AN EMPIRICAL STUDY OF QUALITY AND SATISFACTION WITH A FOCUS ON CREATING A PARSIMONIOUS MEASUREMENT INSTRUMENT IN AN INFORMATION SPACE

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Student satisfaction and service quality are interrelated constructs that are associated with improving student retention. This research investigated the relationships between these constructs in the context of an institution of higher education as an information system and sought to reduce the dimensionality of what have traditionally been considered orthogonal factors of these constructs in order to produce a parsimonious model and survey instrument that may be useful in assessing and predicting overall student satisfaction and overall service quality. The methods of analysis used in this study are quantitative in nature and included the use of descriptive univariate, bivariate, and multivariate analyses; exploratory factor analysis to examine latent dimensions within the data; and multiple linear regressions to measure the predictive efficacy of combinations of variables with respect to overall student satisfaction and overall service quality. It was hypothesized that the statistical treatment of the data would show that some dimensions routinely collapse, leading to possible valuable theoretical implications.

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My intellectual journey to this place has been a long one. It has taken many, many years to come this far and yet it seems like I have only just arrived at another starting point. I am grateful to God for the support I have received on my journey, and for my supportive family, faculty, and peers surrounding me.

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CHAPTER 1

INTRODUCTION

This research considers an institution of higher education to be a form of information system that is therefore amenable to evaluation as an information system. The view of information underlying this conception is both semantically meaningful, requiring a knowing subject, and cognitive in nature. It stems from Brookes's (1980) fundamental equation, where a delta of information is added to a knowledge state to create a new knowledge state and Bateson's view that information is "a difference that makes a difference" (1972, p. 454). The conception of information system that is considered in this study is grounded in Taylor's (1986) value added model. The working definition developed in this study is, any system, whether intellectual or computerized, comprising a formal set of value adding processes, which facilitate and support meaningful human information interaction. It is this definition that allows for the consideration of an institution of higher education to be an information system and to apply information system evaluation to the realm of higher education in the form of user satisfaction study and service quality measurement.

Satisfaction is a construct grounded in business research, particularly that of consumer theory. Student satisfaction posits the student as a consumer of products and services of higher education (Bryant, 2006; Obiekwe, 2000; Odom, 2008). The research literature underlying student satisfaction provides educational researchers with a rich set of theories and constructs applicable to students, as consumers, and to student satisfaction (Bryant, 2006; Obiekwe, 2000; Odom, 2008). One such construct, related to satisfaction, is service quality. In marketing research, the link between satisfaction and

service quality is well established (Ladhari, 2009). Service quality, as is the case with student satisfaction, is linked to retention (Ackerman, & Schibrowsky, 2007). This research investigated the constructs of student satisfaction and service quality as well as their relationships.

Measuring student satisfaction in higher education is big business. The Noel-Levitz Student Satisfaction Inventory (SSI), a commercial instrument, was administered at 1098 institutions of higher education in 2013, to more than 815,000 students. The SSI, according to its authors (Schreiner & Juillerat, 1993), measures dimensions of student satisfaction and is predicated on the link between student satisfaction and recruitment and retention (Juillerat, 1995).

Student retention is important to higher education institutions and has been a primary goal of those institutions for decades (Reason, 2009). It is one of the most widely studied areas in higher education research (Tinto, 2006) that is becoming worldwide concern (Crosling, Heagney & Thomas, 2009). Yet, after nearly 40 years of research, many institutions have not seen significant changes in the number of students retained, in part because of difficulties moving from theory to practice, and partly because of challenges in assessment (Tinto, 2006). The SSI is intended to provide administrators with a method of measuring students' satisfaction levels in order to determine institutional priorities relative to improving student satisfaction, thereby improving student retention (Juillerat, 1995).

The SSI is a large instrument, with more than 100 items. It is a commercial instrument that is costly to purchase, difficult to administer, process and analyze. This study developed and used a quality instrument, based on SERVIMPTp (Landrum,

Prybutok, Peak, & Qin, 2010) for potential use as a surrogate for the larger SSI that should be less costly, easier to administer, simpler to process and analyze.

Problem Statement

Student satisfaction and service quality are interrelated constructs that are associated with improving student retention. The SSI, used to measure student satisfaction at more than a thousand higher education institutions, is a costly instrument to administer and analyze. This research investigated the relationships between student satisfaction and service quality and used reduction techniques to develop a parsimonious instrument capable of measuring both student satisfaction and service quality.

Research Questions

The questions guiding this research are:

1. What are the dimensions of student satisfaction at the researcher's institution?
2. What are the items that measure the student satisfaction construct?
3. What is the minimum number of items needed to create an acceptable student satisfaction measure?
4. Are the dimensions consistent with those posited to exist by the chosen survey instrument's designers?
5. How effective is service quality as a predictor of overall satisfaction?

Limitations

This study was conducted at a large public university in the southwestern United States. The sample was drawn from and stratified by classification and by college within the university at which the study was conducted. The results may not be generalizable

beyond similar institutions. However, there are many similar institutions and there is opportunity to extend this work.

This study is based on data collection as of a point in time and does not address longitudinal considerations. Therefore, it is not possible to draw longitudinally dependent conclusions from the results. The study does not address how student satisfaction or service quality impact student retention.

Chapters Overview

The structure of this dissertation follows the traditional model of five chapters. The first chapter provides the reader with an introduction to the topic of the study, presenting the problem statement, research questions, and limitations. The second chapter presents research literature relevant to the study including the constructs and theory. The third chapter discusses the research design and methodology employed in the study, procedures, and concerns such as reliability and validity. The fourth chapter discusses the analyses and results of the research. The fifth and final chapter reviews the findings, presents implications, limitations, and conclusions as well as recommendations for future research.

Definitions

- *Information system:* A system that is characterized by human interaction with information.
- *Institution of higher education:* A university or college that provides education to degree level or equivalent.
- *Service quality:* A consumer's assessment of the gap between their expectations of a service and their perceptions of the performance of that service.

- *Student retention:* The retaining of students by an institution from their matriculation through graduation.
- *Student satisfaction:* A student's assessment of the degree to which their wants or needs are fulfilled.

CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter is structured as a series of sections with each section containing discussions of scholarly literature bearing on the objects of study. Two metaphors that underlie the study are particularly important to discuss, the first being that an institution of higher education is an information system, and the second being that a student is a consumer of information produced by an institution of higher education. The literature discussed below supports these metaphors as well as their importance to this research.

The first section includes a discussion of the nature of an information system from the perspectives of systems theory and information science. An important distinction between information without semantic meaning and meaningful information is drawn, and it is noted that this study is only concerned with the latter. The conception of a human information interaction model of an information system is introduced and leads to a discussion of Taylor's value added model. Taylor's model exemplifies an information system model that is consistent with the human information interaction model, as presented, that describes, in concrete terms, what comprises an information system. The articulation of what an information system is, logically leads to a discussion of higher education as an information system.

An institution of higher education as an information system is briefly discussed after the discussions of the nature of an information system, the human information interaction model, and Taylor's model; this is followed by a discussion of the student as

a consumer. Once the two metaphors have been supported by literature, the importance of retention in higher education and consumer contexts is discussed.

The constructs of student, or customer satisfaction, and service quality are discussed as being complex, multi-faceted constructs that are important in the context of retention, both in higher education and in business. The debate around whether or not these are, in fact, distinct constructs is also discussed.

Two instruments used in this study to measure student satisfaction and service quality, the Noel-Levitz Student Satisfaction Inventory (SSI), and SERVIMPTp, are discussed next. The review presents information about their origin, development, structure, and criticisms.

The final section is a discussion of the nature, importance, and relevance of dimensional reduction focused on in this research, as a method to reduce the dimensionality of orthogonal factors in an information space.

Information System

The primary metaphorical concept underlying this research is that of an institution of higher education being a form of information system, which can therefore be evaluated as an information system. This begs the question: what is an information system? To answer this question, I draw from the scholarly literature of diverse disciplines and fields including business, communication, education, information science, philosophy and psychology, as well as from academic discussions with my committee.

It is necessary to begin with the idea of a system. My use of the term system arises from its use in systems theory, a generalized theory of systems that in addition to

providing scientific support, underlies popular conceptions of the term. In a revised version (1969) of his seminal work, *General Systems Theory*, Ludwig von Bertalanffy (1951) wrote that systems are “complexes of elements standing in interaction” (p. 33). James Miller (1978), in describing living systems, described a system as “a set of interacting units with relationships among them” (p. 16). In lay terms, a system can be considered “… a set of things – people, cells, molecules, whatever – interconnected in such a way that they produce their own pattern of behavior over time” (Meadows, 2008, p. 2). It is against the background of these conceptions that a working definition of a system is drawn. For this study, I define a system as a coherent entity that is identifiable by characteristic patterns of behavior between interconnected entities.

Information, the other part of the term “information system,” is problematic, especially for information scientists. Its definitions are many and varied (Zins, 2007; Bates, 2009) and its nature hotly debated (Bates, 2011; Hjorland, 2011). Raber (2003) attributed disagreement within the discipline, about meanings of information, to the indeterminacy of its object of study as a theoretical object deriving from “conditions that impose on the word a need to convey different meanings in different contexts” (p. 19). Raber goes on to suggest that there are two primary theoretical realities: one material, the other cognitive. While this is an oversimplification, it is a useful classification for purposes of this discussion. This research does not attempt to add to the plethora of definitions, but rather chooses from the many available, one that is contextually relevant, that is, Brookes’s cognitively oriented fundamental equation:

$$K[S] + \Delta I = K[S + \Delta S]$$

(1980, p. 131).

The general equation states that a person's knowledge structure, or mental schema, K[S] is changed by a delta of information, **Δ**I, into a new schema, K[S + **Δ**S]. The equation is a pseudo-mathematical representation of information. It is worth noting that Brookes considered information to be a small bit of knowledge (Brookes, 1980), but he wrote the equation so that it was clear that the same **Δ**I could affect different K[S]s. In somewhat simpler terms, Bateson (1972), prior to Brookes, stated that information is "a difference that makes a difference" (1972, p. 454). In this study information refers to any difference that makes a difference, to a person's knowledge state, and retains Brookes's view that information and knowledge may be of the same, similar, or related substance.

At this point an important distinction between information without semantic meaning and information with semantic meaning needs to be made. Information theory is an influential theory within information science that disregards semantic meaning and serves as a counterpoint to the position taken by the researcher. Claude Shannon, author of *A Mathematical Theory of Communication* (1948), is credited with having introduced information theory (Machlup & Mansfield, 1983), but it was Warren Weaver, author of *Recent Contributions to the Mathematical Theory of Communication* (1949), who made it accessible to non-mathematicians. While Shannon has been credited with its introduction, it was not his intention to create an information theory, but rather a communication theory, and he later called information theory a "bandwagon" and warned against the use of the hard, mathematical-deductive, core of communication theory in human contexts without the following: a) a thorough understanding of its mathematical foundation and communication application, and b) experimental testing

under a wide variety of conditions. Shannon's description of the fundamental problem of communication explicitly states that information, in the context of communications, specifically electronic communication, is to be considered without regard to its semantic content:

> The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently, the messages have meaning; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem. The significant message is the one selected from a set of possible messages. The system must be designed to operate for each possible selection, not just the one which will actually be chosen since this is unknown at the time of design. (Shannon, 1948, p. 379)

Shannon's model is useful as a conceptual model of communication. Figure 1 is a graphical illustration of Shannon's model.

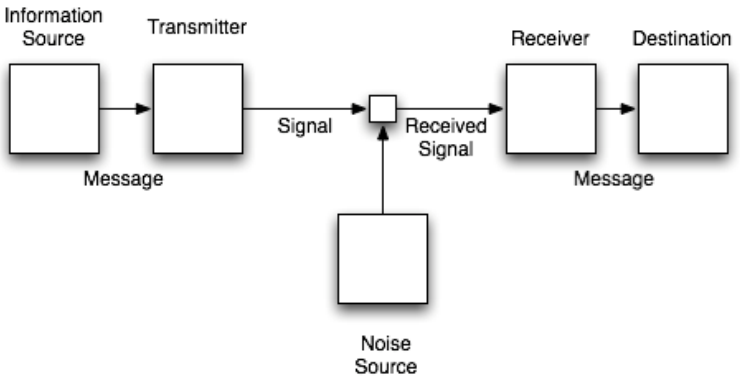


Figure 1. Shannon's communication model. Adapted from Weaver (1949)

This model describes a situation where an information source selects a message, encodes and transmits it through a channel that is subjected to noise coming from a noise source en route to a receiver that decodes and delivers the message to a destination. This is a compellingly simple model that fits with an intuitive understanding of the process underlying communication and is revisited below, in the discussion of

meaningful communication. Debons, Horne, and Cronenweth (1988), describes the failure of the Shannon model to account for meaning:

> Shannon's information theory is important to any discussion of transfer owing to its reference to the message, which is the critical element of the transfer function. Although Shannon's theory provides an account for the transmission aspect of the transfer process, it fails to provide a comprehensive theory of communication that integrates concepts of transmission of messages with measurements of significance or meaning.
> (p. 131)

While information theory is pervasive and has many applications in diverse fields, it does not address meaning and therefore is lacking as a theoretical lens for the current study.

Information in the context of this study is limited to meaningful information. It is meaningful to humans, and as such, is distinctly different from a mechanistic conception of information, such as that found in information theory, that holds information as being devoid of semantic content. Kulthau (2008) discusses a view of information that acknowledges information as meaningful, when she describes the information search process as concerning "intellectual access to information and ideas, and the process of seeking meaning" (p. 230). In Kulthau's view, information without meaning is insufficient. The researcher shares this view.

This information with meaning perspective allows for further articulation of what an information system is, relative to the current research. The term, "information system," implies a system with information as its primary, characterizing entity. Further, taking into account the meaningful nature of information implies a human agent that is predicated on a human's knowledge structure. Put simply, an information system, then, is a system that is characterized by human interaction with information. This definition is

consistent with the organismic view of Allen (1996), who refers to an information system as “a linked and related system of entities that acts as a mechanism through which individuals can inform other people or become informed” (p. 6), as well as with the work of Fidel and Pejtersen (2005), who stated that an information system is “any system, whether intellectual or computerized that facilitates and supports human-information interaction” (p. 88).

A graphical representation of an information system as discussed is presented in Figure 2. This representation is limited to two-dimensions, but is intended to convey the idea of a system where the technology and intellectual apparatus are backgrounded to the privileged human actor and the actor’s interaction with information.

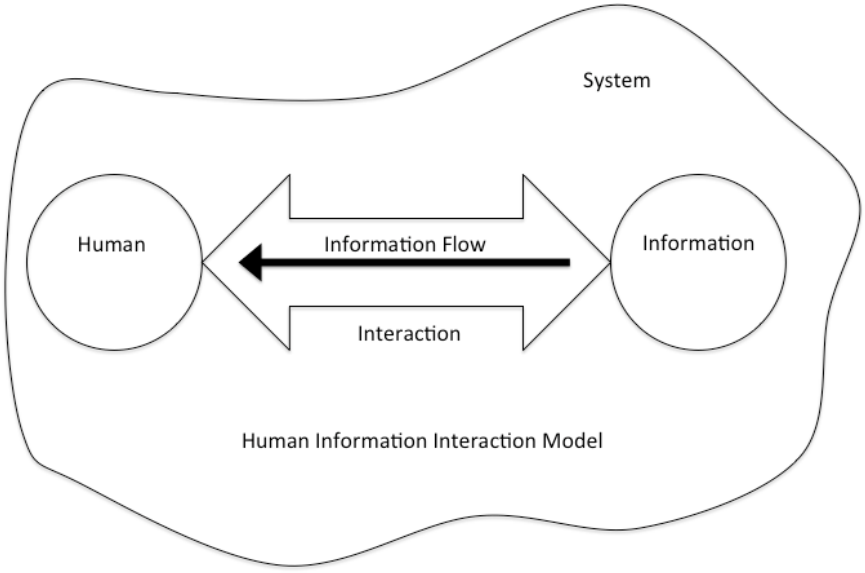


Figure 2. Human information interaction model of an information system.

I hold the view that technology should be maximally transparent to the human and that when this is not the case, it is interruptive to the human’s goal directed activities and contradictive to a functional system.

An early example of an information system model that fits this conception is Robert Taylor's value-added model.

Taylor's Value Added Model

Robert Taylor (1918-2009) was known as one of the great generalists in the field of information science (Van der veer Martins, 1999) and one of the most articulate scholars in emphasizing the role of the user in information systems (Pimentel, 2010). According to Van der veer Martins (1999), Taylor wrote three seminal scholarly contributions to the field: one about process models of information seeking (Taylor 1968), another concerning the value-added model (Taylor, 1986), and an academic-library-as-living-laboratory experiment (Taylor, 1972). Taylor's work on the value-added model is widely cited (Pimentel, 2010) and is useful in generalizing information systems in the discussion following.

The generalizability of Taylor's model was intentional, as was his human-centrism. While the author did not eschew technology, he took pains to distance his model from any specific technologies. This is evident in the following statement, "The term 'system' is used in a very broad sense to encompass any formal set of value-adding processes which have been designed or have accumulated historically to provide chunks of information to some set of potential users. A system may be entirely machine based or entirely human based. Most likely a system will be a mix of the two" (Taylor, 1986, p. 10).

Taylor's model is instructive for a variety of reasons. In this research, the model serves as an abstract model and framework for understanding users, context, value-adding processes, interfaces, and criteria of choice.

Taylor (1986) proposed the model for use in designing and evaluating information systems and is user-centered. It is based on the idea that there are characteristics and attributes of information that when added to other data or information during processing, would provide more utility to users than would be the case otherwise (Taylor, 1986). Taylor admits difficulty in his use of what it means to add value to information, but claims that it is still useful to consider it in these terms. According to Taylor (1986) praxis underlies the development of the value-added model and the model is drawn from his observations of how information systems operate. It is also predicated on the foundation of information and the user-driven model of information systems. Taylor firmly believed that users were central to information systems.

Taylor (1986) defines the term user as being functionally interchangeable with the terms client, customer, and consumer and meaning "an active agent who seeks or receives information from an information system" (p. 11). In this study, when discussing students as consumers of education, the term may apply to students as well. Effectively, a user is a human actor in the human information interaction model discussed previously.

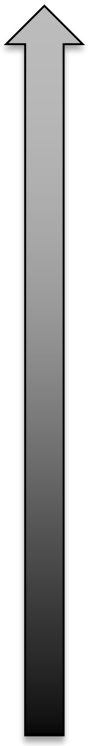
Users exist within a context, that is, within an information use environment (Taylor, 1986). Taylor defines an information use environment formally as "the set of those elements that (a) affect the flow of information messages into, within, and out of any definable entity; and (b) determine the criteria by which the value of information messages will be judged" (Taylor, 1986, pp. 25-26). Taylor (1994) clarifies this meaning as, "... the contexts within which those users make choices about what information is

useful to them at particular times. These choices are based, not only on subject matter, but on other elements of the context within which a user lives and works." Taylor (1986) lists three general types of context, geographical, organizational, and social/intellectual/cultural. This is a reduced set and can easily be extended to include individual differences: physiological, affective, and cognitive. An information use environment may then be considered equivalent to a user's context in modern vernacular and is referred to as context throughout the remainder of the study.

Taylor devised a value-added spectrum of processes that he felt represented a prototypical information system that is based on his definition of the information system as a formal set of value-adding processes. Table 1 shows a representation of the spectrum.

