PERCEIVED DIMENSIONS OF QUALITY IN HIGHER EDUCATION

A Dissertation by

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Submitted to the Department of Industrial and Manufacturing Engineering
and the faculty of the Graduate School of
Wichita State University
in partial fulfillment of
the requirements for the degree of
Doctor of Philosophy

May 2016

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DEDICATION

To my parents, my wife, and my children—the foundation of my life—for their patience and support through every step of this journey

ACKNOWLEDGMENTS

There are a number of people to whom I owe the highest gratitude for their contributions to my life and research during this process.

I thank God for his guidance and strength throughout the research process, and I thank my wife and children for their tremendous support and encouragement in the face of great challenges.

I also offer profound gratitude to my advisor, Dr. Weheba, whose advice and tireless support have significantly impacted this research. Without his constructive criticism and insightful contributions, I would not have developed such a quality proposal and research study.

I would like to sincerely thank my committee members—Dr. Masud, Dr. Sawan, Dr. Asmatulu, and Dr. Toy—for their evaluation of my research and for their helpful guidance. Their thoughtful advice and comments helped transform not only my research but me as a researcher.

Finally, thanks go to my friends, who have offered their support, encouragement, and advice—I express my heartfelt gratitude.

ABSTRACT

Numerous definitions of quality exist in higher education. Diversity of stakeholders, multiplicity of services provided, and variability in the duration of such services make higher education an exceptional service sector. This research, aimed at determining perceptions of quality from the perspectives of academicians and top administrators, utilized two samples: the first was randomly selected from a pool of peer-reviewed publications representing the perceptions of academicians; the second included letters from presidents' of the top 100 universities in the United States reflecting their views on quality. A total of thirteen dimensions pertaining to quality were identified in the literature. A special coding scheme was developed based on these dimensions and validated by a panel of experts to ensure content validity. This coding scheme was then used in Computer-Aided Text Analysis (CATA) coupled with principal components analysis (PCA) to examine the relevance of these dimensions academicians' and top administrators' perceptions of quality in higher education.

Results indicate that all thirteen dimensions were needed to represent perceptions of quality in higher education. Two sets of meta-dimensions were identified: academic aspects, safety, evidence, and empathy, which affect the perceptions of academicians; and empathy, attitude, safety, and reputation, which influence the perceptions of top administrators. Results highlight both similarities and differences. It appears that two meta-dimensions—safety and empathy—were included in the perspectives of both groups; however, academicians appear to place more emphasis on academic aspects, while top administrators emphasize empathy and attitude.

It is hoped that these research findings will help provide a clear understanding of the dimensions of quality and direct improvement efforts in such a critical service sector.

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LIST OF ABBREVIATIONS

CATA	Computer-Aided Text Analysis
CHEA	Council for Higher Education Accreditation
HEdPERF	Higher Education Performance Instrument
HiEdQUAL	Higher Education Quality Instrument
ISO	International Organization for Standardization
MBNQA	Malcolm Baldrige National Quality Award
PC	Principal Component
PCA	Principal Components Analysis
SERVQUAL	Service Quality Measurement Instrument
TQM	Total Quality Management
USDE	United States Department of Education

CHAPTER 1

INTRODUCTION

It is a privilege to have earned the chance to experience the higher education system in the United States and research its nature and quality. Harvey and Knight (1996) stated that "We can no longer take quality for granted in higher education. We can no longer presume we all know what we mean by a 'quality' higher education. Taken-for-granted concepts of quality have to be reassessed in the light of the changing rationale and purpose of higher education."

Higher education institutions adapt industrial models and business management techniques to meet cost-cutting challenges and improve quality. Owlia and Aspinwall (1997) stated that higher education is following industry practices due to common economic pressures.

Studies on quality in higher education have been diverse. Research in this sector presents higher education as a service. The intangibility of the outcome, heterogeneity of the process, and inseparability of production and consumption have been cited in support of such a classification. However, some researchers have viewed higher education as an atypical service industry because many different aspects are incorporated, including the multiplicity of stakeholders and the academic entry requirements that define the population to which the service is provided. Parasuraman et al. (1985) have provided an array of quality dimensions to be considered in the service industry. How these dimensions describe quality in the higher education sector will be addressed in this research.

An initial restricted search using the Wichita State University SmartSearch database utilizing the words "service quality" along with "higher education," "university," or "college" identified 4,059 peer-reviewed journal publications between 2005 and 2014 with those words in their titles. The search was restricted to full-text documents available in English. This research

utilized Computer-Aided Text Analysis (CATA) and multivariate analysis techniques to determine the most frequent constructs used in describing quality in higher education. Additionally, research efforts have been made to identify the perception of quality from the top administrators in higher education sector.

Chapter 2 of this research presents a review of the literature pertaining to quality in service and the higher education sectors. Included in this chapter are definitions, models, systems, and standards of quality in higher education. Chapter 3 discusses the research gap in the literature review and the research objectives, followed in Chapter 4 by a description of the research procedures and methodology involved in analyzing the results. Last, conclusions and future research are highlight in Chapter 5.

CHAPTER 2

LITERATURE REVIEW

This chapter examines the applicable literature relating to the construct of service quality, in particular in the higher education sector. The review highlights studies of quality within the higher education sector, with the aim of assessing similarities and differences among quality perspectives. The chapter is divided into seven sections: Section 2.1 defines higher education and its distinguishing characteristics. Sections 2.2 and 2.3 highlight various definitions of "quality" and "service" as they relate to the higher education sector, and also define the higher education customer. Section 2.4 focuses on higher education models and systems. Section 2.5 identifies stakeholders within the higher education sector and highlights its two main stakeholders: faculty and students. Section 2.6 explains the service quality assessment model and points out various modifications and additions that have been made over time. Section 2.7 describes how service quality assessment tools have been utilized to measure various qualitative and quantitative parameters that are pertinent to higher education service delivery and those models that are most commonly used among higher learning institutions.

2.1 Higher Education

Why is higher education different from other educational institutions? The main difference between K-12 schools and the higher education system is the manner of teaching and the role of the student. In the K-12 system, the student relies on the educator to guide the course of learning and to identify possible areas requiring further focus. In higher learning institutions, the student is primarily responsible for the learning process, and achieves this through the selection of courses and self-assessment by identifying problematic areas through administered continuous tests. With regard to the fundamental importance of the student, Mark (2013)

observed that the knowledge of students in higher education, accrued from previous learning experiences, renders students as active participants in the academic process of higher learning institutions.

Follow-up programs designed to assess student performance in the workplace allow for long-term indicators of the education quality offered to students at various higher learning institutions. Institutions that release well-suited students into the job market may be considered better quality than those that do not. The outcome of well-structured learning programs is manifested in students' abilities to obtain jobs suited to their qualifications, and their ability to retain and perform well in those jobs. High performance among students results in high assessment records in order to verify quality in higher learning institutions.

2.2 Definitions of Quality

The concept of quality is far reaching, generally entailing the adherence of products or processes to expectations (Taguchi et al., 2005). Quality requirements vary depending on parameters that define specific products and processes. Juran (1988) defined three aspects of quality: quality of design, quality of conformance, and quality of performance. Quality is also regarded as a relative measure of appeal based on outcome (Taguchi et al., 2005).

The agreement between design and intended use of products and services is essential in defining quality. Juran (1988) stated that quality is fitness for use. This comprises design, conformance, availability, safety, and field performance. Quality goods and services should surpass user expectations. Therefore, providers of goods and services should understand consumer expectations and accurately address and exceed them. Mukhopadhyay (2005) suggested that observance of requirements is the minimal mark of quality, and not the sufficient achievement for assurance of quality in the rendering of services and production of goods.

Assessing quality is difficult and necessitates the use of holistic approaches. According to Olshavsky (1985), in light of different parameters of quality in singular entities, quality is defined by the overall evaluation of a product, and not through constitutive elements. This view is reflected by Zeithaml (1988) from a consumer's perspective. He observed that an entity's overall superiority or excellence defines its quality. The ambiguity of quality is evidenced especially in the rendering of services because quality is rarely implied from singular transaction. Rowley (1997) observed that "perceived service quality is globally consistent," whereas satisfaction is related to a particular transaction. Thus, the two constructs are related because perpetuated satisfaction yields a perception of overall good quality from the consumer's point of view.

Deming (1986) defined quality based on the efficiency of management in planning, implementing, and improving projects. Management teams offer guidance and directions for the entire organization. Crosby (1979) defined quality as the level of adherence to specifications outlined by the directorate. In light of Deming's definition, Crosby highlighted the execution gap between instructions issued and instructions followed. Eliminating communication breakdowns and advancing implementation of directives in defined patterns observed within outlined timeframes constitutes high quality.

Massey and Wilger (1992) examined the complexity of possible definitions of quality applicable to higher education, pointing out that it is impossible to arrive at an exact definition of quality that is appropriate across learning institutions. Becket and Brookes (2006) observed an ongoing debate regarding the best way to define quality as it pertains to the higher education sector. Sahney et al. (2004) encapsulated the definition of quality as involving value added in

education, whereas Feigenbaum (1983) defined quality in the sector as conformance of education output to planned goals, specifications, and requirements.

Garvin (1984) noted that definitions of quality may fall into one of five approaches: transcendental, product-based, user-based, manufacturing-based, and value-based. According to the transcendental approach, quality cannot be defined precisely because it is abstract; however, it constitutes a high mark that is evident as "innate excellence." The product-based approach is the opposite of this, whereby quality is quantifiable and arrived at by assessing the components of the constituent parts of the main items. The user-based approach is built on the premise that quality is subjective, and each consumer regards quality according to his or her preference. The manufacturing-based definition centers on conformance to requirements, whereby a quality product is one in which processes leading to its formation adhere to the set parameters of operation. The value-based approach defines quality on the basis of cost and price; a quality product offers the best performance at a reasonable price.

Garvin (1984) also developed eight dimensions to explain quality: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality, which are listed in Table 2.1. He indicated that these dimensions can be used to evaluate the quality of products and services. In this regard, Owlia and Aspinwall (1996) have stated that "although the quality dimensions of a product may seem remote from those of a service like higher education, they are still appropriate in providing ideas for generalization."

Ramsden (1992) defined quality in higher learning institutions as being dependent on the level at which students understand the material taught. Assessment of knowledge can be performed by observing trends in test scores and student participation in the application of learned principles. Brysland and Curry (2001) considered quality as a measure of students'

satisfaction, which entails providing intangible service in a satisfactory manner and adding value to the customer.

TABLE 2.1

GARVIN'S EIGHT QUALITY DIMENSIONS

Dimension	Definition
Performance	Primary operating characteristics of a product.
Features	Secondary characteristics of product that supplement its basic functioning.
Reliability	Probability of product's failure-free over specified time period.
Conformance	Degree to which product's physical and performance characteristics meet design specification.
Durability	Measure of useful product life.
Serviceability	Ease, speed, courteousness, and competence of repair.
Aesthetics	How product looks, feels, sounds, tastes, or smells, as a matter of personal preferences.
Perceived Quality	Quality based on image, brand name, or advertising rather than product attributes, as subjectively assessed.

Source: Adapted from "Influence of service and product quality on customer retention: A Swedish grocery store, by M. Hussain and P. Ranabhat, University of Gävle, 2013, p. 14.

