manufacturing gained from the implementation of quality management principles and tools, business, financial institutions and healthcare institutions began to generalize the manufacturing quality tools and methods to their processes. Variation exists in all processes (Shewhart, 1931). Harrington (1991) was an early adapter of the

manufacturing quality tools to business processes. Harrington suggests that benchmarking, graphical representation of the value stream (process mapping), streamlining (lean and waste reduction), qualification and certification (standardization) and quality and continual improvement are keys to business process improvement (Harrington, 1991). Harrington (1991) lays out an approach to business process improvement (BPI) that relies heavily on manufacturing process improvement tools and techniques. Harrington (1991) lists certification, process capability, repeatability, process consistency and thorough documentation as clear similarities between manufacturing and business processes and key to business process improvement.

Knowing and understanding process capability and variation reduction is as important in business and service industries as it is in manufacturing. McDonald's is a clear example of consistency and variation reduction in a service industry. Although one could argue that McDonald's manufacturers hamburgers, McDonald's puts themselves in the service category (Love, 1986). According Love (1986),

> Ray Kroc, the man behind the McDonald's franchise, preached to his young managers the importance of focusing on the long term profits that came from quality performance and not to chase after the short term profits that can be had without focusing on the details.

The McDonald's recipe for success was built upon consistency (defect reduction), standardization, process control and capability and internal benchmarking and sharing of best practices (Love, 1986). The McDonald's Corporation was so focused on these practices and principles that they were even applied to the growing, selection and curing of potatoes for their world famous french fries. McDonald's sets standards for solids weights and sugar content to ensure consistency in their process. McDonald's sought out best practices for planting and

fertilizing to ensure that the product would perform consistently in the controlled cooking process and yield a consistent product. McDonald's would institutionalize their operating procedures into a voluminous document designed to standardize every aspect of their operations (Love, 1986). Adherence to the operating manual paid off for McDonald's franchisees that used the information contained within the manual to reduce variation, ensure standardization and understand their value added processes. For the corporation standardization meant consistency among franchisees worldwide and that french fries produced at the McDonald's in Paris, France tasted exactly like the french fries produced at the McDonald's in Paris, Texas (Love, 1986).

Like McDonald's understanding the process and controlling variation as well as adherence to standard practices is fundamental at the Disney Corporation. Disney is an entertainment service provider with locations around the globe. There have been several studies on the *magic* of Disney. Connellan (1997) writes about the keys to Disney's success. One of those keys is benchmarking, "It's crucial to do surveys, but it's equally important to use other sources that also tell you how you're doing."

In addition to benchmarking, Disney is fanatical about deviation reduction going so far as *scripting* approved ad-libs for the operators of park attractions (Peters & Waterman, 1982). Disney uses process mapping in a different methodology by *storyboarding* processes and attractions to understand points of variation and capability (Grover, 1991). Storyboarding, like benchmarking, is a graphical representation of a process. Storyboarding gets its name from the entertainment industry vernacular but is the graphical representation of a process or attraction. Like McDonald's, Disney prides itself on attention to detail and consistency. Players must study and emulate character's movements and mannerisms so guests experience a live version of their favorite cartoon characters. Continuity between human characters and cartoon characters is an

important factor in the Disney experience. Benchmarking, standardization and consistency are keys to Disney's success (Connellan, 1997).

Financial services companies and the healthcare industry also have seen improvements to their processes and performance through the use of quality tools. Six Sigma has been a key factor in transactional and process improvements at Bank of America (BOA) accounting for approximately $2B in cost savings or added revenues (Six Sigma Blog, 2007). The Six Sigma process uses a framework of Define, Measure, Analyze, Improve and Control to ensure a standardized methodology for process improvement (Breyfogel, 2003). Within that framework several quality improvement tools are used including Ishikawa Diagrams, Pareto Charts, Benchmarking and Process Mapping to identify and eliminate process variation.

Bank of America (BOA) began using Six Sigma in 2001. Jones (2004) believes so strongly in the Six Sigma process that he said, "I share Ken's belief that quality and Six Sigma are disciplines that are contributing to an ongoing revolution in American business." Table 3 presents a list of the six sigma projects at BOA.

Table 3

Six Sigma Projects at Bank of America

Dollar Amount	Category	Project
$1.3 M	Savings	Reduce Cost of Relocating New Hires
$5.0 M	Revenue	Improve Lockbox Deposit Availability
$30.0 M	Revenue	Measure Return on Sponsored Events
$1.5 M	Savings	Measure Return on Sponsored Events
$7.8 M	Revenue	Retain Customers Who Move Within Footprint
$950,000.0	Savings	Complete Federal Tax Return Faster

Table 3 (continued)

Dollar Amount	Category	Project
$6.6 M	Loss Reduction	Reduce ID Theft Through "Account Takeover"
$2.0 M	Revenue	Improve Results From New Sales Hires
$10.7 M	Revenue	Improve Customer Referrals From Tellers
$3.6 M	Revenue	Improve Credit Card Sales

Several other financial institutions in the US and abroad have successfully adopted Six Sigma methodologies and the necessary quality tools to support the continuous improvement process (Averboukh, 2006). Government entities including the U.S. Postal Service, The Central Intelligence Agency (CIA), the U.S. Army and the U.S. Navy have successfully utilized Six Sigma practices and quality tools in their journey to continuous improvement (Gundlach, 2010). Clearly, service industries and government agencies have successfully transitioned traditional quality tools from manufacturing to their respective industries and, as a result, experienced great success. Healthcare services are closely related in their practices and methodologies to academia and share similar organizational structures, philosophies and missions (DiPisa, 2010). As a human service provider the healthcare industry was slow to adopt process definition and control due to preconceived beliefs that medical science is more of an art (Trusko & Pexton, 2007). Early adopters of Six Sigma and continuous improvement tools in healthcare faced opposition to acceptance on several fronts in addition to the *healthcare as art* argument. The opposition to process control practices in healthcare included technical opposition, political opposition and organizational opposition (Stroud, n.d.). Technical opposition to implementation of quality tools in healthcare comes from the practitioners not being technically savvy when it comes to the

understanding and use of quality tools (Stroud, n.d.). Many healthcare professionals are not adept with statistical analysis and/or the fundamental tools required for Six Sigma or continuous improvement. Political opposition occurs when the new methodology is seen as a threat to the status quo. Organizational opposition occurs when an organization is slow to adopt the new methods and points to the lack of progress as failure realizing a self fulfilling prophecy (Paxton, 2010). Overcoming these types of opposition is often accomplished through the use of facts and evidence (Pexton, 2010) and was more prevalent in the early adaptation of continuous improvement methodology and tools. Healthcare services are now widely adopting Six Sigma and associated quality improvement tools in their transactional and medical processes and procedures due to success stories and the realization that the tools and methods produce results. There are numerous examples chronicled in recent literature of cost savings and quality improvements in healthcare brought about through the use of Six Sigma and continuous improvement and quality tools (Trusko & Pexton, 2007).

A Red Thread - ISO, Baldrige, and Accreditation

Healthcare providers can subscribe to a voluntary accreditation through the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO). Like ISO-9000 or the Malcolm Baldrige National Quality Award, registration to JCAHO is not mandatory (JCAHO, 2010). An organization which complies with the JCAHO standard, or is registered to the standard, tells the world that it subscribes and maintains industry standards and best practices. Like the voluntary subscription to a set of standards in manufacturing, service or healthcare, academia has the option to subscribe to accreditation. In order to receive government funding however, and partake in government grant and scholarship dollars for students, academic institutions must be accredited (U.S. Department of Education, 2009). Academic organizations

that are not accredited do not have access to these government funds. Accreditation ensures that the minimum acceptable standards, as set forth by the U.S. Department of Education for educational institutions, are in place (U.S. Department of Education, 2009).

There are six regional accreditation agencies in the United States. Each is an independent agency but recognizes the other's accreditations. The accreditation agency is also a private agency and not part of the U.S. Department of Education but upholds and audits to the standards and practices set forth by the Department of Education (Higher Learning Commission, 2011). The largest accreditation agency is the HLC-NCA, which is the accreditation agency for more than 1,000 colleges and universities in 19 states (Higher Learning Commission, 2011). HLC-NCA offers two paths to accreditation for its member institutions, the Program to Evaluate and Advance Quality (PEAQ) process and the Academic Quality Improvement Program (AQIP). PEAQ is the traditional method and employs a comprehensive evaluation method to determine accreditation status. AQIP is built upon a structured set of continuous improvement principles and requires documentation, performance metrics and continuous improvement projects for accreditation (Higher Learning Commission, 2011). As in manufacturing, service, finance and healthcare, standardization to best practices in academic institutions can set the foundation for continuous improvement. The institutions identified in this study are all accredited through HLC-NCA.

Quality and Continuous Improvement Tools in Higher Education

Many colleges and universities are starting a journey towards continuous improvement. Real attempts at continuous quality improvement in higher education have lagged business and industry (Hawksley, 2000). Traditionally the tools used by colleges and universities have been rearward facing tools dominated primarily by the use of surveys to gauge learning outcomes after

the fact. In the late 1990's Tofte's adaptation of Feigenbaum's Total Quality Management (TQM) philosophy was tried at a number of institutions. Tofte's Model for TQM was a methodology that identified an organization's quality philosophy, quality planning, quality leadership and improvement opportunities (Brewer, Brewer, & Hawksley, 2000) and was heavy on philosophy but light on tools. This and a lack of understanding on the application of tools may have led to false starts in the education industry. As outlined earlier in this chapter, the identified gurus of quality came to usage of the tools first and development of the philosophies second. It was difficult to argue with the philosophy of adapting TQM in higher education and it was equally difficult to institutionalize TQM due to the hard work that must be done to identify and eliminate waste in processes. There has been specific institutional success in applying the concepts and tools of quality and continuous improvement in higher education. While the higher education industry agrees in principle with continuous improvement the majority of institutions are struggling with the understanding and application of traditional manufacturing style quality tools in the educational environment (Fields, 1993). Similarities are seen between the service functions of academia and manufacturing such as accounting, purchasing, inventory and budgeting (Fields, 1993). The teaching process, however, is not viewed as a process. Learning is seen as a process but teaching is seen as an art (Jenkins, 2009). Learning outcomes have become the new metric while the teaching process is left untouched. Learning outcomes and teaching as art are not strictly an American higher education view nor are they strictly an American higher education struggle. The European Center for Higher Education Policy Studies found that European institutes of higher education are complying with accreditation guidelines and focusing on learning outcomes as a quality assurance metric (CHEP, 2010). The process for quality assessment, however, has changed significantly since first being introduced in the

European academic community. What was supposed to be in place for the time period 2007–2012 was abandoned in the spring of 2008 due to strongly expressed dissatisfaction and serious criticisms from universities that the process was not aligned with learning outcomes and demanded too much information which was difficult for the universities to collect (CHEP, 2010). A fundamental shift was made in the process away from evaluation of teacher's activities (process) towards an evaluation of student's activities (outcomes) and from the beginning of the course to the end of the course. A 2007 study by the European University Center looked at the difficulties of embedding a quality culture in higher education including the use of tools and assessment metrics and the opposition by the recipients (European University Association Case Studies [EUA], 2007).

To further support the case for measureable learning outcomes author Jenkins (2009) makes the argument that educational institutions need to focus on learning and that teaching methodologies need to adapt to learning outcomes. Jenkins is an advocate for teaching being the variable and learning being the constant (Jenkins, 2009). A process map of the course delivery process would support alternate methods of teaching and target opportunities for adaptability.

Quality and Continuous Improvement Tools in Community Colleges

Community colleges tend to follow the trends experienced by other institutions of higher education. There are pockets of success when it comes to quality and continuous improvement. That success is primarily based on results of surveys to provide a source of information. Like four year and graduate institutions, community colleges rely heavily on surveys as tools of quality and continuous improvement. A change in the 21st century, however, calls for quality and continuous improvement tools designed and developed to measure learning outcomes. Learning outcomes are a focus area for accreditation agencies and for the U.S. Department of

Education (HLC-NCA, 2010). Peters (1984) said, "What gets measured, gets done." If learning outcome is a focus area of the accreditation agency then it stands to reason that institutional focus will likely gravitate towards learning outcomes. As mentioned earlier, Deming (n.d.) said, "If you can't describe your work as a process, then you don't know what you're doing." If learning outcomes are the metrics of interest then the learning process—including the teaching process or information delivery process—must be fully understood to ensure that the metric has merit for the organization.

This study is focused on community colleges in the State of Michigan that are members of the Michigan Community College Association (MCCA). While all of the study participants are accredited through the HLC-NCA and comply with the standards defined by the U.S. Department of Education some of the colleges have chosen accreditation through the AQIP process and others through PEAQ. Some of the subject colleges participate in the National Community College Benchmarking Project and others do not (Table 1). AQIP and PEAQ, while important for continuous improvement in the academic community, are specific to the academic community. The AQIP process is an innovative path to accreditation based continuous improvement principles predicated on ISO-9000. It was developed using best methods based on the input of several institutions. Using input from various like institutions to develop best practices is called benchmarking. Benchmarking is a tool that has spread across industries and has been proven to be successful in the community college environment (Seybert, 2006).

This study sought to understand whether process mapping, process control, benchmarking and six sigma tools from manufacturing could be applied to the community college environment in the state of Michigan. This study also sought to understand whether course delivery can be defined as a process and can it be controlled. The literature is mixed

about whether teaching (course delivery) is a process or whether learning is the process. Community colleges have utilized certain quality control techniques on transactional processes and have driven out variation and improved quality performance in their business processes but have not looked at their value added processes in terms of variation reduction or systemic quality.

In an internet sampling of community colleges in the state of Michigan only Northwestern Michigan College (NMC) goes beyond recognizing quality in higher education as an accreditation commitment on a search of institutional websites. NMC discusses their quality system and the PDCA cycle as important to their organizational practice and success.

Bay College, Delta College, Grand Rapids Community College, Northwestern Michigan College and Jackson Community College belong to an organization called the Continuous Quality Improvement Network (CQIN). CQIN is a learning network committed to continuous improvement in community colleges and evolved from the TQM in Education movement in the early 1990s (CQIN, 2011). Membership in CQIN requires a commitment to organizational transformation and continuous improvement.

Opposition to Quality and Continuous Improvement Tools in Education

Current literature exhibits a myriad of articles written about opposition to the adaptation of quality tools and methods generalized from manufacturing to an educational environment. The opposition includes faculty resistance, semantic traps brought about through the overuse and under explanation of acronyms, students as customers, apathy and the view that continuous improvement is a "flavor of the month" (Roberts, 1995). Opposition may come in the form of the nature of academic work, the typical management structure of colleges and universities and the variety and role of customers and stakeholders served (Brewer et al., 2000). Brewer et al.

goes on to say that the overall skeptical attitude of faculty members towards a quality implementation may serve as a significant barrier. They also add that professional egos, claims to individual academic freedom and a self-sufficiency separation from stakeholders can create significant barriers to acceptance. Other barriers to acceptance include unwillingness to change, compartmentalization, lack of competition and conformance to minimal requirements (Seymour, 1992). The European education community saw some of the same types of opposition so strongly held by institutions that they had to abandon their original plan and back off on some of the data collection and goals that they had defined (CHEP, 2010).

Pexton (2010) believes that opposition can be combated through the use of data and facts, clearly articulating the goals of the initiative and frequent progress reports. Jenkins (2009) writes that opposition can be overcome through the use of consensus and clear communication.

Review of Similar Studies and Previous Research

A dissertation search for quality and continuous improvement in higher education pointed to several studies focused on Total Quality Management (TQM) in higher education from the late 1990s and early 2000s. There was nothing related to the application of quality and continuous improvement tools in higher education, specifically in community college environments, from a dissertation search. A comprehensive survey performed by CQIN in 2001 included 16 community colleges, none from Michigan, in a study of Key Performance Indicators (KPI). Higher education quality and continuous improvement tools have been predominantly viewed as survey instruments.

Among doctoral studies, Roopchand (1997) studied Total Quality Management in continuing higher education and concluded that TQM can be utilized in the context of higher education. Roopchand's case study driven project took a manufacturing-based methodology

(TQM in the late 1990s) and made the link between a quality methodology formerly associated with manufacturing and higher education. Roopchand recommended that further research be accomplished in the use of quality as an element in program planning as well as continuation of TQM research in academic institutions. Roopchand's work can be extended in this project by studying the further generalization of traditional manufacturing quality tools in the program areas of higher education in the community college environment.

Woll's (2003) research focused on mapping the value stream in instructional production systems. Woll (2003) concluded that value stream mapping aka process mapping had validity in instructional production systems. Woll (2003) made the link between a quality methodology formerly associated with manufacturing and higher education. Woll (2003) suggested further research into value stream mapping in higher education beyond the instructional development process. Continuation of Woll's work is possible in this project by studying the further generalization of traditional manufacturing quality tools to higher education in the community college.

Lail's (1997) research addresses program director's perceptions of quality in higher education and serves to explore the metrics designed to assess quality and the perception of quality in higher education. Lail (1997) suggests that further qualitative and quantitative research be conducted to solicit perceptions in regards to measures of quality and why quality attributes are not seemingly prevalent in higher education. Lail's (1997) work supports the assessment of quality performance in higher education.

McMillan's (1998) study explored the perception of senior administrators regarding Total Quality Management in institutions of higher education in Ohio. This work was a comprehensive study in the perception of applying TQM (from manufacturing at the time) to

institutions of higher education in Ohio. McMillan's (1998) work supports the generalization of other manufacturing focused quality tools to higher education and discusses the perceptions of acceptance and opposition to such applications. McMillan's recommendations for further research include senior level administrator's acceptance of TQM in educational environments. TQM, according to McMillan, is reflected in the use of quality methodologies in all aspects of the organization. McMillan's work can be extended in this project by generalizing the use of quality methodologies and tools to the academic organization.

Pedersen (2010) articulated a research methodology that supports the research in this project. Pedersen's work looks at supervisory tasks in a job shop environment but clearly articulated a research methodology predicated on the Delphi process (Pedersen, 2010) which is the predominant method for this project. Pedersen's recommendation for further research is to run a blank Delphi study in an effort to build familiarity with Delphi panels in doctoral dissertations.

Olson's (2010) offers an in-depth look at a maturing Six Sigma processes in manufacturing and the value that it brings to non-manufacturing entities in the financial sector and small to medium enterprises. The generalization of Six Sigma methodologies to community college environments will serve as an extension of sorts of Olson's work. Olson's (2010) recommendations for further research include more detailed and in-depth studies of organizational Six Sigma applications.

Clearly a gap exists between the application of quality and continuous improvement tools, specifically Six Sigma, process mapping, benchmarking and variation reduction and the success experienced in manufacturing and the lack of proven quality tools and the success of quality initiatives in higher education and community college environments. This research

project was designed to determine whether the application of these manufacturing derived tools is appropriate for higher education and if, in the perceptions of community college administrators in the state of Michigan, the application of these tools can aid community colleges in their pursuit of quality and continuous improvement.

In this chapter the literature surrounding the project was reviewed with a focus on the seven research questions. Findings tables were developed to identify concepts and findings related to the literature and the research questions (Table 4).

Table 4

Findings Table RQ1 Ch2 ROL

Author	Concept	Finding
Adler	Teaching as process	Aristotle defined teaching as art
Anderson, Fagerhaug, Henriksen, and Onsoyen	Process definition, quality and CI tools, process mapping	Process mapping and standardization can lead to process improvement
Biden	Academic improvement, community colleges	Community colleges are vital, CI in community colleges is a must
Brandon	Community colleges, AGI	Community colleges need a process to ensure quality, AGI supports quality and CI
Breyfogel	Process control, quality and CI tools, Six Sigma, quality systems, quality metrics	Six Sigma is a tool that can be used to improve all processes including administrative processes
Camp	Benchmarking, CI tools	Benchmarking and CI tools can help to improve all processes

Table 4 (continued)

Author	Concept	Finding
Crosby	Quality tools, quality systems, quality metrics, quality philosophy	Quality tools and quality systems are vital to improving any process and part of an overall quality philosophy
Ewy and Gmitro	Process definition, process control, quality and CI tools, process mapping, community colleges	Quality and CI tools can and should be used in community colleges. Past reluctantance to define teaching as process
European Center for Higher Education	Accreditation, quality tools, quality metrics	Quality and CI technology are important but not readily accepted, metrics and accreditation are vital
European University Association	Accreditation, quality tools, quality metrics	Quality and CI technology are important but not readily accepted, metrics and accreditation are vital
Feigenbaum	Process definition, quality tools, quality systems, TQM	Process can be defined, quality tools implemented into a quality system (TQM)
Fields	Quality systems, TQM, Community Colleges	Quality systems and TQM is and has been accepted in community colleges
Goldrick-Rab, Harris, Mazzeo, and Kienzl	Community colleges, quality metrics, teaching philosophy	Quality and CI can and must be applied in community colleges
Hansen	Quality systems, quality metrics, community colleges	Yes, quality and CI tools can be applied but may not be readily accepted
HLC - NCA	Accreditation, quality tools, quality metrics, quality systems	A systemic approach to accreditation can be used to improve Higher Ed, an AQIP approach uses quality tools

Table 4 (continued)

Author	Concept	Finding
Ishikawa	Quality and CI tools	Tools can be applied to processes
Jenkins	Community colleges, teaching philosophy	Yes, quality and CI tools can be applied but may not be readily accepted; teaching is an art and a process
Juran	Process definition, process control, quality tools, quality systems, quality metrics, quality philosophy	Yes - tools can be assimilated, metrics lead to improvement tools first, philosophies second
Latzko and Saunders	Quality tools, quality systems, quality metrics, quality philosophy	Quality and CI tools can be applied to non-manufacturing processes
Seybert	Benchmarking, CI tools, community colleges	Quality and CI tools can be applied to community colleges
Shewhart	Process definition, process control, quality tools, quality systems, quality metrics, quality philosophy	Processes are defined, teaching is a process, process control can be applied
Spellings Report	Accreditation, quality philosophy, continuous improvement	Accreditation can be used as a CI tool in higher ed
Townsend and Dougherty	Benchmarking, CI tools, community colleges	Benchmarking is a CI tool that can be used in higher ed
Trusko and Pexton	Process control, quality and CI tools, Six Sigma, quality systems, quality metrics	Overcoming opposition to quality systems and tools relies on facts, evidence and clear communication
Vaughan	Community colleges, teaching philosophy	Community college processes can use quality and CI tools

Note. RQ1. Can quality and continuous improvement technology play a role in academic improvement?