Table 1

Taylor's Value Added Spectrum



Category	Process Type	Example
Action	Decision	Matching goals Compromising Bargaining Choosing
Productive knowledge	Judgmental	Presenting options Presenting advantages Presenting disadvantages
Informing knowledge	Analytical	Separating Evaluating Validating Comparing Interpreting Synthesizing
Information	Organizing	Grouping Classifying Relating Formatting Signaling Displaying
Data		

It shows information and various organizing processes, from information to informing knowledge through analytical processes, from informing knowledge to productive knowledge through judgmental processes, and from productive knowledge to action through decision processes, with examples of each type of process. These are produced here for completeness and as useable examples of value-adding processes.

While Taylor provided an articulate model of the user and of the user context, he also provided a frontier for future research in his explanation of the user interface, what he referred to as the negotiating space between the user context and the value adding processes. What is unique about Taylor's explanation is that it purposefully leaves this area surrounded by a fuzzy boundary. Indeed, Taylor argued that the boundary conditions of the interface were negotiated and therefore changeable. This area of negotiation is similar to the idea Wilbur Shramm (1955) put forth, when he modified Shannon's model to incorporate fields of common experience into a model of communication as in Figure 3.

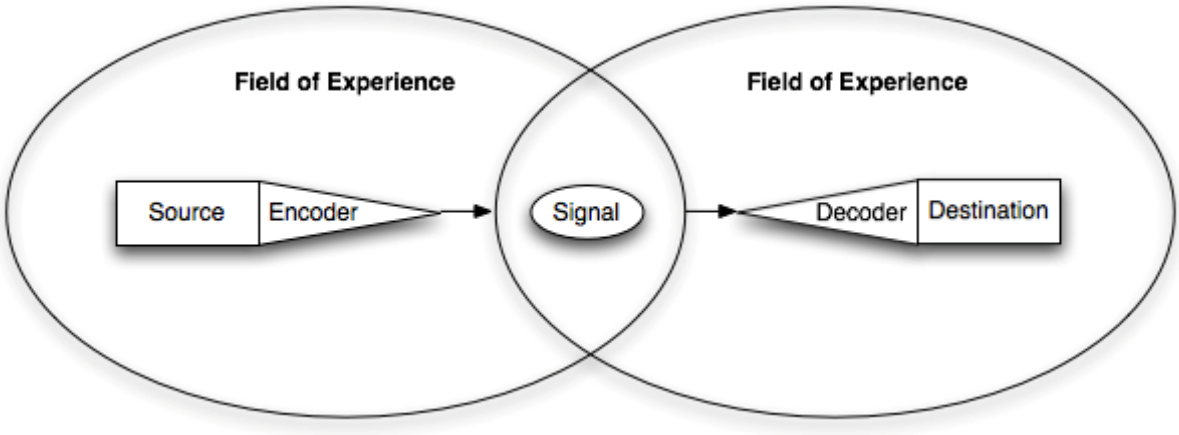


Figure 3. Fields of experience. Adapted from Schramm (1956).

The overlapping fields of experience, according to Schramm, were areas where communication was required to “tune” two communicators so that meaning was conveyed in a conversation. Kulthau (2004), in her description of the information search process, states the need for “zones of intervention,” points located within an information search process where it is possible and desirable to provide interventions to the searcher as they search that help them toward their goals. Schramm’s fields of experience and Kulthau’s zones of intervention are both in line with Taylor’s negotiating space. It is the amorphic interface and its attendant processes that delineate and appear to facilitate interaction in the human information interaction model.

The value added model is comprised of the user, user context, value-adding processes, and information. It can be summarized as a description of a user-driven model where the user, *in situ*, has a need for information, that establishes criteria of choice, that the user carries into a system of processes, that add value through interfaces that aid the user in making choices. This is summarized in Table 2.

Athough Taylor’s examples are library computer system-oriented; they do not constrain systems that are designed with the abstract model in mind.

Taylor's model was originally presented as his early thinking about the field of information and he acknowledged that it might be incomplete, or even superficial (Taylor, 1986, p. ix). Taylor (1994) did additional work with use environments as "an attempt at structuring what it is we know about the information behavior of defined groups of people in their 'natural settings'" (p. 248). This study does not extend Taylor's work, but uses it as an abstract model in order to draw similarities between information systems and higher education.

The working definition of information system becomes, as a result of the preceding discussion, any system, whether intellectual or computerized, comprising a formal set of value adding processes, which facilitate and support meaningful human information interaction. It is this definition that is used to support the argument that an institution of higher education, and higher education, more broadly is an information system.

Table 2

User Criteria and Values Added

User criteria of choice	Interface (values added)	System (value added processes: examples)
Ease of use	Browsing Formatting Interfacing I (mediation) Interfacing II (orientation) Ordering Physical accessibility	Alphabetizing Highlighting important terms
Noise reduction	Access I (item identification) Access II (subject description) Access III (subject summary) Linkage Precision Selectivity	Indexing Vocabulary control Filtering
Quality	Accuracy Comprehensiveness Currency Reliability Validity	Quality control Editing Updating Analyzing and comparing data
User criteria of choice	Interface (values added)	System (value added processes: examples)
Adaptability	Closeness to problem Flexibility Simplicity Validity	Provision of data manipulation capabilities Ranking output for relevancy
Time saving	Response speed	Reduction of processing time
Cost saving	Cost saving	Lower connect time price

Adapted from “Value-Added Processes in Information Systems” by R. Taylor, 1986, p. 50. Copyright Ablex Publishing Corporation.

Higher Education

The Compact Oxford English Dictionary defines higher education as “education to degree level or equivalent, provided at universities or colleges” (Higher education, 2005). It is logical to extend this definition to an institution of higher education as meaning a university or college that provides education to degree level or equivalent. This is the general sense of the term that is used throughout the study. The definition provided in Title I, Part A of the Higher Education Act of 1965 is more detailed, but in essence means the same thing:

> SEC. 101. [20 U.S.C. 1001] GENERAL DEFINITION OF INSTITUTION OF HIGHER EDUCATION.
>
> (a). INSTITUTION OF HIGHER EDUCATION. For purposes of this Act. Other than title IV, the term “institution of higher education” means an educational institution in any State that –
>
> (1). admits as regular students only persons having a certificate of graduation from a school providing secondary education, or the recognized equivalent of such a certificate;
>
> (2). is legally authorized within such State to provide a program of education beyond secondary education;
>
> (3). provides an educational program for which the institution awards a bachelor’s degree or provides not less than a 2-year program that is acceptable for full credit towards such a degree;
>
> (4). is a public or nonprofit institution; and
>
> (5). Is accredited by a nationally recognized accrediting agency or association, or if not so accredited, is an institution that has been recognized by the Secretary for the granting of preaccreditation status, and the Secretary has determined that there is satisfactory assurance that the institution will meet the accreditation standards of such an agency or association within a reasonable time.

An institution of higher education is considered for purposes of this research as an educational institution that provides post-secondary education to individuals to degree level or equivalent. This definition covers all accredited public and private universities and colleges in the United States, but is open to extension for encompassing institutions without respect to national boundaries.

In the abstract, an institution of higher education, hereafter referred to as a university, is an organization comprised of groups of individuals performing administrative or academic functions in support of the mission of the university, which is to provide students with higher education.

This research considers the university as an information system. It is not the first to do so. The university as an information system was written about prior to 1969, when, Robert M. Siegmann, a researcher at the Georgia Institute of Technology, published a report with the support of a National Science Foundation Grant GN-655, that reported in detail that the university, was in fact, an information system because its “effective operation is based on the storage, processing, and communication of various types information” (p. i). Siegmann reported three types of information based on his analysis of user roles: administrator information, teacher information, and researcher information. Siegmann wrote:

> A university is an educational institution having the primary purpose of effectively educating its students. A university is frequently and accurately referred to as an information system in that it can be defined as:
>
> (1) an interacting collection of elements which is
> (2) designed to accomplish certain objectives by
> (3) creating, storing, processing and communicating information.
>
> The elements or components of a university can be considered to be teachers, administrative staff, students, libraries, buildings, facilities and many other basic system entities. These elements interact and relate to one another in various combinations by using information supplied to them by different types of information networks. These information networks provide the necessary binding force which allows the system to accomplish certain objectives. A system composed of one or more information networks is called an information system. (1969, p. 3)

This view of the university as an information system is consistent with the conception of an information given in the discussion about the value added model. It is

a system (of interacting elements), both intellectual and computerized, comprising a formal set of value adding processes (which are designed to accomplish certain objectives, specifically educational objective), which facilitate and support meaningful human information interaction (creating, storing, processing and communicating information).

The Student as a Consumer

Another metaphorical concept underlying this research is that of a student being a consumer, of education. This is not a difficult concept to understand, but it is important to this research. The Compact Oxford English Dictionary (2005) defines the term consumer as, “a person who buys a product or service for personal use” (consumer, p. 209). This lay definition is sufficient for purposes of this research. In this research the distinction between goods (products) and services follows Rathmell (1966) in considering goods and services as two ends of a spectrum, with pure goods being nouns – things, and pure services being verbs – acts. According to Rathmell, “most goods, whether consumer or industrial, require supporting services in order to be useful; most services require supporting goods to be useful” (p. 33). The analogy holds that a student is a person who buys (through payment of tuition), a product or service (in aggregate, information services of education), for personal use. Literature that supports this use of the term includes Long, Tricker, Rangecroft, and Gilroy (1999) who referred to earlier work by Cheng and Tam (1997) when making the case that higher education is increasingly recognizing itself as being a service industry and that the sector is moving to meet the needs of its customers, i.e. its students. The authors go on to explain that this is driving institutions to enhance the quality of their courses as

perceived by the students. Munteanu, Ceobanu, Bobalca, and Anton (2010) also acknowledged that higher education providers were service organizations and students were customers of those organizations. Aldridge and Rowley (1998) based their study on students as customers.

Consideration of the student as a consumer leads, logically, to consideration of how to retain student consumers.

Retention

Retention is a complex issue in higher education that during the 1990s began to receive more attention than any other aspect of enrollment management (Clark, 2000). It has been "arguably the primary goal for higher education institutions for several decades" (Reason, 2009). In the late 1990s researchers began to view the problem of keeping students through a positive lens called persistence where those aspects that relate to a student's persisting as students rather than failing to matriculate is privileged (Clark, 2000). This research considers retention and persistence as two sides of the same coin and the terms are used interchangeably with respect to literature and appropriately when the context requires connotation.

Volumes of literature exist concerning persistence (Reason, 2009). Recent reviews of persistence research include Reason (2003, 2009), Tinto (2006), and Pascarella and Terenzini (1991, 2005). Pascarella and Terenzini (1991) is perhaps the most widely cited reference in the literature with more than 7500 citations, according to Google Scholar search results. Pascarella and Terenzini (1991, 2005) present a multidimensional view of the affects of college on students, student learning, and persistence that begins to address the multifaceted nature of the forces and settings

influencing student learning and persistence (Reason, 2009). Reason (2009) states that the Pascarella and Terenzini (1991, 2005) studies were a call for a more comprehensive and integrated model for studying student outcomes. Terenzini and Reason (2005) produced one such model that is interesting to this study because it incorporates the "wide array of influences on student outcomes indicated in the research literature" (Reason, 2009, p. 662). Specifically, the model addresses precollege characteristics and experiences, organizational context, student peer environment, and individual student experience. It is the multidimensional nature of this problem that drives the researchers interest in this current study. Tinto (2006) looks to the future and suggests that it is finding actionable knowledge that is the challenge facing researchers today.

Retention is big business (Jenicke, Holmes, & Pisani, 2013), and as such it is useful to look at the problem of retention as a business problem. In their analysis of retention costs at a large public university, Jenicke, Holmes, and Pisani (2013) found that it cost more than 25 million dollars in lost revenue and replacement costs (cost to replace students that are not retained) if there was a 20% drop out rate in a student body of approximately 4,000 students. The authors suggested that the six-sigma methodology be applied to student retention because of its holistic quality improvement approach and its focus on defect elimination, where the defect to be eliminated was the at-risk student dropout. Six-sigma uses a structured problem solving approach described by the acronym DMAIC – define, measure, analyze, improve, and control that is used in quality control situations to incrementally improve the quality of processes.

Ackerman and Schibrowsky (2007) bring another concept from business to the problem of student retention that recognizes the student as consumer and equates student retention to customer retention. The authors advocate for the use of relationship marketing as an approach to maintaining existing customers (students). Ackerman and Schibrowsky (2007) describe relationship marketing as:

> a concept that focuses on attracting, maintaining, and building business relationships, has enhanced the profitability of businesses. The core of the relationship marketing approach in business is that resources are directed toward strengthening ties to existing customers on the proven premise that maintaining existing customers is less costly than is attracting new ones. (p. 307)

The concept of retention and its mirror image, persistence, are considered in this research as desirable outcomes related to students as consumers of education. Having established the premise that students may be considered as consumers in an educational information system where their retention and persistence is desired, it is useful to look at two measures that relate to student/consumer retention – student satisfaction and service quality (Elliott & Healy, 2001; Hill, 1995; Parasuraman, Zeithaml, & Berry, 1985; Quinn et al., 2009; Sultan & Wong, 2010).

Student Satisfaction

The Compact Oxford English Dictionary defines satisfaction as “the state of being pleased because one’s needs have been met or one has achieved something” (Satisfaction, p. 916). This affective definition is foundational to many of the definitions of student satisfaction found in the literature. Bean and Bradley (1986) defined student satisfaction as, “a pleasurable emotional state resulting from a person’s enactment of the role of being a student” (p. 398). According to Juillerat (1995) her operationalization of the term was based on the definition “the extent to which a student’s perceived

educational experience meets or exceed his/her expectations" (p. 33). Odom (2008) covers a variety of similar definitions and states, "the definitions of college student satisfaction are many and varied" (p. 34).

Affective definitions of the term remain fuzzy, primarily because of difficulty around defining emotional constructs. According to Babin and Griffin (1996), "More specific definitions become difficult given the 'fuzziness' of emotional constructs" (p. 129). Fehr and Russell (1984) have therefore argued for conveying emotional meanings through the description of specific examples, using prototype. The authors attribute this idea primarily to Eleanor Rosch. Rosch (1973, 1975a, 1975b) and Mervis and Rosch (1981) describe the prototype-based approach to categorization underlying Fehr and Russel's study.

According to Babin and Griffin (1998), drawing from Locke (1969), Westbrook (1980) and Woodruff, Clemons, Schumann, Gardial, and Burns (1983), in marketing terms customer satisfaction, or consumer satisfaction, "can be described as an emotion resulting from appraisals (including disconfirmation, perceived performance, etc.) of a set of experiences" (p. 129). This perspective is found throughout student satisfaction literature. The Cardozo (1965) study of effort, expectation, and satisfaction is considered as a foundational study according to Bryant (2006) and is used by Juillerat (1995) as the theory behind her multidimensional model of student satisfaction. Cardozo's work assumed that "customer satisfaction with a product presumably leads to repeat purchases, acceptance of other products in the same product line, and favorable word of mouth publicity" (p. 244). While Cardozo assumed this, it has since been shown through empirical study that satisfaction is highly correlated with future patronage

intentions (Babin & Griffin, 1998; Patterson, Johnson, & Spreng, 1997). What Cardozo found was that effort and expectation affected product and experience evaluation and that disconfirmation of expectations was significant in producing a negative result. Cardozo also found that high levels of effort moderated negative experiences and perhaps even partially reversed the effects of negative experience. The SSI, discussed below, is based on consumer theory and the Cardozo (1965) study's findings (Bryant, 2006; Obiekwe, 2000).

Schreiner (2009) found that student satisfaction indicators added significantly to the ability to predict student retention and was connected to persistence. Middaugh (2010) noted that there was a strong correlation between student satisfaction and retention and spoke to the centrality of student satisfaction to enrollment management calling it a "cornerstone of enrollment management" (p. 74). Elliot and Shin (2002) attribute the growing importance of student satisfaction to universities as being the result of its "positive impact on student motivation, student retention, recruiting efforts and fundraising" (p. 197) and suggest that it is necessary to consider in maintaining competitive advantage.

The measurement of student satisfaction is discussed further in the section on the Noel-Levitz SSI. Service quality, a related construct is discussed next.

Service Quality

"Quality is an elusive and indistinct construct" (Parasuraman, Zeithaml, & Berry, 1985, p. 41). But as the authors go on to say a few sentences later, "its importance to firms and consumers is unequivocal" (p. 41). It is considered a critical success factor in competitive differentiation and is linked to the retention of customers (Ladhari, 2009).

However, quality, like satisfaction, is a difficult term to describe. Parasuraman et al. (1985), in summarizing the literature up to their time, suggested three themes defining service quality:

1. Service quality is more difficult for the consumer to evaluate than goods quality.
2. Service quality perceptions result from a comparison of consumer expectations with actual service performance.
3. Quality evaluations are not made solely on the outcome of a service; they also involve evaluations of the process of service delivery

(p. 42)

Rather than provide additional normative definitions of service quality, the authors provided a conceptual model of service quality and 10 determinants of service quality that formed the basis for the development of the SERVQUAL scale (Parasuraman, Zeithaml, & Berry, 1988). According the authors, one of the most important insights into the conceptual model was the discovery of gaps between perceptions of service quality and performance in tasks related to service delivery. The gaps identified by the authors included:

1. Consumer expectations versus management perceptions
2. Management perception versus service quality specification
3. Service quality specifications versus service delivery
4. Service delivery versus external communication
5. Expected service versus perceived service

The first 4 gaps are concerned with the firm's marketing function, and the fifth is concerned with the consumer but is impacted by the first four, in combination.

The 10 determinants of service quality, which are referred to as dimensions, in this study are:

1. Access
2. Communication
3. Competence
4. Courtesy
5. Credibility
6. Reliability
7. Responsiveness
8. Security
9. Tangibles
10. Understanding/knowing the customer

Ladhari (2009) notes that these 10 dimensions have been collapsed into five dimensions:

1. Tangibles
2. Reliability
3. Responsiveness
4. Assurance
5. Empathy

SERQUAL, perhaps the most well known scale measuring service quality (Ladhari, 2009), has been used in a variety of industries, according to Ladhari, including: banking, fast food, healthcare, information systems, libraries, retail chains, and telecommunications and more than 8 countries outside of the US.

Service quality has been of interest to higher education as well. Spanbauer (1992) included service quality as an important facet of a quality improvement program and equated education to a service organization (p. 85). Hill (1995) applied the construct to higher education in an exploratory study and concluded that more research was needed to develop adequate performance measures. Quinn, Lemay, Larsen and Johnson (2009) investigated six approaches to measuring and improving service quality in higher education environments and in their conclusion stated that while positive findings were found more research was needed in this area.

Customer Satisfaction and Service Quality

There is debate in the literature as to whether or not customer satisfaction and service quality are in fact distinct constructs (Gottlieb, Grewal, & Brown, 1994; Iacobucci, Ostrom & Grayson, 1995). The relationship of these constructs is briefly discussed prior to the introduction of the measurement scales of either.

Gottlieb, Grewal, and Brown (1994) found that perceived quality affects satisfaction and further that satisfaction affects behavioral intentions, implying that the constructs are complementary, rather than divergent. Iacobucci, Ostrom, and Grayson (1995), on the other hand found no differences between the constructs with respect to disconfirmation, keeping promises, customization, empathy, friendliness, or purchase intentions. They did find differences among the constructs antecedents. Price, back-stage, and expertise were more strongly associated with service quality and timeliness, service recovery, and physical environment were more strongly associated with customer satisfaction. Hernon, Nitecki, and Altman (1999) drew a time-based distinction between the constructs, “Service quality, developed over time, relates to customer

expectations, whereas satisfaction is transaction specific, is a more short-term measure and focuses on a personal, emotional reaction to service" (p. 12). Tam (2004) developed an integrative model that compared customer satisfaction, service quality, and perceived value. The author found that perceived quality has a positive effect on customer satisfaction and that customer satisfaction has a positive effect on post purchase behavior. Qin and Prybutok (2009) also found that perceived quality has a positive correlation with customer satisfaction and that customer satisfaction was positively correlated with behavioral intention. This research investigated the relationship between these constructs further.