Cheng and Tam (1997) observed that controversial definitions of quality result in a vagueness of quality assessment approaches across higher learning institutions. Pounder (1999), in appreciation of the conflict arising across quality assessment in different learning institutions, noted that the meaning of quality differs among stakeholders. Pfeffer and Coote (1991) emphasized the difficulty of arriving at a single definition of quality. In light of multiple stakeholders, Barnes (2007) outlined disparities among similar stakeholders by highlighting differing definitions of quality requirements among varying cultures. He noted that the inability to reflect all stakeholders' preferences in one quality-assessment tool does not eliminate the possibility of assessing quality.

Peters and Waterman (1982) postulated that education quality is defined by excellence in education. However, excellence is an ambiguous aspect requiring concretely described parameters to assess—a complication appreciated by quality engineers operating in the higher education sector. Cheng and Tam (1997) defined quality in higher learning institutions as the achievement of planned goals. Other researchers seem to agree that there is not a best way to approach a definition of quality relative to higher education (Clewes, 2003).

2.3 Service Quality

The distinguishing characteristics of service are intangibility, heterogeneity or variability, inseparability, perishability or inventory, and involvement (Cuthbert, 1996a). Intangibility refers to a service's abstract nature or its lack of perception through touch. The rendering of the benefits of a service are understood by both the producer and the recipient. Heterogeneity, or variability, refers to the difference through which the same service can be provided, even if the person rendering it remains the same. Inseparability refers to the fact that services are inherent to the person providing them. Perishability or inventory points to degeneration of the service through incapacitation of the person rendering it due to various reasons. The consumer's active participation in the service-rendering process constitutes the final characteristic of involvement.

Cuthbert (1996a) defined a service as intangible and heterogeneous, inseparable and perishable and showed that all these characteristics are true in the process of learning in higher education institutions. Quinn et al. (2009) observed that the terms "service quality" and "quality in education" are difficult to define. However, Grönroos (1984) defined service quality as having two main variables: consumers' expectations in term of outcome, and perceptions of the result. O'Neil and Palmer (2004) defined the quality of service based on student expectations to their perceptions of the delivery. Quinn et al. (2009) also observed that higher learning institutions are

atypical in the service sector because they incorporate many different facets. In particular, they suggested that three main services are found in higher learning institutions: academic, administrative, and auxiliary.

Owlia and Aspinwall (1996) observed that manufacturing industries engage in quality assessment by focusing on the real needs of the customer, unlike in the higher learning sector where the motives of many academics are independent of the market. Therefore, the approach in higher learning institutions is different, due to the divergence of academics' perceptions of quality and the multiplicity of stakeholders (Zafiropoulos & Vrana, 2008). Furthermore, unlike many service sectors, higher learning institutions have stringent academic and sometimes personal entry requirements that define the population to which the service is rendered; this creates a specific customer base (Rowley, 1997).

The lack of uniformity in the definition of quality in the higher learning sector is evident from the multiple definitions discussed above. Cultural peculiarities result in different assessments of quality. Furthermore, individual student preferences cause differences in definitions among students within the same course. These differences are the result of perspectives and biases that are unique to individuals (Christian & Sprinkle, 2013).

2.4 Higher Education Models and Systems

As discussed previously, the need for quality assurance is recognized and appreciated across the higher education sector. All stakeholders benefit from relevant and clear parameters of quality across this sector. To that end, various quality assessment approaches, predominantly used in other industries, have been adapted to highlight performance parameters within the higher education sector.

2.4.1 Malcolm Baldrige National Quality Award

The Malcolm Baldrige National Quality Award (MBNQA), established by the U.S. Congress in 1987, was named after the late Secretary of Commerce, Malcolm Baldrige (Lee et al., 2006). The purpose of this award is to highlight the need for quality assessment and assurance across industries. It is based on the assessment of seven main areas of focus: Leadership; Strategic Planning; Customer and Market Focus; Measurement, Analysis, and Knowledge Management; Workforce Focus; Operations Focus; and Performance Results (Education Criteria for Performance Excellence 2013–2014). Wilson and Collier (2000) highlighted the notion that leadership is the most pivotal aspect of determining quality in organizations. This observation may be viewed as applicable to the higher education sector because top leadership ultimately determines and designs systems in higher learning institutions.

2.4.2 ISO 9000 (Higher Education)

In 1987, the International Organization for Standardization (ISO) developed ISO 9000, a series of standards, with the intention of providing a basis for quality assurance to consumers of various services and products (Izadi et al., 1996). In order for higher learning institutions to be listed as ISO 9000-certified, they must provide documented proof of their processes and how these processes have accomplished specifications of the ISO quality standards (Izadi et al., 1996). ISO quality indicators direct organizations to the most essential quality aspects to achieve, but they do not dictate how to achieve them. Typically, it is the role of the institution to ensure conformance. Institutions are certified for three years and checked regularly to ensure conformance. However, it should be noted that although ISO 9000 provides a basis for the evaluation of quality, it does not allow for significant comparison among institutions that attain certification requirements (Izadi et al., 1996).

2.4.3 Total Quality Management in Higher Education

The primary emphasis of total quality management (TQM) is on identifying customer needs and preferences, and ensuring that they are met as effectively as possible. The move toward quality assurance for consumers began in the 1950s and resurged in the 1980s (Sherr & Gregory, 1991). This primary focus on the customer resulted in increased pressure on higher education institutions to provide high-quality services to students in order to remain relevant and profitable (Sahney et al., 2004). Higher learning institutions continue to identify the central role of the student and the need to attract these primary customers through lucrative service offerings. Therefore, this approach necessitates the assurance of quality processes in institutions so that students receive the best value for their expenditure. Furthermore, higher learning institutions have a multiplicity of stakeholders; therefore, assurance of quality in all processes serves to provide a healthy learning environment for all stakeholders involved.

2.4.4 Higher Education Accreditation in the U.S.

Higher education accreditation in the U.S. is achieved through a peer-review process by an accredited organization. The government does not directly decide which higher learning organizations are regarded as fit for accreditation. However, the process is set up to ensure that quality is maintained and sustained through all registered higher learning institutions. This is achieved through rigorous checks on curriculums, equipment, and services, both in registered learning institutions and in institutions seeking registration (Eaton, 2006). Two main bodies are charged with the role of ensuring efficiency and soundness in the accreditation process. The first is the Council for Higher Education Accreditation (CHEA), which is charged with the task of ensuring and perpetuating high-quality standards in higher learning institutions. The second is the United States Department of Education (USDE), which ensures that government-issued funds

are channeled toward high-quality institutions and that those funds are utilized effectively to equip students (Eaton, 2006). Therefore, the process of accreditation in the U.S. serves as a checks and balances system for quality in the higher education sector.

2.5 Stakeholders in Higher Education Sector

Newton (2002) observed that two main cultures are evident in the education system: corporate and academic. The reliance of higher learning institutions on private funding has revolutionized service production in that education becomes transactional (Danjuma & Rasli, 2012). With this change, priorities are redefined; hence, quality requirements necessitate reconstruction in order to remain relevant. A change in institutional organization has occurred in that higher learning institutions are no longer viewed as entities controlled by a group of academics intending to improve curricula (Joseph et al., 2005). Universities are now forced to accommodate the needs and preferences of students in order to secure enrollment, attract students, and stabilize the financial system; this shift introduces a strain because the priorities of other stakeholders in the sector are redefined.

Nedwek and Neal (1994) noted that six major stakeholders can be identified in higher learning institutions: faculty, students, staff, alumni, private employers and public sector employers. Ginsberg (1991) further emphasized the need to include “society” among the stakeholders—a view supported by Lawton (1992). Higher learning institutions are faced with the constant challenge of incorporating all stakeholder concerns and priorities (Neave, 2002). Of the identified stakeholders, Abdullah (2006) observed that the current metrics of quality assessment in higher learning institutions identify students as major shareholders.

In one study, “TQM in the University: A Quality Code of Honor,” Madu et al. (1994) categorized customers of higher learning institutions into three groups: input, transformation, and

output. Input customers include students and parents, transformation customers include faculty, and output customers include corporations and society. The labeling of these stakeholders as customers in the three groups indicates the difference in interest. This difference affects quality definitions of stakeholders because each seeks different aspects definitive of quality from dissimilar standpoints. Quinn et al. (2009) summarized the various stakeholders within the higher learning sector, as shown in Table 2.2.

TABLE 2.2

STAKEHOLDERS OF HIGHER EDUCATION ATTRIBUTES

Customer Group	**Customer Attributes**
Students	Pay for service, receive educational instruction (service), utilize administrative functions, and purchase auxiliary services (lodging, food, etc.).
Parents	Select (or assist in selection of) service provider, pay for service, possibly serve as primary points of contact during some service interactions.
Research Sponsors	Provide funds in exchange for information, service, or activities; often have a contractual arrangement.
State and Federal Government	Provide funds for university to engage in service, and exercise some influence over service/product design.
Society	Benefit from services provided, and pay (through taxes) for portions of the service.
Future Employers of Students	"Purchase" the end product of the service process, and sometimes provide funding and advice in service design.
Disciplinary Academic Committees	Benefit from scholarly activity of faculty members.
Accreditation Bodies	Exercise control over product/service design.
Staff/Faculty Members	Control some of the product/service design, and consume some services.

Source: From "Service Quality in Higher Education," by A. Quinn, G. Lemay, P. Larsen, P., and D. M. Johnson, 2009, *Total Quality Management*, *20*(2), p. 141.

Rowley (1997) observed that the higher education sector features a large number of stakeholders: students, their parents and families, the local community, society, the government,

the governing body, staff, local authorities, and current and potential employers. As highlighted above, an opinion on what exactly constitutes quality differs among stakeholders; therefore, identifying the main customer may serve to simplify the quality definition parameters by shifting stakeholder focus to a focal subject group. Oldfield and Baron (2000) noted that student opinions—because students are the main stakeholders in the sector—should be considered in defining education quality. It is also essential that faculty be identified as major stakeholders because they are concerned with the primary role of equipping students.

Bjørkquist (2009) observed that the change in university management that resulted in stakeholder interests emerged from the 1960s and early 1970s after the democratization of higher learning institutions in order to accommodate student opinion. Sections 2.5.1 and 2.5.2 analyze the two primary stakeholders identified in the higher education sector (faculty and students).

2.5.1 Faculty as Stakeholders

Faculty members contribute to the development of an institution by advancing research efforts and educating students on how to contribute further to the progression of their particular fields of knowledge. Faculty members are significant shareholders and appreciated as being highly pivotal in institution development because they determine ways in which knowledge is imparted to students.

The need for high-performing faculty has significantly accelerated following learning commercialization (Newton, 2002). Boyer (1997) observed that members of faculty serve four primary functions in higher learning institutions: scholarship for discovery, scholarship for integration, scholarship for application, and scholarship for teaching. He also suggested that most higher learning institutions have no definite structures to assess faculty performance. Traditional views of the professoriate in higher learning institutions as a hallmark of knowledge assimilation

and distribution to students have since been challenged, following the advent of increasing pressure to secure enrollment. Higher learning institutions seek to improve their teaching strategy in response to student requirements.