Table 5

Findings Table RQ2 Ch2 ROL

Author	Concept	Findings
Adler	Teaching is an art	Adler quotes Aristotle who defines teaching as a "cooperative art"
Anderson, Fagerhaug, Henriksen, and Onsoyen	Process definition, quality and CI tools, process mapping	Process mapping and standardization can lead to process improvement
Breyfogel	Process control, quality and CI tools, Six Sigma, quality systems, quality metrics	Six Sigma is a tool that can be used to improve all processes including administrative processes
Camp	Benchmarking, CI tools	Benchmarking and CI tools can help to improve all processes
Crosby	Quality tools, quality systems, quality metrics, quality philosophy	Quality tools and quality systems are vital to improving any process and part of an overall quality philosophy
Ewy and Gmitro	Process definition, process control, quality and CI tools, process mapping, community colleges	Quality and CI tools can and should be used in community colleges. Past reluctantance to define teaching as process
European Center for Higher Education	Accreditation, quality tools, quality metrics	Quality and CI technology are important but not readily accepted, metrics and accreditation are vital
Feigenbaum	Process definition, quality tools, quality systems, TQM	Process can be defined, quality tools implemented into a quality system (TQM)

Table 5 (continued)

Author	Concept	Findings
Hansen	Quality systems, quality metrics, community colleges	Yes, quality and CI tools can be applied but may not be readily accepted
Ishikawa	Quality and CI tools	Tools can be applied to processes
Jenkins	Community colleges, teaching philosophy	Yes, quality and CI tools can be applied but may not be readily accepted; teaching is an art and a process
Juran	Process definition, process control, quality tools, quality systems, quality metrics, quality philosophy	Yes - tools can be assimilated, metrics lead to improvement tools first, philosophies second
Latzko and Saunders	Quality tools, quality systems, quality metrics, quality philosophy	Quality and CI tools can be applied to non-manufacturing processes
Seybert	Benchmarking, CI tools, community colleges	Quality and CI tools can be applied to community colleges
Shewhart	Process definition, process control, quality tools, quality systems, quality metrics, quality philosophy	Processes are defined, teaching is a process, process control can be applied
Townsend and Dougherty	Benchmarking, CI tools, community colleges	Benchmarking is a CI tool that can be used in higher ed
Vaughan	Community colleges, teaching philosophy	Community college processes can use quality and CI tools

Note. RQ2. Can the course delivery value stream of a community college be defined as a process?

RQ3. If course delivery can be described as a process, can this process be controlled and improved by applying traditionally defined manufacturing quality and continuous improvement tools.

Table 6

Findings Table RQ3 Ch2 ROL

Author	Concept	Findings
Anderson, Fagerhaug, Henriksen, and Onsoyen	Process definition, quality and CI tools, process mapping	Process mapping and standardization can lead to process improvement
Breyfogel	Process control, quality and CI tools, Six Sigma, quality systems, quality metrics	Six Sigma is a tool that can be used to improve all processes including administrative processes
Camp	Benchmarking, CI tools	Benchmarking and CI tools can help to improve all processes
Crosby	Quality tools, quality systems, quality metrics, quality philosophy	Quality tools and quality systems are vital to improving any process and part of an overall quality philosophy
Ewy and Gmitro	Process definition, process control, quality and CI tools, process mapping, community colleges	Quality and CI tools can and should be used in community colleges. Past reluctance to define teaching as a process
European University Association	Quality systems, quality tools, quality metrics in higher education	Difficult to gain acceptance to using quality tools, systems, and metrics in higher education
Feigenbaum	Process definition, quality tools, quality systems, TQM	Process can be defined, quality tools implemented into a quality system (TQM)

Table 6 (continued)

Author	Concept	Findings
Fields	Quality systems, TQM, community colleges	Quality systems and TQM is and has been accepted in community colleges
Ishikawa	Quality and CI tools	Tools can be applied to processes
Juran	Process definition, process control, quality tools, quality systems, quality metrics, quality philosophy	Yes—tools can be assimilated, metrics lead to improvement tools first, philosophies second
Latzko and Saunders	Quality tools, quality systems, quality metrics, quality philosophy	Quality and CI tools can be applied to non-manufacturing processes
Shewhart	Process definition, process control, quality tools, quality systems, quality metrics, quality philosophy	Processes are defined, teaching is a process, process control can be applied
Trusko and Pexton	Process control, quality and CI tools, Six Sigma, quality systems, quality metrics	Overcoming opposition to quality systems and tools, relies on facts, evidence. and clear communication

RQ4. Can manufacturing quality and continuous improvement tools – specifically process mapping, process improvement, benchmarking and Six Sigma methods – be applied in a community college model?

Table 7

Findings Table RQ4 Ch2 ROL

Author	Concept	Findings
Anderson, Fagerhaug, Henriksen, and Onsoyen	Process definition, quality and CI tools, process mapping	Process mapping and standardization can lead to process improvement
Breyfogel	Process control, quality and CI tools, Six Sigma, quality systems, quality metrics	Six Sigma is a tool that can be used to improve all processes including administrative processes
Camp	Benchmarking, CI tools	Benchmarking and CI tools can help to improve all processes
Ewy and Gmitro	Process definition, process control, quality and CI tools, process mapping, community colleges	Quality and CI tools can and should be used in community colleges. Past reluctance to define teaching as process
Feigenbaum	Process definition, quality tools, quality systems, TQM	Process can be defined, quality tools implemented into a quality system (TQM)
Fields	Quality systems, TQM, Community Colleges	Quality systems and TQM is and has been accepted in community colleges
Juran	Process definition, process control, quality tools, quality systems, quality metrics, quality philosophy	Yes—tools can be assimilated, metrics lead to improvement tools first, philosophies second
Seybert	Benchmarking, CI tools, community colleges	Quality and CI tools can be applied to community colleges
Shewhart	Process definition, process control, quality tools, quality systems, quality metrics, quality philosophy	Processes are defined, teaching is a process, process control can be applied

RQ5. Can accreditation, specifically an AQIP approach, be used as a continuous improvement tool in a community college model?

Table 8

Findings Table RQ5 Ch2 ROL

Author	Concept	Findings
European Higher Learning Commission	Accreditation is to academia as ISO is to manufacturing	Accreditation can be used as a tool for continuous improvement
HLC - NCA	Academic Quality and Improvement Process founded on Baldrige criteria	AQIP designed to foster continuous improvement
Spellings Report	Accreditation is a recommendation for continuing success	Accreditation can serve to foster continuous improvement

RQ6. Are there significant differences in the mean perception between utilizing quality tools and accreditation to improve quality in a community college?

Table 9

Findings Table RQ6 Ch2 ROL

Author	Concept	Findings
Anderson, Fagerhaug, Henriksen, and Onsoyen	Process definition, quality and CI tools, process mapping	Process mapping and standardization can lead to process improvement
Biden	Academic improvement, community colleges	Community colleges are vital to the US, CI in community colleges is a must

Table 9 (continued)

Author	Concept	Findings
Brandon	Community colleges, AGI	Community colleges need a process to ensure quality
Camp	Benchmarking, CI tools	Benchmarking and CI can help to improve all processes
Ewy and Gmitro	Process definition, process control, quality and CI tools, benchmarking, community colleges	Quality and CI tools can and should be used in community colleges.
European Higher Learning Commission	Accreditation is to academia as ISO is to manufacturing	Accreditation can be used as a tool for continuous improvement
HLC - NCA	Academic Quality and Improvement Process founded on Baldrige criteria	AQIP designed to foster continuous improvement
Spellings Report	Accreditation is a recommendation for continuing success	Accreditation can serve to foster continuous improvement

RQ7. Are there significant differences in the mean perception between utilizing AQIP and accreditation to improve quality in a community college?

Table 10

Findings Table RQ7 Ch2 ROL

Author	Concept	Findings
European Higher Learning Commission	Accreditation is to academia as ISO is to manufacturing	Accreditation can be used as a tool for continuous improvement
HLC - NCA	Academic Quality and Improvement Process founded on Baldrige criteria	AQIP designed to foster continuous improvement
Spellings Report	Accreditation is a recommendation for continuing success	Accreditation can serve to foster continuous improvement

Summary

The purpose of this chapter was to provide a review of the literature specific to quality and continuous improvement tools in industry, their migration or generalization from manufacturing to service industries to healthcare and articulate the idea that these tools can be applied to higher education in the community college model. This chapter reviewed a plethora of current literature and available research in this area and sought to identify the gap between the current body of knowledge and practice and the need to complete this important research to bridge the identified gap. Literature specific to the application of quality and continuous improvement tools in community colleges was practically non-existent with the exception of the CQIN study and benchmarking. The literature that is available would suggest that quality philosophies are adopted after quality tools are proven in manufacturing situations as well as service and healthcare industries. Dissertations related to quality and continuous improvement in

higher education, while sparse, focused more on the philosophy of Total Quality Management than quality and continuous improvement tool application especially in a community college environment. The current research provides a foundation to build upon to continue the study of quality and continuous improvement tool application in higher education, specifically to the community college environment. The identified literature did provide an aggregation of quality and continuous improvement tool application from manufacturing to service to health care and identified the gap between these industries and higher education and community colleges.

CHAPTER 3

Research Methodology

Chapter Overview

The purpose of this chapter was to provide a research framework for gathering and analyzing data to support the results of this project. The mixed-method modified Delphi process was chosen to support both the qualitative and quantitative requirements of this case study project. The modified Delphi process is a viable approach to the problem as it addresses the heuristic (experienced-based) and hermeneutic (interpretive) nature of the project (Creswell, 2009). The Delphi process follows a prescribed sequence of discovery and data gathering steps starting with the initial survey instrument design followed by iterative rounds of surveys to gather data. The data gained from the research is presented in Chapter 4 with detailed analysis of the results presented in Chapter 5 of this project.

Research Design Theory

This project used a mixed-method modified Delphi approach to case study research based on the opinions of administrators in a subset of community colleges in the state of Michigan. The case study structure was chosen because the research questions were answered through the opinions of administrators. This would suggest that the study is less a pure statistical exercise and more of a case study relying on opinions rather than hard statistical results. The case study approach and the Delphi method both lend themselves to this type of discovery (Creswell, 2009).

The mixed-method approach combined both qualitative and quantitative research techniques in order to neutralize the biases that may be present in a single method (Creswell, 2009). The qualitative component uncovered information through inquiry such as narratives and case studies while the quantitative component employed strategies of inquiry such as scaled surveys (Creswell, 2003). Qualitative methods can be used to uncover and understand what lies behind phenomena about which little is yet known (Strauss & Corbin, 1990). Quantitative methods are used to examine relationships among variables (Creswell, 2009). The case study approach was designed to provide data where none currently exists. The mixed-method modified Delphi approach defined for this project used a qualitative component (review of the literature and opinion surveys) to develop a quantitative/qualitative survey instrument (Likert scale response) to collect data and apply descriptive statistics. The eventual goal of the project was to determine from the opinions of administrators whether manufacturing quality and continuous improvement tools such as Six Sigma, process mapping, and benchmarking can be applied in a community college model in the state of Michigan.

The survey instrument was created from data collected in prior research and a review of current literature. A panel was then created using subject matter experts who had experience with quality in higher education, specifically community colleges in the state of Michigan, to review survey questions. The role of the panel was to ensure that the survey instrument was clear and understandable to the participants of the study. The end result of the panel supported the survey administered in the first round of the Delphi study. Subsequent rounds were developed based on the findings of previous rounds until satisfactory results were collected (Skulmoski et al., 2007). Once all rounds were exhausted the results were tabulated and

analyzed and conclusions drawn from the study and reported in concluding chapters of this project.

Statement of the Problem

The problem for this study was to answer the question: In the opinions of administrators can quality tools, used to improve the quality of manufacturing processes, be generalized to the community college model in the state of Michigan?

Statement of the Research Questions

Creswell (2009) suggested that a mixed model approach to research provides a thorough framework for a study such as this which requires both qualitative and quantitative analysis. Through the use of a mixed model modified Delphi study research approach this project was designed to answer the following questions based on the opinions of administrators in community colleges in the state of Michigan:

RQ1. Can quality and continuous improvement technology play a role in academic improvement?

RQ2. Can the course delivery value stream of a community college be defined as a process?

RQ3. If course delivery can be described as a process, can this process be controlled and improved by applying traditionally defined manufacturing quality and continuous improvement tools?

RQ4. Can manufacturing quality and continuous improvement tools – specifically process mapping, benchmarking and Six Sigma methods – be applied to the community college model?

RQ5. Can accreditation, specifically an AQIP approach, be used as a continuous improvement tool in a community college model?

RQ6. Are there significant differences in the mean perception between utilizing quality tools and accreditation to improve quality in a community college?

RQ7. Are there significant differences in the mean perception between utilizing AQIP and accreditation to improve quality in a community college?

The first research question, RQ1, sought to discover whether administrators think that quality methodology and continuous improvement technology can be applied to the community college model in Michigan. The answer to RQ1 was found through the use of a qualitative research approach driven primarily through the results of the Delphi study of the defined institutions. The results of the study were discussed through the use of descriptive and graphical representation in Chapter 4.

The second research question RQ2 sought to establish foundational processes in order to define a value stream for the target institutions in the opinions of the administrators. The answer to RQ2 was derived from a thorough forensic review of the literature surrounding the question and the results of the Delphi study of the institutions. The results of the study were discussed through the use of descriptive and graphical representation in Chapter 4.

The third research question, RQ3, sought to understand administrator's opinions as to whether quality and continuous improvement tools used in manufacturing processes can be applied to the value streams in the Michigan community college model. Based upon the outcome of RQ2, RQ3 sought to further define process control and its application in the value stream of the community college model. The results of the study were discussed through the use of descriptive statistics and graphical representation in Chapter 4.

Research Question 4 was exploratory and sought to determine whether specific quality tools, proven to be successful in manufacturing, could be generalized to a community college application according to the opinions of administrators. RQ4 looked specifically at whether the application of process mapping, Six Sigma methods and benchmarking can be used in the community college model. Data gathered from the Delphi Study was researched and used to answer RQ4. The results of the study were discussed through the use of descriptive and graphical representation in Chapter 4.

The fifth research question, RQ5, looked at the role that accreditation, specifically AQIP, might play in continuous improvement within a community college based on the opinions of the administrators. Accreditation may have been seen by some community colleges as intrusive and a *once every 10 years ordeal* rather than a support mechanism which could lead to continuous improvement. Data gathered from the Delphi Study was researched and used to answer RQ5 and was discussed using descriptive statistics and graphical representation in Chapter 4.

Correlation using the Pearson Correlation Coefficient was used to determine if and to what extent that variables are related in a sample. The significance test for *r* evaluates whether there is a linear relationship between the variables in the population. For this study the dependent variable is quality and continuous improvement tools. The 5 independent variables are; Six Sigma, process mapping, benchmarking, AQIP and accreditation. The strength of the relationship was important in this study to establish a relationship, in the opinions of administrators, between the perception of quality and continuous improvement tools and specific tools including accreditation.

The sixth research question, RQ6, was designed to explore the opinions of administrators regarding the use of quality tools and accreditation to improve quality at their institutions. The

data derived from this question may provide insights into administrator's perceptions as to perceived differences between the use of quality and continuous improvement tools and accreditation as a path to improvement. Data gathered from the Delphi Study was researched and used to answer RQ6 and was discussed using descriptive statistics in Chapter 4. A hypothesis was developed for RQ6 that required testing. Hypothesis testing by means of the Pearson Correlation Coefficient provided the mechanism by which to accept or reject the null hypothesis.

$H_0 1$: $\mu 1 = \mu 2$. There is no statistically significant difference in the mean perception utilizing quality tools and accreditation to improve quality in community college.

Ha1: $\mu 1 \neq \mu 2$. There is a statistically significant difference in the mean perception utilizing quality tools and accreditation to improve quality in community college.

The last research question, RQ7, was developed to determine if, in the perceptions of administrators, AQIP is seen a path to continuous improvement beyond accreditation. Data gathered from the Delphi Study was researched and used to answer RQ7 and was discussed using descriptive statistics in Chapter 4. A hypothesis was developed for RQ7 that required testing. Hypothesis testing by means of Pearson Correlation Coefficient provided the mechanism by which to accept or reject the null hypothesis.

$H_0 2$: $\mu 1 = \mu 2$. There is no statistically significant difference in the mean perception between utilizing AQIP and accreditation to improve quality in community college.

Ha2: $\mu 1 \neq \mu 2$. There is a statistically significant difference in the mean perception between utilizing AQIP and accreditation to improve quality in community college.

The Modified Delphi Technique

The modified Delphi technique is appropriate for a number of applications including problems which do not lend themselves to precise analytical techniques but may benefit from the subjective opinions of experts (Pollard & Pollard, 2008). Linstone and Turoff (1975) listed a sample of these applications where a modified Delphi approach is appropriate:

Gathering current and historical data not accurately known or available

Examining the significance of historical events

Evaluating possible budget allocations

Exploring urban and regional planning options

Planning university campus and curriculum development

Putting together the structure of a model

Adler and Ziglio (1996) reported that the Delphi technique can be applied to problems more adequately addressed through informed subjective judgments rather than analytical techniques. The use of Delphi as a research technique is gaining popularity across the globe in graduate and post graduate research projects. The results of a well developed Delphi study represent the collective work of experts in the field who have collaboratively arrived at a final view or solution (Pollard & Pollard, 2008).

The modified Delphi technique is a methodology that can be used to collect and refine the opinions of a number of experts or practitioners. Delphi is conducive to research where geographical distance or time constraints may separate the experts from face to face communications (Pollard & Pollard, 2008). One definition that explains the Delphi technique comes from Linstone and Turoff (1975): “Delphi may be characterized as a method for

structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem."

Delphi does not need to be face-to-face (Skulmoski et al., 2007). Delphi relies on anonymity to gain consensus. Delphi allows a group of experts to make scientific conclusions on complex problems that may be more qualitative and less structured than a pure quantitative issue. The mixed-model modified Delphi technique lends itself well to the case study approach to this project based on the opinions of experts due to some of the polarizing ideas brought to bear such as teaching as a process.

Different researchers have different processes for Delphi investigations. Brooks (1979) accomplished results in eight steps. Turoff and Linstone (1975) accomplished their research goals in four steps. Pollard and Pollard (2008) identified five steps to complete a modified Delphi study. This project will use the four phase, five step Pollard and Pollard mixed-method modified Delphi model. Phase one is the literature review used to develop the first round questionnaire. Phase two includes the creation of the expert panel and identification of the population. Phase two includes the development of the first round tool and the first round tool review by the panel. To save time this series of events followed a parallel path rather than a sequential path ensuring that the first round tool development and identification of the population group is effective and efficient. Phase three is the execution of the iterative Delphi process based on a questionnaire developed from the review of the literature defined further by the opinions of the panel experts. Phase four includes the analysis of data, conclusion and report out of the results. The five steps of the process are:

Step 1. Identify qualified experts. Experts were identified for the panel from the academic leadership on the board of MCCA. Experts for the study were defined as

administrators from 26-member schools of the MCCA. The panel activity preceded the execution of Round One and is used to validate the first round survey instrument. The experts needed to have experience and expertise in the subject matter (Pollard & Pollard, 2008). For the panel experience was required in community college leadership with some experience in quality systems to a lesser degree to validate whether the Round One Questionnaire would yield results congruent with the research questions. All of the experts were required to have experience in community college environments from a metrics/administration point of view.

Step 2. Invite participants. The experts must have some idea of the time commitment and the reason behind the project. The researcher is required to inform the participants of the mechanics of the Delphi study and the expectations required of the participants (Pollard & Pollard, 2008).

Step 3. Round One Questionnaire. After the first round had been vetted by the panel participants were asked to generate responses to the leading questions formulated by the researcher. Round One qualitative responses were used to generate Round Two quantitative questions.

Step 4. Round Two Questionnaire. Based on the responses generated in Round One, Round Two questions were formulated with Likert scale values applied to provide a numerical response to the questions formulated from Round One. The scaled responses were then tabulated for an analysis.

Step 5. Round Three Questionnaire. Round Three was required to validate the responses from Round Two in a rerating exercise and provide expert opinions regarding the qualitative research areas.

There were several considerations that were addressed prior to developing the Round One instrument. Chief among them was the identification of subject matter experts (SME) for the panel and the survey. Both panel and survey participants had to meet four expertise criteria: 1) knowledge and experience with the issues under investigation; 2) capacity and willingness to participate; 3) sufficient time to participate; and 4) effective communication skills (Skulmoski et al., 2007).

The second consideration that had to be addressed was the number of participants required for the study. The numbers required to provide sound analysis in a Delphi study vary from seven to several hundred (Pedersen, 2010). Where the group is homogeneous a smaller number of samples may yield sufficient results (Skulmoski et al., 2007). In one study, nine experts were identified and the study was said to be successful yielding sufficient results (Kinley, 2001). Observations have identified that accuracy increases up to eleven members but then levels off not to improve dramatically in studies with greater than eleven members (Dalkey, 1969). This project was structured to use seven or more experts in a homogeneous group identified as administrators from participating institutions of the MCCA.

A third consideration was that of the initial question creation for the survey instrument. Initial questions were designed to be broad, open ended questions to explore the full continuum of research (Adler & Ziglio, 1996). Alternately focused and structured questions may be used to guide participants towards a certain goal (Linstone & Turloff, 1975). Widely focused questions in the first round are more likely to yield a broader range of responses than a focused set of questions. The trade-off is the time it takes and the number of iterations required to distill the general questions into specific useful data (Skulmoski et al., 2007).

A fourth consideration was the number of rounds or iterations required to yield sufficient results. A two- or three-iteration Delphi is sufficient for most research (Van de Ven & Gustafson, 1975). If group consensus is required and the group is heterogeneous then additional rounds may be required (Delbecq et al., 1975). If the goal is to understand nuances and the group is homogeneous then fewer than three rounds may be sufficient to yield sufficient information (Skulmoski et al., 2007). The participants in the project understand the nuances related to the study and the group is homogeneous however, sound methodology would suggest that at least three iterations would be required.

Other considerations include the mode of interaction and methodological rigor. Mode of interaction is a consideration due to the geographical distance between target participants and the timing constraints of the project. Web-based survey tools such as Survey Monkey™ make survey-taking straightforward, quick, and easy. Fast turnaround of results and participation keeps the enthusiasm and participation high (Skulmoski et al., 2007). Methodological rigor is critical to both quantitative and qualitative results (Creswell, 1994). All of the information captured in the survey and the methods to provide, compile, dissect and analyze the data leaves a clear trail for additional and follow up research. That methodological rigor also ensures that the research can be duplicated and the results substantiated by future researchers.

Analysis of the Data

Analysis of the data was accomplished based on the Pareto Principle of significance and insignificance. The Pareto Principle states that in any population that contributes to a common effect a relatively few of the contributors—the vital few—account for the bulk of the effect (Juran & Gryna, 1988). A combination of Delphi methodology and Pareto analysis was used

successfully in the doctoral research of Pedersen (2010) at Indiana State University. This mixed-method/combination approach lends itself well to this project.

Tests for Significance, Validity, and Bias

Pedersen found that changes in response from iteration-to-iteration of the survey instrument were less than 10% (.10), thus the responses were said to be relevant. When the average total change in response was less than 5% (.05) consensus was achieved and the survey was deemed to be successful (Pedersen, 2010). The range from .01 to .10 is often referred to as the level of significance in the Delphi method and used as meaningful to reach a conclusion (Glass & Hopkins, 1996).

For this study the graphical analysis is the clear indicator of the collective opinions of administrators with regard to research questions R1–R5. The Pearson Correlation Coefficient was used to determine if a relationship exists between identified dependent and independent variables in Rq4 and RQ5. The *t*-test was used to test for significance in the hypothesis questions in R6 and R7. The graphical analysis supports the Pareto Principle in that it clearly illustrates the vital few and the response to the question. For research question RQ6 and RQ7 the *t*-test was chosen to compare the means between two variables as defined by the research questions. The means were calculated using an incremental scale assigned to the question responses. Whereas a higher number of questions may have resulted in a more reliable study, a Pearson Correlation was performed to determine whether and to what extent a relationship exists between quality tools and accreditation which were defined as variables.

Validity is defined as "the best approximation to the truth of a given proposition, inference or conclusion" (Trochim, 2001). Reliability is defined as repeatable or consistent in terms of the Delphi method. "A measure is considered reliable if it would give you the same result over and

over again" (Trochim, 2001). There were a small number of questions defined in the study without a great deal of iteration regarding same topic analysis. A series of questions in the same topic may yield a more stable result.