Instruments

Noel-Levitz Student Satisfaction Inventory (SSI)

The Noel-Levitz Student Satisfaction Inventory (Schreiner & Juillerat, 1993) is a commercially available student satisfaction instrument that is used to measure student satisfaction in institutions of higher education. In its 2013 annual report, *2013 National Student Satisfaction and Priorities Report,* Noel-Levitz reported on results from "nearly 816,000 students at 1,098 four-year and two-year public and private institutions across North America" (Noel-Levitz, 2013).

According to Juillerat (1995), in her dissertation on the validity of the SSI – the need for the SSI was driven by two forces, economic necessity, and the need for "more accurate and comprehensive measures of student satisfaction" (pp. 8-9). The author expands on the second driver at the conclusion of the literature review:

> In light of the theoretical and statistical shortcomings of the existing satisfaction instruments, as well as the changing atmosphere in higher education toward consumer principles, there appears to be a need for a contemporary assessment of student satisfaction.

(p. 56)

Juillerat's dissertation addresses this shortcoming and provides the most comprehensive description of the SSI, its bases, justification, development, and statistical validation available. What the author refers to as the changing atmosphere toward consumer principles is related to the use of consumer theory in providing a rationale for considering students as "consumers who have a choice about whether or not to invest in education at a particular institution, as well as definite expectations about what they want from their college experience" (Juillerat, 1995, p. 60). According to Bryant (2006), and discussed previously, the SSI builds on consumer theory, originating with Cardozo (1965).

The SSI, as described in Juillerat (1995), was developed through interviews, pilot studies, expert panel reviews, and statistical analyses (examination of descriptive statistics, item-total and inter-item correlations, and criterion correlations). The result was an 82 item instrument presented and discussed in Juillerat (1995). Each item of the SSI is a positive statement of expectation that represents a student's expectation about a particular aspect of campus life or an institutional service. Each item is rated on a scale from 1 to 7 along two dimensions, importance and satisfaction. The importance dimension is evaluated by the student in response to the prompt, *How important is it to you?* The satisfaction dimension is evaluated by the student in response to the prompt, *How satisfied are you?* The student's answer is ranked from 1 to 7, with 1 representing *not at all*, and 7 representing, *very*, for either an importance score, or a satisfaction score. Not all items in the instrument are evaluated along both dimensions. There are three criterion variables that are measured soley in terms of satisfaction: overall

satisfaction with the college so far, how well the college has met student expectations, and certainty of re-enrollment in the institution given a second opportunity.

The exploratory factor analysis discussed in Juillerat (1995) found 11 dimensions, referred to by the author as factor-analyzed scales. The dimensions are: campus climate, campus organization and activities, responsiveness to diverse populations, curriculum and instruction, financial aid/billing, campus support services, academic advising, resident life, student acclimation, safety and security, and faculty effectiveness.

Scoring of the SSI is based on three types of scores, importance, satisfaction, and performance gap scores. Juillerat (1995) describes the scores, based on student ratings, as follows:

- Importance score – how important each expectation is to their overall satisfaction
- Satisfaction score – how satisfied they are that expectations are being met
- Performance gap score – the difference between importance and satisfaction scores

In addition to the item scores, a number of summary scores are calculated:

- Total Importance
- Total Satisfaction
- Total Performance Gap
- Mean Importance
- Mean Satisfaction
- Mean Performance Gap
- Total and Mean Scores for each Scale

These scores are intended to allow the administrator of the survey to assess student satisfaction at an institution with both a high level of granularity (item scores) and at a high level of summarization (total and mean scores). The results are amenable to further statistical analysis and are used thusly in this study. In addition to tabular summaries however, Juillerat proposed one graphic representation that deserves further discussion here.

The graphic representation Juillerat (1995) presented is referred to as the institutional priority quadrant in this research. The author explains the basis of the graphic, “Because of its two dimensional format, one method of reporting the summary scores is to create a quadrant which plots the importance and satisfaction means on one diagram, thereby prioritizing an institutions intervention list.” (p. 64). The author describes two different such quadrants: one where item means are plotted along their importance scores and satisfaction scores as in Figure 4; and another where scale means are plotted along their importance and satisfaction scores as in Figure 5.

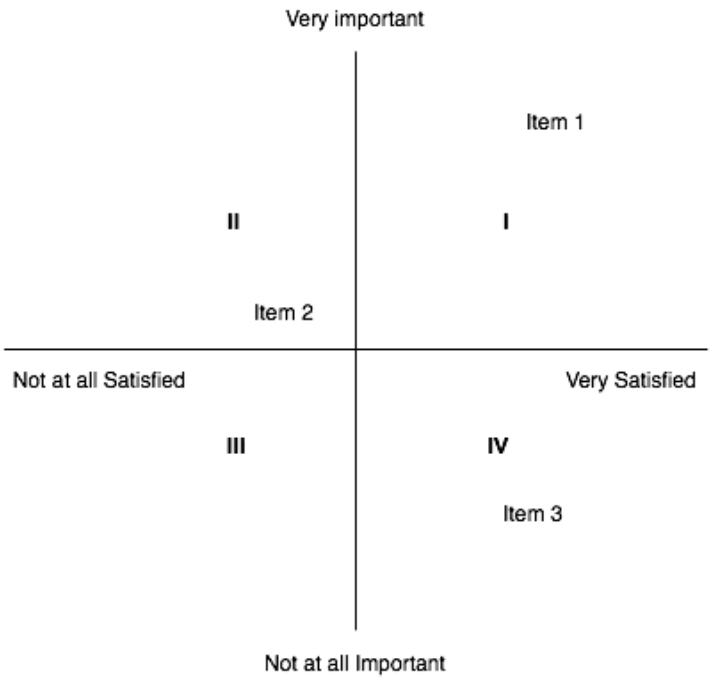


Figure 4. Item quadrants.

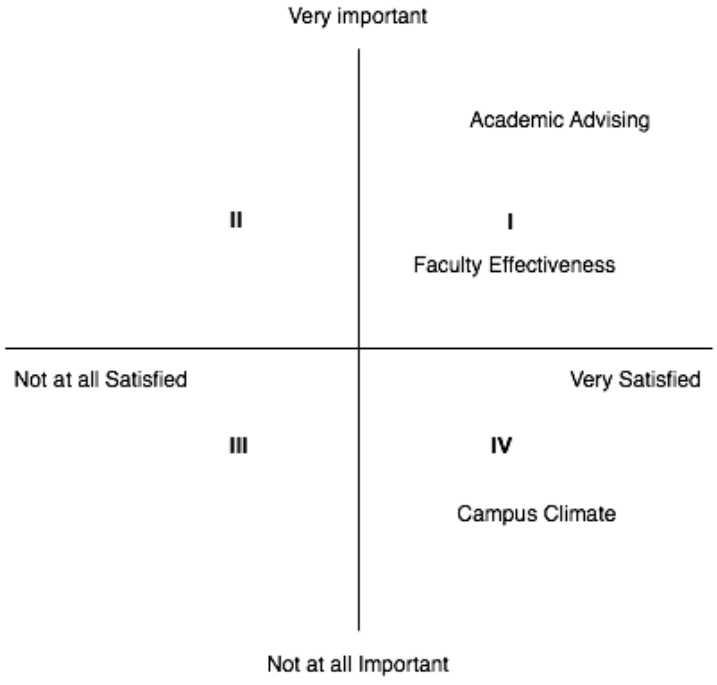


Figure 5. Scale quadrants.

According to Juillerat (1995), institutions are able to prioritize interventions on the basis of the location of the plots of scores in the quadrant. Items that are located in Quadrant I, with high levels of satisfaction and importance are strengths and institutions can focus on maintenance. However, those in Quadrant II, with high levels of importance, but low levels of satisfaction are weaknesses and are logical targets for intervention, rather than maintenance. Those items in Quadrant III, with low levels of importance and satisfaction are weaknesses as well, but they are not a priority because they are not assessed as being important to the student. Quadrant IV with low levels of importance, but high levels of satisfaction are a strength, but not a concern for students, therefore, it is possible that the item is over-supported by the institution and may be a candidate for reallocation of the resourced devoted to the item.

Juillerat (1995) provides detailed analysis of the SSI as it was originally conceived and developed. The current version of the SSI is very similar to the original conception and is discussed in the methodology instruments section.

The SSI is not without criticism, particularly with respect to two areas: its dimensionality, and its use of performance gap scores. Odom (2008) used confirmatory factor analysis and data collected at a large, public, 4-year university, to test the hypothesized factor structure of the SSI and found “little evidence for the multidimensional structure of the Noel-Levitz SSI” (p. 202) and determined that a single factor, General Satisfaction with College, emerged that was sufficient to represent student satisfaction as a unidimensional construct. Obiekwe (2000), on the other hand, found that “the identification of the latent variables of SSI does not appear possible from the item perspective since they are producing dimensions far greater than 11” (p. 4).

Roszkowski (2003) discusses some of the problems with using gap scores, stating that they pose both statistical and interpretive problems for researchers. Citing the Elliot and Healy (2001) study of key factors influencing student satisfaction in the context of recruitment and retention, Roszkowski notes that the authors' findings are inconsistency with gap theory and demonstrate the need for caution in the use of gap scores. Elliot and Healy (2001) found that student centeredness was the highest predictor of student satisfaction using its gap score, but because of its low importance and high satisfaction, was placed into Quadrant IV. Also, the authors found that safety and security was high in importance, low in satisfaction, yet it was found to have only a minor role in predicting satisfaction. The authors suggested that universities exercise additional judgment prior to taking action on the basis of gap scores.

Interestingly, problems with gap scores have been discussed in the scientific literature extensively. Van Dyke, Kappelman, and Prybutok (1997) and van Dyke, Prybutok, and Kappelman (1999) both discuss this problem as it relates to SERVQUAL, which underlies the SERVIMPTp instrument, and point out problems around dimensional stability and predictive and convergent validity issues with difference scores. The authors refer to literature as far back as the 1950s discussing difference score issues including two articles of particular relevance to the current study: Lord (1958) and Johns (1981). Lord (1958) concisely describes the statistical reliability problems around difference scores. It is worth noting that while the author acknowledges the unreliability of such scores, he provides guidance on greatly increasing the utility of the scores: 1) use them only to make "broad rather than pinpoint judgments" (p. 150), and 2) only make judgments based on extreme scores. Johns

(1981) is interesting because while it provides an extensive treatment of the problems inherent in the use of gap scores for social science research, the author also speaks to why their use continues to persist. The author claims that they are intuitively appealing and that they have not attracted much critical attention. Although this appeared to be the case in 1981, it is no longer true that there has not been much critical attention as is attested to in van Dyke et al. (1997 & 1999).

This research further investigated the SSI, by including its factors in additional analyses.

SERVIMPTp

The SERVIMPTp instrument is an 8-item service quality instrument for measuring information service quality. It is relevant to the current research because of its applicability to information services and service quality. Landrum, Prybutok, Peak, and Qin (2010) developed SERVIMPTp based on prior work done on SERVPERF, a performance only derivative of SERVQUAL, which was discussed previously.

SERVPERF is an instrument developed by Cronin and Taylor (1992) as the result of discarding all but the performance based measurement of SERVQUAL. The authors' study had two main objectives of which the first objective was to show the superiority of a simple, performance based measurement of service quality over a gap based measurement, and the second was to examine the relationships between importance, satisfaction, and purchase intentions. The authors were successful in attaining both objectives. What the authors found was that SERVPERF, an instrument requiring 22 questions, performed better than SERVQUAL, requiring 44 questions, with

significantly fewer questions and better reliability. In addition, the authors found, “that service quality is an antecedent of consumer satisfaction and that consumer satisfaction exerts a stronger influence on purchase intentions than does service quality” (p. 65).

Landrum, et al. (2010) extended both previous SERVQUAL studies and SERVPERF studies, including Cronin and Taylor (1992), by investigating the relationship between the importance of items and the importance of each of the five dimensions of SERVQUAL and SERVPERF. The authors express interest in “how the perception of the relative importance of each dimension of service quality corresponds to the importance associated with the items within each dimension” (p. 397). The authors determined that intangibles such as responsiveness and reliability were ranked higher, according to their mean importance scores, than the tangibles – environment, assurance – trust, or empathy – caring dimensions. The authors also found, as the result of multiple regressions, that an 8-item scale was sufficient to measure the 5 dimensions of service quality suggesting that “it is possible to reduce the number of items used to measure each dimension of SERVQUAL to achieve a parsimonious service quality instrument.” (p. 304). The reduced item instrument SERVIMPTp consists of the following eight items:

- Appealing facilities
- Convenient hours
- Dependability
- Keeping users informed
- Readiness to respond
- Courteous staff

- Making users feel secure
- Caring service

Performance only measures of service quality are not without critics, including the original authors of SERVQUAL, Parasuraman, Zeithaml, and Berry, who in 1994, responded to Cronin and Taylor (1992), and also to Teas (1993), who had criticized the gap based approach and proposed an evaluated performance perceived quality approach, saying, “The collective conceptual and empirical evidence casts doubt on the alleged severity of the concerns about the current approach and on the claimed superiority of the alternate approaches proffered by C&T and Teas” (p. 123). Cronin and Taylor (1994) asserted that this criticism was a matter of interpretation and not substance and claim that the emergent literature of that time supported their claims. The authors revisited both their prior work, the prior work of their critics, and the emergent literature in support of their original claims while at the same time acknowledging the contributions of their critics.

The SERVIMPTp instrument was adapted and used in this study to measure service quality in a higher education, as an information system, in part because of its parsimony, and because of its superior reliability.

Dimensional Reduction

This section presents some necessary terminology and then discussion of one of the foci of the current study, reducing the dimensionality of orthogonal factors in an information space.

In mathematics, the term dimension refers to a property of an object that is required to locate that object within a space, i.e., in a Cartesian coordinate system,

there are three properties that define an object's location, the *x*, *y*, and *z* coordinates, each of these coordinates measures distance along one of the space's three dimensions. In multivariate statistics, the term is synonymous with the term factor, and refers to a linear combination of variables that are used as a predictor of an outcome. The term orthogonality in mathematical terms refers to the independence of dimensions, i.e., in the Cartesian example above, *x*, *y*, and *z* do not share any points in common; in fact, their dimensions are completely separate being at 90 degree angles to one another. This is related to the multivariate sense of the term, which refers to statistical independence, where factors do not share any association, i.e., correlation. Note that this is an ideal that is seldom achieved. In this research, the term information space is used to refer to the entire set of the factors that are found through analysis and is informed by the work of van Rijsbergen (1979), Salton, Wong, and Yang (1975), and Oyarce (2000) and their articulation of vector spaces and information. Oyarce (2000), and subsequent discussions with Oyarce, provided the researcher with concrete examples of the use of information space modeling to represent information objects and with different approaches to transforming a highly dimensional representation to a simpler, more compact dimensional representation. Parsimony, in the context of research refers to the ideal of finding the most efficient representation of a model in terms of its properties. The importance of the use of a parsimonious set of items was highlighted as important in the reduction of survey fatigue by (Pather & Uys, 2008) in their study investigating techniques to improve scale quality.

High levels of dimensionality are a problem that confronts researchers in ever growing numbers and are cited as one of the drivers for the popularity of multivariate

statistics (Hair, Black, Babbin, and Anderson, 2010). It has even been called the "Curse of Dimensionality" (Houle, Kriegel, Kroger, Schubert, & Zimek, 2010). Approaches to solving the problem of high dimensionality include multivariate statistical analyses (Hair et al., 2010; Tabachnik & Fidel, 2007), linear embedding (Roweis & Saul, 2000), shared neighbor distances (Oyarce, 2000, Houle et al., 2010), multi-dimensional scaling (Crouch, 1986; Fodor, 2002; Oyarce, 2000), and other diverse statistical methods (Fodor, 2002). Fodor (2002) surveys dimension reduction techniques in light of the fact that "not all the measured variables are 'important' for understanding the underlying phenomena of interest" (p. 1) and further suggests that it is "of interest in many applications to reduce the dimension of the original data prior to any modeling of the data" (p. 1).

This research is predicated on the assumption that a more parsimonious model is superior to more complex models and has as its objective to find the more parsimonious model. A parsimonious model in terms of this research is a model that has a minimum number of factors that are maximally orthogonal within the information space being considered. Such a model is advantageous in a number of regards, it is simpler to understand, instruments based on the model are less expensive to administer and may be administered more often, and data collection and analyses are simplified. This is consistent with "the need for easy and quick monitoring for addressing service standards measurement compliance with continuous improvement and Malcolm Baldrige National Quality Award criteria" (Landrum et al., p. 304).

Summary

This review presented the assumptions underlying this research and provided a discussion of literature bearing on those assumptions. The university, as an institution of higher education was shown to be an information system and its students were shown to be consumers of educational services. The constructs of student satisfaction and service quality along with two instruments measuring the constructs, the SSI and SERVIMPTp were reviewed. The relevance of the constructs to retention was shown and thereby, the appropriateness of using the instruments to measure them. Dimensional reduction and its centrality to the current study were established. The next chapter builds on the foundation presented in this chapter to describe the method of study for this research.

CHAPTER 3

METHODOLOGY

Introduction

This study investigated the relationships between the constructs of student satisfaction and service quality. Both student perceptions of satisfaction and service quality as those perceptions relate to the institution have been shown to impact the retention of students in higher education settings (Elliot & Healy, 2001; Quinn, Lemay, Larsen, & Johnson, 2009). These constructs have been shown to be multidimensional in nature (Juillerat, 1995; Parasuraman, Zeithaml, & Berry, 1985). High levels of dimensionality are problematic for researchers and methods to reduce the multidimensionality of variables are often desirable prior to the modeling of data in analyses (Fodor, 2002). This research sought to reduce the dimensionality of what have traditionally been considered orthogonal factors related to student satisfaction and service quality. This reduction produced a parsimonious model and survey instrument that may be useful in assessing and predicting overall student satisfaction and overall service quality. Survey fatigue is a serious concern for institutional research offices at higher education institutions (Porter, Whitcomb, & Weitzer, 2004) and a survey with a smaller number of items is desirable as discussed in the dimensional reduction section of the literature review.

The methods of analysis used in this study are quantitative in nature and included the use of descriptive univariate, bivariate, and multivariate analyses, exploratory factor analysis, and multiple linear regressions. Descriptive analysis were used in support of the multivariate analysis to determine that the data met the

assumptions of those analyses prior to conducting further analyses. The multivariate method of exploratory factor analysis (EFA) was chosen as the method of analysis to allow the researcher to examine the latent dimensions that emerged from the data and provided factors for additional analyses. EFA is generally useful in the exploration of survey and for dimensional reduction of factors (Hair et al., 2009). Multiple linear regressions were chosen to measure the predictive efficacy of combinations of variables with respect to overall student satisfaction and overall service quality.

This chapter describes the research design for the study by discussing the research questions and related hypothesis. Variables are described using operationalized definitions. The instruments that were used to measure the constructs of student satisfaction and service quality are discussed. Design considerations for reliability and validity are provided. The method of data collection is discussed in detail, including the describing the population, sampling approach, survey administration, data collection, and data analysis.