Manning (2013) observed that higher education institutions are complexly structured, and this results in the inability of external stakeholders to comprehensively understand their operations. In the study "Dimensions of Quality in Higher Education: How Academic Performance Affects University Students' Teacher Evaluations," Mustafa and Chiang (2006) pointed out that faculty members involved directly with students are required to understand and incorporate student perspectives in the learning process. Four key factors were identified as essential: teacher ability, teacher attitude, course material, and course content.

Pariseau and McDaniel (1997) noted that few quality dimensions may be common among students and faculty. The perceptions of faculty (administrative and teaching) and students overlap with regard to the quality of higher learning institutions. However, Cuthbert (1996b) pointed out that this similarity does not independently indicate a correlation that justifies the construction of a single scale addressing both faculty and student needs concerning service quality. Dužević and Časni (2015) highlighted the general notion of perceived difference in perceptions of quality between faculty and students. Faculty are primarily concerned with equipping students and ensuring that they are critical thinkers entering into society, whereas students are more focused on prospects of employment by virtue of their qualifications.

Faculty members remain major shareholders in higher learning institutions. Therefore, their needs, requirements, and mandates should be factored into the assessment of higher education quality. Faculty actions have tremendous implications on other shareholders in higher learning institutions—particularly students.

2.5.2 Students as Stakeholders

Abdullah (2006) noted that quality assessment has come to the forefront in many higher learning institutions. However, limited efforts are geared towards assessing student needs and preferences with the understanding that students are the primary customers in higher learning institutions. Yu (2008) observed that there is a need for identifying student needs to allow for better service to both current and future students.

Students may also be viewed as part of a network that places them in both consumer and producer roles. Rinehart (1993) observed that students can be regarded as consumers in two ways: as incidental customers or as customers intended to provide service to future employers. In Rinehart's second approach, quality is viewed as a measure of education provided. Knowledge acquired by students at the end of their studies should be useful and distinguishing in the job market. In support of the view that students are customers in the higher education sector, Elassy (2013) pointed out that student involvement in decision-making is essential in the bid to improve higher education.

Stakeholder satisfaction is paramount to higher learning institutions (Mahapatra & Khan, 2007). Cheng and Tam (1997) highlighted the importance of addressing strategic needs by using student satisfaction as a parameter to measure education quality. Because curricula are designed with students as the primary focus, it is important to gauge the level to which students are equipped throughout their time in higher learning institutions by inquiring about their levels of satisfaction with outlaid programs. Palli and Mamilla (2012) considered students' satisfaction as a measure of reliability and the ability of faculty and staff to render outlined services.

In addressing quality requirements by students, Gibbs (2010) pointed out that quality indicators vary among departments within the same institution. He argued that prospective

students need specific information that pertains to their desired courses rather than averaged scores that are reflective of the entire institution. This approach emphasizes the need for quality assessment approaches that reflect the needs of students, and not the needs of the entire higher education institution. Students, being the main customers of learning institutions, require well-formulated information that allows for informed decision-making. Hughey (2000) observed that quality is related to intangibles such as undergraduate advising and instructing, student service delivery systems, and personal involvement in the education process.

Darlaston-Jones et al. (2003) suggested that students are the most important stakeholders in higher learning institutions. Students' position in the education system legitimizes their claims on quality as it pertains to academic and administrative services. This view results in a definition of higher education quality that is dependent on students' opinion concerning services rendered to them in the school setup. Lee and Tai (2008) emphasized the need for methodical ways that concretely assess student perceptions of the quality of services they receive in higher learning institutions. The development of systems for carrying out quality assessment leads to the creation of standards tools, among them SERVQUAL, a multiple-item, service quality measurement instrument. However, these are often modified to suit institutions' requirements and specifications.

Chua (2004) observed that the singular focus on students necessitates analysis of dimensions from a marketing perspective, as higher learning institutions compete to secure enrollment and retain students. Pariseau and McDaniel (1997) conducted a questionnaire survey asking the same questions of both faculty and students. Their study revealed that a significant discrepancy exists between the quality perceptions of these main stakeholders, a situation that is

manifested as differences in direction of improvement, which often generates misunderstanding. Kwak and Anbari (2006) supported this difference in the perceptions of these two groups.

Barnard (1999), however, indicated that not all higher learning institutions approach student requirements as essential to the learning process. He pointed out that the traditional view in higher learning institutions resulted in default policies. Traditionally, institutions' management authorities seek to perpetuate existing operations without necessarily appreciating the students at the center of all activities. Gibbs (2010) pointed out that the 3P model—presage, process and product—is focused entirely on student requirements across the learning process.

2.6 Service Quality Models

There is an increasing trend in the service industry to incorporate positive aspects into company operations in order to attract more business. In response to this observation, Parasuraman et al. (1985) conducted a study focused on identifying dimensions of quality in service. Their study included samples of customers of retail banking, credit cards, securities brokerage, and repair shops, and they defined service quality as the ability of an organization to meet or exceed customer expectations. They identified ten determinants of service quality, as outlined in Table 2.3. By using a factor analysis, Parasuraman et al. (1988) reduced the original ten dimensions into five dimensions: reliability, responsiveness, tangibles, assurance, and empathy (Table 2.4). Three dimensions remained the same from the original ten (reliability, responsiveness, and tangibles), and the remaining seven dimensions from the original were consolidated into two (assurance and empathy).

Based on the five dimensions listed in Table 2.4, SERVQUAL, a 22-item survey instrument for measuring service quality was developed. This tool was utilized to measure the

gap between the customer's perceptions of the service experienced and the customer's expectations of the service (Parasuraman et al., 1988).

TABLE 2.3

DETERMINANTS OF SERVICE QUALITY

Dimension	Definition
Reliability	Consistency of performance and dependability. Means the firm performs the service right the first time. Means the firm honors its promises, specifically involving the following: • Billing accurately. • Keeping correct records. • Performing the service on time.
Responsiveness	Willingness or readiness of employees to provide service. Involves timeliness of service regarding the following: • Mailing a transaction slip immediately • Returning customer phone calls quickly. • Providing prompt service, e.g., setting up appointments quickly.
Competence	Possession of the required skills and knowledge to perform the service, and involves the following: • Knowledge and skill of contact personnel. • Knowledge and skill of operational support personnel. • Research capability of the organization, e.g., securities brokerage firm.
Access	Approachability and ease of contact, such as the following: • Service is easily accessible by telephone (lines are not busy and the customer is not put on hold). • Waiting time to receive service (e.g., at a bank) is not extensive. • Hours of operation are convenient. • Service facility is in a convenient location.
Courtesy	Politeness, respect, consideration, and friendliness of contact personnel (such as receptionists, telephone operators, etc.), including the following: • Consideration for consumer property (e.g., no muddy shoes on carpet) • Clean and neat appearance of public contact personnel.

TABLE 2.3 (continued)

Dimension	Definition
Communication	Keeping customers informed in language they can understand and also listening to them; possibly means that the company has to adjust its language for different consumers, i.e., increasing the level of sophistication with a well-educated customer, and speaking simply and plainly with a novice; and involves the following: • Explaining the service itself. • Explaining how much the service will cost. • Explaining the trade-offs between service and cost. • Assuring the consumer that a problem will be handled.
Credibility	Trustworthiness, believability, and honesty, and having customer's best interests at heart and ensures that these qualities are found in the following: • Company name. • Company reputation. • Personal characteristics of the contact personnel. • Degree of hard sell involved in interactions with the customer.
Security	Freedom from danger, risk, or doubt and involves the following: • Physical safety (Will I get mugged at the automatic teller machine?). • Financial security (Does the company know where my stock certificate is?). • Confidentiality (Are my dealings with the company private?).
Understanding/ Knowing the Customer	Making an effort to understand customer's needs, including the following: • Learning the customer's specific requirements. • Providing individualized attention. • Recognizing the regular customer.
Tangibles	Physical evidence of service in the following: • Physical facilities. • Appearance of personnel. • Tools or equipment used to provide the service. • Physical representations of the service, such as a plastic credit card or a bank statement. • Other customers in the service facility.

Source: Adapted from "A conceptual model of service quality and its implications for future research," by A. Parasuraman, V. A. Zeithaml, and L. L. Berry, 1985, *The Journal of Marketing*, *49*(4), p. 45.

TABLE 2.4

REDUCED FIVE DIMENSIONS OF SERVICE QUALITY (SERVQUAL)

Dimension	Definition
Tangibility	Physical evidence of facilities, equipment, and appearance of personnel.
Reliability	Ability to perform the promised service dependably and accurately.
Responsiveness	Willingness to help customers and provide prompt service.
Assurance	Knowledge and courtesy of employees, and their ability to inspire trust and confidence.
Empathy	Caring individualized attention that the firm provides to its customers.

The SERVQUAL instrument has been commonly applied in many service sectors including higher education. Although the five-dimension SERVQUAL was widely accepted as containing representative parameters necessary for service quality evaluation, various criticisms were voiced concerning the validity of the scales.

Van Dyke et al. (1997) observed that, depending on the particular quality under investigation, SERVQUAL can be modified. A lack of systematic assessment procedures in assessing higher education standards results in wide-scale alteration of SERVQUAL. This in turn brings about a multiplicity of results and implications obtained through utilization of SERVQUAL assessment tools devised independently by higher learning institutions.

Cuthbert (1996b) noted that SERVQUAL and other conceptual quality assessment tools have failed to provide homogeneous evaluation procedures. Therefore, there is a need to revisit the dimensions by looking at the original definitions and reconstructing them with reference to education quality. He elaborated further by stating that a course manager-specific, education-specific instrument should be constructed to assess quality. Carman (1990) claimed that the dimensions of the SERVQUAL model are oversimplified. Cronin and Taylor (1992) stated that

the SERVQUAL model is “inadequate” and that the expectations measured are unrelated and unclear.

Zafiropoulos and Vrana (2008) indicated in their study that many researchers have failed to apply SERVQUAL in the higher education sector for different reasons. Ruby (1998) stated that “this model may not suit all areas of education. It holds promise as a means for evaluating the quality of selected support services.” Cuthbert (1996b) did not obtain useful outcomes due to unsuitable words and negative clauses. O’Neill (2003) claimed that the SERVQUAL model in higher education may be influenced by time. Sherry et al. (2004), concluded that SERVQUAL offered useful insights and was an excellent starting point to measure education quality, but a more in-depth analysis of the areas of concern is needed.

The move towards providing education quality necessitates increased involvement of the students. The SERVQUAL quality assessment scale was designed with the aim to measure parity and discrepancy between customer perceptions and customer expectations (Parasuraman et al., 1994). Applying this concept to higher learning institutions, customer perceptions and expectations form the basis of a quality evaluation. SERVQUAL’s prevalence as a quality assessment tool indicates that efforts toward attracting and retaining students by enforcing and advertising quality practices place students’ definition of quality at the center of education improvement efforts.

Owlia and Aspinwall (1996) represented a comparison between the original dimensions proposed by Parasuraman et al. (1985) and five other service quality models. Table 2.5 represents a summary of the dimensions proposed in each model.