Table 111

Chapter 3 Process Findings Table

Research Design	Author	Findings
Delphi Study	Pollard and Pollard; Linstone and Turoff; Adler and Ziglio; Skulmoski, Hartman and Krahn	Delphi Study is ideal for this application due to its effectiveness with informed subjective judgments
Mixed Model Approach	Creswell	A mixed model approach cancels biases introduced in singular methodologies. Combines both qualitative and quantitative methods. Methodological rigor is critical. Addresses experience and interpretive nature of the research. The qualitative nature of a mixed model approach uncovers information through inquiry while the quantitative approach uncovers information through scaled surveys.
Case Study Focus	Creswell; Skulmoski et al; Linstone and Turoff	Delphi studies are effective for use in case study research.
Panel Questions	Pollard and Pollard	Panel used to clarify questions and ensure consistency of vernacular
Round One Questions	Pollard and Pollard; Linstone and Turoff; Adler and Ziglio; Skulmoski, Hartman and Krahn	Derived from the Literature and designed to be open ended questions to yield additional data Time required to answer may dissuade participation

Table 11 (continued)

Research Design	Author	Findings
Round Two Questions	Pollard and Pollard; Linstone and Turoff; Adler and Ziglio; Skulmoski, Hartman and Krahn	Scaled (Likert) to provide numerical data for quantitative analysis of qualitative data.
Round Three Questions	Pollard and Pollard; Linstone and Turoff; Adler and Ziglio; Skulmoski, Hartman and Krahn	Used to clarify and validate important responses
Number of responses required to ensure validity	Pedersen; Skulmoski et al; Kinley; Dalkey	Homogeneous groups require fewer participants. From 7 to several hundred will yield adequate results; after 11, little more is uncovered

Bias can be reduced through the use of a homogeneous sample population in a well structured, academically rigorous process using the judgment of qualified experts (Hallowell, 2010). Bias is not as prevalent in Delphi studies as in other forms of research methodologies due to the physical separation of the participants and the neutrality of the facilitator if the research instrument is of robust design (Lang, 1998).

Mechanics of the Study

For this project the mixed-model modified Delphi method was used to satisfy both the qualitative and quantitative components of this case study approach. According to Skulmoski et

al. (2007), “The Delphi method is a mature and very adaptable research method used in many research arenas by researchers across the globe.”

Creswell (2009) believes that a mixed method approach is likely to cancel the biases introduced in other more singular research methodologies. Pollard and Pollard (2008) believe that Delphi studies are ideal to investigate future trends in a given discipline area as well as current issues and priorities and that Delphi studies have become more prevalent for doctoral dissertations.

The mechanics for this project followed the five step Pollard and Pollard approach to a well-defined modified Delphi study. The study began with the formation of a panel and survey participants. The panel consisted of identified experts from the board of the MCCA whose role was to review the Round One questions, provide insight to determine how the instrument will work under controlled field conditions and clarify the questions in the vernacular of the experts (Fowler, 2009). The survey participants were people who have expertise as administrators in community college environments (Skulmoski et al., 2007). The results of a well-defined Delphi study represent the collective work of *experts* in the field (Pollard & Pollard, 2008).

The Round One Questionnaire was designed with open-ended questions related to the current use of quality and continuous improvement tools and process definition in a community college environment and was distributed to a panel, reviewed and distributed to the survey population. The project was focused on the opinions of administrators with the understanding that they may have a different perspective on quality and continuous improvement than faculty. Round One consisted of open-ended questions. An open-ended question is designed to encourage a full, meaningful answer using the participant's own knowledge and/or feelings about

the subject matter (MediaCollege, n.d.). The questionnaire was derived from a review of the literature and designed to focus on the research questions.

The first round survey was structured with leading questions to generate responses from the participants and was edited prior to release using information obtained from the review of the literature and the panel response. Round One Questions were aligned with the research questions presented in this project, including information gleaned from the panel response, and were predicated on the review of the literature. The project participants were targeted to be administrators including deans and department heads. This may give some contrast to the responses that may be generated by faculty. In some cases department heads are faculty serving dual roles. Increasing the population to include all MCCA member institutions generated a richer response pool and aided research validity (Linstone & Turoff, 1975). Table 12 shows the basis for the survey question construction.

Table 12

Question Construction Basis

Questions	Basis	Type	Participants	Anticipated Response	Expected Result
Round One	ROL RQ	Open Ended	Panel	Qualitative	Clarify/Knowledge Sharing
Round One	ROL/RQ Panel Response	Leading Discreet	Survey Group	Qualitative	Information Gathering
Round Two	ROL/RQ Round One	Scaled	Survey Group	Quantitative	Scoring/Analysis
Round Three	RQ Round 2	Scaled	Survey Group	Qualitative	Clarify Validate

The second round instrument used the information gathered in the review of the literature and the responses from the first round to construct a survey instrument with Likert scale 1 to 4 numerical values. The Likert scale was used to ascribe quantitative value to qualitative data for use in statistical analysis (Business Dictionary, 2010). Likert response carries inherent distortion attributable to several causes. Respondents may avoid using extreme responses (central tendency bias), agree with the statements as presented (acquiescence bias) or try to portray their organization in a more favorable light (social desirability bias) (Business Dictionary, 2010). Acquiescence bias can be addressed by designing a scale with balanced keying but central tendency and social bias may be more problematic. Based on the results of Round Two analyses were exacted upon the quantitative responses as required by the Round Two instrument.

The Round Three Questionnaire was designed to rerate the prior questions for repeatability and reliability (R&R) purposes and query the expert participants regarding their opinions on the final research question. This aligns structurally with the Pollard and Pollard (2008) model for a modified Delphi study.

Round One Questions. "If you do not know how to ask the right question you discover nothing" (Deming, n.d.). Round One Questions were derived from the review of the literature. They were designed to support the research enquiry and clarify research questions for the participants in the vernacular of the subject population (Pollard & Pollard, 2008). Open-ended questions are primarily useful for development work and are used for the first round Delphi study to solicit the expertise and opinions of the targeted experts, assure clarity and support the research questions (Bradburn, Sudman & Wansink, 2004).

Figure 2 represents the path for completion of the survey activity. Open-ended questions were developed for Round One based on the review of the literature and were designed to answer

the research questions. The panel, consisting of administrative experts in community colleges in the state of Michigan, was asked to review Round One questions and provided feedback.

Based on the review of the literature and in support of the research questions the Round One Questionnaire used the following questions: R1Q1. How is quality measured at your institution? This question supports RQ1 and RQ3 and is based on a review of the literature focused on process definition and measurement from Ishikawa (1982), Juran (1995), and Shewhart (1931).

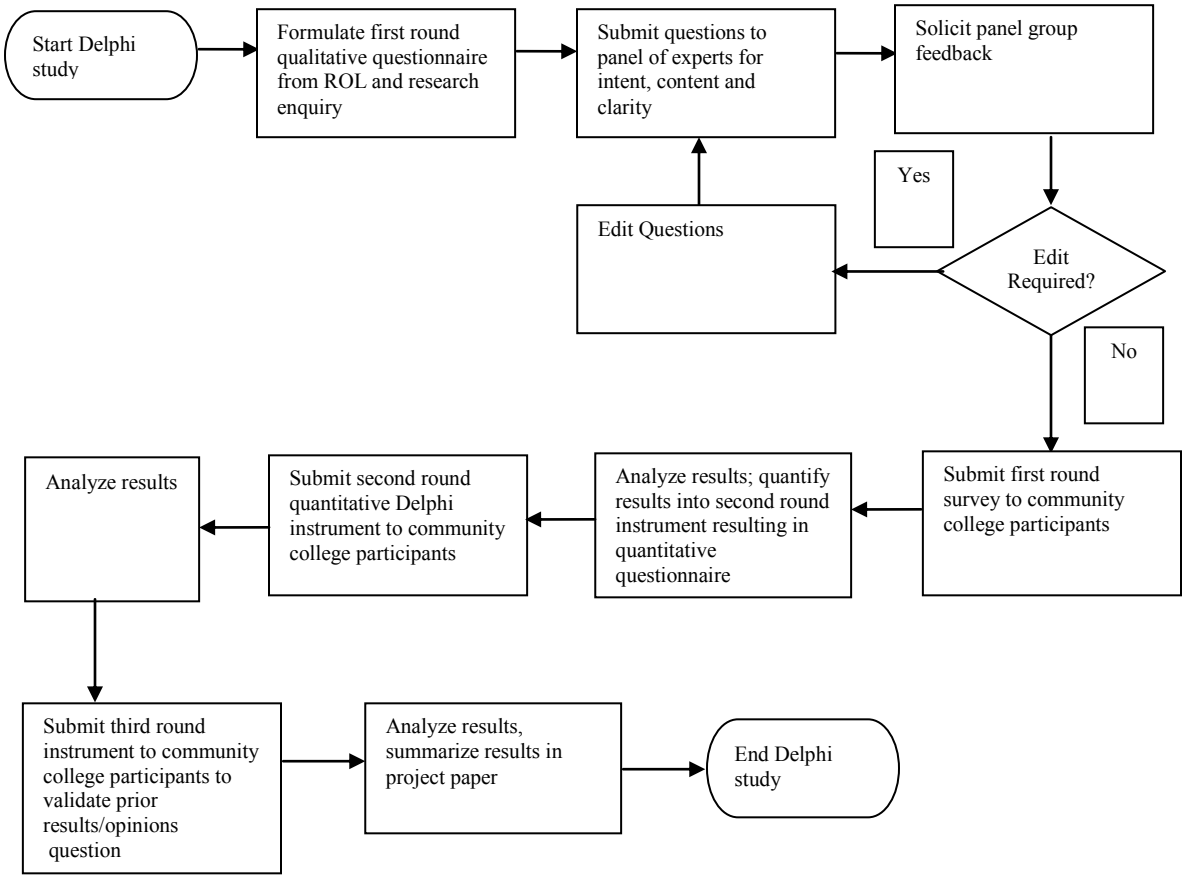


Figure 2. Process map of Delphi study

R1Q2. What is your familiarity with quality and continuous improvement tools? This question supports RQ1and RQ4 and is based on literature focused on quality and continuous

improvement tools from Anderson et al. (2008), Breyfogel (2003), Camp (1989), Crosby (1979), Ishikawa (1982), Juran and Gryna (1988), Latzko and Saunders (1995), Seybert (2006), and Shewhart (1931).

R1Q3. What quality tools are being used at your institution? This question supports RQ1, RQ3, RQ4 and RQ6 and is based on the literature focused on quality tools and implementation from Crosby (1979), Ishikawa (1982), Juran and Gryna (1988), Latzko and Saunders (1995), and Shewhart (1931).

Author																	Year
Adler															•		1977
Anderson et al				•		•	•		•								2008
Brandon												•		•			2009
Breyfogel					•	•	•	•		•			•			•	2003
Camp			•				•										1989
Crosby						•				•			•			•	1979
Ewy and Gmitro				•	•	•	•		•			•					2010
Feigenbaum				•		•				•	•					•	1951
Fields										•	•	•				•	1993
Goldrick-Rab et al												•	•		•		2009
HLC-NCA	•	•															2006
Ishikawa						•	•										1982
Jenkins												•			•		2009
Juran				•	•	•				•			•			•	1988
Latzko and Saunders						•				•			•			•	1995
Seybert			•				•					•					2006
Shewhart				•	•	•				•			•			•	1931
Spellings Report	•																2006
Townsend and Dougherty			•				•					•					2006
Trusko and Pexton					•	•	•	•									2007
Vaughan												•			•		1995
Concept	Accreditation	AQIP	Benchmarking	Process Definition	Process Control	Quality Tools	Continuous Improvement Tools	Six Sigma	Process Mapping	Quality Systems	TQM	Community Colleges	Quality Metrics	American Graduation Initiative	Teaching Philosophy	Quality Philosophy	

Figure 3. Author concept matrix

R1Q4. What are the various value streams at your institution? This question supports RQ2 and is based on the value stream definitions found in the literature of Hansen (2009), Townsend and Dougherty (2006), and Vaughan (1995).

R1Q5. What are the main administrative and academic processes defined by your institution? This question supports RQ2 and is based on the process definitions found in the work of Ewy and Gmitro (2010).

R1Q6. What means or methods of process control are being used to control the processes previously defined? This question supports RQ1and RQ3 and is based on the process control work and tool application of Ewy and Gmitro (2010), Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931).

R1Q7. What continuous improvement methods are in place at your institution? This question supports RQ1and RQ4 and is based on the literary work of Anderson et al. (2008), Breyfogel (2003), Camp (1989), Fields (1993), and Seybert (2006) defining continuous improvement methods used by organizations.

R1Q8. What continuous improvement tools are being used at your institution? This question supports RQ1, RQ3, RQ4 and RQ6 and is based on the literary work of Anderson et al. (2008), Breyfogel (2003), Camp (1989), and Seybert (2006) defining continuous improvement tools being used by various organizations.

R1Q9. In your opinion can quality and continuous improvement tools, currently being used in other industries, be applied to education? This question supports RQ3, RQ4 and RQ6 and is based on the work of Ewy and Gmitro (2010), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

Round 1 Question	Adler	Anderson et al	Biden	Brandon	Breyfogel	Camp	Crosby	Ewy and Gmitro	European Center for Higher Education	European Higher Learning Commissio	European University Association	Feigenbaum	Fields	Goldrick-Rab et a	Hansen	HLC - NCA	Ishikawa	Jenkins	Juran	Latzko and Saunders	Seybert	Shewhart	Spellings Report	Townsend and Dougherty	Trusko and Pexton	Vaughan	Research Question	Category
R1Q1																	•		•			•					RQ1, RQ3	Quality metrics
R1Q2		•			•	•	•										•		•	•	•	•					RQ1, RQ4, RQ6	Quality tools
R1Q3							•										•		•	•		•					RQ1, RQ3, RQ4	Value Stream
R1Q4															•									•		•	RQ2	Processes defined
R1Q5								•																			RQ2	Process Control
R1Q6								•				•							•			•					RQ1, RQ3	CI Methods
R1Q7		•			•	•							•								•						RQ1, RQ4, RQ6	CI Tools
R1Q8		•			•	•															•						RQ1, RQ3, RQ4	Quality and CI Familiarity
R1Q9								•											•			•					RQ3, RQ4	Tools adapted from outside
R1Q10								•											•			•					RQ3, RQ4	Tools adapted from outside
R1Q11								•											•			•					RQ3, RQ4	Tools adapted from outside
R1Q12								•											•			•					RQ3, RQ4	Tools adapted from outside
R1Q13		•			•	•															•						RQ4	Quality and CI tools
R1Q14		•			•	•															•						RQ1, RQ4	Quality and CI tools
R1Q15		•			•	•															•						RQ1, RQ4	Quality and CI tools
R1Q16											•														•		RQ1, RQ3	Change Management
R1Q17								•				•							•			•					RQ1, RQ3	Process Control
R1Q18								•				•							•			•					RQ1, RQ3	Process Control
R1Q19								•				•							•			•					RQ1, RQ3	Process Control
R1Q20								•				•							•			•					RQ1, RQ3	Process Control
R1Q21								•				•							•			•					RQ1, RQ3	Process Control
R1Q22	•								•									•									RQ2	Teaching as art/process
R1Q23	•								•									•									RQ2	Learning as art/process
R1Q24								•				•							•			•					RQ1, RQ3	Process Control
R1Q25								•				•							•			•					RQ1, RQ3	Process Control
R1Q26								•				•							•			•					RQ1, RQ3	Process Control
R1Q27			•	•										•													RQ1	American Graduation Initiative
R1Q28							•	•				•							•			•					RQ1	Quality/Continuous Improvement
R1Q29		•			•	•															•						RQ1, RQ4	Quality and CI tools
R1Q30							•	•				•	•						•			•					RQ1	Quality systems
R1Q31								•				•							•			•					RQ2, RQ3	Standardized work
R1Q32								•				•							•			•					RQ1	Standardization
R1Q33								•				•							•			•					RQ1, RQ3	Standardization
R1Q34										•						•							•				RQ1, RQ4, RQ6	Accreditation
R1Q35										•						•							•				RQ1, RQ5, RQ7	Accreditation
R1Q36																•											RQ5, RQ6, RQ7	Accreditation
R1Q37																•											RQ5, RQ6, RQ7	Accreditation
R1Q38																•											RQ5, RQ6, RQ7	Accreditation as a CI tool
Author	Adler	Anderson et al	Biden	Brandon	Breyfogel	Camp	Crosby	Ewy and Gmitro	European Center for Higher Education	European Higher Learning Commissio	European University Association	Feigenbaum	Fields	Goldrick-Rab et a	Hansen	HLC - NCA	Ishikawa	Jenkins	Juran	Latzko and Saunders	Seybert	Shewhart	Spellings Report	Townsend and Dougherty	Trusko and Pexton	Vaughan		

Figure 4. Delphi questionnaire – question support matrix

R1Q10. In your opinion can quality and continuous improvement tools, currently being used in other industries, be applied to community colleges? This question supports RQ3, RQ4

and RQ6 and is based on the work of Ewy and Gmitro (2010), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

R1Q11. In your opinion can quality and continuous improvement tools, currently being used in other industries, be applied to community colleges in the state of Michigan? This question supports RQ3, RQ4 and RQ6 and is based on the work of Ewy and Gmitro (2010), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

R1Q12. In your opinion can quality and continuous improvement tools, currently being used in other industries, be applied to your institution? This question supports RQ3, RQ4 and RQ6 and is based on the work of Ewy and Gmitro (2010), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

R1Q13. What is your familiarity with process mapping, benchmarking, continuous improvement tools and Six Sigma methods and tools? This question supports RQ4 and is based on the literary work of Anderson et al. (2008), Breyfogel (2003), Camp (1989), and Seybert (2006) surrounding specific continuous improvement tools and their application.

R1Q14. Which, if any, of these tools are being used at your institution? This question supports RQ1and RQ4 and is based on the literary work of Anderson et al. (2008), Breyfogel (2003), Camp (1989), and Seybert (2006) defining continuous improvement tools.

R1Q15. How are these tools being used at your institution? This question supports RQ1and RQ4 and is based on the literary work of Anderson et al. (2008), Breyfogel (2003), Camp (1989), and Seybert (2006) defining continuous improvement tools.

R1Q16. How adept is your institution to accepting new methods and tools not traditionally viewed as academic? This question supports RQ1and RQ3 and is based on case studies from The European University Association (2007) as well as the literature from Trusko

and Pexton (2007) discussing change management and an academic organization's resistance to change developed outside of the academic industry.

Table 13

RQ1 Ch3 Round 1 Questions Findings Table

Relevant Survey Questions	Concept	Authors
R1Q1	Quality and CI Tools	Ishikawa; Juran; Shewhart
R1Q2	Quality and CI Tools	Anderson et al.; Breyfogel; Camp; Crosby; Ishikawa; Juran; Latzko and Saunders; Shewhart
R1Q3	Quality and CI Tools	Crosby; Ishikawa; Juran; Latzko and Saunders; Shewhart
R1Q6	Process Control tools	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q7	CI methods	Andersen et al.; Breyfogel; Camp; Fields; Seybert
R1Q8	CI tools	Andersen et al.; Breyfogel; Camp; Fields; Seybert
R1Q14	Process mapping, benchmarking, Six Sigma	Andersen et al.; Breyfogel; Camp; Seybert
R1Q15	Quality and CI Tools	Andersen et al.; Breyfogel; Camp; Seybert
R1Q16	Acceptability of outside tools	European University Assoc.; Trusko and Pexton
R1Q17	Process definition	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q18	Process control	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q19	Process control	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q20	Process definition	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q21	Teaching as a process	Ewy and Gmitro; Feigenbaum; Juran; Shewhart

Table 13 (continued)

Relevant Survey Questions	Concept	Authors
R1Q24	Process control	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q25	Process control	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q26	Teaching as art	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q27	AGI	Biden; Brandon; Goldrick-Rab et al.
R1Q28	Path to CI	Crosby; Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q29	Quality and CI Tools	Anderson et al.; Breyfogel; Camp; Seybert
R1Q30	Quality system	Ewy and Gmitro; Feigenbaum; Fields; Juran; Shewhart
R1Q32	Std practices	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q33	Std practices	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q34	Accreditation as a CI tool	European Higher Education Commission; HLC-NCA
R1Q35	Accreditation as a CI tool	European Higher Education Commission; HLC-NCA, Spellings Report

Note. RQ is "Can quality and continuous improvement technology play a role in academic improvement?"

R1Q17. What accounting, academic or administrative processes are in effect at your institution? This question supports RQ1 and RQ3 and is based on the work of Ewy and Gmitro (2010), Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

R1Q18. Are there controls in place for these processes? This question supports RQ1 and RQ3 and is based on the work of Ewy and Gmitro (2010), Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

Table 14

RQ2 Ch3 Round 1 Questions Findings Table

Relevant Survey Questions	Concept	Authors
R1Q4	Defining value streams	Hansen; Townsend and Dougherty; Vaughan
R1Q22	Teaching is a process	Adler; ECHE; Jenkins
R1Q23	Teaching is a process	Adler; ECHE; Jenkins
R1Q31	Defining work processes	Ewy and Gmitro; Feigenbaum; Juran; Shewhart

Note. RQ is "Can the course delivery value stream of a community college be defined as a process?"

R1Q19. Should there be controls in place for these processes? This question supports RQ1 and RQ3 and is based on the work of Ewy and Gmitro (2010), Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

R1Q20. Is course delivery defined as a process? This question supports RQ1 and RQ3 and is based on the work of Ewy and Gmitro (2010), Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

R1Q21. In your opinion is course delivery a process? If so, why or why not? This question supports RQ1 and RQ3 and is based on the work of Ewy and Gmitro (2010),

Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

R1Q22. Is teaching a process or an art? Please explain your answer. This question supports RQ2 and is based on the work of Adler (1977), Jenkins (2009), and the European Center for Higher Education (2010) discussing teaching as an art or a science.

R1Q23. Is learning a process or an art? Please explain your answer. This question supports RQ2 and is based on the work of Adler (1977), Jenkins (2009), and the European Center for Higher Education (2010) discussing teaching as an art or a science.

R1Q24. If teaching is a process can it be controlled? This question supports RQ1 and RQ3 and is based on the work of Ewy and Gmitro (2010), Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

R1Q25. If teaching is a process should it be controlled? This question supports RQ1 and RQ3 and is based on the work of Ewy and Gmitro (2010), Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

Table 15

RQ3 Ch3 Round 1 Questions Findings Table

Relevant Survey Questions	Concept	Authors
R1Q1	Quality metrics	Ishikawa; Juran; Shewhart
R1Q3	Quality tools	Crosby; Ishikawa; Juran; Latzko and Saunders;Shewhart;
R1Q6	Process control	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q8	CI tools	Anderson et al; Breyfogel; Camp; Seybert

Table 15 (continued)

Relevant Survey Questions	Concept	Authors
R1Q9	Quality and CI tool application	Ewy and Gmitro; Juran; Shewhart
R1Q10	Quality and CI tool application	Ewy and Gmitro; Juran; Shewhart
R1Q11	Quality and CI tool application	Ewy and Gmitro; Juran; Shewhart
R1Q12	Quality and CI tool application	Ewy and Gmitro; Juran; Shewhart; Juran
R1Q16	Adapting to outside ideas	EUA; Trusko and Pexton
R1Q17	Process definition	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q18	Process control	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q19	Process control	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q20	Process definition	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q21	Process definition	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q24	Process control	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q25	Process control	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q26	Process control	Ewy and Gmitro; Feigenbaum; Juran; Shewhart

Table 15 (continued)

Relevant Survey Questions	Concept	Authors
R1Q31	Process definition	Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q33	Process standardization	Ewy and Gmitro; Feigenbaum; Juran; Shewhart

Note. RQ is "If course delivery can be described as a process, can this process be controlled and improved by applying traditionally defined manufacturing quality and continuous improvement tools?"