Research Questions and Hypotheses

The questions guiding this research are:

1. What are the dimensions of student satisfaction at the researcher's institution?
2. What are the items that measure the student satisfaction construct?
3. What is the minimum number of items needed to create an acceptable student satisfaction measure?
4. Are the dimensions consistent with those posited to exist by the chosen survey instrument's designers?
5. How effective is service quality as a predictor of overall satisfaction?

The hypotheses under investigation are:

H01 - There is no statistically significant relationship between any underlying latent dimension(s) of the student satisfaction survey items and the item representing overall student satisfaction.

H1 - There is a statistically significant relationship between any underlying latent dimension(s) structure of the student satisfaction survey items and the item representing overall student satisfaction.

H02 - There is no statistically significant relationship between the mean of all service quality items and the item representing overall student satisfaction.

H2 - There is a statistically significant relationship between the mean of all service quality items and the item representing overall student satisfaction.

H03 - There is no statistically significant relationship between the mean of all service quality items and the composite item representing overall service quality.

H3 - There is a statistically significant relationship between the mean of all service quality items and the composite item representing overall service quality.

H04 - There is no statistically significant relationship between the composite item representing overall service quality and the overall satisfaction item.

H4 - There is a statistically significant relationship between the composite item representing overall service quality and the overall satisfaction item.

H05 - There is no statistically significant relationship between any underlying latent dimension(s) of the student satisfaction survey items and the composite item representing overall service quality.

H5 - There is a statistically significant relationship between any underlying latent dimension(s) of the student satisfaction survey items and the composite item representing overall service quality.

Instruments

Noel-Levitz Student Satisfaction Inventory (SSI)

The SSI Original Form A for Four-Year College and University (Schreiner & Juillerat, 1993) was administered in this study. The instrument is a machine scannable

form with 116 items. Seventy one of the 116 items measure importance and satisfaction levels for 12 different dimensions of student experience including:

- Academic advising effectiveness
- Campus climate
- Campus life
- Campus support services
- Concern for the individual
- Instructional effectiveness
- Recruitment and financial aid effectiveness
- Registration effectiveness
- Responsiveness to diverse populations
- Safety and security
- Service excellence
- Student centeredness

As noted by Odom (2008) and presented in Figure 6, there is overlap in the items as they appear within the dimensions.

Dimension	AA	CC	CL	CSS	CON	IE	RE	SS	SE	SC
AA										
CC										
CL		2, 67								
CSS										
CON	14	3, 59	30							
IE		3, 41			25					
RE										
SS		7								
SE		2, 57, 60, 71		13	22		27			
SC		1, 2, 10, 29, 45, 59								

Figure 6 -Noel-Levitz SSI item matrix indicating item overlap by content area. Adapted from Odom (2008).

The SSI consists of the following items, organized by dimension:

- Academic advising (5 items)
- Campus climate (17 items)
- Campus life (15 items)
- Campus support services (7 items)
- Concern for the individual (6 items)
- Instructional effectiveness (15 items)
- Recruitment and financial aid (6 items)
- Registration effectiveness (5 items)
- Responsiveness to diverse populations (6 items)

- Safety and security (4 items)
- Service excellence (8 items)
- Student centeredness (6 items)
- Overall satisfaction (3 items)
- Demographic (14 items)
- User defined (10 items)
    - Refer to the discussion on SERVIMPTp-HE below.
- Not included in any scale (2 items)
- Importance only (9 items)
- Unused (1 item)

In summary, of the 116 items, 2 items are not part of any scale, 9 items measure only importance levels and are not associated with any scale, 3 items measure overall satisfaction,14 items are demographic, 10 items are are provided for institutions to supply additional questions, and one item was not used. The dimensions of the SSI were originally developed and refined by factor analysis (Juillerat, 1995).

SERVIMPTp

The SERVIMPTp instrument developed by Landrum, Prybutok, Peak, and Qin (2010) and available for public use, was adapted for use in a higher education context for this study. The adapted instrument, SERVIMPTp-HE, measures service quality performance and provides a service quality construct for the analyses. SERVIMPTp is based on the popular SERVQUAL instrument and its performance based derivative,

SERVPERF. These instruments are used in service quality measurement to measure along 5 dimensions of service quality:

Tangibles
Reliability
Responsiveness
Assurance
Empathy

SERVIMPTp was developed to provide a parsimonious service quality instrument with high predictive validity with a minimum number of items for use when instrument size constraints exist. The reduced SERVIMPTp instrument is comprised of the following 5 dimensions and 8 items:

Tangibles
- Appealing facilities
- Convenient hours

Reliability
- Dependability
- Keeping users informed

Responsiveness
- Readiness to respond

Assurance
- Courteous staff
- Making users feel secure

Empathy
- Caring service

The adapted instrument, SERVIMPTp-HE. is comprised of the following 11 items where the original 5 dimensions are preserved and two items are added that form a composite item representing overall service quality:

Tangibles (2 items)
Reliability (2 items)
Responsiveness (1 item)

Assurance (3 items)
Empathy (1 item)
Overall Service Quality (2 items)

Criterion/Predictor variables

There are three constructed variables that were used as both criterion and predictor variables in multivariate linear regressions.

OVERALLSAT - Overall Satisfaction. This variable is Item 100, Rate your overall satisfaction with your experience here thus far.

OVERALLQUAL - Overall Quality. This variable is composed of the mean of the following items:

82. Rate the overall quality of service provided to you by the institution.
83. There is a commitment to quality at this institution.

QUALITEMS - Quality Items. This variable is composed of the mean of the following items:

74. The campus facilities are appealing.
75. The campus has convenient operating hours.
76. Campus services are dependable.
77. The university keeps me informed about the availability of its services.
78. The university is ready to respond to my requests.
79. University faculty are courteous to me.
80. University staff are courteous to me.
7. The campus is safe and secure for all students.
81. University staff care about me.

Reliability

Reliability is an important consideration in research. The degree of stability of scores across time or as measured in different ways can enhance or degrade an analysis (Tabachnick and Fidel, 2007). This study included a number of measures of

reliability in the analysis. The primary measure to assess reliability of the instrument within the context of the EFA was Cronbach's alpha, commonly referred to as the reliability coefficient (Hair et al., 2010). Since Cronbach's alpha is sensitive to the number of items in a scale, the researcher used two other measures of reliability that are common with EFA, item-to-total correlation and inter-item correlation. Hair et al. (2010) discusses these measures and suggests that as a rule of thumb, item-to-total correlations exceed .50 and that inter-item correlation exceed .30. These are the guidelines that were used in this research.

Validity

Validity is also an important consideration in research. The term refers to the accuracy of a measure in reflecting the concept that is it is intended to measure (Babbie, 2007). Hair et al. (2010) discuss four types of validity, one conceptually determined and three empirically determined. Face validity or content validity refers to the degree of correspondence between an item or summated scale and the concept it is intended to represent. The face validity of the instruments chosen for this research have already been established in literature and it is expected that there is a high degree of empirical correspondence between the instruments' underlying theoretical constructs and the measures of them (Mentzer & Flint, 1997). According to Hair, et al. (2010) convergent validity refers to the degree of correlation between measures of the same concept and is measured by inter-item correlations between items within the same dimension in this study. Discriminant validity refers to the degree to which measures predict concepts that are distinct. Inter-item correlations are again used to measure items outside of the dimension, but with the expectation that the correlations are low.

Nomological validity refers to the degree to which a construct accurately predicts other theoretically derived concepts. This is established with prior research and is consistent with the results of this research.

Procedures

The administration of the SSI with SERVIMPTp-HE items, hereafter referred to as the survey, was conducted by the researcher through and with the assistance of the Office of Institutional Research at a large public university in the southwest United States. A stratified random sample was drawn from the students attending the university by course and classification. Packets were sent to instructors for each course that contained the materials necessary to complete the surveys through intercampus mail. Surveys were returned to the office of institutional research through intercampus mail as well. Once the completed surveys were collected, they were sent to Noel-Levitz for processing. Noel-Levitz scanned the surveys and sent the researcher the resulting raw data files. Noel-Levitz provided a summarized report of descriptive statistics for the dataset that were used as a cross-check against the descriptive analyses of the study. The raw data was imported into SPSS and descriptive statistics were generated by the researcher and validated against the results provided by Noel-Levitz to confirm that the datasets were the same. Missing value analysis was conducted and the appropriate steps were taken to address the deficiencies arising from missing values. The resultant dataset was then randomly split into two samples, one for analysis and one held in reserve. As discussed previously, descriptive statistics were used to analyze the samples prior to conducting further analyses. EFA and multiple linear regressions were

the methods of analysis used to determine the dimensional structure and correlations within the samples. SPSS version 22 was the software used to conduct these analyses.

Population

The population in this study is the students attending a large public university in the southwest United States as of the census date of the semester in which the study was conducted. The university is a general academic institution that offers more than 190 different degrees and is home to more than 34,000 students. The population is an appropriate choice for this research because it is representative of a student population that belongs to an institution of higher education and exists within an informing environment where the measurement of service quality is relevant.

Sample

A stratified random sample of students was selected from the entire body of students registered for classed as of the 12th day of classes (the census date) of the semester in which the study was conducted. Strata were determined by examining the population in terms of college and classification and calculating percentages of students belonging to each group at the time of study as shown in Figure 7.

College	Undergraduate	Graduate
Arts and Sciences	38.5%	16.0%
Business	22.8%	7.3%
Community Service	7.9%	5.7%
Education	10.0%	35.2%
Graduate School	0.0%	15.4%
Library and Information Sciences	0.1%	7.7%
Merchandising	2.6%	0.4%
Music	4.8%	6.6%
Visual Arts	8.6%	2.2%
Engineering	4.7%	3.5%

Figure 7. Sample strata by college and classification.

Approximately 4.1% of the population was targeted for inclusion in the sample. The method of inclusion was to select students taking courses being taught through a college as an undergraduate or graduate course. This resulted in a sample size of approximately 1400 students given the population of 34,000 students.

Method of Analysis

Descriptive statistical analyses were performed against the working sample to assess the degree to which the data fit the underlying assumptions of the multivariate data analysis techniques of exploratory factor analysis and multivariate linear regressions, particularly with respect to measures of central tendency, variability, and normality. Multivariate normality and multicollinearity were also evaluated.

EFA is appropriate for determining the underlying latent dimensional structure residing in data collected from survey instruments and was the method used by Juillerat (1995) to devise the original SSI. The dimensional structure of data obtained from this study cannot be assumed to adhere to the dimensions found by Juillerat nor implied in the scales comprising the SSI and thus it is appropriate for use in this study as a method of analysis. EFA is an interdependence technique that is well suited to situations requiring the simultaneous evaluation of multiple variables without distinction of dependent or independent variables. Further, EFA is designed for data summarization, where variates (factors) maximally describe an entire dataset and for data reduction, where a parsimonious set of representative variables can be identified that are capable of representing the entire dataset (Hair et al., 2010).

Multiple linear regression is a dependence technique refers to a statistical technique that allows the researcher to asses the relationship between a dependent variable (DV) and multiple independent variables (IVs) (Tabachnick and Fidell, 2009). The technique is typically used to analyze the ability of the IVs to predict the DV but it is also used to asses the relationship between IVs and DV. When used to predict, the term regression applies, when used to assess the relationship, correlation applies. In this study multiple linear regression was used to assess the predictive ability of the IVs with respect to the DVs as indicated by the aforementioned hypotheses.

EFA and multiple linear regressions are compatible analyses that can be usefully combined to provide the researcher a suite of powerful analytical tools. It was the use of this combination of methods that allowed the researcher to meet the stated goal of

reducing the dimensionality of orthogonal factors in an information space and to create a parsimonious instrument.

Summary

This chapter presented the researchers approach to conducing the research necessary to meet the goals of this study. The study's research questions and hypotheses that were tested were discussed. The survey instruments being used and its variable definitions were described. Issues of reliability were addressed and threats to validity as well as the relevant assessment techniques the researcher used in the research. The procedures used to administer the survey, collect the data, handle missing values, and stage a working and reserved dataset were provided to the reader. Finally, the methods of analysis and their appropriateness for use in the context of this study were discussed.

CHAPTER 4

RESULTS OF DATA ANALYSES

Introduction

The results presented below were obtained from analyses of data collected according to the design described in the previous chapter. This chapter begins with this introduction, followed by a brief discussion of the survey administration. Steps taken to prepare the data for analysis are summarized, including the processes of missing value analysis and splitting the sample into a sample for analysis and a reserve. Univariate and bivariate statistics are presented as prelude to a brief discussion around the assumptions of the multivariate analyses. Once the assumptions are presented, the results of the exploratory factor analysis are presented and discussed followed by a presentation of the results of a series of multiple linear regressions. Reliability and validity are analyzed within the context of each analysis. Then, each hypothesis is presented and evidence in support or in contradiction with each hypothesis is provided and discussed. This chapter concludes with a table summarizing the results and a discussion of the findings. As discussed previously, the five questions guiding this research are:

1. What are the dimensions of student satisfaction at the researcher's institution?
2. What are the items that measure the student satisfaction construct?
3. What is the minimum number of items needed to create an acceptable student satisfaction measure?

4. Are the dimensions consistent with those posited to exist by the chosen survey instrument’s designers?
5. How effective is service quality as a predictor of overall satisfaction?

Survey Administration

Surveys were sent according to the procedures described previously to a stratified sample of 1400 students drawn from the student body of a large public university in the southwest United States. The sample comprised approximately %4.1 of the population. 790 surveys were returned for a response rate of approximately %54. The returned surveys were sent to Noel-Levitz for scanning and processing. Raw data files resulting from the scanning procedures and a summary report of descriptive statistics were returned to the researcher.

Data Preparation

The raw data files were provided in a tab-delimited format with an SPSS script that was capable of importing the records into an SPSS dataset. The script was modified only insofar as to allow for easy identification of missing values. 790 cases were imported into SPSS and saved to a backup location. The researcher then wrote scripts to:

1) Add labels to the 10 researcher supplied questions:

1. The campus facilities are appealing'.
2. The campus has convenient operating hours'.
3. Campus services are dependable'.
4. The university keeps me informed about the availability of its services'.
5. The university is ready to respond to my requests'.
6. University faculty are courteous to me'.
7. University staff are courteous to me'.
8. University staff care about me'.
9. Rate the overall quality of service provided to you by the institution'.
10. There is a commitment to quality at this institution'.

2) Add labels for Majors.

3) Calculate a gap variable for use in future analyses.

The cases were then analyzed for missing values and any cases missing importance or satisfaction responses across all 10 researcher supplied questions were removed from the dataset. The researcher removed 119 cases from consideration on this basis. The remaining 671 cases were then analyzed to identify cases where more than 10% of the responses were missing. The researcher then removed 34 cases on this basis. 637 cases were set aside for further analysis.

The researcher then randomly split the 637 case sample into two separate samples, a working sample of 318 cases, and a reserved sample of 319 cases respectively. The results presented below are derived from analyses of the 318 case working sample dataset.

Exploratory Factor Analysis

Meeting the Assumptions

The assumptions for exploratory factor analysis (EFA) are primarily conceptual in nature, and what statistical assumptions there are only apply to the extent that they diminish observed correlations (Hair et al., 2010).

Conceptual Assumptions

A major conceptual assumption is that an underlying structure to the data exists. The theoretical basis for this assumption is established in literature as discussed in the literature review chapter. Another important assumption is that the analysis does not include both independent and dependent variables. The researcher specifically excluded the identified dependent variables from the EFA analyses described below.

Statistical Assumptions

The only statistical assumption required by the EFA procedure is normality and only in the case of statistical tests of significance. In EFA, the object is often to identify interrelationships among variables, so a degree of multicollinearity is desirable (Hair et al., 2010).

Descriptive analyses were run for each item in the inventory and the data were found to be primarily leptokurtic and negatively skewed as seen in Table 3.

Table 3

Descriptive Statistics for all Items in the Inventory Plus the Calculated Gap Scores

			Statistic	
Item	M	SD	Kurtosis	Skewness
IMP1	5.45	1.51	-1.12	1.10
IMP2	6.17	1.02	-1.65	3.85
IMP3	5.97	1.20	-1.44	2.42
IMP4	6.14	1.23	-1.99	5.07
IMP5	5.60	2.01	-1.66	1.94
IMP6	6.38	1.15	-2.68	8.84
IMP7	6.50	0.94	-2.48	7.90
IMP8	6.55	0.82	-2.45	8.12
IMP9	4.53	2.03	-0.73	-0.31
IMP10	5.66	1.51	-1.76	3.76
IMP11	5.99	1.32	-1.81	4.35
IMP12	5.93	1.71	-2.05	4.01
IMP13	5.43	1.74	-1.50	2.09
IMP14	6.19	1.29	-2.51	7.94
IMP15	5.46	2.04	-1.54	1.57
IMP16	6.61	0.81	-2.70	9.41
IMP17	6.03	1.64	-2.26	5.09

(table continues)

Table 3 *(continued).*

			Statistic	
Item	M	SD	Kurtosis	Skewness
IMP18	5.92	1.53	-2.13	5.19
IMP19	6.01	1.36	-2.07	5.49
IMP20	5.58	1.81	-1.67	2.44
IMP21	6.08	1.73	-2.40	5.23
IMP22	5.44	2.07	-1.58	1.57
IMP23	4.12	2.82	-0.46	-1.45
IMP24	4.31	2.35	-0.61	-0.90
IMP25	6.30	1.17	-2.40	7.47
IMP26	6.30	1.25	-3.00	11.20
IMP27	5.83	1.67	-2.11	4.56
IMP28	5.88	1.74	-2.02	3.80
IMP29	6.20	1.12	-1.95	5.37
IMP30	3.58	2.77	-0.19	-1.56
IMP31	4.42	2.65	-0.66	-1.08
IMP32	5.36	2.13	-1.52	1.27
IMP33	6.39	1.33	-3.06	10.64
IMP34	6.52	1.04	-3.10	12.40
IMP35	5.86	1.65	-2.06	4.48
IMP36	5.20	2.56	-1.25	0.03
IMP37	5.54	1.69	-1.42	1.81
IMP38	5.06	2.24	-1.20	0.33
IMP39	6.39	1.07	-2.79	10.92
IMP40	3.70	2.76	-0.29	-1.53
IMP41	6.29	1.14	-2.56	8.84
IMP42	4.17	2.54	-0.51	-1.11
IMP43	5.19	2.26	-1.32	0.63
IMP44	5.56	2.02	-1.70	2.05
IMP45	5.97	1.33	-1.99	5.11
IMP46	5.42	1.88	-1.51	1.75
IMP47	6.27	1.16	-2.69	9.80
IMP48	5.01	2.32	-1.20	0.21
IMP49	5.60	2.06	-1.72	1.98
IMP50	5.91	1.66	-2.18	4.87
IMP51	6.09	1.31	-2.40	7.54
IMP52	5.13	2.21	-1.23	0.43
IMP53	5.96	1.46	-2.03	4.76

(table continues)