TABLE 2.5

RESEARCHER COMPARISONS OF DIMENSIONS OF SERVICE QUALITY MODELS

Parasuraman et al. (1985)	**Sasser et al., (1987)**	**Haywood-Farmer (1988)**	**Stewart & Walsh (1989)**	**Grönroos (1990)**	**Schvaneveldt et al. (1991)**
Reliability	Consistency		Reliability, Accuracy, Mistake-Free	Reliability, Trustworthiness	Accuracy
Responsiveness		Timeliness	Timeliness		Responsiveness
Understanding Customers		Diagnosis Advice, Guidance, Attentiveness	Understanding Users' Needs		
Access	Availability		Ease of access	Accessibility	Ease of use
Competence		Knowledge and Skill	Competence, Knowledge	Professionalism and Skill	
Courtesy	Attitude	Warmth, Neatness, and Politeness	Courtesy and Respect	Attitudes and Behavior	Emotion
Communication		Communication	Helpfulness in Contact		
Credibility		Honesty	Credibility	Reputation and Credibility	
Security	Security	Confidentiality	Security		
Tangibles	Conditions	Physical Facilities	Surroundings		Environment
	Completeness		Effective Use of Technology		Completeness
		Handling Complaints and Solving Problems	Redress	Recovery	
		Flexibility	Capacity for Choice	Flexibility	

Source: From "A framework for the dimensions of quality in higher education," by M. S. Owlia and E. M. Aspinwall, 1996, *Quality Assurance in Education*, 4(2), p. 16.

2.7 Quality Models in Higher Education

Abdullah (2006) saw the need for more encompassing tools. He pointed out that quality entails more than academic competency and includes aspects of the total service environment as

experienced by the students. He also noted the positive relationship between quality standards and such aspects as increased profitability, customer satisfaction, customer loyalty, customer retention, customer attraction, and positive word of mouth. Based on this, he proposed a scale for assessing quality known as the Higher Education Performance (HEdPERF) scale.

Quinn et al. (2009) indicated that the focus on quality improvement within higher education was initiated during the 1990s owing to increased competition among students and operational costs. Quality assessment in higher education is also essential to secure both private and public funds. This was shown through a strong positive relationship between cost and quality perceptions (Kellogg et al., 1997).

Ong and Nankervis (2012) observed that focusing on service quality is essential because it improves student advisory services, assists in building a long-term relationship between the university and its customers, and enhances its reputation over time. Cuthbert (1996b) noted that the focus on student attraction is ongoing as higher learning institutions vigorously promote their brands.

Houston and Rees (1999) identified the complexity of outlining specific measurement parameters that are useful in assessing quality in higher education. However, the need for quality parameters is appreciated as a consequence of increasing competition between higher learning institutions. Donnelly and Shiu (1999) pointed to aspects of quality that can be assessed concurrently, emphasizing the need for quality housing in a higher learning institution as a factor that is useful in assessing overall service quality.

With a focus on service rendered to students, Harvey and Green (1993) suggested that quality as related to service entails one of five classes. These are exceptional, perfection or consistency, fitness for purpose, value for money, and transformation.

Morales and Calderón-Moncloa (2008) noted that students' opinions on quality present the most pivotal definition of quality in a higher learning institution. They identified five dimensional measures of service quality in higher education: tangibility, faculty, administration, reliability, and empathy.

Cheng and Tam (1997) suggested that quality in higher learning institutions can be defined by a set of components in the input, process, and output that satisfy explicit and implicit expectations. In achieving systemization in quality assessment, they proposed seven-component model. These include goal and specification, resources, processes, satisfaction, legitimacy, absence of problems, and organizational learning.

Faganel (2010) observed that efforts to deliver quality in higher education are often focused on one specific area, such as teaching, and then the findings are projected to represent the overall quality of the institution, ignoring aspects of administrative services. He suggested that improvements in clarity, accuracy, and reliability of services offered by instructors are fundamental to the overall quality. Ling et al. (2010) focused on four main areas of education quality as perceived by students: staff responsiveness, curriculum, librarians, and the amount of recreational activities. They determined eight dimensions that significantly impact students' perceptions of service quality" reputation, contact personnel, staff responsiveness, curriculum, quality of librarians, access to facilities, activities, and cost of courses.

LeBlanc and Nguyen (1997) examined the service quality in higher education and proposed seven dimensions: reputation, administrative personnel, faculty, curriculum, responsiveness, physical evidence, and access to facilities. Owlia and Aspinwall (1996) proposed a framework for defining quality in higher education based on the six dimensions, as shown in Table 2.6.

TABLE 2.6

DEFINITIONS OF QUALITY IN HIGHER EDUCATION

Dimension	Definition
Tangibles	Sufficient equipment/facilities. Modern equipment/facilities. Ease of access. Visually appealing environment. Support services (accommodation, sports, etc.).
Competence	Sufficient (academic) staff. Theoretical knowledge, qualifications. Practical knowledge. Up-to-date teaching expertise, communication.
Attitude	Understanding students' needs. Exhibiting willingness to help. Being available for guidance and advice. Giving personal attention. Showing emotion, courtesy.
Content	Relevance of curriculum to future jobs of students. Effectiveness. Containing primary knowledge/skills. Completeness, use of computer. Communication skills and team working. Flexibility of knowledge, being cross-disciplinary.
Delivery	Effective presentation. Sequencing, timeliness. Consistency. Fairness of examinations. Feedback from students, encouraging students.
Reliability	Trustworthiness. Giving valid award. Keeping promises, matched to goals. Handling complaints, solving problems.

Source: From "A framework for the dimensions of quality in higher education," by M. S. Owlia and E. M. Aspinwall, 1996, *Quality Assurance in Education*, 4(2), p. 19.

Although this study focused specifically on the higher education sector, the six quality aspects presented are viewed from the standpoint of students being the primary customers of the sector. The study proposed a unidirectional approach towards assessing quality with faculty included only to the extent by which they contribute to the students' learning.

Mahapatra and Khan (2007) proposed an EduQUAL instrument for measuring the critical factors of students' perceived service quality by using learning outcomes. Definitions of each are shown in Table 2.7.

TABLE 2.7

EduQUAL DIMENSIONS IN HIGHER EDUCATION

Dimensions	**Definition**
Learning Outcomes	Ability to provide the promised service dependably and accurately
Responsiveness	Willingness to help customers and provide prompt service
Physical Facilities	Physical facilities, equipment, personnel and communication material
Personality Development	Overall development of students' personality, enhancement of knowledge
Academics	Expert faculties, individualized attention to the customer

Annamdevula and Bellamkonda (2012) developed a measurement scale to evaluate the quality of service in higher education, known as the Higher Education Service Quality (HiEdQUAL) scale. Their study considered only students as the main customers in the sector. This scale has 27 items containing five dimensions including teaching and course content, administrative services, academic facilities, campus infrastructure, and support services.

Chua (2004) proposed addressing quality requirements in higher learning institutions from a marketing point of view. He divided the service rendering process into three stages; input, process, and output. Input entails such factors as selection criteria as defined by higher education entry requirements. Process involves the actual teaching and learning activities administered by faculty to students. Output involves such factors as access to high-paying jobs, placement, and academic performance. Where students view the process and output stages as most pivotal, faculty members tend to focus on the input and process stages. The difference in the perception

of the importance of these stages results in different quality definitions from the two stakeholders.

CHAPTER 3

RESEARCH OBJECTIVES AND QUESTIONS

This chapter presents the findings and their relevance to the literature regarding the quality dimensions in higher education and the defined research gap and objectives. In Chapter 2 on the literature review, service quality refers to value as well as impact on profitability (Buzzell & Gale, 1987), customer satisfaction (Bolton & Drew, 1991), and customer retention (Reichheld & Sasser, 1990). The pioneering work of Parasuraman et al. (1985) has motivated researchers to measure quality as the difference between expectations and perceptions. However, the original work reported by Parasuraman et al. (1985) was focused on customers of retail banks, credit card institutions, securities brokerages, and repair shops. Customers of higher education were not included in their study. When compared to other service quality models, the list of dimensions by Parasuraman et al. (1985) appears to be the most inclusive. However, in a subsequent study, Parasuraman et al. (1988) reduced the total number of dimensions to five, thus forming a foundation for the SERVQUAL instrument.

Few researchers have adopted these dimensions in the higher education sector without examining their suitability. As shown in Table 3.1, some researchers have tried to apply these revised dimensions to higher education without success.

Morales and Calderón-Moncloa (2008) identified five dimensions of service quality in higher education: reliability, empathy, faculty, administration, and tangibility. To identify these dimensions they conducted a principal components analysis (PCA) on collected questionnaire data from 559 executive students by devolving the scale based on the five dimensions of SERVQUAL.

TABLE 3.1

RESEARCHER COMPARISONS OF SERVICE QUALITY IN HIGHER EDUCATION

Annamdevula & Bellamkonda (2012)	**Morales & Calderón-Moncloa (2008)**	**Mahapatra & Khan (2007)**	**Abdullah (2006)**	**LeBlanc & Nguyen (1997)**	**Owlia & Aspinwall (1996)**
	Reliability	Learning Outcomes	Non-academic aspects	Reputation	Reliability
Support services	Empathy	Responsiveness	Understating	Responsiveness	Attitude
	Faculty	Personality Development	Reputation	Faculty	Competence
Teaching course content		Academics	Academic aspects	Curriculum	Content
Administrative services	Administration		Programmed issues	Administrative personnel	Delivery
Campus infrastructure	Tangibility		Access	Physical evidence	Tangibles
Academic facilities				Access to facilities	

Mahapatra and Khan (2007) conducted a questionnaire survey based on the SERVQUAL instrument. Data were collected from students, alumni, parents of students, and recruiters of different institutions. Responses from 1,024 participants followed by the PCA resulted in the development of the EduQUAL instrument, which included the following dimensions: learning outcomes, responsiveness, personality development, and academics.

Annamdevula and Bellamkonda (2012) developed the HiEdQUAL instrument for measuring service quality in the higher education sector based on SERVQUAL. Their study featured five focus groups and expert opinion groups, including senior students. Factor analysis was utilized in identifying five dimensions: teaching and course content, administrative services, academic facilities, campus infrastructure, and support services.

LeBlanc and Nguyen (1997) defined seven dimensions of quality: reputation, responsiveness, faculty, curriculum, administrative personnel, physical evidence, and access to

facilities. From the original SERVQUAL dimensions, a questionnaire containing 38 variables was generated. They utilized PCA to analyze the responses of 388 students.

Abdullah (2006) developed six dimensions: non-academic aspects, understating, reputation, academic aspects, programmed issues, and access. The study used three focus-group interviews to create items for a questionnaire to which 409 students responded. The factor analysis method was used to identify the dimensions of service quality in higher education.

Owlia and Aspinwall (1996) defined six dimensions: reliability, attitude, competence, content, delivery, and tangibles. Their study grouped a total of 30 elements (called "quality characteristics") from the literature based on the similarities of dimensions across different sectors.

3.1 Research Gap

Previous research work has caused more disagreement in the higher education sector than in other service industry sectors, thus indicating the need for more studies on the dimensions of quality in higher education, given its importance and dynamic nature. The research in this dissertation aimed at objectively identifying these dimensions based on pertinent publications over the last ten years.