R1Q26. If teaching is an art should it be controlled? This question supports RQ1 and RQ3 and is based on the work of Ewy and Gmitro (2010), Feigenbaum (1951), Juran (1988), and Shewhart (1931) defining process and process control.

R1Q27. How does the American Graduation Initiative affect your institution? This question supports RQ1 and is based on the studies of Biden (2010), Brandon (2009), and Goldrick-Rab et al. (2009) regarding the American Graduation Initiative and the impact of AGI on community colleges.

R1Q28. What, in your opinion, would be the path to continuous improvement and quality at your institution? This question supports RQ1 and RQ7 and is based on the work of Crosby (1979), Ewy and Gmitro (2010), Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931) and defining quality plans, methods and practices that must be in place to improve quality and continuous improvement in an organization.

R1Q29. What tools, in your opinion, could be used to improve quality and aid continuous improvement in your organization? This question supports RQ1, RQ4 and RQ7 and

is based on the literary work of Anderson et al. (2008), Breyfogel (2003), Camp (1989), and Seybert (2006) defining continuous improvement tools.

R1Q30. Please describe the quality system at your institution. This question supports RQ1 and is based on Crosby (1979), Ewy and Gmitro (2010), Feigenbaum (1951), Fields (1993), Juran and Gryna (1988), and Shewhart (1931) and defining quality systems and quality system methodology in an organization.

R1Q31. Please define the work processes in place that you follow? This question supports RQ2 and RQ3 and is based on the work of Ewy and Gmitro (2010), Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931) defining process and process control.

R1Q32. Do you follow standard practices for these processes? If so, for which processes do you follow standard practices? This question supports RQ1 and is based on the work of Ewy and Gmitro (2010), Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931) regarding standardization of systems, practices and processes.

R1Q33. If you could standardize one process, not currently standardized, at your institution what would it be? This question supports RQ1and RQ3 and is based on the work of Ewy and Gmitro (2010), Feigenbaum (1951), Juran and Gryna (1988), and Shewhart (1931) and regarding standardization of systems, practices and processes.

Table 16

RQ4 Ch3 Round 1 Questions Findings Table

Relevant Survey Questions	Concept	Authors
R1Q2	Quality and CI tools	Anderson et al.; Breyfogel; Camp; Crosby; Ishikawa; Juran; Latzko and Saunders; Seybert; Shewhart;
R1Q3	Quality tools	Crosby; Ishikawa; Juran; Latzko and Saunders; Shewhart

Table 16 (continued)

Relevant Survey Questions	Concept	Authors
R1Q7	CI tools and methods	Anderson et al.; Breyfogel; Camp; Fields; Seybert
R1Q8	CI tools	Anderson et al.; Breyfogel; Camp; Seybert
R1Q9	Quality and CI tools	Ewy and Gmitro; Juran; Shewhart
R1Q10	Quality and CI tools in community colleges	Ewy and Gmitro; Juran; Shewhart
R1Q11	Quality and CI tools in community colleges	Ewy and Gmitro; Juran; Shewhart
R1Q12	Quality and CI tools in community colleges	Ewy and Gmitro; Juran; Shewhart
R1Q13	CI tools	Anderson et al.; Breyfogel; Camp; Seybert
R1Q14	CI tools	Anderson et al.; Breyfogel; Camp; Seybert
R1Q15	Quality and CI tools	Anderson et al; Breyfogel; Camp; Seybert
R1Q29	Quality and CI tools	Anderson et al; Breyfogel; Camp; Seybert
R1Q34	Accreditation as CI tool	EHEC; HLC-NCA; Spellings Report

Note. RQ is "Can manufacturing quality and continuous improvement tools - specifically process mapping, benchmarking and Six Sigma methods - be applied to the community college model?"

R1Q34. In your opinion how can accreditation be used to improve quality at your institution? This question supports RQ1, RQ4, RQ6 and RQ7 and is based on the Spellings Report (2006), The European Higher Education Commission (2010) and the Higher Learning Commission–North Central Accreditation (2010) information on accreditation and its value to institutes of higher education.

R1Q35. Do you view accreditation audits as an opportunity or an intrusion and why? This question supports RQ1, RQ5, RQ6 and RQ7 and is based on the Spellings Report (2006), The European Higher Education Commission (2010) and the Higher Learning Commission–North Central Accreditation (2010) defining accreditation and its value to an academic organization.

R1Q36. Have you heard of the Academic Quality Improvement process (AQIP) for accreditation? This question supports RQ5 and RQ7 and is based on the literature of the Higher Learning Commission – North Central Accreditation (HLC-NCA, 2011) as well as the Malcolm Baldrige National Quality Award criteria (2010) regarding AQIP accreditation as a continuous improvement tool.

R1Q37. Has your institution subscribed to the Academic Quality Improvement Process (AQIP) for accreditation? In your opinion why or why not? This question supports RQ5 and RQ7 and is based on the literature of the Higher Learning Commission–North Central Accreditation (HLC-NCA, 2011) as well as the Malcolm Baldrige National Quality Award criteria (2010) regarding AQIP accreditation as a continuous improvement tool.

R1Q38. Based on your knowledge of AQIP, how could it be used as a continuous improvement tool in your organization?

Table 17

RQ5 Ch3 Round 1 Questions Findings Table

Relevant Survey Questions	Concept	Authors
R1Q35	Accreditation as CI tool	European Higher Education Commission; Higher Learning Commission – North Central Accreditation; Spellings Report
R1Q36	AQIP accreditation as a CI Tool	Higher Learning Commission–North Central Accreditation
R1Q37	AQIP accreditation as a CI Tool	Higher Learning Commission–North Central Accreditation
R1Q38	AQIP accreditation as a CI Tool	Higher Learning Commission–North Central Accreditation

Note. RQ is "Can Accreditation, specifically an AQIP approach, be used as a continuous improvement tool in a community college model?

This question supports RQ5 and RQ7 and is based on the literature of the Higher Learning Commission–North Central Accreditation (HLC-NCA, 2011) as well as the Malcolm Baldrige National Quality Award criteria (2010) regarding AQIP accreditation as a continuous improvement tool.

The Round Two Questionnaire used a Likert scale numeric application to quantify the results of similar questions based on the literature review and information obtained in the Round One Questionnaire. The Likert scale assignment quantifies the opinions and perceptions of the participants in order to apply descriptive statistics to the response. The number of questions for Round Two was reduced based on feedback from Round One respondents. Round Two questions and their relationship to the research questions are found in the Ch3 Round 2 Question

Matrix Figure 6. Round Two Questions and their corresponding scales can be found in Appendix B.

Table 18

RQ6 Ch3 Round 1 Questions Findings Table

Relevant Survey Questions	Concept	Authors
R1Q3	Quality and CI Tools	Ishikawa; Juran; Shewhart
R1Q10	Quality and CI tool application	Ewy and Gmitro; Juran; Shewhart
R1Q28	Path to CI	Crosby; Ewy and Gmitro; Feigenbaum; Juran; Shewhart
R1Q29	Quality and CI Tools	Anderson et al.; Breyfogel; Camp; Seybert
R1Q34	Accreditation as a CI tool	European Higher Education Commission; HLC-NCA
R1Q35	Accreditation as CI tool	EHEC; HLC-NCA
R1Q36	AQIP as a CI Tool	HLC-NCA; MBNQA
R1Q37	AQIP as a CI Tool	HLC-NCA; MBNQA
R1Q38	AQIP as a CI Tool	HLC-NCA; MBNQA

Note. RQ is "Are there differences in the mean perception between utilizing quality tools and accreditation to improve quality in a community college?"

The Round Three Questionnaire used a quantitative response to gain further clarity regarding the perceptions of administrators on the application and use of quality and continuous improvement tools in community colleges in the state of Michigan.

Data gathered from Round Three was be used to corroborate the data gathered in previous rounds. Round Three questions can be found in Appendix C.

Table 19

RQ7 Ch3 Round 1 Questions Findings Table

Relevant Survey Questions	Concept	Authors
R1Q34	Accreditation as CI tool	HLC-NCA; Spellings
R1Q35	Accreditation as CI tool	EHEC; HLC-NCA
R1Q36	AQIP as a CI Tool	HLC-NCA; MBNQA
R1Q37	AQIP as a CI Tool	HLC-NCA; MBNQA
R1Q38	AQIP as a CI Tool	HLC-NCA; MBNQA

Note. RQ is "Are there significant differences in the mean perception between utilizing AQIP and accreditation to improve quality in a community college?"

Round 2 Question								Round 1 Question Basis
R2Q1	•							R1Q7, R1Q8
R2Q2	•					•		R1Q9, R1Q10, R1Q11, R1Q12, R1Q16
R2Q3	•							R1Q1
R2Q4				•				R1Q13, R1Q14, R1Q15
R2Q5				•				R1Q13, R1Q14, R1Q15
R2Q6				•				R1Q13, R1Q14, R1Q15
R2Q7				•				R1Q13, R1Q14, R1Q15
R2Q8				•				R1Q13, R1Q14, R1Q15
R2Q9				•				R1Q13, R1Q14, R1Q15
R2Q10	•							R1Q9, R1Q10, R1Q11
R2Q11	•							R1Q9, R1Q10, R1Q11
R2Q12		•						R1Q20, R1Q21, R1Q22, R1Q23, R1Q24
R2Q13			•					R1Q24, R1Q25, R1Q26
R2Q15			•					R1Q24, R1Q25, R1Q26
R2Q16				•				R1Q10, R1Q11, R1Q12, R1Q13, R1Q14, R1Q15
R2Q17				•				R1Q10, R1Q11, R1Q12, R1Q13, R1Q14, R1Q15
R2Q18				•				R1Q10, R1Q11, R1Q12, R1Q13, R1Q14, R1Q15
R2Q19				•				R1Q10, R1Q11, R1Q12, R1Q13, R1Q14, R1Q15
R2Q20				•				R1Q10, R1Q11, R1Q12, R1Q13, R1Q14, R1Q15
R2Q21					•			R1Q28, R1Q30, R1Q34
R2Q23					•		•	R1Q34, R1Q38
R2Q25					•	•	•	R1Q34, R1Q38
Research Question	RQ1	RQ2	RQ3	RQ4	RQ5	RQ6	RQ7	

Figure 5. Delphi study round two question matrix

Delphi Study Round Three Question Matrix								
Round 3 Question								Round 2 Question Basis
R3Q1	•							R2Q1
R3Q2	•					•		R2Q2
R3Q3	•							R2Q10
R3Q4		•						R2Q12
R3Q5			•					R2Q13
R3Q6				•				R2Q16
R3Q7				•				R2Q17
R3Q8				•				R2Q19
R3Q9					•			R2Q22
R3Q10					•		•	R2Q23
R3Q11					•			R2Q24
R3Q12					•	•	•	R2Q25
Research Question	RQ1	RQ2	RQ3	RQ4	RQ5	RQ6	RQ7	

Figure 6. Delphi study round three question matrix

Summary

The purpose of this chapter was to provide a research framework for gathering and analyzing data to support the project. The Delphi process was chosen to support both the qualitative and quantitative requirements of this mixed model case study project. The Delphi process is a viable approach to the problem as it addresses the heuristic (experienced based) and hermeneutic (interpretive) nature of the project. The Delphi process followed a prescribed sequence of discovery and data gathering starting with a panel consisting of expert administrators to review the Round One survey prior to release. This was followed by iterative rounds to survey the study participants consisting of administrator, chairs and department heads from community college members of the MCCA to gather qualitative and quantitative data. The

Delphi method is only as good as the survey instrument designed to support the project. Quantitative data can be gleaned from a qualitative study by applying a Likert scale approach to round two and used to develop the analysis necessary to answer the research questions in this case study. A Pearson Correlation Coefficient was used to determine if a relationship between variables exists between identified variables from RQ4 and RQ5 and the strength of these relationships. The Delphi method is a viable approach to doctoral research and is gaining popularity in graduate research across the globe. The data gained from this research was presented in Chapter 4 with detailed analysis of the results presented in Chapter 5 of this project.

CHAPTER 4

Results of the Study

Discussion of the Data

This chapter presents results from the data analysis of the case study using a modified Delphi method which collected data from administrators and staff from community colleges in the state of Michigan related to their opinions on the adaptation and use of quality and continuous improvement tools in community college environments. All of the colleges polled are members of the MCCA. The purpose of the study was to determine, in the opinions of administrators and staff, whether quality and continuous improvement tools used in other environments could be generalized to a community college environment. The study identified specific quality and continuous improvement tools, Six Sigma, benchmarking and process mapping for use in community colleges and sought to gain an understanding of the knowledge of administrators regarding quality in community colleges.

A link to the electronic survey was distributed to the institutional research leaders of the 28 member institutions of the MCCA for redistribution to the administrative staff of their institution. The e-mail notification included the survey purpose, a link to the survey, contact information, IRB information and a timetable for completing the survey. This survey instrument was designed for administrators and staff at this time. Only faculty serving in an administrative or staff positions were to be surveyed. Faculty opinions may be solicited at a future time.

Table 20

Chapter 4 Process Findings Table

Research Design	Author	Findings	Results
Delphi Study	Pollard and Pollard; Linstone and Turoff; Adler and Ziglio; Skulmoski et al.	Delphi Study is ideal for this application due to its effectiveness with informed subjective judgments	The Delphi approach provided a wealth of information and a structure to complete the project.
Mixed-Model Approach	Creswell	A mixed model approach cancels biases introduced in singular methodologies. Combines both qualitative and quantitative methods. Methodological rigor is critical. Addresses experience and interpretive nature of the research. The qualitative nature of a mixed model approach uncovers information through inquiry while the quantitative approach uncovers information through scaled surveys.	Mixed model approach yielded qualitative data with sufficient detail to refine Round Two questions and adequate quantitative data with which to complete a statistical analysis
Case Study Focus	Creswell; Skulmoski et al; Linstone and Turoff	studies are effective for use in case study research.	Case study approach provided an effective research foundation
Panel Questions	Pollard and Pollard	Panel used to clarify questions and ensure consistency of vernacular	Response was very low although detailed

Table 20 (continued)

Research Design	Author	Findings	Results
Round One Questions	Pollard and Pollard; Linstone and Turoff; Adler and Ziglio; Skulmoski et al.	Derived from the Literature and designed to be open ended questions to yield additional data Time required to answer may dissuade participation	Response was very low although detailed
Round Two Questions	Pollard and Pollard; Linstone and Turoff; Adler and Ziglio; Skulmoski et al.	Scaled (Likert) to provide numerical data for quantitative analysis of qualitative data.	Response was better due to the reduction and structure of the survey questions
Round Three Questions	Pollard and Pollard; Linstone and Turoff; Adler and Ziglio; Skulmoski et al.	Used to clarify and validate important responses	Response was very good due to the limited number of questions and the structure of the questions
Number of responses required to ensure validity	Pedersen; Skulmoski et al; Kinley; Dalkey	Homogeneous groups require fewer participants. From 7 to several hundred will yield adequate results; after 11, little more is uncovered	Survey resulted in *n*=61 respondents

A review panel was identified from board members of the MCAA. The five panel members consisted of the President of MCCA and four college presidents who are currently on the board. Their task was to review and comment on the Round One instrument. There were no changes to the Round One instrument as a result of panel comments. Of the 28 institutional

members of the MCCA asked to participate in the study two institutions elected not to participate. The 26 participating institutions generated 61 responses. Based on the number of administrators in a community college the response rate was seen to be low. Based on the literature reviewed which described and defined a modified Delphi approach to research $n = 61$ provides an ample data set to substantiate the research (Dalkey 1969; Kinley 2001; Skulmowski et al., 2007).

Data Collection

Data collection for the panel response occurred via e-mail. Each of the five panel members were identified from the MCCA website and contacted through e-mail. Data collection for each round of the modified Delphi survey occurred via a web-based survey service called SurveyMonkey™. SurveyMonkey™ is a survey support service and a familiar tool for many college and university employees providing a well presented and comfortable approach to data collection (SurveyMonkey, 2010).

Panel Response

The panel response was poor with feedback from one respondent. The feedback was taken to heart, however, and changes were made to the second round survey instrument as a result of the feedback. The respondent felt that Round One was too long. That comment was echoed by other respondents in the Round One response and changes were made to Round Two and Three to support this recommendation. The panel respondent also suggested changes to the response method that were incorporated into the quantitative rounds of the survey.

Modified Delphi Round One

Round One of the modified Delphi study provided a qualitative look at administrator's perceptions on the adaptation and use of quality and continuous improvement tools in

community colleges in the state of Michigan. The literature suggested that open-ended questions would elicit a richer response from participants. Responses suggested by the respondents suggest just the opposite effect. Many of the respondents polled suggested that open-ended questions required too much time to formulate an answer and that respondents did not want to reflect and ponder upon answers to open-ended questions. Respondents felt that Round One took too much of their time to craft a response. In addition to the responses that noted that the questions were difficult to answer, many respondents also noted that there were too many questions to answer. As a result Round One response was low at $n = 9$ or 15% of the total number of respondents. Raw responses to Round One questions can be found in Appendix A. The following are the qualitative responses to Round One of the survey:

R1Q1. How is quality measured at your institution? This open-ended question served two purposes. The first purpose was to understand administrator's perceptions of what *quality* means. The second purpose was to determine if administrators know and understand the quality metrics of the organization. The results of the question indicated that *quality* in community colleges is understood to be multifaceted and includes quality of learning, quality of the experience, quality of service and general systemic quality. Measurement of quality is just as multifaceted and includes grades and artifact reviews for educational outcomes, satisfaction surveys for employees and students, state and federal benchmarks, institutional effectiveness reviews, a balanced scorecard approach and feedback from AQIP to gauge overall quality at the institution.

R1Q2. What is your familiarity with quality and continuous improvement tools? This open-ended question was designed to lead the respondent into the crux of the project. All of the respondents were familiar to very familiar with quality and continuous improvement tools.

R1Q3. What quality tools are being used at your institution? While many people may be familiar with quality and continuous improvement tools in theory, this question was designed to ferret out specific tools being used by community colleges for quality and continuous improvement. Several tools are being used by community colleges including Hoshin planning, lean and 5S, problem solving tools, satisfactions surveys, dashboard metrics, PDCA, cause and effect diagrams and flow charting are several examples that were cited.

R1Q4. What are the various value streams at your institution? (Value streams provide funding sources to your institution). This question was designed to determine the administrators understanding of the institution's value stream beyond the sources of funding to set up further queries regarding benchmarking and process mapping. All of the respondents clearly articulated sources of funding from property taxes, tuition and fees and state appropriations and grants.

R1Q5. What are the main administrative and academic processes defined by your institution? This question was designed to stimulate administrators to begin to think in terms of value-added processes for upcoming questions related to teaching and learning as processes. Responses varied from a thorough articulation of administrative and financial processes including general assessment processes, curriculum reviews, AQIP processes, security processes and board processes to some participants who were unfamiliar with the term *process* or did not understand the question.

R1Q6. What means or methods of process control are being used to control the processes previously defined? This question was designed to gauge a participant's understanding of process control. The administrators who answered R1Q5 with process knowledge understood what was meant by process control. Those administrators who did not understand what was meant by *process* did not understand process control.

R1Q7. What continuous improvement methods are in place at your institution? This question was designed to elicit responses from administrators to understand what specific quality and continuous improvement tools are being used at their institutions. Several of the administrators (43%) cited PDCA while AQIP was mentioned in 57% of the responses. Only 1 response did not know what was meant by continuous improvement methods.

R1Q8. What continuous improvement tools are being used at your institution? This question was designed to provide more specificity in identifying continuous improvement tools currently used in community colleges in the state of Michigan.

The responses included process mapping, benchmarking, AQIP, PDCA, 5S, lean tools, cause and effect diagrams, scatter diagrams and flow charting.

R1Q9. In your opinion can quality and continuous improvement tools, currently being used in other industries, be applied to education? This question was fundamental to the research questions that make up the core of this project. A total of 71% of the respondents answered yes. Another 14% answered probably and another 14% answered that they were not sure.

R1Q10. In your opinion can quality and continuous improvement tools currently being used in other industries be applied to community colleges? This question was fundamental to the research questions that make up the core of this project. Again, 71% of the respondents answered yes. An additional 14% answered probably and 14% answered that they were not sure.

R1Q11. In your opinion can quality and continuous improvement tools currently being used in other industries be applied to community colleges in the state of Michigan?

This question was fundamental to the research questions that make up the core of this project. A total of 71% of the respondents answered yes; 14% answered probably and 14% answered that they were not sure.

R1Q12. In your opinion can quality and continuous improvement tools currently being used in other industries be applied to your institution? This question was fundamental to the research questions that make up the core of this project. A total of 71% of the respondents answered yes; 14% answered probably, and 14% answered that they were not sure. One respondent relayed that they are currently being used.

R1Q13. What is your familiarity with process mapping, benchmarking, continuous improvement tools and Six Sigma methods and tools? This question was designed specifically to address the tools defined in this project. The responses to this question varied from 50% of respondents being familiar or very familiar to 12.5% having no familiarity at all. A total of 37.5% were familiar with process mapping and benchmarking while 0% were familiar with Six Sigma methods.

R1Q14. Which, if any, of these tools are being used at your institution? This question was designed specifically to address the use of the quality and continuous improvement tools defined in this project—process mapping, benchmarking and Six Sigma—in the respondent's institutions. A total of 50% of the respondent's institutions use process mapping and benchmarking, 50% did not register either process mapping or benchmarking, and 0% of respondent's institutions use Six Sigma.

R1Q15. How are these tools being used at your institution? This question was designed to understand the perceptions of administrators regarding the use of specific tools as defined by this project. A total of 17% did not know while 83% of the respondents were well versed in the application of process mapping and benchmarking and understood where the tools were used in their institution.

R1Q16. How adept is your institution to accepting new methods and tools not traditionally viewed as academic? This question was designed to investigate the agility of a community college to accept ideas and tools developed outside of their industry. A total of 29% of the respondents stated that their institution was quick to adopt ideas developed outside, 43% stated that their institutions were slow to adopt ideas from outside of academia, 14% claimed that their institution was somewhat adept, and 14% just did not know.

R1Q17. What accounting, academic or administrative processes are in effect at your institution? This question was designed to lead the respondent towards identifying processes within their institution. A total of 33% identified specific processes with respect to accounting, academic or administration while 50% did not know, and 17% became disgruntled with the length of the survey and bowed out at this juncture.

R1Q18. Are there controls in place for these processes? This question was designed to prompt the respondent into thinking about control mechanisms related to processes to set up questions R1Q20 – R1Q26. A total of 40% of respondents said yes while 60% of respondents did not know.

R1Q19. Should there be controls in place for these processes? This question was designed to prompt the respondent into thinking about control mechanisms related to processes to set up questions R1Q20 – R1Q26. A total of 80% of respondents said yes while 20% of respondents did not know.

R1Q20. Is course delivery defined as a process? This question was designed to substantiate the literature differentiating course delivery and teaching as an art or a process. A total of 50% said that course delivery is defined as a process, 16.3% did not know, 16.3% said that course delivery was not defined as a process but the approval to develop and offer the course

was a process, 16.3% claimed that they were not a faculty member and therefore could not offer an opinion.

R1Q21. In your opinion is course delivery a process? If so, why or why not? This question was designed to subdivide the nuance between whether course delivery was defined as a process or course delivery is a process in the opinions of the respondents. This splits a finer hair. A total of 80% of respondents believed that course delivery was a process in their opinion, and 20% said that course delivery was not a process in itself but should be part of a bigger process.

R1Q22. Is teaching a process or an art? Please explain your answer. This question was designed to substantiate the literature differentiating course delivery and teaching as an art or a process. A total 100% of respondents cited that teaching is both an art and a process.