Table 3 *(continued).*

			Statistic	
Item	M	SD	Kurtosis	Skewness
IMP54	5.59	1.71	-1.66	2.80
IMP55	6.33	1.14	-2.57	8.59
IMP56	4.84	2.28	-1.00	-0.10
IMP57	5.84	1.70	-2.03	3.96
IMP58	6.46	1.08	-3.03	11.71
IMP59	6.04	1.34	-2.14	5.77
IMP60	5.38	1.78	-1.37	1.54
IMP61	5.89	1.61	-2.14	4.78
IMP62	5.63	1.90	-1.69	2.22
IMP63	5.18	2.28	-1.34	0.62
IMP64	5.21	2.23	-1.28	0.51
IMP65	6.16	1.40	-2.53	7.51
IMP66	6.31	1.33	-2.82	9.24
IMP67	5.73	1.84	-1.83	2.83
IMP68	6.45	1.13	-3.14	12.34
IMP69	6.30	1.26	-2.71	8.91
IMP70	5.92	1.67	-2.25	5.10
IMP71	5.43	2.05	-1.62	1.77
IMP72	6.14	1.25	-2.40	7.83
IMP73	5.77	1.81	-1.92	3.32
IMP74	6.01	1.20	-1.72	4.15
IMP75	6.25	1.03	-1.89	4.83
IMP76	6.15	1.22	-2.48	8.40
IMP77	5.99	1.36	-1.95	4.66
IMP78	5.98	1.39	-2.21	6.28
IMP79	6.25	1.14	-2.26	6.75
IMP80	6.18	1.16	-2.10	5.84
IMP81	5.94	1.33	-1.70	3.54
IMP82	6.24	1.32	-2.84	9.64
IMP83	6.30	1.19	-2.95	11.19
IMP90	6.28	1.34	-2.62	7.83
IMP91	5.51	2.17	-1.46	0.92
IMP92	5.80	1.42	-1.49	2.37
IMP93	4.60	1.93	-0.52	-0.58
IMP94	2.87	2.17	0.47	-1.03
IMP95	4.29	2.13	-0.44	-0.94

(table continues)

Table 3 *(continued).*

			Statistic	
Item	M	SD	Kurtosis	Skewness
IMP96	5.49	1.74	-1.38	1.39
IMP97	5.04	1.79	-0.98	0.39
IMP98	4.69	2.06	-0.73	-0.49
SAT1	5.13	1.41	-0.64	0.18
SAT2	5.42	1.26	-1.03	1.43
SAT3	5.24	1.33	-0.65	0.11
SAT4	5.00	1.62	-1.04	0.95
SAT5	4.21	2.16	-0.71	-0.48
SAT6	5.37	1.78	-1.22	0.92
SAT7	5.67	1.23	-1.01	0.96
SAT8	5.53	1.41	-1.16	1.25
SAT9	4.49	2.08	-1.01	0.27
SAT10	4.75	1.82	-1.12	1.00
SAT11	4.77	1.68	-0.87	0.41
SAT12	4.43	1.95	-0.71	-0.17
SAT13	5.10	1.87	-1.34	1.57
SAT14	5.06	1.89	-1.12	0.60
SAT15	4.19	2.36	-0.72	-0.67
SAT16	5.58	1.42	-1.34	2.05
SAT17	4.44	2.04	-0.68	-0.37
SAT18	5.33	1.83	-1.58	2.22
SAT19	4.87	1.97	-0.97	0.20
SAT20	4.71	2.05	-1.00	0.34
SAT21	2.74	1.95	0.66	-0.63
SAT22	3.97	2.29	-0.66	-0.73
SAT23	3.08	2.39	-0.19	-1.42
SAT24	3.32	2.13	-0.19	-0.97
SAT25	5.37	1.41	-0.93	0.90
SAT26	5.70	1.57	-1.73	3.18
SAT27	5.09	1.74	-1.32	1.64
SAT28	4.56	1.87	-0.81	0.07
SAT29	5.45	1.40	-1.04	0.95
SAT30	3.01	2.44	-0.07	-1.40
SAT31	3.86	2.61	-0.45	-1.24
SAT32	4.34	2.40	-0.76	-0.68
SAT33	5.44	1.87	-1.37	1.28
SAT34	5.08	1.72	-0.86	0.03

(table continues)

Table 3 *(continued).*

			Statistic	
Item	M	SD	Kurtosis	Skewness
SAT35	4.99	1.76	-1.11	1.05
SAT36	3.27	2.64	-0.11	-1.46
SAT37	4.92	1.74	-0.83	0.23
SAT38	4.17	2.22	-0.65	-0.58
SAT39	5.67	1.30	-1.21	1.71
SAT40	2.97	2.53	0.01	-1.47
SAT41	5.30	1.51	-1.14	1.33
SAT42	3.37	2.31	-0.27	-1.11
SAT43	4.32	2.26	-0.76	-0.50
SAT44	4.72	2.05	-1.12	0.53
SAT45	5.33	1.47	-1.16	1.85
SAT46	4.87	1.96	-1.07	0.61
SAT47	5.11	1.54	-0.84	0.43
SAT48	4.20	2.32	-0.72	-0.64
SAT49	4.63	2.17	-0.89	-0.12
SAT50	4.94	1.94	-1.13	0.74
SAT51	5.45	1.52	-1.37	2.26
SAT52	4.40	2.37	-0.74	-0.65
SAT53	5.06	1.61	-0.95	0.72
SAT54	5.11	1.90	-1.30	1.31
SAT55	5.47	1.42	-1.03	0.89
SAT56	4.30	2.24	-0.76	-0.42
SAT57	4.54	1.90	-0.70	-0.24
SAT58	5.44	1.47	-1.03	0.71
SAT59	5.09	1.55	-0.94	1.12
SAT60	4.61	1.75	-0.65	0.17
SAT61	4.97	1.80	-1.08	0.84
SAT62	5.19	1.84	-1.33	1.55
SAT63	4.37	2.36	-0.82	-0.54
SAT64	4.46	2.20	-0.74	-0.45
SAT65	5.58	1.52	-1.50	2.73
SAT66	5.10	1.69	-0.96	0.49
SAT67	5.34	1.72	-1.51	2.33
SAT68	5.73	1.35	-1.42	2.32
SAT69	5.68	1.38	-1.27	1.80
SAT70	4.89	1.92	-1.11	0.62
SAT71	4.17	2.25	-0.64	-0.64

(table continues)

Table 3 *(continued).*

			Statistic	
Item	M	SD	Kurtosis	Skewness
SAT72	5.58	1.44	-1.34	2.03
SAT73	4.22	2.12	-0.57	-0.60
SAT74	5.17	1.55	-0.80	0.04
SAT75	5.66	1.27	-1.08	1.14
SAT76	5.38	1.54	-1.38	2.34
SAT77	5.23	1.54	-0.91	0.81
SAT78	4.92	1.73	-0.96	0.88
SAT79	5.76	1.31	-1.36	2.24
SAT80	5.59	1.33	-1.16	1.84
SAT81	5.30	1.51	-0.99	1.08
SAT82	5.63	1.23	-1.14	1.73
SAT83	5.61	1.33	-1.09	1.27
SAT84	4.43	2.33	-0.84	-0.43
SAT85	4.56	2.24	-0.95	-0.15
SAT86	4.19	2.53	-0.68	-0.94
SAT87	4.13	2.51	-0.64	-0.95
SAT88	4.54	2.21	-0.72	-0.54
SAT89	4.17	2.64	-0.59	-1.12
SAT99	4.70	1.29	-0.08	0.66
SAT100	5.50	1.26	-1.23	1.36
SAT101	5.62	1.49	-1.25	1.00
GAP1	-0.32	1.71	0.14	1.81
GAP2	-0.75	1.40	-0.25	3.19
GAP3	-0.72	1.52	-0.02	2.46
GAP4	-1.16	1.68	-0.69	1.80
GAP5	-1.40	2.19	-0.47	0.82
GAP6	-1.01	1.85	-1.03	2.06
GAP7	-0.83	1.36	-0.32	3.20
GAP8	-1.02	1.51	-0.89	3.07
GAP9	-0.04	1.91	-0.21	2.13
GAP10	-0.91	1.82	-0.66	2.02
GAP11	-1.21	1.98	-0.42	1.01
GAP12	-1.49	2.16	-0.34	0.72
GAP13	-0.32	1.58	-0.43	3.66
GAP14	-1.14	1.88	-1.10	2.02
GAP15	-1.28	2.31	-0.69	1.10
GAP16	-1.03	1.51	-0.87	3.55

(table continues)

Table 3 *(continued).*

			Statistic	
Item	M	SD	Kurtosis	Skewness
GAP17	-1.61	2.24	-0.30	0.48
GAP18	-0.59	1.50	-0.75	5.94
GAP19	-1.14	1.99	-0.95	1.59
GAP20	-0.89	1.92	-0.84	1.86
GAP21	-3.33	2.55	0.78	-0.01
GAP22	-1.46	2.25	-0.74	1.07
GAP23	-1.05	2.43	-0.63	0.78
GAP24	-1.02	2.30	-0.33	0.52
GAP25	-0.94	1.55	-0.33	3.33
GAP26	-0.60	1.42	-0.93	4.29
GAP27	-0.73	1.59	-0.77	4.11
GAP28	-1.32	2.00	-0.34	0.88
GAP29	-0.76	1.42	-0.77	3.71
GAP30	-0.60	2.16	-0.61	1.94
GAP31	-0.62	2.38	-0.74	2.11
GAP32	-1.03	2.11	-1.08	1.83
GAP33	-0.97	1.77	-1.20	3.17
GAP34	-1.44	1.85	-0.61	1.17
GAP35	-0.90	1.71	-0.63	3.53
GAP36	-1.94	2.65	-0.71	-0.17
GAP37	-0.62	1.72	-0.57	2.19
GAP38	-0.90	2.09	-0.69	1.50
GAP39	-0.72	1.30	-0.72	4.81
GAP40	-0.74	2.09	-0.94	1.98
GAP41	-0.99	1.61	-0.51	3.31
GAP42	-0.83	2.15	-0.65	1.15
GAP43	-0.88	1.83	-0.86	3.05
GAP44	-0.87	1.70	-0.89	4.51
GAP45	-0.64	1.48	-0.89	4.28
GAP46	-0.55	1.64	-0.39	3.50
GAP47	-1.16	1.62	-0.65	1.87
GAP48	-0.80	1.89	-1.04	3.31
GAP49	-0.98	1.89	-0.65	2.46
GAP50	-0.98	1.82	-1.03	2.26
GAP51	-0.62	1.42	-0.84	4.39
GAP52	-0.72	2.01	-0.95	2.15
GAP53	-0.88	1.78	-0.17	2.46

(table continues)

Table 3 *(continued).*

			Statistic	
Item	M	SD	Kurtosis	Skewness
GAP54	-0.49	1.57	-0.90	3.89
GAP55	-0.86	1.54	-0.43	2.85
GAP56	-0.56	1.85	-0.46	4.01
GAP57	-1.31	2.06	-0.34	1.34
GAP58	-1.02	1.51	-0.59	3.27
GAP59	-0.94	1.62	-0.45	3.31
GAP60	-0.77	1.98	-0.20	1.03
GAP61	-0.92	1.73	-0.97	2.80
GAP62	-0.44	1.73	-0.32	4.07
GAP63	-0.86	2.04	-1.22	3.05
GAP64	-0.78	2.08	-0.51	2.27
GAP65	-0.59	1.48	-0.35	5.41
GAP66	-1.21	1.78	-0.47	1.84
GAP67	-0.41	1.70	0.17	4.28
GAP68	-0.72	1.39	-0.53	5.70
GAP69	-0.63	1.45	-0.10	5.54
GAP70	-1.00	1.82	-0.60	2.53
GAP71	-1.27	2.26	-0.61	0.94
GAP72	-0.55	1.45	-0.13	5.48
GAP73	-1.52	2.19	-0.57	0.70
GAP74	-0.85	1.75	-0.77	1.96
GAP75	-0.59	1.31	-0.63	5.45
GAP76	-0.76	1.46	-1.35	5.53
GAP77	-0.76	1.55	-0.49	2.75
GAP78	-1.07	1.69	-0.84	2.99
GAP79	-0.49	1.24	-0.73	5.99
GAP80	-0.59	1.32	-0.43	4.61
GAP81	-0.63	1.54	-0.35	3.39
GAP82	-0.61	1.52	0.92	6.70
GAP83	-0.69	1.49	0.61	7.26

Sufficient intercorrelations

The data in this research have met both the conceptual and limited statistical assumptions for EFA and are appropriate for further analysis. In order to determine if

the data was sufficiently intercorrelated to perform EFA, I generated three separate correlation matrices. One for the IMP items, one for the SAT items, and one for the GAP items. A visual inspection of the correlation matrices in all cases revealed substantial intercorrelations > .30. An Excel analysis of the results can be seen in Table 4.

Table 4

Intercorrelations > .30

Items	Correlations > .30	Number Items	Percentage of Items
IMP	1609	82	24%
SAT	1383	79	22%
GAP	1332	73	25%

According to Hair et al. (2010), high partial correlations can indicate that data may not be suitable for EFA. The researcher analyzed the partial correlations for IMP, SAT, and GAP items using the negatives of the values obtained from SPSS anti-image matrix and found no partial correlations > .70. Another indication that there are correlations between at least some of the items is Bartlett's test of sphericity. When applied to the IMP, SAT, and GAP items, Bartlett's was significant in all cases. A final measure of the degree of intercorrelations used in this research was the measure of sampling adequacy (MSA). The overall statistic used in this research to indicate the MSA is the Kaiser-Meyer-Olkin MSA (KMO). The overall KMO was meritorious for the IMP, SAT, and GAP items tested. The results of the Bartlett's test of sphericity and KMO are shown in Table 5.

In addition to analyzing the overall MSAs, the researcher analyzed individual MSAs using the SPSS generated anti-image correlation matrix containing the MSAs for individual items in its diagonal. It was found that all items exhibited sufficiently large MSAs. The IMP items all had MSA values above .6, with only 3 items less than .8. The

SAT items all had MSA values above .7 with only 1 item less than .8. Likewise the GAP items all had MSA values above .7 with only 1 item less than .8.

Table 5

Bartlett's Test of Sphericity and Kaiser-Meyer-Olkin MSA Results for IMP, SAT, and GAP Items

Items	Bartlett's Test of Sphericity	Kaiser-Meyer-Olkin MSA
IMP	Significant at .0001	.91
SAT	Significant at .0001	.92
GAP	Significant at .0001	.92

According to Hair et al. (2010) MSA values increases with larger samples, increasing average correlations, increased number of variables, decreased number of factors. It is therefore not surprising to see high individual MSA's and overall MSA. The data in this research are appropriate for EFA and meet the assumptions adequately for further analyses.

Overview

The results of three EFAs are presented below, one EFA was conducted on the IMP item set, one on the SAT item set, and one on the computed GAP scores where the GAP is the difference between the expectation IMP score and the performance SAT score.

Each EFA was conducted using SPSS's FACTOR procedure with the following options set initially, univariate descriptives, initial solution, coefficients, significance levels, KMO and Bartlett's test of sphericity, and anti-image matrix. The extraction method chosen was Principal Axis Factoring (PAF) analyzed using the correlation matrix, the options for the extraction set initially were, unrotated factor matrix, scree plot, and eigenvalues > 1, with 25 iterations maximum set for convergence. The unrotated factor solutions in each case were not sufficiently explanatory, so the researcher chose

to display a rotated solution using the VARIMAX orthogonal rotation method, which produces a column simplified factor matrix for interpretation, and 30 iterations maximum for convergence.

The researcher chose PAF because it is suitable for investigating the latent dimensions that reflect common variance shared between variables, and because of the lack of knowledge of the specific and error variance (Hair et al, 2010). This approach to dimensional analysis has been shown to arrive at nearly identical results as principal components analysis, the default method of analysis in SPSS, when the number of items exceeds 30 or the bulk of the communalities are above .6 (Hair et al., 2010). The eigenvalue criteria used in this research is to initially retain only those factors with eigenvalues of 1.0 or higher (Kaiser, 1960). In addition to the eigenvalue based criteria, this research also used the scree plot criteria established by Cattell (1966) where the scree plot is reviewed and those items above the so-called elbow, the point where the curve begins to decline much less sharply and to level off, are retained for further analyses. VARIMAX was chosen to maximally differentiate items between factors using orthogonal rotation.

The strategy employed in this research to develop a parsimonious model for each item set, is based on the approach outlined in Hair (2010), and was to run the EFA without rotation first, to determine if rotation was actually needed. Then, since rotation was needed to arrive at an interpretable factor model, the factors were rotated using the orthogonal VARIMAX rotation, and the researcher began iterating through the EFA, removing items one at a time, in order to derive a model with items loading greater than or equal to .5 on only a single factor. In order to determine candidate items for deletion

from the analysis, the rotated factor matrix was reviewed, and any items that did not have correlations higher than .5 were ranked from lowest to highest and the item with the lowest maximum correlation on any factor was selected for removal. The item was then removed and another iteration of the EFA was executed. Once all items with correlations lower than .5 were removed from the analysis, items with cross-loadings were considered as candidates for removal. An item was considered to be cross-loaded in the analysis if it loaded on more than one factor with a correlation of .4 or higher. Candidate cross-loaded items were ranked according to their highest loading, referred to here as their primary loading, and then by their second highest loading, referred to as their secondary loading. The item with the highest primary and secondary loading was then selected for removal from the analysis, and another iteration of the EFA was executed. Once all cross-loaded items had been removed, candidate items were selected from the model with loading less than .5, and the EFA continued until all items loaded on a single factor with correlations of .5 or greater. If at any point the model failed to converge, the researcher reviewed the previously rotated factor matrix and selected the next item for removal from that review, and continued with the next iteration of the EFA.

IMP Item Set EFA

The first EFA included only those items measured against importance, those labeled IMP1-IMP73 and IMP90-IMP98. The researcher specified items, IMP74-IMP83, were excluded from the analysis to allow for their use as dependent variables in linear regression. As discussed previously, descriptive statistics for the IMP item set and correlation analyses indicated that the data were sufficient for further analyses. The

overall KMO for these items was .912, which is meritorious and Bartlett's test of sphericity was significant at the .0001 level. All individual MSA's found in the diagonal of the anti-image correlation matrix in SPSS were above .6, with only 3 items less than .8.

The initial unrotated factor matrix produced 16 factors with eigenvalues greater than 1 and accounting for 63.66% of the total variance in the model as shown in Table 6.

Table 6

Initial IMP Items Unrotated Factor Matrix

Total Variance Explained						
Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	26.39	32.18	32.18	26.04	31.75	31.75
2	7.04	8.59	40.77	6.73	8.21	39.96
3	3.32	4.05	44.82	2.95	3.60	43.56
4	2.79	3.40	48.22	2.42	2.95	46.51
5	2.60	3.18	51.39	2.27	2.76	49.28
6	2.15	2.62	54.02	1.79	2.18	51.46
7	2.05	2.50	56.52	1.71	2.08	53.54
8	1.82	2.22	58.74	1.47	1.79	55.33
9	1.51	1.84	60.58	1.18	1.44	56.77
10	1.36	1.66	62.24	1.00	1.22	57.98
11	1.29	1.57	63.81	0.89	1.08	59.07
12	1.22	1.49	65.30	0.86	1.05	60.12
13	1.19	1.45	66.75	0.80	0.98	61.09
14	1.17	1.43	68.18	0.76	0.93	62.02
15	1.12	1.36	69.54	0.68	0.84	62.86
16	1.05	1.28	70.82	0.66	0.81	63.66
Extraction Method: Principal Axis Factoring.						

A review of the scree plot was inconclusive, showing an elbow at or around 3, 5, 8 and 16 factors respectively as shown in Figure 8.

The unrotated factor solution was not amenable to a reasonable interpretation, so the solution was rotated using VARIMAX and evaluated in accordance with the

strategy discussed previously. The researcher iteratively removed 28 items on the basis of their not loading at .5 or above and an additional 5 items that cross-loaded on multiple factors.