3.2 Research Objectives

The quality model proposed by Parasuraman et al. (1985) has been successfully implemented by many service industries. However, it has not been used successfully in assessing quality in higher education. The research here aims to examine the viability of the service quality model in higher education and account for all stakeholder perspectives, including those of top administration. In other words, this research seeks to provide objective answers to the following two questions:

- What set of dimensions can be utilized to describe quality in higher education from the perspective of academicians?
- Can the same set of dimensions be used to describe quality from the viewpoint of top administrators in higher education?

The research was motivated by similar work of Parasuraman et al. (1988), which helped identify the dimensions of service quality. It also draws inspiration from the work of Usrey and Dooley (1996), which outlined the dimensions of software quality. Research efforts are based on the idea that a clear understanding of the dimensions of quality in such a crucial sector would be beneficial to researchers, administrators, and policy makers. Such a list of dimensions would help stakeholders understand the nature of quality and increase the effectiveness of improvement efforts. From a research standpoint, this list would support efforts to model changing economics, demographics, and geographic factors on perceptions of quality. Most important, it could help capture trends in the relative importance of these dimensions over time.

CHAPTER 4

RESEARCH METHODOLOGY

This chapter describes the methodology and research techniques used to answer two research questions: (1) What set of dimensions can be utilized to describe quality in higher education from the perspective of academicians? and (2) Can the same set of dimensions be used to describe quality from the viewpoint of top administrators in higher education?

This analysis involved a collection of journal articles representing research on quality in the higher education sector and several letters from presidents of top ranked universities in the U.S. representing the quality perspectives from top administrators. This research employed the Computer-Aided Text Analysis technique, which was chosen for its ability to analyze the textual content of a large sample of data. As Berelson (1952) pointed out, content analysis is utilized in research for systematic, objective, and quantitative description of the manifest communication content. As noted by Holsti (1968), content analysis is inherently broad and yields reliable results.

All research methods and steps are explained in the following sections, and an overview is shown in Figure 4.1.

4.1 Initial Constructs

The first step in this research utilizes the results of the literature review discussed in Chapter 2, which identifies ten dimensions of service quality and three dimensions from Garvin (1984). These thirteen dimensions (constructs) are listed in Table 4.1 and represent the starting set of constructs. The definition for each construct, as proposed by Parasuraman et al. (1985), refers to “stakeholder” rather than “customer,” as used in the original work. In addition, definitions of the constructs in Table 2.1 proposed by Garvin (1984)—“performance,”

"features," and "conformance"—were modified using the term "institution" in place of "corporation and/or product."

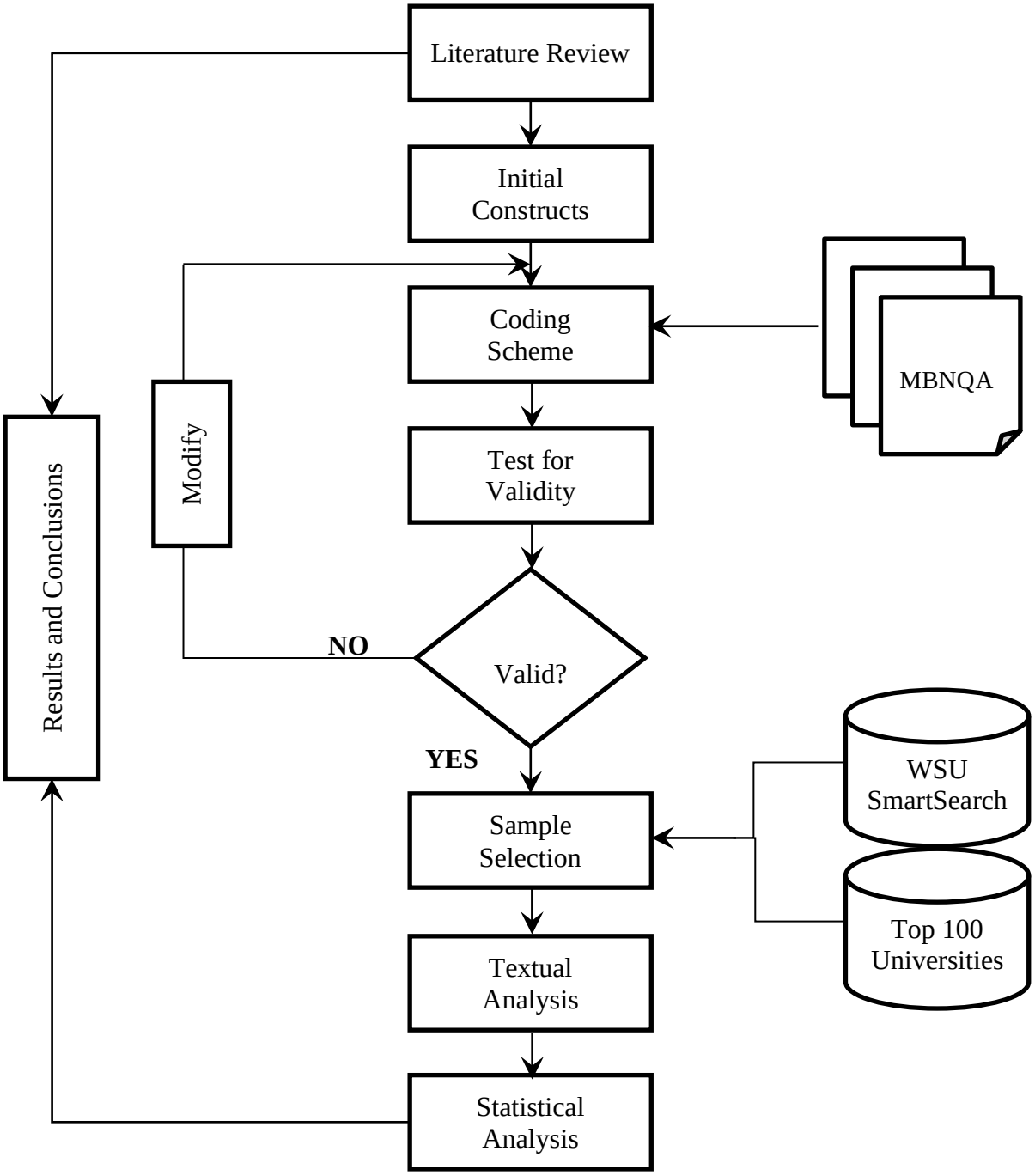

Figure 4.1: Research methodology

TABLE 4.1

DETERMINANTS OF SERVICE QUALITY IN HIGHER EDUCATION

Construct	Determinant
Reliability	Consistency of performance and dependability; means performing the service right the first time and that the institution honors its promises.
Responsiveness	Willingness and readiness of faculty and staff to provide service.
Competence	Possession of required skills and knowledge to perform the service.
Access	Approachability and ease of contact.
Courtesy	Politeness, respect, consideration, and friendliness of contact personal.
Communication	Keeping stakeholders informed and listening to them.
Credibility	Trustworthiness, believability, and honesty.
Security	Freedom from danger, risk, or doubt.
Understanding	Making an effort to understand stakeholders' needs.
Tangibles	Physical evidence of service.
Performance	Primary operating functions of the institution.
Conformance	Extent to which the institution meets pre-established standards (both internal and external).
Features	Supplemental characteristics offered by the institution.

4.2 Coding Scheme

In the second step of this research, a list of words (codes) for each construct was created, based on the summary of applications of three winners of the Malcolm Baldrige National Quality Award in higher education: University of Wisconsin-Stout in 2001, Kenneth W. Monfort College of Business in 2004, and Richland College in 2005. A deductive procedure, as recommended by Short et al. (2009), was followed to enhance content validity, or assessment of measures by experts to determine whether the measures are appropriate for the study. Validation of the list of codes is typically performed with the help of experts in the field in which the study takes place. By using QSR International's NVivo 10 software (2014), a list of the most frequent words used by MBNQA winners was generated. This list of codes was sorted by two higher education

experts under each of the thirteen constructs selected; the list also included codes from the definition of the constructs and recommendations from the experts. A special survey was designed and used to validate the codes list, as shown in (Appendix A). This survey was completed by five members of the committee as content experts.

Lawshe's method (1975) refers to a technique used for measuring content validity by relying on experts and their feedback. When put into a formula, this technique reads as

$$CVR = (ne – N/2)/ (N/2)$$

where CVR refers to the content validity ratio, ne refers to the number of panel members who rate an item as "agree," and N is the total number of panel members who participated in the survey. Lawshe (1975) recommended a threshold of 0.99, in order to reject or accept each code. The method was applied to the survey to determine the codes for each construct.

In order to avoid bias among the selected constructs, the total number of codes for each construct was unified to six codes. The only constructs that exceeded the unified number were those codes selected based on the frequency of occurrence in the three winners of MBNQA applications. The final list of codes used to perform a CATA is shown in Table 4.2.

TABLE 4.2

LIST OF CODES

Construct	Code	Construct	Code
Reliability	Accuracy Completeness Confidence Consistency Stability	Security	Assurance Confidentiality Protection Safeguard Safety
Responsiveness	Flexibility Diversity Readiness Willingness Preparedness	Understanding	Accept Assist Appreciate Cooperate Recognize
Competence	Capability Experience Knowledge Skill Qualification	Tangibles	Centers Classrooms Facilities Laboratories Libraries Equipment
Access	Advising Affordability Approachability Availability Capacity	Performance	Developing Evaluating Improving Measuring Training
Courtesy	Accommodating Consideration Friendliness Politeness Respect	Conformance	Accredit Achieve Review Satisfy Update
Communication	Contact Inform Interact Listen Participate	Features	Curricula Degree Offerings Opportunities Program
Credibility	Believability Ethical Honesty Integrity Trustworthiness		

4.3 Perception of Quality from Academicians' Perception

This search involved an academic search engine (SmartSearch) that restricted the findings to peer-reviewed journal articles. The search of publications was limited to those articles between 2005 and 2014 with titles containing the word "service quality" combined with the words "higher education," "university," or "college" with full text in English language and a searchable pdf file text. The search resulted in 4,059 publications.

Due to the large number of publications, a random sampling technique was used to select a representative sample. The sample size was determined based on the final count of validated codes (six codes), the limiting margin of error of 0.025, and the desired level of confidence of 0.95. Such a technique was recommended by Bartlett et al. (2001) who recommended following Cochran's (1977) formula:

$$\hat{P} = \frac{1}{13 * 6} = 0.012$$

$$\hat{P} \pm Z_{\alpha/2}\sqrt{\frac{\hat{P}_o\left(1-\hat{P}\right)}{\mathrm{n}}}$$

$$n_1 = \left(\frac{1.96}{0.025}\right)^2 (0.012)(0.988) \approx 73$$

The sample was selected from the list of publications at random without replacement and used as the foundation for textual analysis. No attempt was made to eliminate any publications based on country, institute, or journal issue, as listed in Appendix B.

Computer-Aided Text Analysis refers to the use of computer applications to analyze wording used in passages and surveys. It is useful for coding, analyzing, and interpreting text. This type of analysis allows researchers to take advantage of automated processes in making guided conclusions based on textual contents of publications. It also saves time and improves

accuracy. The procedures recommended by Short et al., (2009) for conducting CATA were followed to ensure accuracy. These procedures can be applied to a large set of data and still maintain high reliability (Duriau et al., 2007). The full texts of the selected publication samples were analyzed using the NVivo 10 software, whereby eEach sample was imported into the software to determine the occurrence frequency of each construct within the sample, as shown in Figure 4. 2.