R1Q23. Is learning a process or an art? Please explain your answer. This question was designed to satisfy the researcher's curiosity as to, in the opinions of administrators in community colleges in the state of Michigan, whether teaching would be classified as an art and learning a process. Again, 100% of respondents cited that learning is a process.

R1Q24. If teaching is a process can it be controlled? This question was designed to stimulate thought regarding teaching as a process and process control in terms of quality and continuous improvement tools. A total of 40% of respondents thought that if teaching is a process then it can be controlled, 20% thought that the process part of teaching can be controlled, 20% thought that it could be controlled somewhat, and 20% commented that no one at their institution was trying to control teaching styles.

R1Q25. If teaching is a process should the process be controlled? This question was designed to understand, in the opinions of administrators, whether the process of teaching should

be controlled. All 100% of respondents thought that the process part of teaching should be controlled.

R1Q26. If teaching is an art should it be controlled? This question was designed to provoke the thoughts of the administrators around controlling the artistic content of teaching if it was not determined to be a process. A total of 80% of respondents thought that the artistic part of teaching should not be controlled and 20% thought that it should be controlled through the hiring process.

R1Q27. How does the American Graduation Initiative affect your institution? This question was designed to satisfy the researcher's curiosity with administrator's understanding of the American Graduation Initiative (AGI). A total of 20% of respondents were not familiar with the AGI and 80% of respondents were familiar with the AGI, but 60% of the respondents felt that the AGI was *off the mark* and required data that was not specific to the mission of community colleges.

R1Q28. What, in your opinion, would be the path to continuous improvement and quality at your institution? This question was designed to provide insight into administrator's opinions of whether their institution was focused on the right things regarding quality and continuous improvement. A total of 40% believed that AQIP is the path to quality and continuous improvement in their institutions, 20% believed that consistency in communication and training would lead to continuous improvement and quality, 20% believe that positional power rather than knowledge is detrimental to quality and continuous improvement, and 20% believe that their institution is on the correct path but needs to get more people on board.

R1Q29. What tools, in your opinion, could be used to improve quality and aid continuous improvement at your institution? This question was designed to validate the

administrator's understanding of quality and continuous improvement methods and tools. A total of 50% reiterated the quality and continuous improvement tools from earlier survey questions including PDCA, 5S, lean and AQIP, 33.2% cited more tightly controlled data integrity as an improvement tool, and 16.6% cited surveys as a tool that could be used to improve quality and aid continuous improvement.

R1Q30. Please describe the quality system at your institution. This question was designed to test whether administrators understood the organization's quality system. A total of 60% of respondents listed AQIP as their quality system, 20% cited data gathering as their institutions quality system, and 20% cited the use of aforementioned quality tools as their institutions quality system.

R1Q31. Please define the work processes that are currently in place that you follow. This question was designed to understand respondent's perception of what constitutes a work process or process. There were several processes cited including creating timelines and work instructions for standardized work, event scheduling, updating and improving any process that needs improvement. Sixteen percent of respondents felt that it was impossible to follow and process.

R1Q32. Do you follow standard practices for these processes? If so for which processes do you follow standard practices? This question was designed to satisfy the researcher's curiosity regarding standardized work in an academic environment. All 100% of the respondents follow some sort of standardized work. Some standard work was developed by the institution and some developed by the individual administrator to improve their work process.

R1Q33. If you could standardize one process, not currently standardized, at your institution what would it be? This question was designed to provide insight into administrator's

opinions of whether their institution was focused on the right things regarding quality and continuous improvement. Processes included strategic planning, data entry in key transaction in ERP, information collection and integrity, student life approval processes and budgeting at the college level.

R1Q34. In your opinion how can accreditation be used to improve quality at your institution? This question was designed to glean opinions from administrators regarding the role of accreditation in quality and continuous improvement. A total of 50% of respondents believe that AQIP is vital to quality and continuous improvement due to the organizational feedback and focus that the process provides, 16.6% of respondents thought that accreditation did not improve quality but rather quality could be improved through the use of a rigorous PDCA process, 16.6% felt that accreditation could be used to improve quality through benchmarking, and 16.6% felt that the very nature of third party assessment could improve quality as external expectations often force action.

R1Q35. Do you view accreditation audits as an opportunity or an intrusion and why? This question was designed to gather respondent's opinions on their perceived value of accreditation. A total of 33% of respondents believed that accreditation audits were beneficial, 16.5% of respondents did not have *audits,* 33% of respondents thought that audits were a lot of work, and 16.5% of respondents did not have access to audit information.

R1Q36. Have you heard of the Academic Quality Improvement process (AQIP) for accreditation? This question was designed to determine the extent of understanding for the AQIP process among administrators. All 100% of respondents had heard of AQIP.

R1Q37. Has your organization subscribed to the Academic Quality Improvement Process (AQIP) for accreditation? In your opinion why or why not? This question was designed

to dive deeper into the understanding of AQIP by administrators at Michigan community colleges. All 100% of respondents are in AQIP organizations. Comments were positive regarding the quality and continuous improvement nature of the AQIP structure.

R1Q38. Based on your knowledge of AQIP, how could it be used as a continuous improvement tool at your institution? This question was designed to reinforce accreditation as a means to continuous improvement. All 100% of respondents believed that the focus and project-centric nature of AQIP were keys to using the process to continuously improve the institutional effectiveness of the college.

Summary of Results for Round One

Round One provided a qualitative narrative that laid the foundation for the quantitative structure of Round Two. Round One was deemed to be too long for the patience and tenacity of the respondents. Comments suggested that open ended questions did not promote participation. Turn out for Round One was light at $n = 9$. Round One alone did not provide enough data to answer the research questions. It did give a *flavor* for ideas and attitudes expressed by the respondents regarding quality and continuous improvement tools and methodologies currently in place in community colleges in the state of Michigan. Round One provided a great deal of information not all of which was germane to the project.

Modified Delphi Round Two

Round Two of the modified Delphi method as applied to this case study provided a qualitative look at administrator's perceptions on the adaptation and use of quality and continuous improvement tools in community colleges in the state of Michigan. Round Two was designed to provide a Likert style (scalable) response which was more amenable to respondents and provided quantifiable data for analysis. The average for each response was balanced and no

answer carried more weight than any other answer. A 4-column structure was chosen with the mid-point answer (neither agree nor disagree) omitted from the scale. This was done to force the respondent to provide an answer to the question. The weight of each answer totaled 1. The survey was reduced to 25 scalable questions which improved the number of responses. Total Round Two response improved to *n* = 29 or 48% of total respondents.

R2Q1 – Quality and continuous improvement tools have been successful in improving quality in higher education.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	2	4	19	3	2.82
Respondents in the affirmative =	22		Respondents in the negative = 6		
Skipped = 1			*SD* = .723		

R2Q2 – Quality and continuous improvement tools that have been successful in other organizations and industries can be applied to processes in higher education.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	2	3	13	11	3.14
Respondents in the affirmative =	24		Respondents in the negative = 5		
Skipped = 0			*SD* = .875		

R2Q3 – My institution measures quality.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	2	3	15	8	3.04
Respondents in the affirmative =	23		Respondents in the negative = 5		
Skipped = 1			*SD* = .838		

R2Q4 – I am familiar with Six Sigma methods and tools.

	Not at all	I have heard of Six Sigma	I am familiar with Six Sigma	I've used Six Sigma	Rating Avg.
Participant Response	4	16	7	1	2.18

Respondents in the affirmative = 8 Respondents in the negative = 20

Skipped = 1 *SD* = .723

R2Q5 – My institution uses Six Sigma.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	7	19	2	0	1.82

Respondents in the affirmative = 2 Respondents in the negative = 26

Skipped = 1 *SD* = .548

R2Q6 – I am familiar with benchmarking.

	Not at all	I've heard of benchmarking	I'm familiar with benchmarking	I've used benchmarking	Rating Avg.
Participant Response	0	1	14	12	3.41

Respondents in the affirmative = 26 Respondents in the negative = 1

Skipped = 2 *SD* = .572

R2Q7 – My institution uses benchmarking.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	1	3	13	11	3.21

Respondents in the affirmative = 24 Respondents in the negative = 4

Skipped = 1 *SD* = .790

R2Q8 – I am familiar with process mapping.

	Not at all	I have heard of process mapping	I am familiar with process mapping	I've used process mapping	Rating Avg.
Participant Response	3	4	12	10	3.00

Respondents in the affirmative = 22 Respondents in the negative = 7

Skipped = 0 *SD* = .964

R2Q9 – My institution uses process mapping.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	2	9	13	4	2.68

Respondents in the affirmative = 11 Respondents in the negative = 17

Skipped = 1 *SD* = .819

R2Q10 – Quality and continuous improvement tools and methods play a role in academic improvement.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	2	13	14	3.41

Respondents in the affirmative = 27 Respondents in the negative = 2

Skipped = 0 *SD* = .628

R2Q11 – Quality and continuous improvement tools and methods play a significant role in academic improvement.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	1	5	12	11	3.14

Respondents in the affirmative = 23 Respondents in the negative = 6

Skipped = 0 *SD* = .833

R2Q12 – Teaching (course delivery) is a process.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	0	20	9	3.31
Respondents in the affirmative =	29		Respondents in the negative = 0		
Skipped = 0			*SD* = .471		

R2Q13 – The teaching process can be controlled and improved using quality and continuous improvement tools.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	1	20	8	3.24
Respondents in the affirmative =	28		Respondents in the negative = 1		
Skipped = 0			*SD* = .511		

R2Q14 – Learning is a process.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	0	17	11	3.39
Respondents in the affirmative =	28		Respondents in the negative = 0		
Skipped = 1			*SD* = .497		

R2Q15 – Quality and continuous improvement tools used to control processes in other industries can be applied to the teaching process.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	2	18	8	3.21
Respondents in the affirmative =	26		Respondents in the negative = 2		
Skipped = 1			*SD* = .568		

R2Q16 – Six Sigma methods can be applied in community colleges.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	7	15	3	2.84

Respondents in the affirmative = 18 Respondents in the negative = 7

Skipped = 4 *SD* = .620

R2Q17 – Process mapping can be applied in community colleges.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	1	14	10	3.36

Respondents in the affirmative = 24 Respondents in the negative = 1

Skipped = 4 *SD* = .569

R2Q18 – Process mapping can be used to define the teaching process.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	3	19	5	3.07

Respondents in the affirmative = 24 Respondents in the negative = 3

Skipped = 2 *SD* = .550

R2Q19 – Benchmarking can be applied in/to community colleges.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	0	17	10	3.37

Respondents in the affirmative = 27 Respondents in the negative = 0

Skipped = 2 *SD* = .492

R2Q20 – Benchmarking other institutions would help us to improve our processes.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	2	18	9	3.24

Respondents in the affirmative = 27 Respondents in the negative = 2

Skipped = 0 *SD* = .577

R2Q21 – Accreditation is our quality system.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	2	4	17	6	2.93

Respondents in the affirmative = 23 Respondents in the negative = 6

Skipped = 0 *SD* = .799

R2Q22 – My institution is accredited through the HLC-NCA Academic Quality Improvement Process (AQIP).

	Yes	No	I Do not Know
Participant Response	26	2	1

Respondents in the affirmative = 26 Respondents in the negative = 2

I Do Not Know = 1

R2Q23 – AQIP can be used as a continuous improvement tool in community colleges.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	0	17	12	3.41

Respondents in the affirmative = 29 Respondents in the negative = 0

Skipped = 0 *SD* = .500

R2Q24 – My institution is accredited through the HLC-NCA Program to Evaluate and Advance Quality (PEAQ).

	Yes	No	I Do Not Know
Participant Response	3	18	8

Respondents in the affirmative = 3 Respondents in the negative = 18

I Do Not Know = 8

R2Q25 – Accreditation can be used to improve quality in our institution.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	1	20	8	3.24

Respondents in the affirmative = 28 Respondents in the negative = 1

Skipped = 0 *SD* = .511

Summary of Results for Round Two

Round Two yielded much better participation due to the reduced number of questions and structure of the response according to comments by respondents. Round Two data provided quantifiable analysis of the information pertinent to the project. From this data a statistical picture began to emerge from which conclusions were drawn. The picture is clear from the graphical representation that accompanies the data on the following pages. The graphical representation tells the story that supports the statistical data.

RQ1. Can Quality and Continuous Improvement Technology play a role in academic improvement? Questions R2Q10 and R2Q11 are directly related to this research question.

R2Q10 – Quality and continuous improvement tools and methods play a role in academic improvement.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	2	13	14	3.41

Respondents in the affirmative = 27 Respondents in the negative = 2

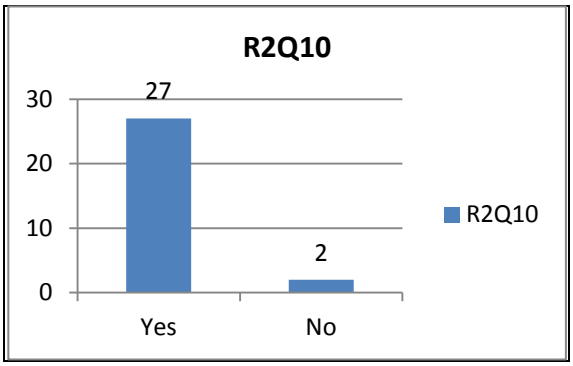
Skipped = 0 *SD* = .628

R2Q11 – Quality and continuous improvement tools and methods play a significant role in academic improvement.

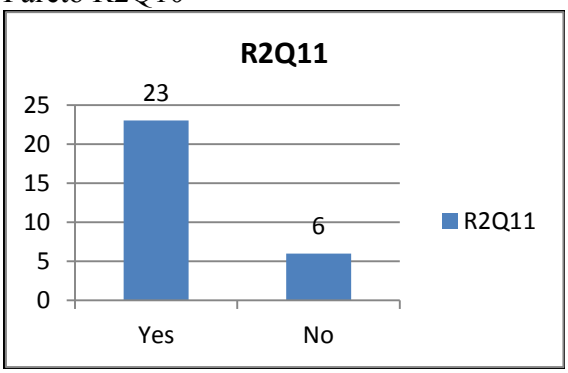
	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	1	5	12	11	3.14

Respondents in the affirmative = 23 Respondents in the negative = 6

Skipped = 0 *SD* = .833

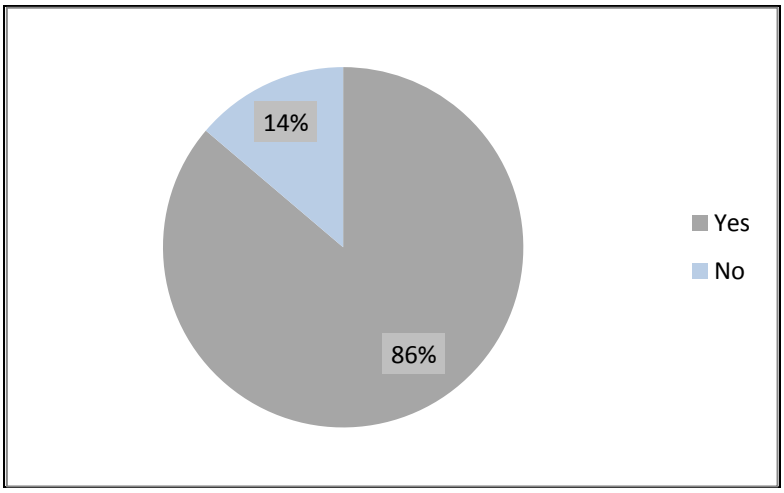


Pareto R2Q10



Pareto R2Q11

RQ1 = R2Q10 + R2Q11



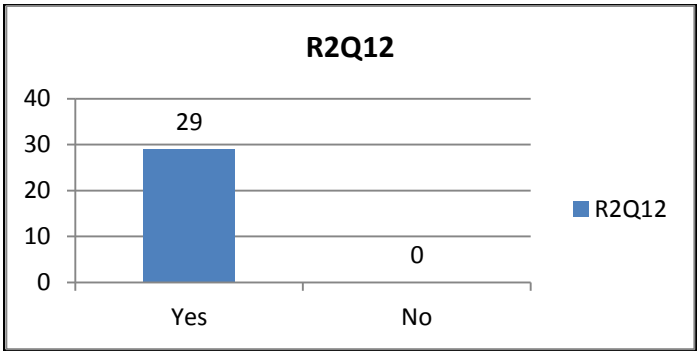
RQ2. Can the course delivery value stream of a community college be defined as a process? Question R2Q12 directly addresses this research question

R2Q12 – Teaching (course delivery) is a process

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	0	20	9	3.31

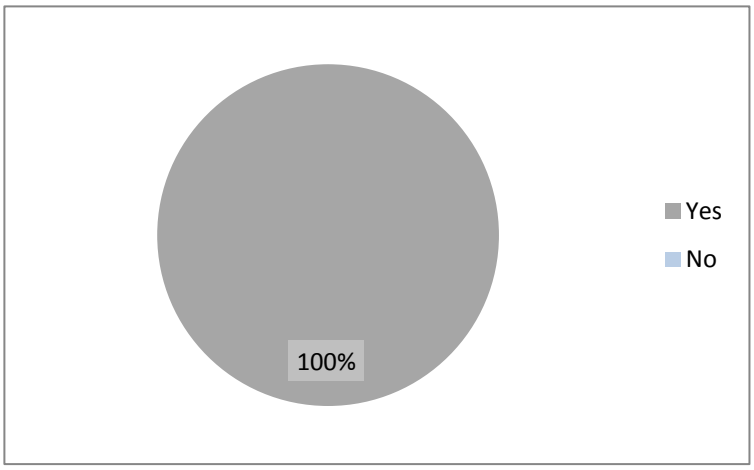
Respondents in the affirmative = 29 Respondents in the negative = 0

Skipped = 0 *SD* = .471



Pareto R2Q12

RQ2 = R2Q12



RQ3. If course delivery can be described as a process can this process be controlled and improved by applying traditionally defined manufacturing quality and continuous improvement tools? Questions R2Q15 specifically addresses this research question while R2Q13 offers strong support.

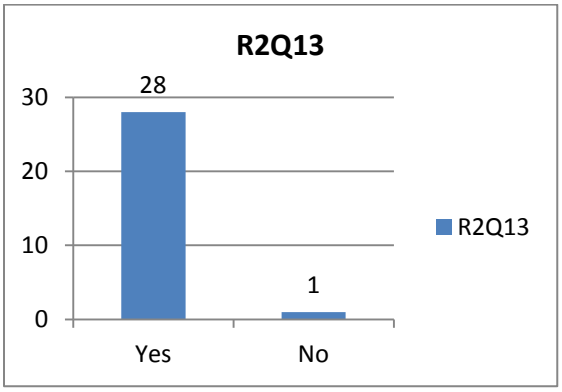
R2Q13 – The teaching process can be controlled and improved using quality and continuous improvement tools

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	1	20	8	3.24
Respondents in the affirmative =	28		Respondents in the negative = 1		
Skipped = 0			*SD* = .511		

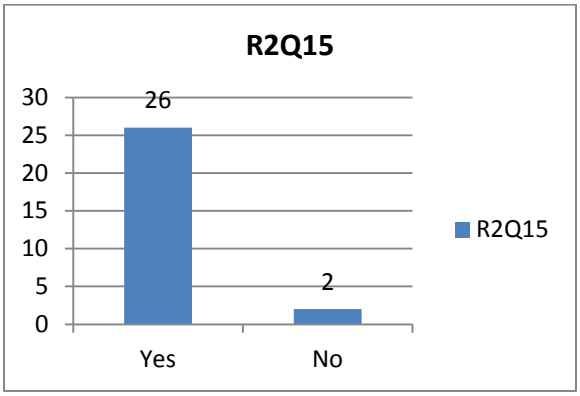
R2Q15 – Quality and continuous improvement tools used to control processes in other industries can be applied to the teaching process.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	2	18	8	3.21
Respondents in the affirmative =	26		Respondents in the negative = 2		

Skipped = 1 *SD* = .568

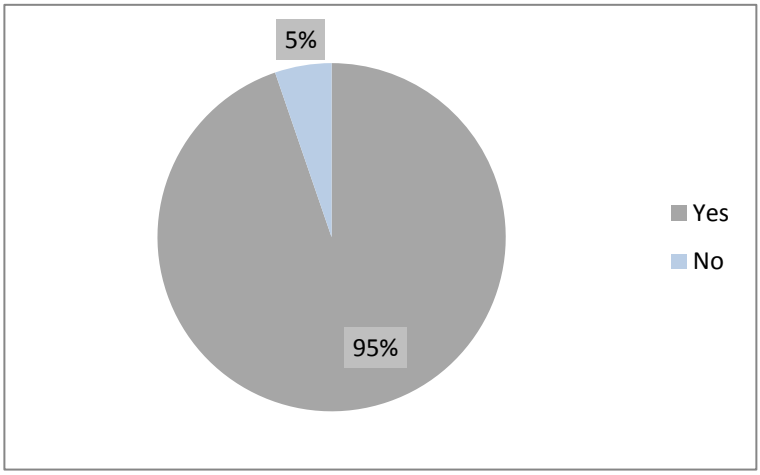


Pareto R2Q13



Pareto R2Q15

RQ3 = R2Q13 + R2Q15



RQ4. Can manufacturing quality and continuous improvement tools – specifically process mapping, benchmarking and Six Sigma methods – be applied to the community college model? Questions R2Q16, R2Q17 and R2Q19 directly address this research question. Questions R2Q5, R2Q7 and R2Q9 suggest that benchmarking and process mapping are already in use in the community college model. Six Sigma methods are not in use in the majority of respondent's institutions.

R2Q5 – My institution uses Six Sigma.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	7	19	2	0	1.82
Respondents in the affirmative =	2		Respondents in the negative = 26		
Skipped = 1			*SD* = .548		

R2Q7 – My institution uses benchmarking.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	1	3	13	11	3.21
Respondents in the affirmative =	24		Respondents in the negative = 4		
Skipped = 1			*SD* = .790		

R2Q9 – My institution uses process mapping.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	2	9	13	4	2.68
Respondents in the affirmative =	17		Respondents in the negative = 11		
Skipped = 1			*SD* = .819		

R2Q16 – Six Sigma methods can be applied in community colleges.

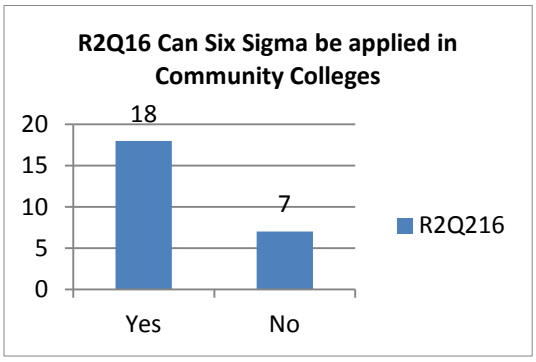
	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	7	15	3	2.84
Respondents in the affirmative =	18		Respondents in the negative = 7		
Skipped = 4			*SD* = .620		

R2Q17 – Process mapping can be applied in community colleges.

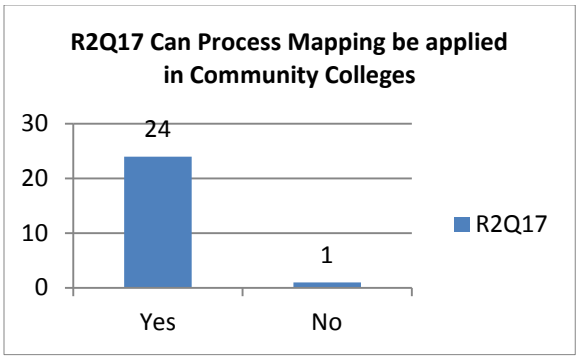
	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	1	14	10	3.36
Respondents in the affirmative =	24		Respondents in the negative = 1		
Skipped = 4			*SD* = .569		

R2Q19 – Benchmarking can be applied in/to community colleges.