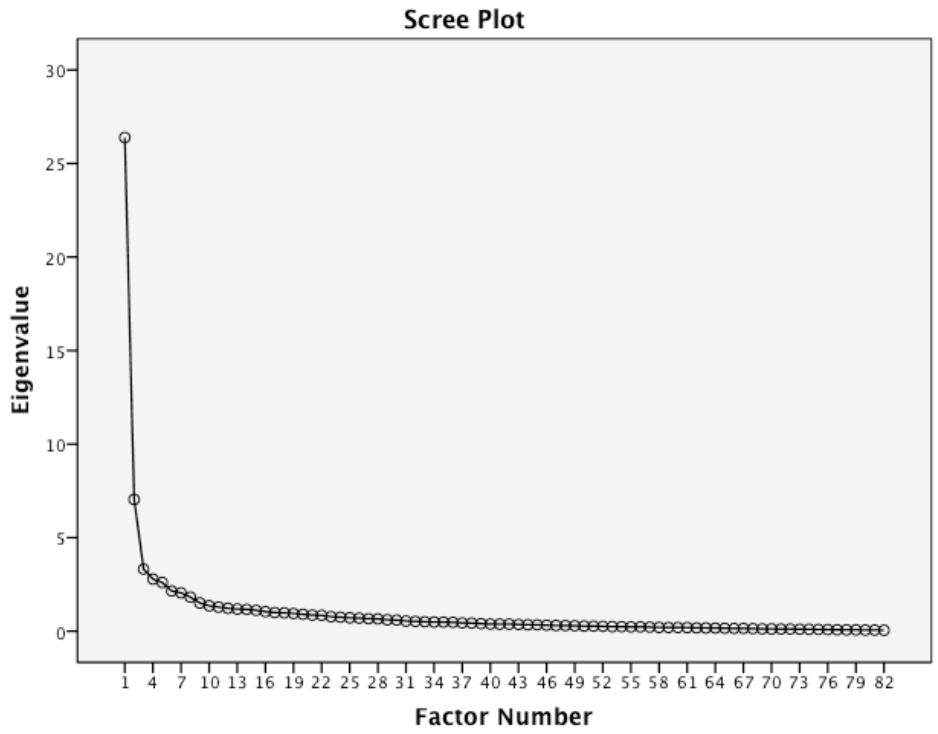


Figure 8. Scree plot for IMP item set unrotated factor solution.

The resulting factor model is shown in Table 7.

Table 7

IMP Item set Final Factor Model

	Factors and Loadings							
Item	1	2	3	4	5	6	7	8
IMP58	.88							
IMP68	.85							
IMP47	.76							
IMP55	.75							
IMP39	.74							
IMP69	.74							
IMP29	.72							
IMP41	.71							
IMP25	.71							
IMP72	.69							
IMP34	.68							
IMP66	.63							
IMP59	.63							
IMP65	.61							
IMP53	.60							
IMP45	.59							
IMP51	.54							
IMP26	.54							
IMP48		.70						
IMP63		.68						
IMP71		.68						
IMP43		.66						
IMP56		.65						
IMP44		.58						
IMP36		.57						
IMP49		.54						
IMP32		.53						
IMP40			.86					
IMP30			.80					
IMP23			.77					
IMP38			.55					
IMP42			.52					
IMP97				.74				
IMP98				.66				
IMP93				.63				
IMP95				.63				

(table continues)

Table 7 *(continued).*

	Factors and Loadings							
Item	1	2	3	4	5	6	7	8
IMP92				.58				
IMP94				.54				
IMP17					.81			
IMP12					.80			
IMP5					.68			
IMP91					.60			
IMP2						.74		
IMP7						.56		
IMP4						.54		
IMP3						.53		
IMP18							.75	
IMP13							.65	
IMP28								.70
IMP21								.67

The total variance explained by the 8-factor model, 59.44%, is shown in Table 8.

The 8 extracted factors were then named based on the items with the highest loadings. The resulting factors are shown in Table 9.

The model was then subjected to reliability analyses using Cronbach's (1951) coefficient alpha, inter-item correlations, and item-total correlations as shown in Tables 11 - 18. Factors 7 and 8 with 2 items each are not assessed using Cronbach's which requires more than 2 items, but correlations are calculated for these factors. Table 10 shows that Cronbach's alpha was above .70 for all factors, indicating sufficient reliability (Hair et al., 2010. The review of inter-item correlations for all factors found all correlations exceeded the .30 established a priori as the lower bound.

The item-total correlations of all scales and items exceeded the lower bound .50 established a priori. Only two items would improve Cronbach's alpha if removed and both were retained on the basis of high correlation, conceptual fit, or negligible impact

on the model. Item IMP38, in Factor 3, had a correlation of .541 and its removal would add less than .01 to Cronbach's alpha. Item IMP91, in Factor 5, had a correlation of .552 and its removal would add .016 to Cronbach's. It was retained because of conceptual fit, being a financial aid related question. The 8 factor model was found to be sufficiently reliable to be used in further analyses.

Table 8

Total Variance Explained by 8 Factor IMP Item Set Factor Model

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.39	32.77	32.77	15.99	31.99	31.99	10.29	20.59	20.59
2	5.21	10.42	43.19	4.85	9.70	41.68	5.04	10.07	30.66
3	2.71	5.42	48.61	2.33	4.65	46.33	3.32	6.64	37.30
4	2.38	4.76	53.37	1.94	3.88	50.21	3.25	6.49	43.80
5	1.79	3.57	56.95	1.40	2.80	53.01	2.61	5.21	49.01
6	1.56	3.12	60.06	1.18	2.36	55.37	1.98	3.96	52.97
7	1.46	2.93	62.99	1.09	2.17	57.54	1.90	3.80	56.76
8	1.30	2.61	65.60	0.95	1.90	59.44	1.34	2.68	59.44

Extraction Method: Principal Axis Factoring.

Table 9

IMP Item Set Factor Names

Factor	Name
F1	Faculty and Academic Excellence
F2	Academic Support
F3	Living Conditions
F4	Influences on Decision to Enroll
F5	Financial Aid
F6	Faculty and Staff
F7	Library Resources and Staff
F8	Parking

Table 10

Internal Reliability of Factors of IMP Item Set

Factor	Name	Cronbach's Alpha
F1	Faculty and Academic Excellence	.96
F2	Academic Support	.90
F3	Living Conditions	.88
F4	Influences on Decision to Enroll	.82
F5	Financial Aid	.83
F6	Faculty and Staff	.83
F7	Library Resources and Staff	.81
F8	Parking	.77

Table 11

Faculty and Academic Excellence Inter-Item Correlations

	IMP58	IMP68	IMP47	IMP55	IMP39	IMP69	IMP29	IMP41
IMP58	1.00	.80	.78	.70	.70	.75	.68	.66
IMP68	.80	1.00	.70	.65	.65	.74	.67	.58
IMP47	.78	.70	1.00	.64	.59	.67	.64	.57
IMP55	.70	.65	.64	1.00	.63	.62	.66	.62
IMP39	.70	.65	.59	.63	1.00	.64	.61	.67
IMP69	.75	.74	.67	.62	.64	1.00	.68	.59
IMP29	.68	.67	.64	.66	.61	.68	1.00	.60
IMP41	.66	.58	.57	.62	.67	.59	.60	1.00
IMP25	.67	.67	.73	.66	.57	.61	.62	.56
IMP72	.66	.70	.62	.58	.56	.65	.62	.54
IMP34	.60	.59	.58	.62	.55	.55	.56	.55
IMP66	.66	.70	.62	.54	.52	.60	.56	.49
IMP59	.62	.61	.68	.51	.49	.59	.58	.54
IMP65	.63	.63	.59	.59	.53	.59	.56	.51
IMP53	.56	.58	.54	.62	.45	.51	.52	.46
IMP45	.57	.53	.56	.54	.65	.58	.58	.57
IMP51	.51	.50	.47	.54	.54	.48	.56	.54
IMP26	.47	.52	.50	.52	.46	.49	.50	.42

(table continues)

Table 11 *(continued).*

	IMP25	IMP72	IMP34	IMP66	IMP59	IMP65	IMP53	IMP45	IMP51	IMP26
IMP58	.67	.66	.60	.66	.62	.63	.56	.57	.51	.47
IMP68	.67	.70	.59	.70	.61	.63	.58	.53	.50	.52
IMP47	.73	.62	.58	.62	.68	.59	.54	.56	.47	.50
IMP55	.66	.58	.62	.54	.51	.59	.62	.54	.54	.52
IMP39	.57	.56	.55	.52	.49	.53	.45	.65	.54	.46
IMP69	.61	.65	.55	.60	.59	.59	.51	.58	.48	.49
IMP29	.62	.62	.56	.56	.58	.56	.52	.58	.56	.50
IMP41	.56	.54	.55	.49	.54	.51	.46	.57	.54	.42
IMP25	1.00	.54	.57	.56	.61	.49	.51	.54	.45	.49
IMP72	.54	1.00	.47	.54	.58	.69	.65	.65	.54	.47
IMP34	.57	.47	1.00	.46	.44	.45	.46	.47	.41	.52
IMP66	.56	.54	.46	1.00	.57	.50	.44	.46	.40	.39
IMP59	.61	.58	.44	.57	1.00	.50	.64	.57	.39	.46
IMP65	.49	.69	.45	.50	.50	1.00	.58	.51	.44	.50
IMP53	.51	.65	.46	.44	.64	.58	1.00	.59	.43	.47
IMP45	.54	.65	.47	.46	.57	.51	.59	1.00	.49	.43
IMP51	.45	.54	.41	.40	.39	.44	.43	.49	1.00	.36
IMP26	.49	.47	.52	.39	.46	.50	.47	.43	.36	1.00

Table 12

Academic Support Inter-Item Correlations

	IMP48	IMP63	IMP71	IMP43	IMP56	IMP44	IMP36	IMP49	IMP32
IMP48	1.00	.53	.51	.62	.69	.46	.53	.54	.55
IMP63	.53	1.00	.63	.49	.56	.54	.46	.45	.49
IMP71	.51	.63	1.00	.60	.53	.49	.41	.42	.41
IMP43	.62	.49	.60	1.00	.59	.65	.49	.46	.50
IMP56	.69	.56	.53	.59	1.00	.45	.44	.50	.52
IMP44	.46	.54	.49	.65	.45	1.00	.45	.40	.55
IMP36	.53	.46	.41	.49	.44	.45	1.00	.48	.50
IMP49	.54	.45	.42	.46	.50	.40	.48	1.00	.43
IMP32	.55	.49	.41	.50	.52	.55	.50	.43	1.00

Table 13

Living Conditions Inter-Item Correlations

	IMP40	IMP30	IMP23	IMP38	IMP42
IMP40	1.00	.84	.79	.53	.61
IMP30	.84	1.00	.76	.47	.55
IMP23	.79	.76	1.00	.47	.50
IMP38	.53	.47	.47	1.00	.42
IMP42	.61	.55	.50	.42	1.00

Table 14

Influences on Decision to Enroll Inter-Item Correlations

	IMP97	IMP98	IMP93	IMP95	IMP92	IMP94
IMP97	1.00	.62	.53	.46	.46	.44
IMP98	.62	1.00	.48	.39	.44	.31
IMP93	.53	.48	1.00	.42	.39	.36
IMP95	.46	.39	.42	1.00	.39	.53
IMP92	.46	.44	.39	.39	1.00	.32
IMP94	.44	.31	.36	.53	.32	1.00

Table 15

Financial Aid Inter-Item Correlations

	IMP17	IMP12	IMP5	IMP91
IMP17	1.00	.71	.61	.51
IMP12	.71	1.00	.66	.49
IMP5	.61	.66	1.00	.45
IMP91	.51	.49	.45	1.00

Table 16

Faculty and Staff Inter-Item Correlations

	IMP2	IMP7	IMP4	IMP3
IMP2	1.00	.58	.58	.65
IMP7	.58	1.00	.55	.51
IMP4	.58	.55	1.00	.46
IMP3	.65	.51	.46	1.00

Table 17

Library Resources and Staff Inter-Item Correlations

	IMP18	IMP13
IMP18	1.00	.69
IMP13	.69	1.00

Table 18

Parking Inter-Item Correlations

	IMP28	IMP21
IMP28	1.00	.63
IMP21	.63	1.00

Table 19

Faculty and Academic Excellence Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IMP58	.85	.95
IMP68	.83	.95
IMP47	.80	.95
IMP55	.79	.95
IMP39	.75	.96
IMP69	.79	.95
IMP29	.78	.95
IMP41	.72	.96
IMP25	.75	.96
IMP72	.78	.95
IMP34	.67	.96
IMP66	.68	.96
IMP59	.72	.96
IMP65	.71	.96
IMP53	.69	.96
IMP45	.71	.96
IMP51	.61	.96
IMP26	.60	.96

Table 20

Academic Support Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IMP48	.75	.89
IMP63	.69	.89
IMP71	.66	.89
IMP43	.73	.89
IMP56	.71	.89
IMP44	.66	.89

(table continues)

Table 20 *(continued).*

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IMP36	.62	.90
IMP49	.61	.90
IMP32	.65	.89

Table 21

Living Conditions Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IMP40	.87	.82
IMP30	.81	.84
IMP23	.77	.85
IMP38	.54	.89
IMP42	.61	.88

Table 22

Influences on Decision to Enroll Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IMP97	.69	.76
IMP98	.59	.78
IMP93	.59	.79
IMP95	.60	.78
IMP92	.53	.80
IMP94	.53	.80

Table 23

Financial Aid Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IMP17	.73	.76
IMP12	.74	.76

IMP5	.67	.78
IMP91	.55	.85

Table 24

Faculty and Staff Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IMP2	.74	.75
IMP7	.65	.79
IMP4	.62	.80
IMP3	.64	.79

SAT Item Set EFA

The second EFA included only those items measured against satisfaction, those labeled SAT1-SAT73, SAT84-SAT89. The researcher specified items, SAT74-SAT83 and the general satisfaction items SAT99-SAT101, were excluded from the analysis to allow for their use as dependent variables in linear regression. As discussed previously, descriptive statistics for the SAT item set and correlation analyses indicated that the data were sufficient for further analyses. The overall KMO for these items was .922, which is meritorious and Bartlett’s test of sphericity was significant at the .0001 level. All individual MSA’s found in the diagonal of the anti-image correlation matrix in SPSS were above .7, with only 1 item less than .8.

The initial unrotated factor matrix produced 17 factors with eigenvalues greater than 1 and accounting for 62.29% of the total variance in the model as shown in Table 25.

Table 25

Initial Unrotated SAT Item Factor Matrix

Total Variance Explained									
Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	24.69	31.25	31.25	24.32	30.78	30.78	13.99	17.70	17.70
2	6.30	7.97	39.22	5.95	7.53	38.30	4.98	6.31	24.01
3	3.18	4.03	43.25	2.86	3.62	41.92	4.64	5.87	29.88
4	3.00	3.80	47.05	2.70	3.42	45.34	3.76	4.76	34.65
5	2.13	2.69	49.74	1.77	2.24	47.58	3.27	4.14	38.79
6	1.99	2.52	52.25	1.65	2.09	49.67	2.61	3.30	42.08
7	1.70	2.15	54.40	1.31	1.66	51.32	2.49	3.15	45.24
8	1.58	1.99	56.39	1.22	1.54	52.86	2.40	3.04	48.28
9	1.47	1.86	58.25	1.07	1.35	54.21	1.88	2.37	50.65
10	1.43	1.80	60.05	1.03	1.30	55.52	1.77	2.24	52.89
11	1.35	1.70	61.76	0.95	1.20	56.72	1.32	1.67	54.56
12	1.25	1.58	63.33	0.86	1.09	57.80	1.28	1.62	56.18
13	1.23	1.56	64.89	0.84	1.06	58.86	1.25	1.58	57.76
14	1.16	1.46	66.35	0.78	0.98	59.85	0.99	1.26	59.01
15	1.09	1.38	67.73	0.69	0.87	60.71	0.92	1.16	60.17
16	1.04	1.31	69.05	0.64	0.81	61.53	0.89	1.13	61.30
17	1.02	1.29	70.34	0.61	0.77	62.29	0.78	0.99	62.29
Extraction Method: Principal Axis Factoring.									

A review of the scree plot was inconclusive, showing an elbow at or around 3, 5, and 6 factors respectively as shown in Figure 9.

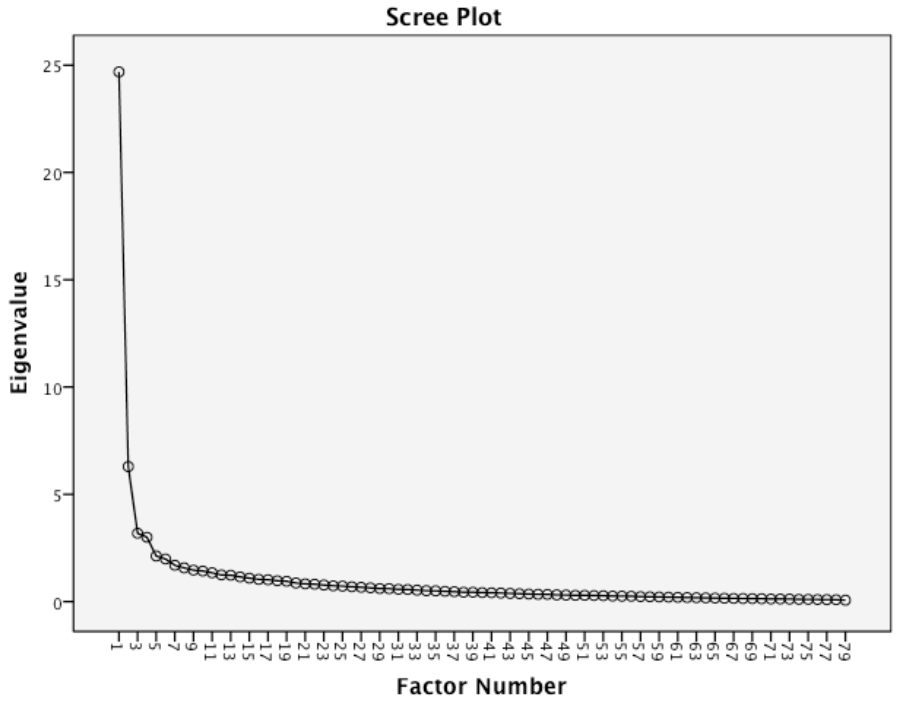


Figure 9. Scree plot for SAT item unrotated factor solution.

The unrotated factor solution was not amenable to a reasonable interpretation, so the solution was rotated using VARIMAX and evaluated in accordance with the strategy discussed previously. The researcher iteratively removed 32 items on the basis of their not loading at .5 or above and an additional 3 items that cross-loaded on multiple factors. The resulting 6 factor model is shown in Table 26.

Table 26

SAT Item Set Final Factor Model

	Factors and Loadings					
Items	1	2	3	4	5	6
SAT58	.80					
SAT39	.78					
SAT29	.76					
SAT68	.75					
SAT59	.74					
SAT41	.74					

(table continues)

Table 26 *(continued).*

	Factors and Loadings				
SAT45	.71				
SAT66	.71				
SAT69	.70				
SAT53	.69				
SAT47	.68				
SAT37	.67				
SAT55	.67				
SAT8	.63				
SAT25	.62				
SAT65	.61				
SAT72	.61				
SAT51	.60				
SAT1	.58				
SAT34	.55				
SAT2	.55				
SAT7	.53				
SAT46	.52				
SAT86		.83			
SAT87		.78			
SAT84		.76			
SAT85		.73			
SAT89		.69			
SAT88		.66			
SAT23			.85		
SAT40			.84		
SAT30			.83		
SAT42			.65		
SAT31			.59		
SAT36			.54		
SAT14				.84	
SAT6				.81	
SAT33				.75	
SAT19				.74	
SAT17					.84
SAT12					.71
SAT5					.57
SAT18					.77
SAT13					.63

The total variance explained by the 6-factor model, 56.67%, is shown in Table 27.