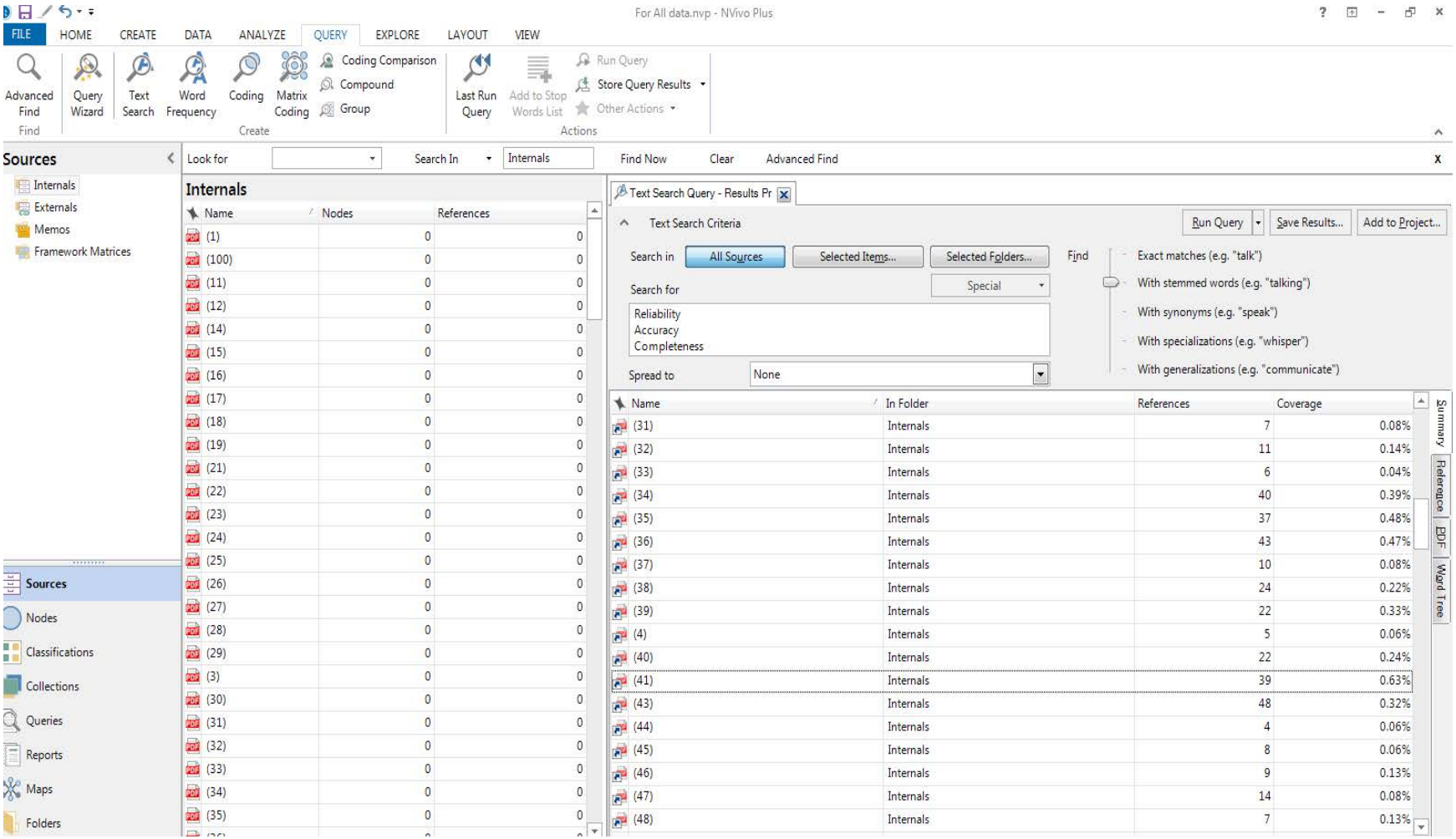

Figure 4.2: NVivo text search query

Results from the NVivo software were exported as an Excel file, and statistical analysis was applied. According to Fodor (2002), principal components analysis is a statistical "multivariate technique" that can be used to reduce a set of variables into a number of uncorrelated variables called principal components (PCs). The method used to select the component is the Kaiser-Guttman rule, which is the most widely used stopping rule in PCA. The rule's condition is that components associated with eigenvalues greater than 1 should be considered PCs (Kaiser, 1960).

The statistical software package Stratographics® Centurion XVI 2009 was used to analyze the occurrence results for each construct in the publications. Considering the fact that the publications selected tallying vectors as rows and constructs as columns, a 100 × 13 contingency table was created. A chi-square test was applied to test the null hypothesis that the two classifications were independent. The test resulted in a P-value < 0.0001 (less than 0.05). The null hypothesis was rejected at the 95% significant level, as shown in Table 4.3.

TABLE 4.3

TESTS OF INDEPENDENCE—ACADEMICIANS

Test	**Statistic**	**Df**	**P-Value**
Chi-Square	9519.974	1188	0.0001

Applying the Kaiser-Guttman rule, four PCs were identified as shown in the scree plot in Figure 4.3. The first PC contributes 27.4% of variance coverage. The first and second PCs describe a large proportion of the variance, as shown in Table 4.4. The four components selected account for 59.7%.

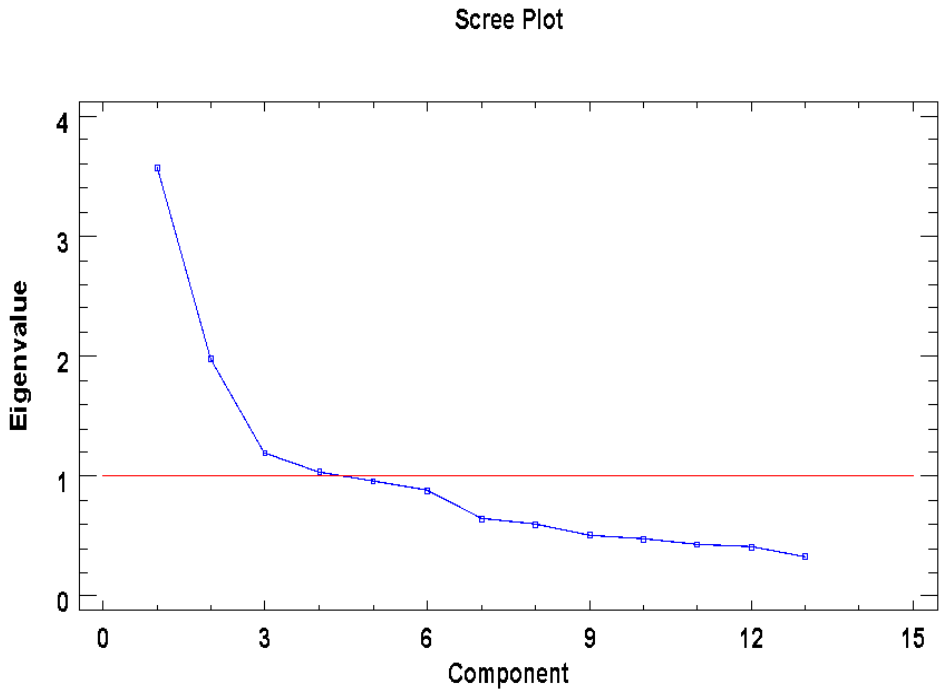

Figure 4.3. Scree plot—academicians

TABLE 4.4

PRINCIPAL COMPONENTS ANALYSIS—ACADEMICIANS

Component Number	Eigenvalue	Percent of Variance	Cumulative Percentage
1	3.57169	27.475	27.475
2	1.98315	15.255	42.729
3	1.18746	9.134	51.864
4	**1.03122**	**7.932**	**59.796**
5	0.957133	7.363	67.159
6	0.883381	6.795	73.954
7	0.639645	4.920	78.874
8	0.597731	4.598	83.472
9	0.50535	3.887	87.360
10	0.473442	3.642	91.002
11	0.430271	3.310	94.311
12	0.40841	3.142	97.453
13	0.331123	2.547	100.000

From the academicians' perspective, the most frequently found quality dimensions were the following: "Understanding," "Reliability," "Features," "Credibility," and "Security." Table 4.5 shows the weight dimensions of each component. According to Swan and Sandilands (1995) and Legendre and Legendre (2012), positive weights indicate that the dimensions and principal components are positively correlated, negative weights show the reverse (negative correlation), and both weights (positive or negative) indicate that the dimension has a strong effect on the PC.

TABLE 4.5

COMPONENT WEIGHTS—ACADEMICIANS

Constructs	**Component 1**	**Component 2**	**Component 3**	**Component 4**
Reliability	0.0364715	**0.570177**	-0.130379	0.11891
Responsiveness	0.151733	**0.499236**	0.122728	0.26826
Competence	**0.324454**	-0.231698	0.0945633	-0.0139477
Access	0.326966	-0.164233	0.0545721	**-0.467786**
Courtesy	**0.309638**	0.138663	0.176256	-0.143996
Communication	**0.358784**	-0.164522	-0.216915	0.133548
Credibility	0.347997	-0.1208	**-0.487288**	0.0552805
Security	0.117848	**0.475731**	-0.220293	-0.222602
Understanding	0.241088	-0.15394	0.118219	**0.600559**
Tangibles	0.248178	0.136219	**0.418931**	-0.400973
Performance	0.332064	0.00401684	**-0.346728**	-0.114818
Conformance	**0.276626**	0.124456	-0.0882468	0.152113
Features	0.312048	0.00621789	**0.523865**	0.214313

The large weights for each dimension related to the components in Table 4.5 were compared with those in Table 4.6, which lists the dimensions that made a significant contribution to each principal component. Principal component 1 (PC 1) includes

"Conformance," "Courtesy," "Competence," and "Communication." Principal component 2 (PC 1) includes "Reliability," "Responsiveness," and "Security." Principal component 3 (PC 3) includes "Features," "Credibility," "Tangibles" and "Performance." Principal component 4 (PC4) includes "Understanding," and "Access."

TABLE 4.6

DIMENSIONS RELATIVE TO PRINCIPAL COMPONENTS—ACADEMICIANS

PC 1	**PC 2**	**PC 3**	**PC 4**
Communication	Reliability	Features	Understanding
Competence	Responsiveness	Credibility	Access
Courtesy	Security	Tangibles	
Conformance		Performance	

4.4 Perception of Quality from Top Administrators' Perspective

Similar procedures were also followed to analyze administrator perspectives. The sample used in this research was selected from letters from presidents from the top-ranked universities in the U.S., as proposed in 2015 by *U.S. News and World Report Education* and shown in Appendix C. From this list, presidents' letters were downloaded from their university websites. Results of the PC analysis compared the perceptions of quality from the viewpoints of these top administrators in higher education.

Based on the perspectives of top administrators, a 100 × 13 contingency table was also created. Rows represent the presidents' letters and columns represent the constructs. A chi-square test was applied to test that the null hypotheses of the two classifications are independent. The test resulted in a P-value < 0.0001, and the null hypotheses were rejected at the 95% significant level, as shown in Table 4.7.