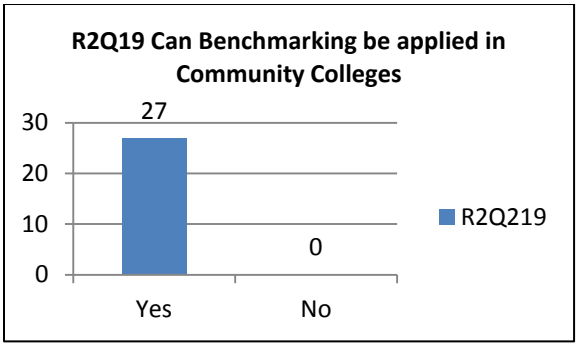
	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	0	17	10	3.37
Respondents in the affirmative =	27		Respondents in the negative = 0		
Skipped = 2			*SD* = .492		



Pareto R2Q16



Pareto R2Q17



Pareto R2Q1

RQ5. Can accreditation, specifically and AQIP approach, be used as a continuous improvement tool in a community college model? Questions R2Q23 and R2Q25 directly address this research question.

R2Q23 – AQIP can be used as a continuous improvement tool in community colleges

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	0	17	12	3.41

Respondents in the affirmative = 29 Respondents in the negative = 0

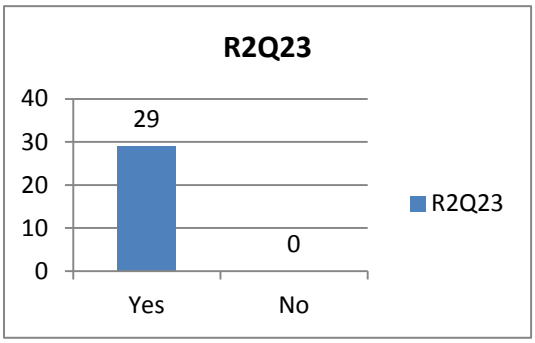
Skipped = 0 *SD* = .500

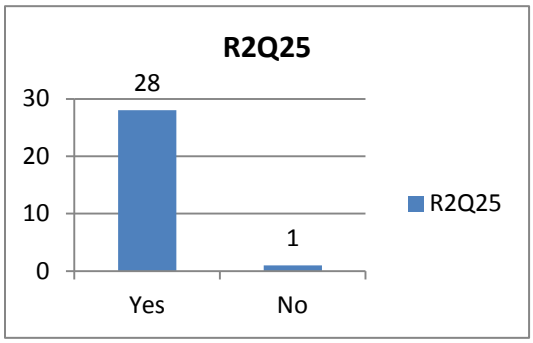
R2Q25 – Accreditation can be used to improve quality in our institution.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	1	20	8	3.24

Respondents in the affirmative = 28 Respondents in the negative = 1

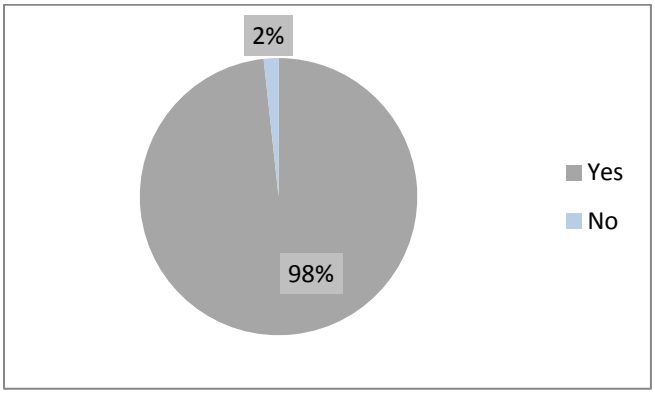
Skipped = 0 *SD* = .511





Pareto R2Q23 Pareto R2Q25

RQ5 = R2Q23 + R2Q25



RQ6. Are there significant differences in the mean perception between utilizing quality tools and accreditation to improve quality in a community college? The mean score from R2Q23

and the mean score from R2Q25 are used to determine whether the null hypothesis is rejected or not rejected.

$H_0$1: μ1 = μ2. There is no statistically significant difference in the mean perception utilizing quality tools and accreditation to improve quality in community college.

Ha1: μ1 ≠ μ2. There is a statistically significant difference in the mean perception utilizing quality tools and accreditation to improve quality in community college.

R2Q2 – Quality and continuous improvement tools that have been successful in other organizations and industries can be applied to processes in higher education.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	1	4	12	11	3.14

Respondents in the affirmative = 23 Respondents in the negative = 5

Skipped = 1 *SD* = .875

R2Q25 – Accreditation can be used to improve quality in our institution.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	1	20	8	3.24

Respondents in the affirmative = 28 Respondents in the negative = 1

Skipped = 0 *SD* = .511

R2Q2 *N*=29 Mean = 3.138 *SD* = 0.875 Std Err Mean = 0.16

R2Q25 *N*=29 Mean = 3.241 *SD* = 0.511 Std Err Mean = 0.095

Difference = mu_{R2Q2} - mu_{R2Q25} Est for difference = -0.103

95% CI for difference = (-0.482, 0.276) *T*-test of diff = 0 (vs not =)

T-Value = -0.55 *P*-Value = 0.585 *DF*=45

Do not reject the null.

RQ7. Are there significant differences in the mean perception between utilizing AQIP and accreditation to improve quality in a community college? The mean score from R2Q23 and the mean score from R2Q25 are used to determine whether the null hypothesis is rejected or not rejected.

$H_0$2: μ1 = μ2. There is no statistically significant difference in the mean perception between utilizing AQIP and accreditation to improve quality in community college.

Ha2: μ1 ≠ μ2. There is a statistically significant difference in the mean perception between utilizing AQIP and accreditation to improve quality in community college.

R2Q23 – AQIP can be used as a continuous improvement tool in community colleges.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response		0	17	12	3.41

Respondents in the affirmative = 29 Respondents in the negative = 0

Skipped = 0 *SD* = .500

R2Q25 – Accreditation can be used to improve quality in our institution

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	1	20	8	3.24

Respondents in the affirmative = 28 Respondents in the negative = 1

Skipped = 0 *SD* = .511

R2Q23 *N*=29 Mean = 3.414 *SD* = 0.501 Std Err Mean = 0.093

R2Q25 *N*=29 Mean = 3.241 *SD* = 0.511 Std Err Mean = 0.095

Difference = mu_{R2Q23} - mu_{R2Q25} Est for difference = 0.172

95% CI for difference = (-0.094, 0.439) *T*-*t*est of diff = 0 (vs not =)

T-Value = 1.30 *P*-Value = 0.200 *DF*=55 Do not reject the null.

Table 21 represents the Minitab data that supports the results from the *t*-test. R2Q2, R2Q23 and R2Q25 are the second round questions that are related to the hypothesis testing. Table 21 displays the Minitab results.

Table 21

Round Two Descriptive Statistics

Variable	*N*	*N**	Mean	*SE* Mean	*SD*	Min	Q1	Med	Q3	Max
R2Q2	29	0	3.1380	0.1630	0.8750	1.000	3.000	3.000	4.000	4.000
R2Q23	29	0	3.4138	0.0931	0.5012	3.000	3.000	3.000	4.000	4.000
R2Q25	29	0	3.2414	0.0949	0.5110	2.000	3.000	3.000	4.000	4.000

Modified Delphi Round Three Response

Round Three of the modified Delphi study provided a qualitative look at administrator's perceptions on the adaptation and use of quality and continuous improvement tools in community colleges in the state of Michigan. Round Three was designed to further clarify information pertaining to the project as well as validate previous responses but not to uncover new data.

R3Q1 (R2Q1) – Quality and continuous improvement tools have been successful in improving quality in higher education.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	2	4	19	3	2.82
n = 28			*SD* = .723		
Round 3 Response	0	1	18	3	3.09
n = 22			*SD* = .430		

Combined Response: Respondents in the affirmative = 43; Respondents in the negative = 7

Skipped = 2

R3Q2 (R2Q2) – Quality and continuous improvement tools that have been successful in other organizations and industries can be applied to processes in higher education.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	2	3	13	11	3.14
n = 29			*SD* = .875		
Round 3 Response	0	0	11	12	3.52
n = 23			*SD* = .510		

Combined Response: Respondents in the affirmative = 47; Respondents in the negative = 5

R3Q3 (R2Q10) – Quality and continuous improvement tools and methods play a role in academic improvement.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	2	13	14	3.41
n = 29			*SD* = .628		
Round 3 Response	0	0	12	11	3.48
n = 23			*SD* = .510		

Combined Response: Respondents in the affirmative = 50; Respondents in the negative = 2

R3Q4 (R2Q12) – Teaching (course delivery) is a process.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	0	20	9	3.31
n = 29			*SD* = .471		
Round 3 Response	0	0	10	13	3.57
n = 23			*SD* = .510		

Combined Response: Respondents in the affirmative = 52; Respondents in the negative = 0

R3Q5 (R2Q13) – The teaching process can be controlled and improved using quality and continuous improvement tools.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	1	20	8	3.24
n = 29			*SD* = .511		
Round 3 Response	0	0	14	9	3.39
n = 23			*SD* = .500		

Combined Response: Respondents in the affirmative = 51; Respondents in the negative = 1

R3Q6 (R2Q16) – Six Sigma methods can be applied in community colleges.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	7	15	3	2.84
n = 25			*SD* = .620		
Round 3 Response	0	1	13	4	3.17
n = 18			*SD* = .510		

Combined Response: Respondents in the affirmative = 35; Respondents in the negative = 8

Skipped = 9

R3Q7 (R2Q17) – Process mapping can be applied in community colleges.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	1	14	10	3.36
n = 25			*SD* = .569		
Round 3 Response	0	2	8	12	3.45
n = 22			*SD* = .670		

Combined Response: Respondents in the affirmative = 44; Respondents in the negative = 3

Skipped = 5

R3Q8 (R2Q19) – Benchmarking can be applied in/to community colleges.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	0	17	10	3.37
n = 27			*SD* = .492		
Round 3 Response	0	1	10	11	3.45
n = 22			*SD* = .600		

Combined Response: Respondents in the affirmative = 48; Respondents in the negative = 1

Skipped = 3

R3Q9 (R2Q22) – My institution is accredited through the HLC-NCA Academic Quality Improvement Process (AQIP).

	Yes	No	I Do Not Know
Round 2 Response	26	2	1
n = 29			
Round 3 Response	22	1	0
n = 23			

Combined Response: Respondents in the affirmative = 48; Respondents in the negative = 3

Respondents that do not know = 1

R3Q10 (R2Q23) – AQIP can be used as a continuous improvement tool in community colleges.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	0	17	12	3.41
n = 29			*SD* = .500		
Round 3 Response	0	0	11	11	3.50
n = 22			*SD* = .510		

Combined Response: Respondents in the affirmative = 51; Respondents in the negative = 0

Skipped = 1

R3Q11 (R2Q24) – My institution is accredited through the HLC-NCA Program to Evaluate and Advance Quality (PEAQ).

	Yes	No	I Do Not Know
Round 2 Response	3	18	8
n = 29			
Round 3 Response	3	8	12
n = 23			

Combined Response: Respondents in the affirmative = 6; Respondents in the negative = 26

Respondents that do not know = 20

R3Q12 (R2Q25) – Accreditation can be used to improve quality in our institution.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	1	20	8	3.24
n = 29			*SD* = .511		
Round 3 Response	0	1	10	11	3.45
n = 22			*SD* = .600		

Combined Response: Respondents in the affirmative = 49; Respondents in the negative = 2

Skipped = 1

The Pearson Correlation Coefficient is used to assess the degree that variables are related linearly. SPSS was used to calculate the Pearson Coefficient. The dependent variable used in the calculation is quality and continuous improvement tools illustrated through the use of data derived from R3Q2. The 5 independent variables are Six Sigma methods, illustrated by the data derived from R3Q6, Process Mapping illustrated by data derived from R3Q7, Benchmarking from R3Q8, AQIP from R3Q10 and accreditation from R3Q12 as illustrated in Figure 6.

Figure 7. Pearson correlation coefficient relationship

Table 22.

Correlations: Descriptive Statistics

	Mean	*SD*	*N*
QualityTools	3.52	.511	23
SixSigma	3.17	.514	18
ProcessM	3.45	.671	22
BenchM	3.45	.596	22
AQIP	3.50	.512	22
Accreditation	3.45	.596	22

Table 23

Statistical Analyses

		Quality Tools	SixSigma	ProcessM	BenchM	AQIP	Accredit-ation
Quality Tools	Pearson Correlation	1	.646**	.693**	.625**	.818**	.781**
	Sig. (2-tailed)		.004	.000	.002	.000	.000
	N	23	18	22	22	22	22
SixSigma	Pearson Correlation	.646**	1	.667**	.385	.646**	.577*
	Sig. (2-tailed)	.004		.003	.115	.004	.012
	N	18	18	18	18	18	18
ProcessM	Pearson Correlation	.693**	.667**	1	.888**	.826**	.636**
	Sig. (2-tailed)	.000	.003		.000	.000	.002
	N	22	18	22	22	21	21
BenchM	Pearson Correlation	.625**	.385	.888**	1	.771**	.580**
	Sig. (2-tailed)	.002	.115	.000		.000	.006
	N	22	18	22	22	21	21
AQIP	Pearson Correlation	.818**	.646**	.826**	.771**	1	.625**
	Sig. (2-tailed)	.000	.004	.000	.000		.002
	N	22	18	21	21	22	22
Accredit-ation	Pearson Correlation	.781**	.577*	.636**	.580**	.625**	1
	Sig. (2-tailed)	.000	.012	.002	.006	.002	
	N	22	18	21	21	22	22

Note. **=Correlation is significant at the 0.01 level (2-tailed); *= Correlation is significant at the 0.05 level (2-tailed).

RQ6 Hypothesis *T*-test Round 3 Validation

R3Q2 *N*=23 Mean = 3.522 *SD* = 0.511 *SE* Mean = 0.11

R3Q12 *N*=22 Mean = 3.455 *SD* = 0.596 *SE* Mean = 0.13

Difference = mu_{R3Q2} - mu_{R3Q12} Est for difference = 0.067

95% CI for difference = (-0.27, 0.40) T-Test of diff = 0 (vs not =)

T-Value = 0.41 *P*-Value = 0.69 *DF*= 41

Do not reject the null.

Table 24

Round Three Descriptive Statistics

Variable	*N*	*N**	Mean	*SE* Mean	*SD*	Min	Q1	Med	Q3	Max
R2Q2	22	0	3.500	0.109	0.512	3.000	3.000	3.500	4.000	4.000
R2Q23	22	0	3.500	0.109	0.512	3.000	3.000	3.500	4.000	4.000
R2Q25	22	0	3.455	0.127	0.596	2.000	3.000	3.500	4.000	4.000

RQ7 Hypothesis *T*-test Round 3 Validation

R3Q10 *N*=22 Mean = 3.500 *SD* = 0.512 *SE* Mean = 0.11

R3Q12 *N*=22 Mean = 3.455 *SD* = 0.596 *SE* Mean = 0.13

Difference = mu_{R3Q10} - mu_{R3Q12} Est for difference = 0.045

95% CI for difference = (-0.293, 0.384) *T*-test of diff = 0 (vs not =)

T-Value = 0.27 *P*-Value = 0.787 *DF*=41

Do not reject the null.

Summary of Results for Round Three

Round Three supports the data collected in Round Two. Round Three was designed to validate the findings that apply to the research questions in the study. Round Three successfully

validated the findings from Round Two with a slight increase in the mean values from Round Two to Round Three but no change in the relationship between negative and positive results and no change to the result of the hypothesis testing, do not reject the null hypothesis.

Summary of Key Findings

This chapter presented results from the data analysis of the case study using a modified Delphi method which collected data from administrators and staff from community colleges in the state of Michigan related to their opinions on the adaptation and use of quality and continuous improvement tools in community college environments. All of the colleges polled are members of the MCCA.

A link to the electronic survey was distributed to the institutional research leaders of the 28 member institutions of the MCCA for redistribution to the administrative staff of their institution. The e-mail notification included the survey purpose, a link to the survey, contact information, IRB information and a timetable for completing the survey. This survey instrument was designed for administrators and staff at this time. Only faculty serving in an administrative or staff position including chairs and department heads were to be surveyed. Faculty opinions may be solicited at a future time.

Table 25

Chapter 4 Results Findings Table

RQ	ROL	Delphi
RQ1 Can Quality and CI technology play a role in academic improvement?	Supports the affirmative (Table 4)	Supports the affirmative
RQ2 Can the course delivery value stream of a community college be defined as a process?	Supports the affirmative (Table 5)	Supports the affirmative

Table 25 (continued)

RQ	ROL	Delphi
RQ5 Can accreditation specifically an AQIP approach be used as a continuous improvement tool in a community college model?	Supports the affirmative (Table 8)	Supports the affirmative
RQ6 Are there significant differences in the mean perception between utilizing quality tools and accreditation to improve quality in a community college?	Suggests that accreditation is a quality tool (Table 9)	Round 2 do not reject null Round 3 do not reject null Pearson Correlation Coefficient
RQ7 Are there significant differences in the mean perception between utilizing AQIP and accreditation to improve quality in a community college?	AQIP is a path to accreditation (Table 10)	Round 2 do not reject null Round 3 do not reject null Pearson Correlation Coefficient

A review panel was identified from board members of the MCCA. The five panel members consisted of the President of MCCA and four college presidents who are currently on the board. Their task was to review and comment on the Round One instrument. There were no changes to the Round One instrument as a result of panel comments. The panel response was disappointing with only one panel member responding. The respondents comments were implemented in Round Two of the survey as designed.

Of the 28 MCCA member institutions queried for the project two chose not to participate. The 26 participating institutions generated 61 responses. Based on the number of administrators in a community college the response rate was seen to be low. However, based on the literature

reviewed which described and defined a modified Delphi approach to research $n = 61$ provides an ample data set to substantiate the research (Dalkey, 1969; Kinley, 2001; Skulmowski et al. 2007).

Data collection for the panel response occurred via e-mail. Data collection for each round of the modified Delphi survey occurred via a web based survey service called SurveyMonkey™. SurveyMonkey™ is a survey support service and a familiar tool for many college and university employees providing a well presented and comfortable approach to data collection (SurveyMonkey, 2011). Round One was qualitative and consisted of open ended questions requiring written answers. The survey was said to be too long and many of the questions too difficult. Round Two was quantitative applying a Likert style scaled response. The number of survey questions was reduced and survey response improved. Round Three was designed to validate Round Two results and again scalable. As a result Round Three was shorter than Round Two and survey response improved again. The data from the study was then analyzed and reported in both numerical and graphical style. Conclusions are discussed in Chapter 5.

CHAPTER 5

Conclusions

Discussion of the Results

Chapter 5 provides a summary of the project, conclusions and discussion, as well as recommendations for further research. The first section summarizes the problem statement, purpose of the study, research questions and hypothesis, methodology, analysis and findings. The second section provides conclusions to the research questions and provides insight to researcher's observations that are not part of the research questions or hypothesis. The third section offers recommendations for further research.

The problem for this study was to answer the question: In the opinion of administrators, can quality tools, used to improve the quality of manufacturing processes, be generalized to the community college model?

The purpose of this study was to examine the current research in the field of quality, process control and continuous improvement and determine if community college administrators believe that the tools prevalent in manufacturing and service organizations can be applied to a community college model in the state of Michigan. The research methodology for this case study used data collected in a mixed model modified Delphi method from MCCA participating community colleges in the state of Michigan. The research explores, through a case study approach, the opinions of administrators to determine whether continuous improvement and

quality tools, which have been found to add value to other industries, can be generalized to add value to community colleges in the state of Michigan. This study contributes to the academic literature in the quality field through the documentation of a method of generalizing existing manufacturing quality tools to the education industry. Results of this study may help participating institutions reduce variability in their administrative processes and value streams as well as provide a path to continuous organizational improvement.

There were seven research questions that this project was designed to answer. Five research questions were answered using graphical analysis. Two research questions had hypotheses that required testing. The hypothesis testing was accomplished through the use of the Pearson Correlation Coefficient. The Pearson Correlation Coefficient was also used to determine if a relationship exists between identified variables. The research questions were:

RQ1. Can quality and continuous improvement technology play a role in academic improvement?

RQ2. Can the course delivery value stream of a community college be defined as a process?

RQ3. If course delivery can be described as a process, can this process be controlled and improved by applying traditionally defined manufacturing quality and continuous improvement tools?

RQ4. Can manufacturing quality and continuous improvement tools – specifically process mapping, benchmarking and Six Sigma methods – be applied to the community college model?

RQ5. Can accreditation, specifically an AQIP approach, be used as a continuous improvement tool in a community college model?

RQ6. Are there significant differences in the mean perception between utilizing quality tools and accreditation to improve quality in a community college?

$H_0$1: $\mu 1 = \mu 2$. There is no statistically significant difference in the mean perception between utilizing quality tools and accreditation to improve quality in community college.

Ha1: $\mu 1 \neq \mu 2$. There is a statistically significant difference in the mean perception between utilizing quality tools and accreditation to improve quality in community college.

RQ7. Are there significant differences in the mean perception between utilizing AQIP and accreditation to improve quality in a community college?

$H_0$2: $\mu 1 = \mu 2$. There is no statistically significant difference in the mean perception between utilizing AQIP and accreditation to improve quality in community college.

Ha2: $\mu 1 \neq \mu 2$. There is a statistically significant difference in the mean perception between utilizing AQIP and accreditation to improve quality in community college.

This project used a mixed method modified Delphi approach to case study research based on the opinions of administrators in community colleges in the state of Michigan. The mixed-method approach combines both qualitative and quantitative research techniques in order to neutralize the biases that may be present in a single method. The qualitative component uncovers information through inquiry such as narratives while the qualitative component employs strategies of inquiry such as experiments or surveys. Qualitative methods can be used to uncover and understand what lies behind phenomena about which little is yet known.

Quantitative methods were used to examine relationships among variables. The case study approach was designed to provide data where none currently exists. The three round mixed-method modified Delphi approach defined for this project used a qualitative component (review of the literature and opinion surveys) to develop a quantitative/qualitative survey instrument (Likert scale response) to collect data and apply descriptive statistics. The eventual goal of the project was to determine from the opinions of administrators whether manufacturing quality and continuous improvement tools such as Six Sigma, process mapping, and benchmarking can be applied in a community college model in the state of Michigan. The findings from the study and the analysis of the data were presented in detail in Chapter 4.

Conclusions

Based on the data retrieved from the modified Delphi study the following conclusions were drawn:

RQ1. Can quality and continuous improvement technology play a role in academic improvement?

Questions R2Q10 and R2Q11 are directly related to this research question.

R2Q10 – Quality and continuous improvement tools and methods play a role in academic improvement.

Respondents in the affirmative = 27	Mean = 3.41
Respondents in the negative = 2	*SD* = 0.628

R2Q11 – Quality and continuous improvement tools and methods play a significant role in academic improvement.

Respondents in the affirmative = 23	Mean = 3.14
Respondents in the negative = 6	*SD* = 0.833

Conclusion: Based on the opinions of administrators in community colleges in the state of Michigan quality and continuous improvement technology can play a role in academic improvement.

RQ2. Can the course delivery value stream of a community college be defined as a process?

Question R2Q12 directly addresses this research question.