Table 27

Total Variance Explained by 6 Factor SAT Item Set Factor Model

Total Variance Explained									
Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.12	32.09	32.09	13.67	31.08	31.08	10.99	24.97	24.97
2	4.67	10.62	42.71	4.29	9.75	40.83	3.88	8.82	33.79
3	2.68	6.09	48.80	2.35	5.35	46.18	3.67	8.35	42.14
4	2.58	5.86	54.66	2.21	5.03	51.21	3.01	6.85	48.99
5	1.67	3.80	58.46	1.31	2.98	54.18	1.92	4.37	53.35
6	1.48	3.35	61.81	1.10	2.49	56.67	1.46	3.32	56.67
Extraction Method: Principal Axis Factoring.									

The 6 extracted factors were then named based on the items with the highest loadings as shown in Table 28.

Table 28

SAT Item Set Factor Names

Factor	Name
F1	Academic and Campus Environment
F2	Commitment to Non-Traditional Students
F3	Living Conditions
F4	Academic Advising
F5	Financial Aid
F6	Library Resources and Staff

The model was then subjected to reliability analyses using Cronbach's coefficient alpha, inter-item correlations, and item-total correlations as shown in Tables 30-35. Factor 6 with 2 items each was not assessed using Cronbach's which requires more than 2 items, but correlations were calculated for this factors. Table 29 shows that Cronbach's alpha was above .70 for all factors, indicating sufficient reliability. The review of inter-

item correlations for all factors found all correlations exceeded the .30 established a priori as the lower bound.

Table 29

Internal Reliability of SAT Item Set Factors

Factor	Name	Cronbach's Alpha
F1	Academic and Campus Environment	.95
F2	Commitment to Non-Traditional Students	.90
F3	Living Conditions	.87
F4	Academic Advising	.90
F5	Financial Aid	.79
F6	Library Resources and Staff	.81

Table 30

Academic and Campus Environment Inter-Item Correlations

	SAT58	SAT39	SAT29	SAT68	SAT59	SAT41	SAT45	SAT66	SAT69	SAT53	SAT47	SAT37
SAT58	1.00	.63	.59	.64	.62	.59	.46	.56	.56	.56	.55	1.00
SAT39	.63	1.00	.65	.57	.52	.58	.59	.60	.61	.46	.51	.63
SAT29	.59	.65	1.00	.51	.57	.58	.58	.55	.53	.48	.47	.59
SAT68	.64	.57	.51	1.00	.56	.55	.48	.53	.65	.54	.51	.64
SAT59	.62	.52	.57	.56	1.00	.60	.50	.58	.49	.58	.52	.62
SAT41	.59	.58	.58	.55	.60	1.00	.53	.55	.51	.50	.51	.59
SAT45	.46	.59	.58	.48	.50	.53	1.00	.46	.41	.46	.51	.46
SAT66	.56	.60	.55	.53	.58	.55	.46	1.00	.48	.50	.53	.56
SAT69	.56	.61	.53	.65	.49	.51	.41	.48	1.00	.41	.38	.56
SAT53	.56	.46	.48	.54	.58	.50	.46	.50	.41	1.00	.52	.56
SAT47	.55	.51	.47	.51	.52	.51	.51	.53	.38	.52	1.00	.55
SAT37	.51	.57	.65	.47	.55	.55	.57	.51	.48	.49	.40	.51
SAT55	.57	.50	.48	.53	.46	.47	.45	.52	.45	.56	.54	.57
SAT8	.50	.59	.48	.43	.42	.44	.44	.51	.53	.40	.42	.50
SAT25	.43	.45	.43	.50	.44	.48	.42	.50	.42	.41	.42	.43
SAT65	.47	.52	.46	.58	.48	.49	.57	.47	.51	.48	.43	.47
SAT72	.41	.45	.51	.49	.44	.47	.50	.46	.52	.45	.34	.41
SAT51	.45	.52	.49	.49	.46	.48	.49	.54	.50	.45	.37	.45
SAT1	.45	.44	.55	.37	.52	.45	.46	.43	.40	.40	.33	.45
SAT34	.52	.38	.39	.45	.49	.41	.40	.45	.40	.41	.45	.52
SAT2	.39	.41	.41	.45	.48	.53	.42	.38	.41	.39	.37	.39
SAT7	.39	.43	.50	.33	.39	.46	.45	.34	.41	.37	.38	.39
SAT46	.42	.48	.46	.37	.39	.42	.52	.40	.39	.33	.40	.42

(table continues)

Table 30 *(continued).*

	SAT55	SAT8	SAT25	SAT65	SAT72	SAT51	SAT1	SAT34	SAT2	SAT7	SAT46
SAT58	.57	.50	.43	.47	.41	.45	.45	.52	.39	.39	.42
SAT39	.50	.59	.45	.52	.45	.52	.44	.38	.41	.43	.48
SAT29	.48	.48	.43	.46	.51	.49	.55	.39	.41	.50	.46
SAT68	.53	.43	.50	.58	.49	.49	.37	.45	.45	.33	.37
SAT59	.46	.42	.44	.48	.44	.46	.52	.49	.48	.39	.39
SAT41	.47	.44	.48	.49	.47	.48	.45	.41	.53	.46	.42
SAT45	.45	.44	.42	.57	.50	.49	.46	.40	.42	.45	.52
SAT66	.52	.51	.50	.47	.46	.54	.43	.45	.38	.34	.40
SAT69	.45	.53	.42	.51	.52	.50	.40	.40	.41	.41	.39
SAT53	.56	.40	.41	.48	.45	.45	.40	.41	.39	.37	.33
SAT47	.54	.42	.42	.43	.34	.37	.33	.45	.37	.38	.40
SAT37	.43	.42	.36	.42	.44	.48	.53	.38	.34	.38	.42
SAT55	1.00	.46	.41	.42	.37	.39	.38	.48	.38	.39	.30
SAT8	.46	1.00	.35	.34	.33	.37	.40	.36	.36	.49	.26
SAT25	.41	.35	1.00	.41	.37	.33	.31	.36	.47	.35	.28
SAT65	.42	.34	.41	1.00	.51	.47	.31	.35	.35	.37	.40
SAT72	.37	.33	.37	.51	1.00	.54	.31	.33	.33	.37	.40
SAT51	.39	.37	.33	.47	.54	1.00	.33	.31	.35	.34	.45
SAT1	.38	.40	.31	.31	.31	.33	1.00	.31	.43	.42	.30
SAT34	.48	.36	.36	.35	.33	.31	.31	1.00	.42	.33	.21
SAT2	.38	.36	.47	.35	.33	.35	.43	.42	1.00	.42	.29
SAT7	.39	.49	.35	.37	.37	.34	.42	.33	.42	1.00	.26
SAT46	.30	.26	.28	.40	.40	.45	.30	.21	.29	.26	1.00

Table 31

Commitment to Non-Traditional Students Inter-Item Correlations

	SAT86	SAT87	SAT84	SAT85	SAT89	SAT88
SAT86	1.00	.76	.65	.61	.67	.59
SAT87	.76	1.00	.62	.52	.74	.55
SAT84	.65	.62	1.00	.73	.51	.57
SAT85	.61	.52	.73	1.00	.44	.60
SAT89	.67	.74	.51	.44	1.00	.52
SAT88	.59	.55	.57	.60	.52	1.00

Table 32

Living Conditions Inter-item Correlations

	SAT23	SAT40	SAT30	SAT42	SAT31	SAT36
SAT23	1.00	.78	.74	.49	.48	.41
SAT40	.78	1.00	.77	.52	.48	.41
SAT30	.74	.77	1.00	.53	.50	.44
SAT42	.49	.52	.53	1.00	.49	.48
SAT31	.48	.48	.50	.49	1.00	.50
SAT36	.41	.41	.44	.48	.50	1.00

Table 33

Academic Advising Inter-Item Correlations

	SAT14	SAT6	SAT33	SAT19
SAT14	1.00	.79	.69	.72
SAT6	.79	1.00	.67	.66
SAT33	.69	.67	1.00	.68
SAT19	.72	.66	.68	1.00

Table 34

Financial Aid Inter-Item Correlations

	SAT17	SAT12	SAT5
SAT17	1.00	.63	.53
SAT12	.63	1.00	.51
SAT5	.53	.51	1.00

Table 35

Library Resources and Staff Inter-Item Correlations

	SAT18	SAT13
SAT18	1.00	.68
SAT13	.68	1.00

The item-total correlations of all scales and items exceeded the lower bound .50 established a priori. No items would improve Cronbach's alpha if removed.

Table 36

Academic and Campus Environment Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SAT58	.75	.95
SAT39	.76	.95
SAT29	.75	.95
SAT68	.73	.95
SAT59	.73	.95
SAT41	.74	.95
SAT45	.70	.95
SAT66	.72	.95
SAT69	.68	.95
SAT53	.67	.95
SAT47	.65	.95
SAT37	.68	.95
SAT55	.65	.95
SAT8	.61	.95
SAT25	.58	.95
SAT65	.64	.95
SAT72	.61	.95
SAT51	.63	.95
SAT1	.58	.95
SAT34	.56	.95
SAT2	.57	.95
SAT7	.56	.95
SAT46	.53	.95

Table 37

Commitment to Non-Traditional Students Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SAT86	.81	.87
SAT87	.79	.88
SAT84	.74	.88
SAT85	.69	.89
SAT89	.70	.89
SAT88	.67	.89

Table 38

Living Conditions Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SAT23	.74	.84
SAT40	.76	.83
SAT30	.77	.83
SAT42	.63	.86
SAT31	.61	.86
SAT36	.55	.87

Table 39

Academic Advising Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SAT14	.83	.86
SAT6	.79	.87
SAT33	.75	.89
SAT19	.76	.88

Table 40

Financial Aid Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SAT17	.67	.67
SAT12	.65	.69
SAT5	.58	.78

The 6 factor model was found to be sufficiently reliable to be used in further analyses.

GAP Scores Item Set EFA

The third EFA included only those items calculated as the GAP score by subtracting the SAT score from the IMP score, those labeled GAP1-GAP73. The GAP scores calculated from the researcher specified items, GAP74-GAP83, were excluded from the analysis to allow for their use as dependent variables in linear regression. As discussed previously, descriptive statistics for the GAP item set and correlation analyses indicated that the data were sufficient for further analyses. The overall KMO for these items was .917, which is meritorious and Bartlett's test of sphericity was significant at the .0001 level. All individual MSA's found in the diagonal of the anti-image correlation matrix in SPSS were above .7 with only 1 item less than .8.

The initial unrotated factor matrix produced 15 factors with eigenvalues greater than 1 and accounting for 58.07% of the total variance in the model as shown in Table 41.

Table 41

Initial Unrotated GAP Factor Matrix

Total Variance Explained						
Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	24.03	32.91	32.91	23.62	32.36	32.36
2	3.64	4.99	37.90	3.25	4.45	36.81
3	2.87	3.93	41.83	2.47	3.38	40.19
4	2.17	2.97	44.80	1.80	2.46	42.65
5	1.98	2.71	47.51	1.55	2.12	44.78
6	1.83	2.51	50.02	1.44	1.97	46.75
7	1.72	2.36	52.38	1.32	1.81	48.56
8	1.63	2.23	54.61	1.19	1.63	50.19
9	1.48	2.03	56.64	1.07	1.46	51.65
10	1.42	1.95	58.59	1.02	1.40	53.05
11	1.26	1.72	60.31	0.83	1.14	54.19
12	1.21	1.66	61.97	0.79	1.08	55.27
13	1.15	1.58	63.55	0.73	0.99	56.27
14	1.12	1.53	65.08	0.67	0.92	57.19
15	1.08	1.48	66.55	0.64	0.88	58.07
Extraction Method: Principal Axis Factoring.						

A review of the scree plot was inconclusive, showing an elbow at or around 2, 4, and 16 factors respectively as shown in Figure 10.

The unrotated factor solution was not amenable to a reasonable interpretation, so the solution was rotated using VARIMAX and evaluated in accordance with the strategy discussed previously. The researcher iteratively removed 33 items on the basis of their not loading at .5 or above and an additional 4 items that cross-loaded on multiple factors.

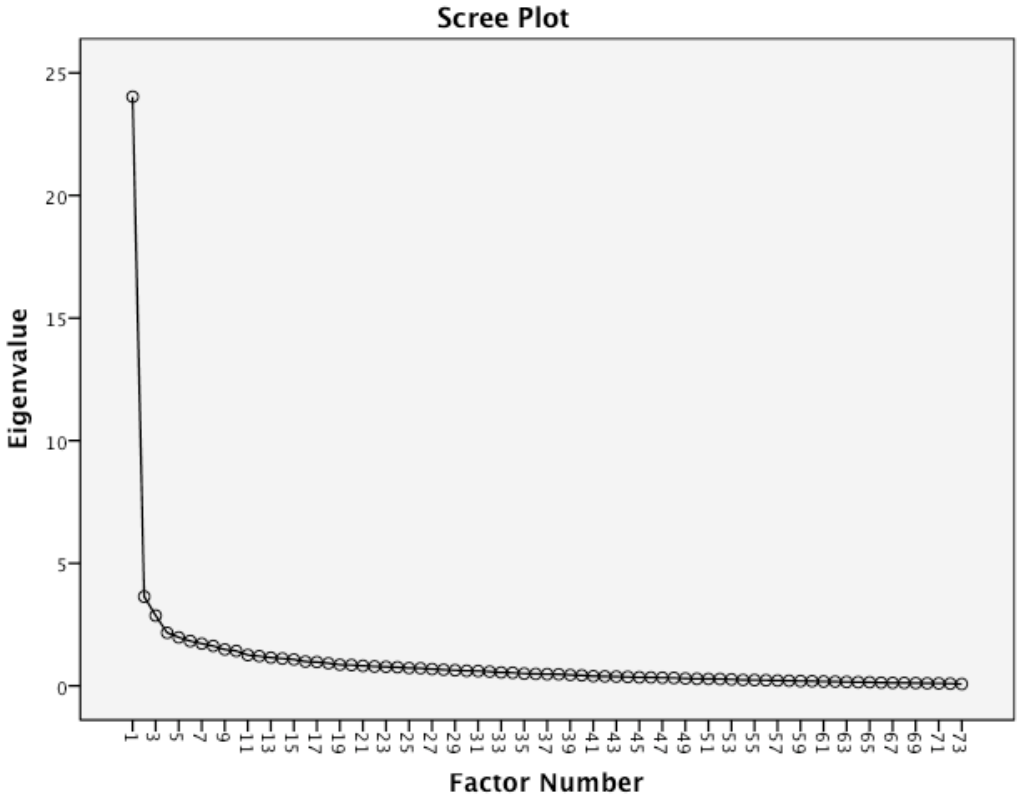


Figure 10. Scree plot for GAP item set unrotated factor solution.

The resulting factor model is shown in Table 42.

Table 42

GAP Item Set Final Factor Model

	Factor and Loadings				
Item	1	2	3	4	5
GAP68	.76				
GAP58	.75				
GAP59	.69				
GAP66	.68				
GAP29	.67				
GAP41	.66				
GAP55	.66				
GAP69	.65				
GAP65	.65				
GAP45	.64				
GAP47	.61				

(table continues)

	Factor and Loadings				
Item	1	2	3	4	5
GAP72	.61				
GAP51	.61				
GAP27	.61				
GAP34	.60				
GAP35	.59				
GAP25	.57				
GAP44	.57				
GAP67	.53				
GAP26	.51				
GAP14		.85			
GAP6		.75			
GAP19		.74			
GAP33		.65			
GAP30			.81		
GAP40			.79		
GAP23			.72		
GAP42			.67		
GAP12				.78	
GAP17				.67	
GAP5				.58	
GAP11				.55	
GAP18					.60
GAP15					.60
GAP20					.58
GAP13					.53

The total variance explained by the 5-factor model, 52.64%, is shown in Table 43.

Table 43

Total Variance Explained by 5 Factor GAP Item Set Factor Model

Total Variance Explained									
Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.97	36.029	36.029	12.492	34.701	34.701	8.894	24.706	24.706
2	2.635	7.321	43.349	2.236	6.211	40.912	2.787	7.741	32.447
3	2.292	6.368	49.717	1.898	5.272	46.184	2.714	7.54	39.987
4	1.782	4.951	54.668	1.391	3.863	50.047	2.375	6.597	46.584
5	1.443	4.009	58.677	0.934	2.596	52.643	2.181	6.059	52.643
6	0.987	2.741	61.417						
7	0.917	2.547	63.964						
8	0.863	2.398	66.362						
9	0.831	2.308	68.67						
10	0.773	2.147	70.816						
11	0.716	1.99	72.806						
12	0.665	1.849	74.655						
13	0.64	1.779	76.434						
14	0.625	1.737	78.171						
15	0.601	1.668	79.839						
16	0.52	1.445	81.284						
17	0.502	1.393	82.677						
18	0.487	1.353	84.03						
19	0.457	1.269	85.299						
20	0.45	1.25	86.549						
21	0.433	1.204	87.753						
22	0.428	1.188	88.941						
23	0.409	1.136	90.077						
24	0.391	1.086	91.163						
25	0.369	1.026	92.189						
26	0.347	0.965	93.154						
27	0.343	0.954	94.108						
28	0.304	0.844	94.952						
29	0.298	0.828	95.78						
30	0.271	0.752	96.532						
31	0.256	0.711	97.244						
32	0.229	0.635	97.879						
33	0.217	0.603	98.482						
34	0.199	0.552	99.034						
35	0.181	0.504	99.538						
36	0.166	0.462	100						
Extraction Method: Principal Axis Factoring.									

The 5 extracted factors were then named based on the items with the highest loadings.

The resulting factors are shown in Table 44.

Table 44

GAP Item Set Factor Names

Factor	Name
F1	Faculty and Academic Excellence
F2	Academic Advising
F3	Living Conditions
F4	Financial Aid and Billing
F5	Library and Academic Support

The model was then subjected to reliability analyses using Cronbach's coefficient alpha, inter-item correlations, and item-total correlations as shown in Tables 46-50. Table 45 shows that Cronbach's alpha was above .70 for all factors, indicating sufficient reliability (Hair et al., 2010). The review of inter-item correlations for all factors found all correlations exceeded the .30 established a priori as the lower bound.