TABLE 4.7

TESTS OF INDEPENDENCE—ADMINISTRATORS

Test	Statistic	Df	P-Value
Chi-Square	1808.019	1188	0.0001

The principal components analysis was applied to the administrators' sample as well. From Figure 4.4, it appears that four components could be used to describe quality from the viewpoints of the top administrators. The first components seem to have more eigenvalue than the other components and could be the most important. Table 4.8 shows that the first principal component contributes 43.1% of the total variance, the second PC 11.9 %, the third 9.8%, and the fourth PC 7.8%.

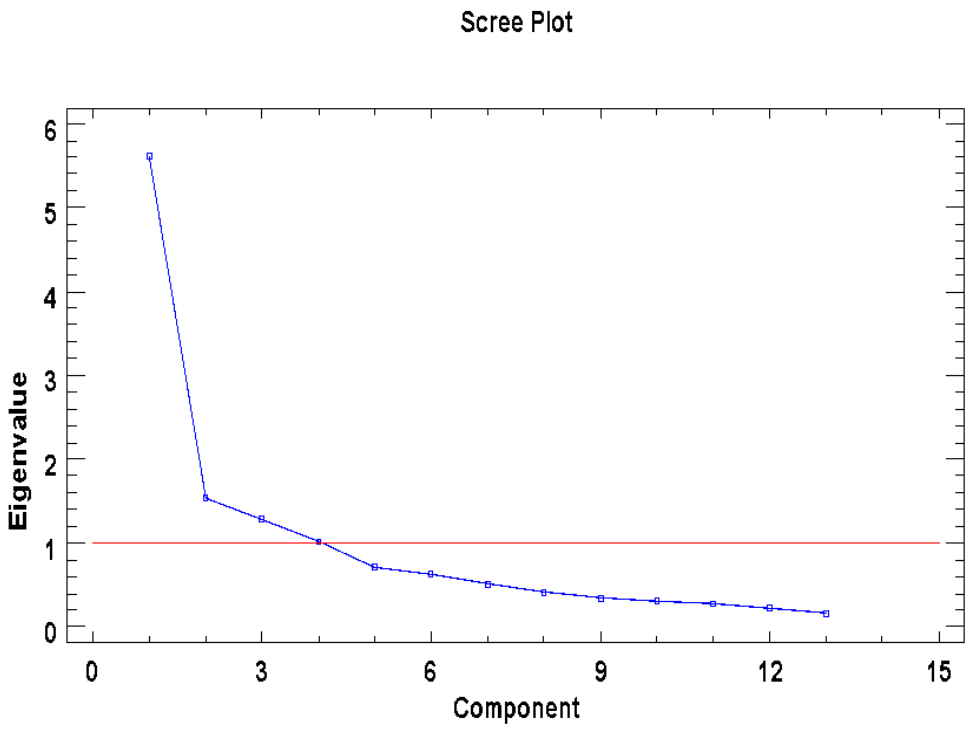

Figure 4.4. Scree plot—administrators

TABLE 4.8

PRINCIPAL COMPONENTS ANALYSIS—ADMINISTRATORS

Component Number	Eigenvalue	Percent of Variance	Cumulative Percentage
1	5.61316	43.178	43.178
2	1.54205	11.862	55.040
3	1.28315	9.870	64.910
4	**1.01554**	**7.812**	**72.722**
5	0.704163	5.417	78.139
6	0.626856	4.822	82.961
7	0.503094	3.870	86.831
8	0.409285	3.148	89.979
9	0.338769	2.606	92.585
10	0.305424	2.349	94.935
11	0.271826	2.091	97.026
12	0.228274	1.756	98.782
13	0.158405	1.218	100.000

From Table 4.9, it can be seen that the dimensions appearing most frequently for administrators were “Courtesy,” “Credibility,” “Competence,” “Responsiveness,” and “Security.”

TABLE 4.9

COMPONENT WEIGHTS—ADMINISTRATORS

Constructs	Component 1	Component 2	Component 3	Component 4
Reliability	0.260864	-0.0268606	**-0.266317**	-0.0684558
Responsiveness	0.229578	**0.507153**	0.275682	-0.026998
Competence	0.219368	-0.0912024	0.390875	**0.513426**
Access	**0.326378**	-0.0687589	-0.166728	-0.00452369

TABLE 4.9 (continued)

Constructs	Component 1	Component 2	Component 3	Component 4
Courtesy	0.173385	**0.596864**	0.194777	0.073251
Communication	**0.344548**	0.249459	-0.102271	-0.153678
Credibility	0.208005	-0.164936	0.437692	**-0.517424**
Security	0.239285	0.201616	**-0.452053**	-0.23706
Understanding	**0.332557**	-0.169381	0.247567	-0.145742
Tangibles	0.276368	-0.211273	-0.257226	**0.279873**
Performance	**0.342797**	0.00624929	-0.262416	0.173204
Conformance	0.261955	**-0.360795**	0.0820319	-0.336808
Features	0.319682	-0.197891	0.158506	**0.36748**

Table 4.10 lists dimensions that made a significant contribution to each component. PC1 consists of “Communication,” “Performance,” “Understanding,” and “Access.” PC2 includes “Courtesy,” “Responsiveness,” and “Conformance.” PC3 includes “Security,” and “Reliability.” PC4 includes “Credibility,” “Competence,” “Features,” and “Tangibles.” Of all the dimensions, “Communication” reflected the most similarity among perspectives of academicians and top administrators, and made the highest weight in the first principal component.

TABLE 4.10

DIMENSIONS RELATIVE TO PRINCIPAL COMPONENTS—ADMINISTRATORS

PC 1	PC 2	PC 3	PC 4
Communication	Courtesy	Security	Credibility
Performance	Responsiveness	Reliability	Competence
Understanding	Conformance		Features
Access			Tangibles

CHAPTER 5

SUMMARY, CONCLUSIONS, AND FUTURE RESEARCH

This chapter summarizes the research efforts of this dissertation, provides some concluding remarks, discusses the answers to both research questions, and cites areas where continuous research effort is needed.

5.1 Summary and Conclusions

This research was aimed at providing objective answers to two questions. The first question involves identifying a set of dimensions that can be used to describe quality from the perspective of academicians. The second involves examining the dimensions of quality from the perspective of top university administrators, as reflected in letters from university presidents. In answering both questions, thirteen dimensions of quality were identified from the literature. Appropriate codes (symbols) were selected and validated by a panel of experts. The final list included six codes used to represent each dimension.

To seek answers to the first question, a random sample of 100 was selected from a pool of 4,056 peer-reviewed publications pertaining to quality in higher education. This sample was used to capture perceptions of quality from the viewpoint of academicians. These publications formed the unit of analysis. The frequency of occurrence of each dimension (and its codes) was determined using NVivo 10 qualitative data analysis software. Results were summarized in a 100 × 13 matrix and input for principal component analysis using Statgraphics® software. Results indicated that the top four principal components explain about 60% of the total variability in the data. For convenience, these are represented in Table 5.1.

TABLE 5.1

ACADEMICIANS' PERSPECTIVE OF QUALITY IN HIGHER EDUCATION

PC 1	**PC 2**	**PC 3**	**PC 4**
Communication	Security	Tangibles	Understanding
Courtesy	Responsiveness	Features	Access
Competence	Reliability	Performance	
Conformance		Credibility	

As can be seen, all thirteen dimensions have been used to describe perceptions of quality from academicians' perspective. Communication, courtesy, competence, and conformance appear to have the highest contributions to the first principal component (27.5% of total variability). This component appears to correlate with both functional and technical aspects. Functional aspects such as communication and courtesy refer to interactions between members of the institution (faculty and staff) and stakeholders. These are often perceived subjectively and have been represented by Owlia and Aspinwall (1996) under the "delivery" dimension. On the other hand, technical aspects such as conformance and competence relate to offerings (program or course design) and can typically be measured objectively. These results suggest a dimension of "academic aspects," as defined by Abdullah's (2006), or "academics," as defined by Mahapatra and Khan (2007). In addition, the dimension appears to be consistent with "teaching and course content" defined by Annamdevula and Bellamkonda (2012). These results support the validity of the proposed dimension.

It is worth noting here that none of the five dimensions considered by Parasuraman et al., (1988) and included in the SERVQUAL tool are included in the first principal component. This may explain why many research studies have failed to apply SERVQUAL in the higher education sector. Examples include Zafiropoulos and Vrana (2008), Van Dyke et al., (1997),

Cuthbert (1996b), Carman (1990), and Cronin and Taylor (1992). Results can also be used to explain the relative success reported with applications of the HiEdQUAL, and HEdPERF instruments. Both appear to include aspects from the first PC in their models.

The second principal component includes security, responsiveness, and reliability, suggesting a dimension of "Safety" because they all deal with perceptions of quality following exposure to risk and emergencies. They reflect the institution's ability to maintain a secure environment, protect records, and contain risks at all times. This dimension of "Safety" was acknowledged in the original ten dimensions proposed by Parasuraman et al., (1985), and considered to be an element of the "Administrative Services" dimension by Annamdevula and Bellamkonda (2012). This is not surprising given the importance of safety and its impact on the perceptions of quality by a majority of the stakeholders.

Tangibles, features, performance, and credibility are elements of the third principal component. These reflect a dimension of "evidence" as they deal with campus infrastructure, support services, and their strong correlation with performance and credibility.

Both understanding and access are elements of the fourth principal component, which represents the ability of the institution to provide individualized attention and care to its stakeholders. These were included as two separate dimensions by Abdullah (2006) in designing the HEdPERF tool, and they reflect the dimension of "empathy" as reported by Parasuraman et al. (1988).

In answering the second research question, letters from presidents of the top 100 universities were selected from the national rankings published in 2015 by *U.S. News and World Report Education* (2016). Copies of these letters were obtained from university websites and used as surrogates to capture top administrators' perceptions of quality. Procedures similar to

those observed in the previous answer were followed in this analysis as well, and the results indicated that the top four principal components contribute about 72% of the total variability. These results are represented in Table 5.2.

TABLE 5.2

TOP ADMINISTRATORS' PERSPECTIVE OF QUALITY IN HIGHER EDUCATION

PC 1	**PC 2**	**PC 3**	**PC 4**
Communication	Courtesy	Security	Credibility
Understanding	Responsiveness	Reliability	Competence
Access	Conformance		Features
Performance			Tangibles

Once again, all thirteen dimensions are included in the four principal components. However, the first PC accounts for 43% of variability and includes functional aspects that relate to interactions between the institution and its stakeholders. Communication, understanding, access, and performance are often perceived subjectively. These were classified by Nelson (1974) as experience properties that can only be assessed after or during service. This suggests a dimension of "empathy and performance" because they mostly deal with "support services" as defined by Annamdevula and Bellamkonda (2012). In this research, communication appears to correlate more with understanding and access within the context of empathy.

The second principle component as shown in Table 5.2, suggests a dimension of "attitude" since it includes behavioral aspects such as courtesy, responsiveness and conformance. These are also functional aspects, often perceived subjectively, and can only be evaluated during or after interaction. This is supported by Owlia and Aspinwall (1996).