R2Q12 – Teaching (course delivery) is a process.

Respondents in the affirmative = 29 Mean = 3.31

Respondents in the negative = 0 *SD* = 0.471

Conclusion: Based on the opinions of administrators in community colleges in the state of Michigan course delivery (teaching) can be defined as a process.

RQ3. If course delivery can be described as a process, can this process be controlled and improved by applying traditionally defined manufacturing quality and continuous improvement tools?

Questions R2Q15 specifically addresses this research question while R2Q13 offers strong support.

R2Q13 – The teaching process can be controlled and improved using quality and continuous improvement tools.

Respondents in the affirmative = 28 Mean = 3.24

Respondents in the negative = 1 *SD* = 0.511

R2Q15 – Quality and continuous improvement tools used to control processes in other industries can be applied to the teaching process

Respondents in the affirmative = 26 Mean = 3.21

Respondents in the negative = 2 *SD* = 0.568

Skipped = 1

Conclusion: Based on the opinions of administrators in community colleges in the state of Michigan the process of teaching can be controlled and improved by applying traditionally defined manufacturing quality and continuous improvement tools.

RQ4. Can manufacturing quality and continuous improvement tools – specifically process mapping, process improvement, benchmarking and Six Sigma methods – be applied to the community college model?

Questions R2Q16, R2Q17 and R2Q19 directly address this research question. Questions R2Q5, R2Q7 and R2Q9 suggest that benchmarking and process mapping are already in use in the community college model. Six Sigma methods are not in use in the majority of respondent's institutions.

R2Q5 – My institution uses Six Sigma

Respondents in the affirmative = 2 Mean = 1.82

Respondents in the negative = 26 *SD* = 0.548

Skipped = 1

R2Q7 – My institution uses benchmarking

Respondents in the affirmative = 24 Mean = 3.21

Respondents in the negative = 4 *SD* = 0.790

Skipped = 1

R2Q9 – My institution uses process mapping

Respondents in the affirmative = 17 Mean = 2.68

Respondents in the negative = 11 *SD*= 0.819

Skipped = 1

R2Q16 – Six Sigma methods can be applied in community colleges

Respondents in the affirmative = 18 Mean = 2.84

Respondents in the negative = 7 *SD* = 0.620

Skipped = 4

R2Q17 – Process mapping can be applied in community colleges

Respondents in the affirmative = 24 Mean = 3.36

Respondents in the negative = 1 *SD* = 0.569

Skipped = 4

R2Q19 – Benchmarking can be applied in/to community colleges

Respondents in the affirmative = 27 Mean = 3.37

Respondents in the negative = 0 *SD* = 0.492

Skipped = 2

The Pearson Correlation Coefficient results all proved to be significant at the 0.01 level suggesting that a relationship exists between Quality and Continuous Improvement Tools and Six Sigma methods, process mapping, benchmarking, AQIP and Accreditation.

Conclusion: Based on the opinions of administrators in community colleges in the state of Michigan; process mapping, benchmarking, AQIP, accreditation and Six Sigma methods are viewed as quality and continuous improvement tools and can be applied to the community

college model. In many cases process mapping and benchmarking are already being used in Michigan community colleges. Six Sigma is not widely used.

RQ5. Can accreditation, specifically an AQIP approach, be used as a continuous improvement tool in a community college model?

Questions R2Q23 and R2Q25 directly address this research question.

R2Q23 – AQIP can be used as a continuous improvement tool in community colleges.

Respondents in the affirmative =	29	Mean = 3.41
Respondents in the negative =	0	*SD* = 0.500

R2Q25 – Accreditation can be used to improve quality in our institution.

Respondents in the affirmative =	28	Mean = 3.24
Respondents in the negative =	1	*SD* = 0.511

Conclusion: Based on the opinions of administrators in community colleges in the state of Michigan accreditation, specifically an AQIP approach, can be used as a continuous improvement tool in a community college model. In many institutions AQIP is the system used for quality and continuous improvement.

RQ6. Are there significant differences in the mean perception between utilizing quality tools and accreditation to improve quality in a community college?

$H_0 1$: $\mu 1 = \mu 2$. There is no statistically significant difference in the mean perception between utilizing quality tools and accreditation to improve quality in community college.

Ha1: $\mu 1 \neq \mu 2$. There is a statistically significant difference in the mean perception between utilizing quality tools and accreditation to improve quality in community college. Do not reject the null hypothesis.

Conclusion: Based on the opinions of administrators in community colleges in the state of Michigan there is no statistically significant difference in the mean perception utilizing quality tools and accreditation to improve quality in a community college.

RQ7. Are there significant differences in the mean perception between utilizing AQIP and accreditation to improve quality in a community college?

$H_0 2$: $\mu 1 = \mu 2$. There is no statistically significant difference in the mean perception between utilizing AQIP and accreditation to improve quality in community college.

Ha2: $\mu 1 \neq \mu 2$. There is a statistically significant difference in the mean perception between utilizing AQIP and accreditation to improve quality in community college.

Do not reject the null hypothesis.

Conclusion: Based on the opinions of administrators in community colleges in the state of Michigan there is no statistically significant difference in the mean perception utilizing AQIP and accreditation to improve quality in a community college.

The problem statement for this study was to answer this question: In the opinion of administrators, can quality tools, used to improve the quality of manufacturing processes, be generalized to the community college model in the state of Michigan? The results and conclusions of this study support an affirmative response to the problem statement. In the opinions of administrators, quality and continuous improvement tools used to improve manufacturing can be generalized to the community college model in the state of Michigan. Table 26 shows the project linkage that led to the final conclusions.

Researcher's Observations

The modified Delphi approach is, as espoused in the research, an effective tool for social research, case studies and opinion based research. The structural recommendation by Delphi developers for open ended questions, however, was a deterrent to some respondents. A beginning researcher mistake was designing the survey to be too long. This researcher asked several questions not directly related to the study but satisfied some curiosities which may lead to further research. According to respondent's comments the additional questions were a deterrent to participation.

Table 26

Chapter 5 Research Questions Conclusions Table

RQ	ROL	Delphi	Conclusions
RQ1. Can quality and CI technology play a role in academic improvement	Supports the affirmative (Table 4)	Supports the affirmative	Based on the opinions of administrators in community colleges in the state of Michigan, quality and continuous improvement technology can play a role in academic improvements.
RQ2. Can the course delivery value stream of a community college be defined as a process?	Supports the affirmative (Table 5)	Supports the affirmative	Based on the opinions of administrators in community colleges in the state of Michigan, the course delivery value stream of a community college can be defined as a process
RQ3. If course delivery can be described as a process, can this process be controlled and improved by applying traditionally defined manufacturing quality and CI tools?	Supports the affirmative (Table 6)	Supports the affirmative	Based on the opinions of administrators in community colleges in the state of Michigan, the course delivery process can be controlled and improved by applying traditionally defined manufacturing quality and CI tools

Table 26 (continued)

RQ	ROL	Delphi	Conclusions
RQ4. Can manufacturing and CI tools specifically process mapping, benchmarking Six Sigma methods be applied to a community college model?	Supports the affirmative (Table 7)	Supports the affirmative	Based on the opinions of administrators in community colleges in the state of Michigan process mapping, benchmarking and Six Sigma methods can be applied to a community college model
RQ5. Can accreditation specifically an AQIP approach be used as a continuous improvement tool in a community college model?	Supports the affirmative (Table 8)	Supports the affirmative	Based on the opinions of administrators in community colleges in the state of Michigan, an AQIP approach to accreditation can be used as a continuous improvement tool in a community college model
RQ6. Are there significant differences in the mean perception between utilizing quality tools and accreditation to improve quality in a community college?	Suggests that accreditation is a quality tool (Table 9)	Round 2 do not reject null Round 3 do not reject null Pearson Correlation Coefficient	Based on the opinions of administrators in community colleges in the State of Michigan, there is no statistically significant difference in the mean perception utilizing quality tools and accreditation to improve quality in a community college.
RQ7. Are there significant differences in the mean perception between utilizing AQIP and accreditation to improve quality in a community college	AQIP is a path to accreditation (Table 10)	Round 2 do not reject null Round 3 do not reject null Pearson Correlation Coefficient	Based on the opinions of administrators in community colleges in the state of Michigan, there is no statistically significant difference in the mean perception utilizing AQIP and accreditation to improve quality in a community college.

Participation from community college administrators was disappointing. Comments were that this is a bad time to be requesting participation due to the end of the year activities happening at many institutions. Other comments were that administrators receive many requests for survey participation through the course of the year and cannot respond to all of them. There is a perceived difference between the bias for action (response time) of community colleges and industry. The researcher's perception is that community colleges act in a more deliberate manner choosing to reflect on the task at hand which is perceived as slow compared to the pace of manufacturing.

It is important to note in the Pearson Correlation Coefficient application that a low *r* doesn't mean that the relationship is less important but respondents may not be as familiar with the concepts. This is evident in the Pearson Correlation Coefficient table where the relationship between Six Sigma and Benchmarking is .385. Based on the survey responses community college administrators are less familiar with Six Sigma than other quality and continuous improvement tools listed in the project rather than less important.

Recommendations for Further Research

It is possible that the results of this study may be used to further the understanding of quality and continuous improvement in higher education. The following are recommendations for further study:

- This study should be replicated using faculty members rather than administrators to give a different perspective. Faculty members may present a different view on the use and implementation of quality and continuous improvement tools in community colleges in the state of Michigan.

- This study should be replicated using different criteria to determine sample groups. Separation of institutions by AQIP and PEAQ accreditation may yield data of interest to researchers focused on the use of accreditation as a path to continuous improvement and quality.
- This study should be replicated using other quality and continuous improvement tools and methods, such as Hoshin Kanri, Advanced Project Quality Planning (APQP), Taguchi methods, a deeper investigation into Six Sigma methods and lean tools and principles.
- This study could be replicated using legislator's opinions regarding quality and continuous improvement in community colleges and higher education rather than the opinions of college employees. This could give a different perception from those that provide funding and represent the general populous or special interest groups.
- This study could be replicated nationwide rather than limited to Michigan. It could be expanded to four year institutions rather than limited to community colleges.
- It would be interesting to see what continuous improvement methods are available to higher education from other accreditation agencies. HLC-NCA offers AQIP and PEAQ. What methods are available to higher education from other regional accreditation agencies?
- It would be interesting to see if quality and continuous improvement activities are more effective or readily adopted if the tools are introduced prior to the introduction of a quality system such as TQM or ISO in industry or academia. This study suggests that the tools should be introduced prior to the systems as implemented in Japan by Deming and Juran. Is that the best method?

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Appendix A: Delphi Survey Round One

Round One Questions

R1Q1 – How is quality measured at your institution?

R1Q2 – What is your familiarity with quality and continuous improvement tools?

R1Q3 – What quality tools are being used at your institution?

R1Q4 – What are the various value streams at your institution? (Value streams provide funding sources to your institution)

R1Q5 – What are the main administrative and academic processes defined by your institution?

R1Q6 – What means or methods of process control are being used to control the processes previously defined?

R1Q7 – What continuous improvement methods are in place at your institution?

R1Q8 – What continuous improvement tools are being used at your institution?

R1Q9 – In your opinion can quality and continuous improvement tools, currently being used in other industries, be applied to education?

R1Q10 – In your opinion can quality and continuous improvement tools currently being used in other industries be applied to community colleges?

R1Q11 – In your opinion can quality and continuous improvement tools currently being used in other industries be applied to community colleges in the state of Michigan?

R1Q12 – In your opinion can quality and continuous improvement tools currently being used in other industries be applied to your institution?

R1Q13 – What is your familiarity with process mapping, benchmarking, continuous improvement tools and Six Sigma methods and tools?

R1Q14 – Which, if any, of these tools are being used at your institution?

R1Q15 – How are these tools being used at your institution?

R1Q16 – How adept is your institution to accepting new methods and tools not traditionally viewed as academic?

R1Q17 – What accounting, academic or administrative processes are in effect at your institution?

R1Q18 – Are there controls in place for these processes?

R1Q19 – Should there be controls in place for these processes?

R1Q20 – Is course delivery defined as a process?

R1Q21 – In your opinion is course delivery a process? If so, why or why not?

R1Q22 – Is teaching a process or an art? Please explain your answer.

R1Q23 – Is learning a process or an art? Please explain your answer.

R1Q24 – If teaching is a process can it be controlled?

R1Q25 – If teaching is a process should the process be controlled?

R1Q26 – If teaching is an art should it be controlled?

R1Q27 – How does the American Graduation Initiative affect your institution?

R1Q28 – What, in your opinion, would be the path to continuous improvement and quality at your institution?

R1Q29 – What tools, in your opinion, could be used to improve quality and aid continuous improvement at your institution?

R1Q30 – Please describe the quality system at your institution.

R1Q31 – Please define the work processes that are currently in place that you follow.

R1Q32 – Do you follow standard practices for these processes? If so for which processes do you follow standard practices?

R1Q33 – If you could standardize one process, not currently standardized, at your institution what would it be?

R1Q34 – in your opinion how can accreditation be used to improve quality at your institution?

R1Q35 – Do you view accreditation audits as an opportunity or an intrusion and why?

R1Q36 – Have you heard of the Academic Quality Improvement process (AQIP) for accreditation?

R1Q37 – Has your organization subscribed to the Academic Quality Improvement Process (AQIP) for accreditation? In your opinion why or why not?

R1Q38 – Based on your knowledge of AQIP, how could it be used as a continuous improvement tool at your institution?

Round One Questions with Raw Responses

R1Q1 – How is quality measured at your institution?

The quality of learning is determined through grades, artifact reviews for general education outcomes, third party feedback through licensure exams and advisory committee input. Quality is measured on the services side through student feedback and external auditing. Overall we use the AQIP process through the Higher Learning Commission to report and get feedback on our quality.

Customer satisfaction, employee satisfaction, state and federal benchmarks (e.g. % completion) AQIP feedback.

We have teams that attack problems such as retention, student success etc that are directly tied to accreditation outcomes.

There are institutional indicators of effectiveness which are regularly measured and reported on. Each area or department also may (or may not) have established its own quality measurements to augment the institutional ones.

AQIP, personal evaluations, surveys of staff and students.

One comment at the start. Your letter asks me for a few minutes to provide responses yet this survey has 38 open ended questions. I will spend 15 minutes on this and see how far I get. The main process that we are using is the AQIP system at the institutional level. Reading the systems portfolios of the community colleges that do participate in AQIP will give you the most comprehensive view of how quality is measured at each institution.

Data measures tied to improvement projects, data integrity auditing.

We measure quality with several key performance indicators in our institutional effectiveness system.

We use a balanced scorecard at the board level to measure process and outcome performance of key indicators of institutional success. Performance is monitored in the following areas: student learning, customer/stakeholder satisfaction, engagement, process effectiveness, workforce leadership, budget, financial and market share.

What is your familiarity with quality and continuous improvement tools?

Very familiar

Very familiar

On what scale? I would rank myself above average if comparing myself to other staff at my College.

Being on committees which work on AQIP projects.

I am more familiar with broad concepts (i.e., measuring and using data to verify or refute assumptions) than I am with specific tools.

I was on a team and so I am familiar with the process.

I am very familiar but gained that knowledge when employed by The Dow Chemical Company. In addition, NMC trains us in Toyota's Lean Manufacturing principles.

I am somewhat familar with quality improvement.

R1Q3 – What quality tools are being used at your institution?

Hoshin planning, and Lean tools, problem solving techniques, root cause analysis, A3 planning documents

charts, graphs, dashboards, satisfaction surveys etc.

We use several.

Many offices use the LEAN process improvement system.

As far as follow up and follow through, I am not sure about this. I was only involved in the planning. I know they gather data all the time. How that is transformed into tools that work, I am not sure.

5S Lean

We use research and data extensively in making our decisions. Plan-Do-Check-Adjust is part of every program and services review. Our processes are often examined to determine smoothier processes. We look at cause and effect and extensively use flow charting.

R1Q4 – What are the various value streams at your institution? (Value streams provide funding sources to your institution)

tuition property taxes state funding

property taxes, tuition and fees, state appropriations, grants

Not any different than any other community college.

Tuition, local taxes, state taxes, endowments, grants

Students, businesses, parents and other entities provide tuition and fee revenue for students attending. County property owners pay millage in the form of property tax. State income and business taxes are allocated in part to colleges. Donors provide funds for operation and investment as well as scholarships. Federal grants and loans give students the ability to pay tuition and fees.

Do not know

I am aware of revenue generated via apartment rentals, conference room, classroom, and conferencing rentals.

We are funded primarily through student tuition and fees, property taxes, and state aid. A small portion comes from the college foundation.

R1Q5 – What are the main administrative and academic processes defined by your institution?

general education assessment curriculum review AQIP accreditation economic development business model understanding student and stakeholder needs human resource management and development communication strategic planning and operational planning measuring effectiveness security finance fund-raising technology support

Academic Affairs, Student Services, Physical Plant, Accounting/finance, HR, Alumni development

Helping students learn

Our governance processes include policy making from the board on down, strategic planning and budget creation. Students are grouped by goals: non-credit, for-credit (degree and

transfer seeking), and those wishing to enhance professional skills either through credit or non-credit courses.

I am not sure what would be labeled a "process" here and what would be labled an identified series of "events" to accomplish a goal.

I'm not sure what this question means. I don't think "processes" is a term we use here.

We have program review on an annual basis that determines how well we reached our goals and meet a series of metrics for student success. We also have annual audits of our funds. Our shared governance council prioritizes our expenses according to our strategic directions set by the president and approved by the board of trustees.

R1Q6 – What means or methods of process control are being used to control the processes previously defined?

help desk ticketing systems performance feedback Hoshin planning

administratively defined in each work area

We are increasingly measuring the speed and effectiveness of students' reaching their learning goals at our institution.

Do not know

Don't know.

Each executive officer is charged with oversight of his or her units. These report to the president on an annual basis.

R1Q7 – What continuous improvement methods are in place at your institution?

We use the plan do check adjust cycle of continuous improvement

AQIP Action Project teams, other task forces/committees, strategic planning tied to budgeting

Currently AQIP although all employees have annual evaluations.

Measures mentioned in question 1. I don't know the difference between "quality measurements" and "continuous improvement methods."

The AQIP committees.....

We are trained to plan, do, check, act. This is applied at the individual, departmental, and institutional level.

The PDCA method is the core of our reviews at the unit and college levels. As an AQIP college, we use this method in our analysis of our processes and accomplishments of our goals.

R1Q8 – What continuous improvement tools are being used at your institution?

Process mapping - current state and future state Benchmarking with other institutions in and out of higher education

many

AQIP

See #7.

I believe it would be the committees.

Facilitators are made available to assist with mapping the current state and work with us thru the plan, do, check, act process. We use 5S Lean.

We use the standard tools such as cause and effect, fishbone diagrams, scatter plots, histograms, and most importantly flow charting.

R1Q9 – In your opinion can quality and continuous improvement tools, currently being used in other industries, be applied to education?

Yes

yes

Probably, especially if they have been used in a mission-based enterprise.

Not sure

Yes, in the sense that there is a goal and its outcomes can be measured.

Yes, of course.

We are always open to looking at what happens externally. Our lean manufacturing courses came from our research of this methodology and converted it to just-in-time training.

R1Q10 – In your opinion can quality and continuous improvement tools currently being used in other industries be applied to community colleges?

Yes

yes

Same as 9

I'm not familiar with what is being used in industry.

Yes.

Yes, of course, with little modification.

Absolutely.

It is now within our workforce development arm of the college.

R1Q11 – In your opinion can quality and continuous improvement tools currently being used in other industries be applied to community colleges in the state of Michigan?

Yes

yes

Same as 9

Same

Yes.

Of course

Yes.

Yes. It is particularly important as the state must finds ways to reinvent itself to diversify its economy and improve its current industries.

R1Q12 – In your opinion can quality and continuous improvement tools currently being used in other industries be applied to your institution?

Yes

yes

Same as 9

Same

Yes.

Of course

Definitely.

They currently are being used.

R1Q13 – What is your familiarity with process mapping, benchmarking, continuous improvement tools and Six Sigma methods and tools?

Very familiar - Lean champion certification

pretty familiar

above average

none

I understand how to map a process, develop benchmarks, and define measurable goals. I don't know anything about Six Sigma.

I know our training and research arm teaches these, but the extent to what they are used by us is unknown.

I use process mapping all the time but brought that tool with me from The Dow Chemical Company. I also use 5S Lean.

I am familar with process mapping, benchmarking and continuous improvement tools as the Institutional Research Dept. currently reports to me.

R1Q14 – Which, if any, of these tools are being used at your institution?

Lean tools

process mapping, benchmarking, continuous improvement

This kind of question could be more quickly answered if it was multiple choice

not sure

We use process mapping in some departments, but it is strongly individualized (i.e., more in use in some areas than others). Benchmarking is used in business and human resources, and possibly other areas with which I am not familiar. Institutionally we are using measures and external/internal scans to assess and improve quality.

I have seen mapping, benchmarking and other tools used by departments, but choices are always up to the department. To my knowledge not one tool is used by all.

5S Lean

Process mapping, benchmarking, continuous improvement tools

R1Q15 – How are these tools being used at your institution?

By departments and by quality improvement teams (action project teams)

within dept. work groups and cross-functional committees

Departments use LEAN process mapping to improve efficiency. Benchmarking is used to set salary and benefit targets and maintain competetiveness.

You would have to ask each program and/or department.

Many departments are using 5S Lean to streamline processes.

They are extensively used particularly at the institutional level.

R1Q16 – How adept is your institution to accepting new methods and tools not traditionally viewed as academic?

It's a slow process that has to evolve and be piloted by a small number of departments. Once the rest of the institution sees the benefit they are readily adopted.

somewhat

We are receptive to new methods and tools

I don't know. In order to judge this I would have to be familiar with business processes before they are adopted by my institution. I do not know what is new.

Over the past years it has been very hard to introduce an idea, a plan, etc., except it comes from the top.

It took several years for 5S Lean to catch on. My department was an early adopter but now probably most administrative areas have been exposed to it. I'm not sure about faculty.

We are pretty adaptive and AQIP really helps use embrace new approaches.

R1Q17 – What accounting, academic or administrative processes are in effect at your institution?

See previous answer

all standard higher ed processes

This survey is far too long. I am wasting my time.

Do not know

Again, not sure what you mean by "processes".

We have a program approval process that is based on evidence based needs and assessments.

R1Q18 – Are there controls in place for these processes?

Unknown

yes

Goodbye.

Do not know

DK

Yes; at the unit, executive, presidential and board levels.

R1Q19 – Should there be controls in place for these processes?

Probably

yes

Of course there should.

DK

Yes.

R1Q20 – Is course delivery defined as a process?

Yes

yes

Not a faculty member

Yes, I think early on in my experience here at this institution I kept saying that activities were called processes when, in fact, they were not.

DK

Only in terms of the actual approval to develop and offer the course.

R1Q21 – In your opinion is course delivery a process? If so, why or why not?

Yes.

yes, includes all parts of the college in planning, development, deployment and measurement

No it should be part of the bigger process....

I would think so.

It could be viewed as a process but one largely left to the individual faculty member.

R1Q22 – Is teaching a process or an art? Please explain your answer.

Both, process for organization, and thoroughness. An art for student engagement.

an art, informed by systems processes

Both. Once you become adept at teaching to all learning styles in a classroom, you find there are certain things you must do to present concepts, etc. Once you understand yourself why this important and see it work, then it can become an art in your field if you have a passion for it.

Teaching is a process and an art. I'm in a professional administrative position now, but have been an elementary school teacher. Teaching is science, relationships, communication, connection, and more.