Security and reliability are included in the third principal component, which accounts for almost 10% of the variability. These can be considered aspects of safety as they relate to campus environment and the ability to protect individuals, properties and data over time.

The fourth component includes aspects of competence, credibility, features and tangibles, accounting for 8% of variability. These are mostly image-related aspects that correlate with the "reputation" of the institution as perceived by the stakeholders. Such analysis is supported by LeBlanc and Nguyen (1997). The above aspects include a combination of both experience and search properties as defined by Nelson (1974). Search properties involve technical aspects that can be evaluated without interaction such as tangible and features, whereas, competence and credibility represent functional aspects. They are typically perceived subjectively after or during interactions.

In conclusion, this research has indicated that all thirteen dimensions identified are needed for a better description of quality in higher education. It also suggests some meta-dimensions of quality in higher education: academic aspects, safety, evidence, and empathy (from the perspective of academicians); and empathy, attitude, safety, and reputation (from the perspective of top administrators). These results highlight similarities and differences. It appears that both perspectives include safety and empathy as meta-dimensions. Safety was emphasized more than empathy by academicians, whereas top administrators appear to place more emphasis on empathy than safety.

Looking at differences, the analysis indicated that the publication sample's placed the highest weight on academic aspects (first principal component). This may indicate that academicians tend to form their perceptions of quality based on technical (design and delivery)

aspects. As such, they appear to be focused on processes (teaching and learning) and conformance to standards.

In contrast, top administrators appear to form their perceptions based on experience aspects. Both empathy and attitude (first and second principal components) are dominated by aspects that relate to interactions with stakeholders. Performance is used within the context of efficiency (utilization of funds and/or potentials for graduates). Functional aspects appear to dominate their perceptions of quality.

Finally, the author concurs with Usrey and Dooley (1996) that content analysis is a useful technique for theory construction and validation. Given the availability of computer-assisted text analysis software, a larger number of researchers would enjoy its benefits.

5.2 Future Research

The quality dimensions identified in this research describe quality in higher education based on selected samples. It is expected that different samples would provide different results, just as much as different stakeholders would have different perceptions about quality. Time is also a factor in defining the aspects of quality. Such variability requires further investigation as suggested in the following:

- Stability of dimensions: This research provided a static picture of current perceptions of quality in higher education. As expectations change over time, perceptions of quality are expected to follow. Repeated research efforts over appropriate periods of time would help detect changes and trends in the perceptions of quality in higher education. Given the volume of the work published, this research may be repeated every five years.
- Perceptions of other stakeholders (students, government, and employers): It is expected that different stakeholders would have different perceptions of quality. One of the

distinguishing features of higher education is the number and diversity of its stakeholders. This research focused on perceptions of quality from the viewpoints of academicians and top administrators. Future research efforts could target perceptions of students and employers as stakeholders. Similar research using online reviews and job announcements as units of analysis would also be beneficial. Such efforts would be facilitated by the growing number of social media users and the availability of data mining techniques.

- Correlates of perceptions (economic, cultural and demographic effects): In the current research, no attempt was made to stratify the data based on economic, geographic, or demographic factors. For example, samples of letters from presidents from the top 100 universities were analyzed without consideration of the funding source. Stratification of the sample data into public and private funding may help quantify the effect of this economic factor on the perception of quality. In addition, future research may stratify universities based on their geographic location to help quantify cultural impacts. Similarly, forthcoming research could stratify publications according to various factors and quantify their impact on perceptions.

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APPENDICES

APPENDIX A

CONTENT VALIDATION SURVEY

Dear Participant,

The Department of Industrial and Manufacturing Engineering at Wichita State University is conducting research on the dimensions of quality in higher education. You have been selected to participate in a survey, which is an integral part of this ongoing research.

The purpose of this survey is to identify key words (symbols) used to describe dimensions of quality in higher education. The construct dimensionality was established based on the ten determinates of service quality originally proposed by Parasuraman, Zeithaml, and Berry (1985). These include the following: reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding, and tangibles. The definition for each is included with the term "stakeholder" instead of "customer" used in the original work.

In addition, three of the eight dimensions of product quality defined by Garvin (1984) are included. These are performance, conformance, and features. Definitions of these dimensions have been modified by using the term "institution" in place of word "corporation and/or product."

We appreciate your help in validating the attached list as a **content expert**. Please check the appropriate box indicating your recommendation to either agree or disagree for each word as a symbol of the construct as defined.

Thank you and please feel free to contact me if you have any question.

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(1) RELIABILITY:

Reliability involves consistency of performance and dependability.

Symbol	Agree	Disagree
Accuracy		
Completeness		
Confidence		
Consistency		
Correctness		
Dependability		
Soundness		
Stability		
Trueness		

(2) <u>RESPONSIVENESS</u>:

Responsiveness concerns willingness and readiness to provide service.

Symbol	Agree	Disagree
Agility		
Diversity		
Flexibility		
Openness		
Preparedness		
Readiness		
Sensitivity		
Willingness		

(3) <u>COMPETENCE</u>:

Competence means possession of the required skills and knowledge to perform the service.

Symbol	Agree	Disagree
Ability		
Capability		
Experience		
Intellect		
Knowledge		
Proficiency		
Qualification		
Skill		

(4) <u>ACCESS</u>:

Access involves approachability and ease of contact.

Symbol	Agree	Disagree
Admission		
Advising		
Affordability		
Approachability		
Availability		
Capacity		
Convenience		
Counseling		
Enrollment		

(5) <u>COURTESY</u>:

Courtesy involves politeness, respect, consideration, and friendliness.

Symbol	Agree	Disagree
Accommodating		
Compassion		
Consideration		
Empathy		
Friendliness		
Kindness		
Mindfulness		
Politeness		
Respect		
Support		
Sympathy		

(6) COMMUNICATION:

Communication means keeping stakeholders informed and listening to them.

Symbol	Agree	Disagree
Connect		
Consult		
Contact		
Convers		
Convey		
Correspond		
Exchange		
Inform		
Interact		
Listen		
Participate		
Post		
Publish		

(7) <u>CREDIBILITY</u>:

Credibility involves trustworthiness, believability and honesty.

Symbol	Agree	Disagree
Authority		
Believability		
Convincing		
Ethical		
Honesty		
Integrity		
Sincerity		
Transparent		
Trustworthiness		

(8) SECURITY:

Security is freedom from danger, risk, or doubt.

Symbol	Agree	Disagree
Alertness		
Assurance		
Confidentiality		
Guarantee		
Health		
Insurance		
Privacy		
Protection		
Reassurance		
Safeguard		
Safety		

(9) <u>UNDERSTANDING</u>:

Understanding involves making the effort to understand stakeholders' needs.

Symbol	Agree	Disagree
Accept		
Assist		
Appreciate		
Aware		
Cooperate		
Identify		
Interpret		
Rapport		
Realize		
Recognize		
Tolerate		

(10) <u>TANGIBLES</u>:

Tangibles include the physical evidence of service.

Symbol	Agree	Disagree
Accommodations		
Amenities		
Buildings		
Centers		
Classrooms		
Equipment		
Facilities		
Infrastructure		
Instruments		
Laboratories		
Lecture halls		
Libraries		
Parking		
Transportation		

(11) <u>PERFORMANCE</u>:

Performance is concerned with the primary operating functions of the institution.

Symbol	Agree	Disagree
Collaborating		
Developing		
Disseminating		
Evaluating		
Generating		
Graduating		
Improving		
Integrating		
Measuring		
Planning		
Preparing		
Recruiting		
Teaching		
Training		
Utilizing		

(12) <u>CONFORMANCE</u>:

Conformance refers to the extent to which the institution meets pre-established standards (both internal and external).

Symbol	Agree	Disagree
Accredit		
Achieve		
Affirm		
Approve		
Certify		
Correct		
Fulfill		
Rate		
Review		
Satisfy		
Validate		
Update		

(13) FEATURES:

Features are supplemental characteristics offered by the institution.

Symbol	Agree	Disagree
Curricula		
Degree		
Fund		
Internships		
Offerings		
Opportunities		
Program		
Software		
Scholarships		
Web		
Network		
Technology		

APPENDIX B

SAMPLE OF JOURNAL ARTICLES

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APPENDIX C

RANKING OF TOP 100 NATIONAL UNIVERSITIES IN U.S. IN 2015 BY *U.S. NEWS AND WORLD REPORT EDUCATION* (2016)

Rank	**University**
1	Princeton University
2	Harvard University
3	Yale University
4	Columbia University
5	Stanford University
6	University of Chicago
7	Massachusetts Institute of Technology
8	Duke University
9	University of Pennsylvania
10	California Institute of Technology
11	Johns Hopkins University
12	Dartmouth College
13	Northwestern University
14	Brown University
15	Cornell University
16	Vanderbilt University
17	Washington University in St. Louis
18	Rice University
19	University of Notre Dame
20	University of California, Berkeley
21	Emory University
22	Georgetown University
23	Carnegie Mellon University
24	University of California, Los Angeles

APPENDIX C (continued)

Rank	University
25	University of Southern California
26	University of Virginia
27	Tufts University
28	Wake Forest University
29	University of Michigan, Ann Arbor
30	Boston College
31	University of North Carolina, Chapel Hill
32	New York University
33	University of Rochester
34	Brandeis University
35	College of William and Mary
36	Georgia Institute of Technology
37	Case Western Reserve University
38	University of California, Santa Barbara
39	University of California, Irvine
40	University of California, San Diego
41	Boston University
42	Rensselaer Polytechnic Institute
43	Tulane University
44	University of California, Davis
45	University of Illinois, Urbana-Champaign
46	University of Wisconsin, Madison
47	Lehigh University
48	Northeastern University
49	Pennsylvania State University, University Park
50	University of Florida

Rank	University
51	University of Miami
52	Ohio State University, Columbus
53	Pepperdine University
54	University of Texas, Austin
55	University of Washington
56	Yeshiva University
57	George Washington University
58	University of Connecticut
59	University of Maryland, College Park
60	Worcester Polytechnic Institute
61	Clemson University
62	Purdue University, West Lafayette
63	Southern Methodist University
64	Syracuse University
65	University of Georgia
66	Brigham Young University, Provo
67	Fordham University
68	University of Pittsburgh
69	University of Minnesota, Twin Cities
70	Texas A&M University, College Station
71	Virginia Tech
72	American University
73	Baylor University
74	Rutgers, The State University of New Jersey, New Brunswick
75	Clark University
76	Colorado School of Mines

Rank	University
77	Indiana University, Bloomington
78	Michigan State University
79	Stevens Institute of Technology
80	University of Delaware
81	University of Massachusetts, Amherst
82	Miami University, Oxford
83	Texas Christian University
84	University of California, Santa Cruz
85	University of Iowa
86	Marquette University
87	University of Denver
88	University of Tulsa
89	Binghamton University, SUNY
90	North Carolina State University, Raleigh
91	Stony Brook University, SUNY
92	SUNY College of Environmental Science and Forestry
93	University of Colorado, Boulder
94	University of San Diego
95	University of Vermont
96	Florida State University
97	Saint Louis University
98	University of Alabama
99	Drexel University
100	Loyola University Chicago