It is partially a process as one plans out the outcomes and delivery methods. But there is also an art to teaching that includes the talents of the teacher to see that the students learn.

R1Q23 – Is learning a process or an art? Please explain your answer.

Process

a process enhanced by individual human behavior

Teaching and learning are two-way streets. If a learner is serious about "application," then the same can occur with learning... Find your style, practice it, see the outcome. If you are comfortable with it, then you refine it which is what I call an art.

Learning is a very individualized process.

Learning is a process since there is a certain order to it but there is an art to know how to develop the process to best meet the individual learning approaches of students.

R1Q24 – If teaching is a process can it be controlled?

The process part of it can be.

somewhat

By whom? Many times students attempt to control the teaching process. I do not believe anybody at our institution is trying to control our teaching style.

Yes, aspects of teaching can be controlled...the process part...content, best practices, etc.

It can be controlled to make sure the basic parts are in place: learning objectives and outcomes, assessments, learning activities and assignments, etc. But there is a part of learning that is unplanned that is more difficult to control.

R1Q25 – If teaching is a process should the process be controlled?

Yes

the mechanics of syllabi, assignments, deadlines, learning support tools etc.

Outcomes should be the same for all, and if this means some kind of control then so be it.

Yes, to some degree process should be controlled for quality.

The part of teaching that is process should be controlled to assure quality.

R1Q26 – If teaching is an art should it be controlled?

Through the hiring and development process, teachers can learn to make teaching an art.

not controlled, suppported

An art is solely connected to the personality of the teacher. The same concepts, etc., can be delivered in many different ways and styles. Art after the basics are achieved should never be controlled.

As long as it teachers use socially acceptable behaviors and students learn, the art of teaching should probably not be controlled.

The part of teaching that is an art should not be controlled to allow the instructor the liberty to innovate and change to better meet the students needs.

R1Q27 – How does the American Graduation Initiative affect your institution?

It helps us focus on metrics that the Federal Executive Branch is interested in.

pressure from state and federal entities for more data

We're working on it right now.

I am not familiar with this initiative by name.

The AGI gave us a new focus to change our goals and processes to focus on the graduation of our students. This is difficult for a community college that has a large portion of its students see their transfer institution as their ultimate goal.

R1Q28 – What, in your opinion, would be the path to continuous improvement and quality at your institution?

Carrying on the same path we are on with more people involved. That will help make it more of culturally based.

AQIP

I am at the grass roots level in recruiting and working with the general public including teaching an important class in the first-semester experience. I have learned so much by observation, and am I called upon to give my input in important initiatives? No. Some committees are discussing items I proposed nearly five years ago. I think the same people in places where they have advantages are on different committees because of the position they hold, not the knowledge. It's exhausting watching this year after year. This is how time and money are wasted in education.

If NMC had a shared vocabulary/knowledge about continuous improvement and related tools that would be a big step forward. We are headed in that direction. Our President is affecting a change wihin our culture. Consistent training acorss employee groups and including all individuals would be a big help.

AQIP is our path.

R1Q29 – What tools, in your opinion, could be used to improve quality and aid continuous improvement at your institution?

I don't know of any different ones than what I have mentioned above.

more tightly controlled data integrity

surveys

Use the knowledge of front line people who have expertise over other supervisory positions who receive and present their input through hearsay. Something is always lost in transition by not going to the source.

I like the tools we've chosen...5S Lean, AQIP

As stated earlier, we currently use a host of tools as part of our quality improvement, especially PDCA.

R1Q30 – Please describe the quality system at your institution.

See above answers.

AQIP

Someone who continually works with it here would do a better job of description....(1) gather data, (2) gather data, and (3) gather data.

We use AQIP to focus our quality efforts.

We use the AQIP accreditation model.

R1Q31 – Please define the work processes that are currently in place that you follow.

Creating timelines and work instructions for all standardized work.

refer to AQIP at HLC website

Upgrading and improving any processes that are deemed needing improvement

Once I am off a committee, it is nearly impossible to follow any process, the communication is so disjointed.

Event scheduling

PDCA in program review.

R1Q32 – Do you follow standard practices for these processes? If so for which processes do you follow standard practices?

Surveying

we try to...we have good results with describing problems and reporting progress

I created the program I run, and I have my own practices that I use which have paid off. That's about as much as I can do.

I am working with other schedulers to document and standardize practices.

Our program review follows a standard documented process.

R1Q33 – If you could standardize one process, not currently standardized, at your institution what would it be?

strategic planning

data entry in key transaction points in the ERP

I would standardize how to collect information from the grassroots and how it is accurately passed along to the top where decisions are made based on fact, not opinion.

Student Life (student organizations, clubs)...approval process, student/advisor roles, etc.

Budgeting at the college level.

R1Q34 – in your opinion how can accreditation be used to improve quality at your institution?

Let us define the opportunities for improvement through rigorous PDCA processes.

external expectations often force action

By comparisons to other institutions

It already is being used through AQIP.

We like AQIP because we get lots of feedback and it's a continuous process.

The AQIP model does a wonderful job of helping us identify areas needing improvement and areas of strength. Through the action project model, it helps us to focus on a manageable number of improvements so they can be accomplished.

R1Q35 – Do you view accreditation audits as an opportunity or an intrusion and why?

We don't have audits.

both - they create "extra" work, but we might not do the work if we didn't have to

Lots of work

They are not shared with me, but much of what I seek is usually available through reports that appear on our shared drive.

NMC welcomes "audits". We like fresh eyes looking at how we do things.

Definitely as an opportunity.

R1Q36 – Have you heard of the Academic Quality Improvement process (AQIP) for accreditation?

Yes

yes

yes

Yes

Yes.

Yes. We are an AQIP school

R1Q37 – Has your organization subscribed to the Academic Quality Improvement Process (AQIP) for accreditation? In your opinion why or why not?

Yes, it fits with what we want our culture to be.

yes

Yes, to have continuous qualify improvement

Yes

Yes...we've been doing it for a couple of years now. Our leaders believe in continuos improvement.

Yes. This process turned improvement from a once in ten years top-down review to a on-going supportive review process.

R1Q38 – Based on your knowledge of AQIP, how could it be used as a continuous improvement tool at your institution?

The way we are using it.

brings focus to specific projects aimed at improvement using holistic education model

By continuing to recognize areas for improvement and working to improve those processes

We do it, and the challenge is once a committee has made recommendations, like the one I was on, is to implement them and then stick with them. Once off this committee, I have no knowledge of how the recommendations were implemented or changed or maybe they are not being done at all in the form first recommended. I know we write good reports.

We are using it to prioritize and stay focused.

It is used as a way to identify areas especially needing improvement; it also advises on continuous improvement tools that help us improve. Benchmarking is just one example.

Appendix B: Delphi Survey Round Two

R2Q1 – Quality and continuous improvement tools have been successful in improving quality in higher education

R2Q2 – Quality and continuous improvement tools that have been successful in other organizations and industries can be applied to processes in higher education

R2Q3 – My institution measures quality

R2Q4 – I am familiar with Six Sigma methods and tools

R2Q5 – My institution uses Six Sigma

R2Q6 – I am familiar with benchmarking

R2Q7 – My institution uses benchmarking

R2Q8 – I am familiar with process mapping

R2Q9 – My institution uses process mapping

R2Q10 – Quality and continuous improvement tools and methods play a role in academic improvement

R2Q11 – Quality and continuous improvement tools and methods play a significant role in academic improvement

R2Q12 – Teaching (course delivery) is a process

R2Q13 – The teaching process can be controlled and improved using quality and continuous improvement tools

R2Q14 – Learning is a process

R2Q15 – Quality and continuous improvement tools used to control processes in other industries can be applied to the teaching process

R2Q16 – Six Sigma methods can be applied in community colleges

R2Q17 – Process mapping can be applied in community colleges

R2Q18 – Process mapping can be used to define the teaching process

R2Q19 – Benchmarking can be applied in/to community colleges

R2Q20 – Benchmarking other institutions would help us to improve our processes

R2Q21 – Accreditation is our quality system

R2Q22 – My institution is accredited through the HLC-NCA Academic Quality Improvement Process (AQIP)

R2Q23 – AQIP can be used as a continuous improvement tool in community colleges

R2Q24 – My institution is accredited through the HLC-NCA Program to Evaluate and Advance Quality (PEAQ)

R2Q25 – Accreditation can be used to improve quality in our institution

Delphi Survey Round Two with Responses

R2Q1 – Quality and continuous improvement tools have been successful in improving quality in higher education

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	2	4	19	3	2.82
Respondents in the affirmative = 22			Respondents in the negative = 6		
Skipped = 1			*SD* = .723		

R2Q2 – Quality and continuous improvement tools that have been successful in other organizations and industries can be applied to processes in higher education

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	2	3	13	11	3.14

Respondents in the affirmative = 24 Respondents in the negative = 5

Skipped = 0 *SD* = .875

R2Q3 – My institution measures quality

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	2	3	15	8	3.04

Respondents in the affirmative = 23 Respondents in the negative = 5

Skipped = 1 *SD* = .838

R2Q4 – I am familiar with Six Sigma methods and tools

	Not at all	I've heard of Six Sigma	I'm familiar with Six Sigma	I've used Six Sigma	Rating Avg.
Participant Response	4	16	7	1	2.18

Respondents in the affirmative = 8 Respondents in the negative = 20

Skipped = 1 *SD* = .723

R2Q5 – My institution uses Six Sigma

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	7	19	2	0	1.82

Respondents in the affirmative = 2 Respondents in the negative = 26

Skipped = 1 *SD* = .548

R2Q6 – I am familiar with benchmarking

	Not at all	I've heard of benchmarking	I'm familiar with benchmarking	I've used benchmarking	Rating Avg.
Participant Response	0	1	14	12	3.41

Respondents in the affirmative = 26 Respondents in the negative = 1

Skipped = 2 *SD*= .572

R2Q7 – My institution uses benchmarking

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	1	3	13	11	3.21

Respondents in the affirmative = 24 Respondents in the negative = 4

Skipped = 1 *SD* = .790

R2Q8 – I am familiar with process mapping

	Not at all	I've heard of process mapping	I'm familiar with process mapping	I've used process mapping	Rating Avg.
Participant Response	3	4	12	10	3.00

Respondents in the affirmative = 22 Respondents in the negative = 7

Skipped = 0 *SD* = .964

R2Q9 – My institution uses process mapping

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	2	9	13	4	2.68

Respondents in the affirmative = 11 Respondents in the negative = 17

Skipped = 1 *SD* = .819

R2Q10 – Quality and continuous improvement tools and methods play a role in academic improvement

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	2	13	14	3.41
Respondents in the affirmative = 27			Respondents in the negative = 2		
Skipped = 0			*SD* = .628		

R2Q11 – Quality and continuous improvement tools and methods play a significant role in academic improvement

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	1	5	12	11	3.14
Respondents in the affirmative = 23			Respondents in the negative = 6		
Skipped = 0			*SD* = .833		

R2Q12 – Teaching (course delivery) is a process

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	0	20	9	3.31
Respondents in the affirmative = 29			Respondents in the negative = 0		
Skipped = 0			*SD* = .471		

R2Q13 – The teaching process can be controlled and improved using quality and continuous improvement tools

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	1	20	8	3.24
Respondents in the affirmative = 28			Respondents in the negative = 1		
Skipped = 0			*SD* = .511		

R2Q14 – Learning is a process

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	0	17	11	3.39
Respondents in the affirmative =	28		Respondents in the negative = 0		
Skipped = 1			*SD* = .497		

R2Q15 – Quality and continuous improvement tools used to control processes in other industries can be applied to the teaching process

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	2	18	8	3.21
Respondents in the affirmative =	26		Respondents in the negative = 2		
Skipped = 1			*SD* = .568		

R2Q16 – Six Sigma methods can be applied in community colleges

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	7	15	3	2.84
Respondents in the affirmative =	18		Respondents in the negative = 7		
Skipped = 4			*SD* = .620		

R2Q17 – Process mapping can be applied in community colleges

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	1	14	10	3.36
Respondents in the affirmative =	24		Respondents in the negative = 1		
Skipped = 4			*SD* = .569		

R2Q18 – Process mapping can be used to define the teaching process

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	3	19	5	3.07
Respondents in the affirmative =	24		Respondents in the negative = 3		
Skipped = 2			*SD* = .550		

R2Q19 – Benchmarking can be applied in/to community colleges

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	0	17	10	3.37

Respondents in the affirmative = 27 Respondents in the negative = 0

Skipped = 2 *SD* = .492

R2Q20 – Benchmarking other institutions would help us to improve our processes

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	2	18	9	3.24

Respondents in the affirmative = 27 Respondents in the negative = 2

Skipped = 0 *SD* = .577

R2Q21 – Accreditation is our quality system

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	2	4	17	6	2.93

Respondents in the affirmative = 23 Respondents in the negative = 6

Skipped = 0 *SD* = .799

R2Q22 – My institution is accredited through the HLC-NCA Academic Quality Improvement Process (AQIP)

	Yes	No	I Don't Know
Participant Response	26	2	1

Respondents in the affirmative = 26 Respondents in the negative = 2

I Don't Know = 1

R2Q23 – AQIP can be used as a continuous improvement tool in community colleges

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	0	17	12	3.41

Respondents in the affirmative = 29 Respondents in the negative = 0

Skipped = 0 *SD* = .500

R2Q24 – My institution is accredited through the HLC-NCA Program to Evaluate and Advance Quality (PEAQ)

	Yes	No	I Don't Know
Participant Response	3	18	8

Respondents in the affirmative = 3 Respondents in the negative = 18

I Don't Know = 8

R2Q25 – Accreditation can be used to improve quality in our institution

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Participant Response	0	1	20	8	3.24

Respondents in the affirmative = 28 Respondents in the negative = 1

Skipped = 0 *SD* = .511

Appendix C: Delphi Survey Round Three

R3Q1 (R2Q1) – Quality and continuous improvement tools have been successful in improving quality in higher education

R3Q2 (R2Q2) – Quality and continuous improvement tools that have been successful in other organizations and industries can be applied to processes in higher education

R3Q3 (R2Q10) – Quality and continuous improvement tools and methods play a role in academic improvement

R3Q4 (R2Q12) – Teaching (course delivery) is a process

R3Q5 (R2Q13) – The teaching process can be controlled and improved using quality and continuous improvement tools

R3Q6 (R2Q16) – Six Sigma methods can be applied in community colleges

R3Q7 (R2Q17) – Process mapping can be applied in community colleges

R3Q8 (R2Q19) – Benchmarking can be applied in/to community colleges

R3Q9 (R2Q22) – My institution is accredited through the HLC-NCA Academic Quality Improvement Process (AQIP)

R3Q10 (R2Q23) – AQIP can be used as a continuous improvement tool in community colleges

R3Q11 (R2Q24) – My institution is accredited through the HLC-NCA Program to Evaluate and Advance Quality (PEAQ)

R3Q12 (R2Q25) – Accreditation can be used to improve quality in our institution

Delphi Survey Round Three with Responses

R3Q1 (R2Q1) – Quality and continuous improvement tools have been successful in improving quality in higher education

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	2	4	19	3	2.82
n = 28				*SD* = .723	
Round 3 Response	0	1	18	3	3.09
n = 22				*SD* = .430	
Combined Response			Skipped = 2		
Respondents in the affirmative = 43			Respondents in the negative = 7		

R3Q2 (R2Q2) – Quality and continuous improvement tools that have been successful in other organizations and industries can be applied to processes in higher education

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	2	3	13	11	3.14
n = 29				*SD* = .875	
Round 3 Response	0	0	11	12	3.52
n = 23				*SD* = .510	
Combined Response					
Respondents in the affirmative = 47			Respondents in the negative = 5		

R3Q3 (R2Q10) – Quality and continuous improvement tools and methods play a role in academic improvement

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	2	13	14	3.41
n = 29				*SD* = .628	
Round 3 Response	0	0	12	11	3.48
n = 23				*SD* = .510	

Combined Response

Respondents in the affirmative = 50 Respondents in the negative = 2

R3Q4 (R2Q12) – Teaching (course delivery) is a process

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	0	20	9	3.31
n = 29				*SD* = .471	
Round 3 Response	0	0	10	13	3.57
n = 23				*SD* = .510	

Combined Response

Respondents in the affirmative = 52 Respondents in the negative = 0

R3Q5 (R2Q13) – The teaching process can be controlled and improved using quality and continuous improvement tools

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	1	20	8	3.24
n = 29				*SD* = .511	
Round 3 Response	0	0	14	9	3.39
n = 23				*SD* = .500	

Combined Response

Respondents in the affirmative = 51 Respondents in the negative = 1

R3Q6 (R2Q16) – Six Sigma methods can be applied in community colleges

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	7	15	3	2.84
n = 25				*SD*= .620	
Round 3 Response	0	1	13	4	3.17
n = 18				*SD* = .510	
Combined Response		Skipped = 9			
Respondents in the affirmative = 35		Respondents in the negative = 8			

R3Q7 (R2Q17) – Process mapping can be applied in community colleges

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	1	14	10	3.36
n = 25				*SD* = .569	
Round 3 Response	0	2	8	12	3.45
n = 22				*SD* = .670	
Combined Response		Skipped = 5			
Respondents in the affirmative = 44		Respondents in the negative = 3			

R3Q8 (R2Q19) – Benchmarking can be applied in/to community colleges

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	0	17	10	3.37
n = 27				*SD* = .492	
Round 3 Response	0	1	10	11	3.45
n = 22				*SD* = .600	
Combined Response		Skipped = 3			
Respondents in the affirmative = 48		Respondents in the negative = 1			

R3Q9 (R2Q22) – My institution is accredited through the HLC-NCA Academic Quality Improvement Process (AQIP)

	Yes	No	I Don't Know
Round 2 Response	26	2	1
n = 29			
Round 3 Response	22	1	0
n = 23			

Combined Response

Respondents in the affirmative = 48 Respondents in the negative = 3

Respondents that do not know = 1

R3Q10 (R2Q23) – AQIP can be used as a continuous improvement tool in community colleges

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	0	17	12	3.41
n = 29				*SD* = .500	
Round 3 Response	0	0	11	11	3.50
n = 22				*SD* = .510	

Combined Response Skipped = 1

Respondents in the affirmative = 51 Respondents in the negative = 0

R3Q11 (R2Q24) – My institution is accredited through the HLC-NCA Program to Evaluate and Advance Quality (PEAQ)

	Yes	No	I Don't Know
Round 2 Response	3	18	8
n = 29			
Round 3 Response	3	8	12
n = 23			

Combined Response

Respondents in the affirmative = 6 Respondents in the negative = 26

Respondents that do not know = 20

R3Q12 (R2Q25) – Accreditation can be used to improve quality in our institution

	Strongly Disagree	Disagree	Agree	Strongly Agree	Rating Avg.
Round 2 Response	0	1	20	8	3.24
n = 29				*SD* = .511	
Round 3 Response	0	1	10	11	3.45
n = 22				*SD* = .600	
Combined Response		Skipped = 1			
Respondents in the affirmative = 49		Respondents in the negative = 2			

Appendix D: Study Participants

Panel Members

Mr. Mike Hansen, President, Michigan Community College Association

Mr. Timothy Nelson, President, Northwestern Michigan College

Ms. Nancy Showers for Dr. Timothy Meyer, Chancellor, Oakland Community College

Dr. Gary Wheeler, President, Glen Oaks Community College

Dr. Jean Goodnow, President, Delta College

Participant Focal Points and Institutions

Bay College
Mr. Mark Kinney, Director of Institutional Research, Bay College
Dr. Laura Coleman, President, Bay College

Delta College
Mr. Michael Wood, Director of Institutional Research, Delta College
Dr. Jean Goodnow, President, Delta College

Gogebic Community College
Ms. Miranda Lawver, Office of Institutional Research, Gogebic Community College
Mr. James Lorenson, President, Gogebic Community College

Grand Rapids Community College
Mr. Bruce Morrison, Office of Institutional Research
Dr. Steven Ender, President, Grand Rapids Community College

Kellogg Community College
Ms. Doris Lewis, Director of Institutional Research, Kellogg Community College
Dr. Dennis Bona, President, Kellogg Community College

Mott Community College
Dr. Steven Robinson, Dean of Planning, Research and Quality, Mott Community College
Dr. M. Richard Shaink, President, Mott Community College

Northwestern Michigan College
Dr. Darby Hiller, Director of Institutional Research, Northwestern Michigan College
Mr. Timothy Nelson, President, Northwestern Michigan College

Wayne County Community College District
Ms. Johnesa Dimicks, Vice Chancellor, Institutional Effectiveness, Wayne County Community College District
Dr. Curtis Ivery, Chancellor, Wayne County Community College District

Glen Oaks Community College
Ms. Alissa Sheftic, Director of Institutional Research, Glen Oaks Community College
Dr. Gary Wheeler, President, Glen Oaks Community College

Henry Ford Community College
Ms. Becky Chadwick, Director of Institutional Research, Henry Ford Community College
Dr. Gail Mee, President, Henry Ford Community College

Jackson Community College
Ms. Nancy Miller, Director of Institutional Research, Jackson Community College
Dr. Daniel J. Phelan, President, Jackson Community College

Kalamazoo Valley Community College
Mr. Stephen Cannell, Director of Institutional Research, Kalamazoo Valley Community College
Dr. Marilyn J. Schlack, President, Kalamazoo Valley Community College

Kirtland Community College
Ms. Kathy Marsh, Director of Institutional Research, Kirtland Community College
Dr. Thomas Quinn, President, Kirtland Community College

Lake Michigan College
Mr. Randall Melton, Director of Institutional Research, Lake Michigan College
Dr. Robert Harrison, President, Lake Michigan College

Lansing Community College
Mr. Jason Mayland, Director of Institutional Research, Lansing Community College
Dr. Brent Knight, President, Lansing Community College

Macomb Community College
Dr. Randall Hickman, Director of Institutional Research, Macomb Community College
Dr. James B. Jacobs, President, Macomb Community College

Mid Michigan Community College
Ms. Carol Darlington, Director of Institutional Research, Mid-Michigan Community College
Ms. Carol Churchill, President, Mid Michigan Community College

Monroe Community College
Ms. Suzanne Wetzel, Vice President of Administration, Monroe Community College
Dr. David Nixon, President, Monroe Community College
Montcalm Community College
Ms. Maria Suchowski, Director of Institutional Research, Montcalm Community College
Dr. Robert Ferrentino, President, Montcalm Community College

Muskegon Community College
Ms. Anne Meilof, Director of Institutional Research, Muskegon Community College
Dr. Dale Nesbary, President, Muskegon Community College

North Central Michigan College
Dr. Debra Hagen-Foley, Director of Institutional Research, North Central Michigan College
Dr. Cameron Brunet-Koch, President, North Central Michigan College

Oakland Community College
Ms. Nancy Showers, Director of Institutional Research, Oakland Community College
Dr. Timothy Meyer, Chancellor, Oakland Community College
Special Thanks to Ms. Cherie Foster, Executive Assistant to the Chancellor

St. Clair County Community College
Mr. David Goetze, Director of Institutional Research, St. Clair County Community College
Dr. Kevin A. Pollock, President, St. Clair County Community College

Southwestern Michigan Community College
Ms. Charlotte McGowan, Director of Institutional Research, Southwestern Michigan Community College
Dr. David Mathews, President, Southwestern Michigan Community College

Washtenaw Community College
Mr. Roger Mourad, Director of Institutional Research, Washtenaw Community College
Dr. Larry Whitworth, President, Washtenaw Community College

Westshore Community College
Ms. Jill Sweet, Director of Institutional Research, Westshore Community College
Dr. Charles Dillon, President, Westshore Community College