Table 45

Internal Reliability of GAP Item Set Factors

Factor	Name	Cronbach's Alpha
F1	Faculty and Academic Excellence	.94
F2	Academic Advising	.88
F3	Living Conditions	.84
F4	Financial Aid and Billing	.81
F5	Library and Academic Support	.75

Table 46

Faculty and Academic Excellence Inter-Item Correlations

	GAP68	GAP58	GAP59	GAP66	GAP29	GAP41	GAP55	GAP69	GAP65
GAP68	1.00	.63	.59	.57	.54	.50	.48	.58	.60
GAP58	.63	1.00	.60	.54	.50	.55	.56	.51	.47
GAP59	.59	.60	1.00	.48	.53	.51	.41	.48	.52
GAP66	.57	.54	.48	1.00	.47	.45	.50	.42	.49
GAP29	.54	.50	.53	.47	1.00	.49	.45	.47	.53
GAP41	.50	.55	.51	.45	.49	1.00	.43	.46	.41
GAP55	.48	.56	.41	.50	.45	.43	1.00	.48	.47
GAP69	.58	.51	.48	.42	.47	.46	.48	1.00	.48
GAP65	.60	.47	.52	.49	.53	.41	.47	.48	1.00

(table continues)

Table 46 *(continued).*

	GAP68	GAP58	GAP59	GAP66	GAP29	GAP41	GAP55	GAP69	GAP65
GAP45	.50	.45	.52	.47	.57	.47	.45	.44	.47
GAP47	.52	.53	.44	.50	.41	.42	.52	.41	.46
GAP72	.49	.37	.38	.40	.53	.39	.43	.43	.44
GAP51	.51	.44	.44	.38	.52	.54	.44	.45	.49
GAP27	.47	.45	.50	.45	.43	.40	.43	.42	.53
GAP34	.47	.56	.53	.49	.39	.39	.47	.43	.37
GAP35	.48	.42	.49	.49	.46	.44	.48	.45	.47
GAP25	.48	.41	.46	.48	.40	.38	.34	.35	.42
GAP44	.46	.50	.48	.44	.38	.40	.45	.46	.58
GAP67	.49	.36	.47	.43	.37	.35	.42	.44	.43
GAP26	.40	.35	.37	.44	.34	.40	.40	.41	.44

Table 46 *(continued).*

	GAP45	GAP47	GAP72	GAP51	GAP27	GAP34	GAP35	GAP25	GAP44	GAP67	GAP26
GAP68	.50	.52	.49	.51	.47	.47	.48	.48	.46	.49	.40
GAP58	.45	.53	.37	.44	.45	.56	.42	.41	.50	.36	.35
GAP59	.52	.44	.38	.44	.50	.53	.49	.46	.48	.47	.37
GAP66	.47	.50	.40	.38	.45	.49	.49	.48	.44	.43	.44
GAP29	.57	.41	.53	.52	.43	.39	.46	.40	.38	.37	.34
GAP41	.47	.42	.39	.54	.40	.39	.44	.38	.40	.35	.40
GAP55	.45	.52	.43	.44	.43	.47	.48	.34	.45	.42	.40
GAP69	.44	.41	.43	.45	.42	.43	.45	.35	.46	.44	.41
GAP65	.47	.46	.44	.49	.53	.37	.47	.42	.58	.43	.44
GAP45	1.00	.44	.54	.46	.44	.38	.48	.43	.47	.41	.41
GAP47	.44	1.00	.38	.38	.41	.47	.43	.43	.42	.32	.32
GAP72	.54	.38	1.00	.47	.40	.34	.35	.40	.35	.38	.44
GAP51	.46	.38	.47	1.00	.38	.36	.38	.29	.37	.28	.37
GAP27	.44	.41	.40	.38	1.00	.41	.55	.46	.55	.41	.46
GAP34	.38	.47	.34	.36	.41	1.00	.48	.33	.43	.29	.36
GAP35	.48	.43	.35	.38	.55	.48	1.00	.40	.41	.36	.37
GAP25	.43	.43	.40	.29	.46	.33	.40	1.00	.35	.32	.44
GAP44	.47	.42	.35	.37	.55	.43	.41	.35	1.00	.37	.38
GAP67	.41	.32	.38	.28	.41	.29	.36	.32	.37	1.00	.32
GAP26	.41	.32	.44	.37	.46	.36	.37	.44	.38	.32	1.00

Table 47

Academic Advising Inter-Item Correlations

	GAP14	GAP6	GAP19	GAP33
GAP14	1.00	.74	.72	.63
GAP6	.74	1.00	.69	.53
GAP19	.72	.69	1.00	.60
GAP33	.63	.53	.60	1.00

Table 48

Living Conditions Inter-Item Correlations

	GAP30	GAP40	GAP23	GAP42
GAP30	1.00	.65	.64	.50
GAP40	.65	1.00	.62	.56
GAP23	.64	.62	1.00	.48
GAP42	.50	.56	.48	1.00

Table 49

Financial Aid and Billing Inter-Item Correlations

	GAP12	GAP17	GAP5	GAP11
GAP12	1.00	.60	.55	.54
GAP17	.60	1.00	.49	.47
GAP5	.55	.49	1.00	.40
GAP11	.54	.47	.40	1.00

Table 50

Library and Academic Support Inter-Item Correlations

	GAP18	GAP15	GAP20	GAP13
GAP18	1.00	.42	.44	.53
GAP15	.42	1.00	.49	.39
GAP20	.44	.49	1.00	.38
GAP13	.53	.39	.38	1.00

The item-total correlations of all scales and items exceeded the lower bound .50 established a priori. No items would improve Cronbach's alpha if removed.

Table 51

Faculty and Academic Excellence Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
GAP68	.75	.94
GAP58	.71	.94
GAP59	.71	.94
GAP66	.68	.94
GAP29	.67	.94
GAP41	.64	.94
GAP55	.66	.94
GAP69	.66	.94
GAP65	.69	.94
GAP45	.67	.94
GAP47	.63	.94
GAP72	.60	.94
GAP51	.60	.94
GAP27	.66	.94
GAP34	.61	.94
GAP35	.64	.94
GAP25	.58	.94
GAP44	.63	.94
GAP67	.55	.94
GAP26	.56	.94

Table 52

Academic Advising Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
GAP14	.81	.82
GAP6	.75	.85
GAP19	.77	.84
GAP33	.65	.88

Table 53

Living Conditions Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
GAP30	.71	.79
GAP40	.73	.78
GAP23	.69	.80
GAP42	.59	.84

Table 54

Financial Aid and Billing item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
GAP12	.71	.71
GAP17	.64	.75
GAP5	.58	.78
GAP11	.56	.78

Table 55

Library and Academic Support Item-Total Correlations and Cronbach's Alpha if Item Deleted

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
GAP18	.58	.68
GAP15	.55	.70
GAP20	.56	.67
GAP13	.53	.70

The 5 factor model was found to be sufficiently reliable to be used in further analyses.

Multiple Linear Regression

Meeting the Assumptions

Hair et al. (2010) specifies four assumptions in multiple regression analysis that can be diagnosed using scatterplots of the residuals vs predicted values (1-3) or normal probability plots (4):

1. Linearity of the phenomenon measured
2. Constant variance of the error terms
3. Independence of the error terms
4. Normality of the error term distribution

Each of the assumptions are evaluated as part of the analyses below.

Overview

The results of seven linear regressions are presented below. Items included in the regressions include the generated scales resulting from the 5 dimension SAT item set EFA model discussed in the previous section, labeled SAT_F1 – SAT_F6; generated scales generated from the Noel-Levitz specified model of 12 dimensions, labeled SAT_NL_F1-SAT_NL_F12; the overall satisfaction measure, SAT100; the mean of the service quality items, labeled QUALITEMS_SAT; and the composite item OVERALLQUAL represented by the mean of the two overall quality items IMP82 and IMP83. The seven regressions as described are:

1. SAT_F1..SAT_F6 x SAT100
2. SAT_NL_F1..SAT_NL_F12 x SAT100
3. QUALITEMS_SAT x SAT100
4. QUALITEMS_SAT x OVERALLQUAL_SAT
5. OVERALLQUAL_SAT x SAT100
6. SAT_F1..SAT_F6 x OVERALLQUAL_SAT
7. SAT_NL_F1..SAT_NL_F12 x OVERALLQUAL_SAT

Each regression was conducted using SPSS's REGRESSION command with ENTER method selected for bivariate analyses and STEPWISE method selected for

multivariate analyses. Options included estimates and confidence intervals for the regression coefficients, model fit, descriptives, collinearity diagnostics, standardized residual plots, histograms, and normal probability plots.

SAT Item Set EFA 6 Factor Model and Overall Satisfaction

The first linear regression assessed the predictive efficacy of the 6 factor SAT model in predicting overall satisfaction as represented by the overall satisfaction item, SAT100. Using the stepwise method, a significant model emerged, $F_{2,272}=163.372$, $p < 0.0001$, Adjusted R square=.542.

Table 56

SAT Item Set EFA 6 Factor Model X Overall Satisfaction Linear Regression Model Summary

Model Summary[c]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.73[a]	.53	.53	.87
2	.74[b]	.55	.54	.86
a. Predictors: (Constant), SAT_F1				
b. Predictors: (Constant), SAT_F1, SAT_F6				
c. Dependent Variable: SAT100				

The model found was comprised of two predictor variables SAT_F1 and SAT_F6. SAT_F1 accounted for 6 times the variance in the model of the second predictor, SAT_F6. Table 57 summarizes the model coefficients and collinearity diagnostics.

Table 57

SAT Item Set EFA 6 Factor Model X Overall Satisfaction Linear Regression Coefficients and Collineary Statistics

Coefficients[a]										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	0.75	.28		2.72	.01	0.21	1.29		
	SAT_F1	0.89	.05	.73	17.63	.00	0.79	0.99	1.00	1.00
2	(Constant)	0.90	.28		3.26	.00	0.36	1.45		
	SAT_F1	0.96	.06	.79	17.34	.00	0.85	1.06	.82	1.23
	SAT_F6	-0.10	.03	-.13	-2.83	.01	-0.17	-0.03	.82	1.23
a. Dependent Variable: SAT100										

The tolerance value is greater than .2 and the variable inflation factor (VIF) is less than 4, indicating that the model does not have a high degree of multicollinearity. A review of the histogram in Figure 11 shows no significant departure from normality and the normal probability plot in Figure 12 and the residuals plot in Figure 13 show no significant violations of the assumptions.

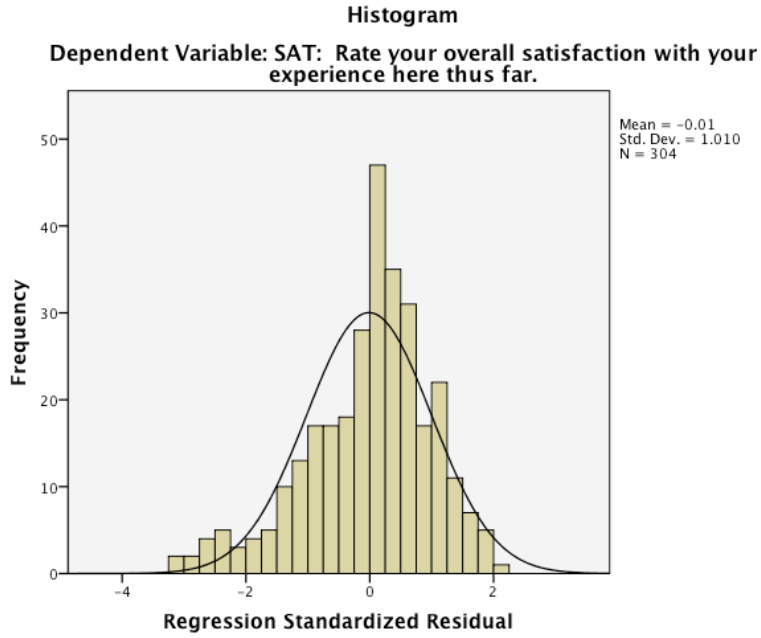


Figure 11. Histogram of standardized residuals SAT factors x SAT.

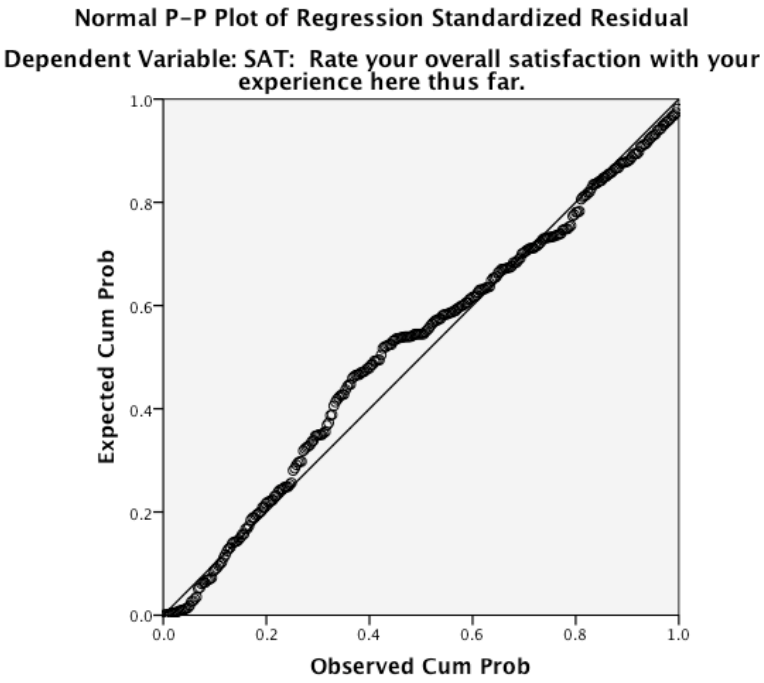


Figure 12. Normal P-P plot of standardized residuals SAT factors x SAT.

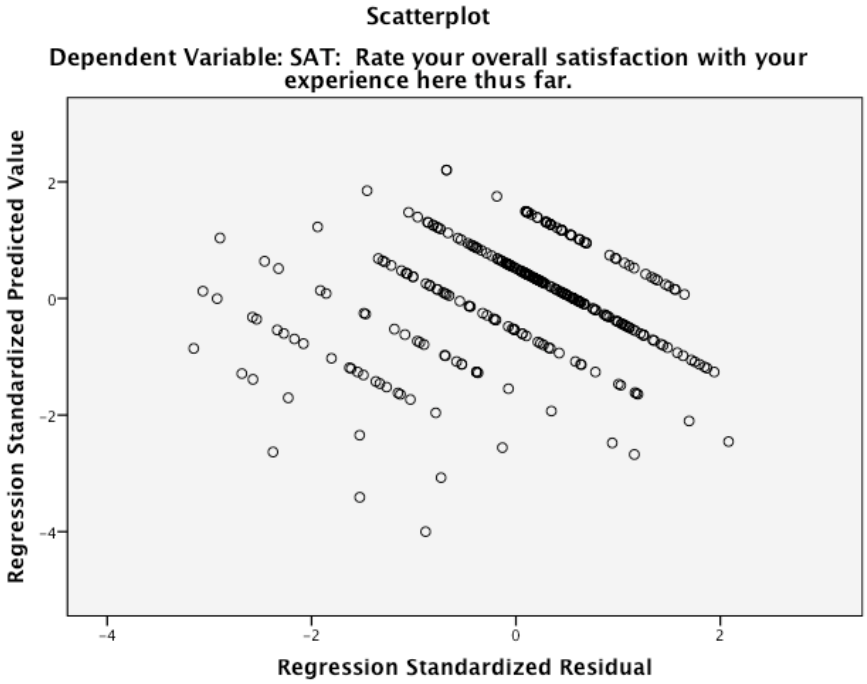


Figure 13. Scatter plot of standardized residuals - ZRES x ZPRED SAT factors x SAT.

NL SAT 12 Factor Model and Overall Satisfaction

The second linear regression assessed the predictive efficacy of the 12 factor SAT model specified by Noel-Levitz in predicting overall satisfaction as represented by the overall satisfaction item, SAT100. Using the stepwise method, a significant model emerged, $F_{4,253}=69.331$, $p < 0.0001$, Adjusted R square=.515.

Table 58

NL SAT 12 Factor Model X Overall Satisfaction Linear Regression Model Summary

Model Summary[e]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.68[a]	.47	.46	.93
2	.70[b]	.49	.49	.91
3	.72[c]	.51	.51	.89
4	.72[d]	.52	.52	.88
a. Predictors: (Constant), SAT_NL_F1				
b. Predictors: (Constant), SAT_NL_F1, SAT_NL_F3				
c. Predictors: (Constant), SAT_NL_F1, SAT_NL_F3, SAT_NL_F10				
d. Predictors: (Constant), SAT_NL_F1, SAT_NL_F3, SAT_NL_F10, SAT_NL_F12				
e. Dependent Variable: SAT100				

The model found was composed of four predictor variables SAT_NL_F1 and SAT_NL_F3, SAT_NL_F10, and SAT_NL_F12. Each of the four variables accounted for about the same amount of variance within the model. Table 59 summarizes the model coefficients and collinearity diagnostics.

Table 59

NL SAT 12 Factor Model X Overall Satisfaction Linear Regression Coefficients and Collinearity Statistics

Coefficients[a]										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	1.39	.28		4.94	.00	0.84	1.95		
	SAT_NL_F1	0.79	.05	.68	14.96	.00	0.68	0.89	1.00	1.00
2	(Constant)	0.97	.30		3.21	.00	0.37	1.56		
	SAT_NL_F1	0.50	.10	.44	5.15	.00	0.31	0.70	.28	3.57
	SAT_NL_F3	0.36	.10	.29	3.45	.00	0.15	0.56	.28	3.57
3	(Constant)	1.04	.30		3.50	.00	0.45	1.62		
	SAT_NL_F1	0.59	.10	.51	5.99	.00	0.40	0.79	.26	3.85
	SAT_NL_F3	0.47	.11	.38	4.40	.00	0.26	0.67	.25	3.94
	SAT_NL_F10	-0.24	.07	-.22	-3.43	.00	-0.38	-0.10	.46	2.17
4	(Constant)	1.07	.29		3.63	.00	0.49	1.65		
	SAT_NL_F1	0.38	.14	.33	2.83	.01	0.12	0.65	.14	7.22
	SAT_NL_F3	0.34	.12	.28	2.87	.01	0.11	0.57	.20	5.01
	SAT_NL_F10	-0.37	.09	-.34	-4.15	.00	-0.55	-0.20	.28	3.60
	SAT_NL_F12	0.46	.20	.39	2.31	.02	0.07	0.86	.07	14.94

a. Dependent Variable: SAT100

The tolerance values are greater than .2 for SAT_NL_F3, SAT_NL_F10, SAT_NL_F12, and the variable inflation factor (VIF) is greater than 4 for SAT_NL_F3 and SAT_NL_F12, indicating that the model has some multicollinearity. A review of the histogram in Figure 14 shows no significant departure from normality and the normal probability plot in Figure 15 and the residuals plot in Figure 16 show no significant violations of the assumptions.

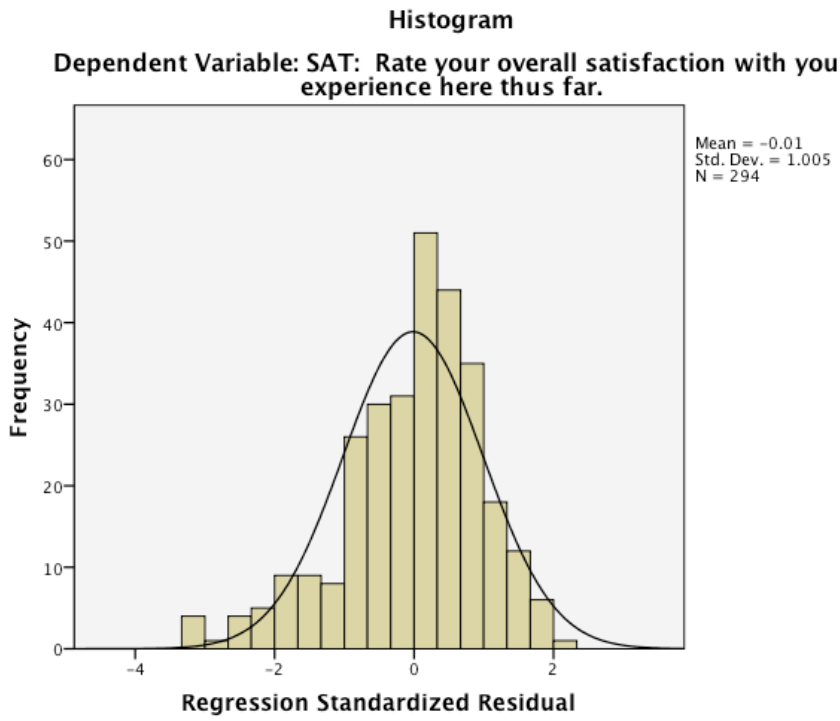


Figure 14. Histogram of standardized residuals NL SAT factors x SAT.

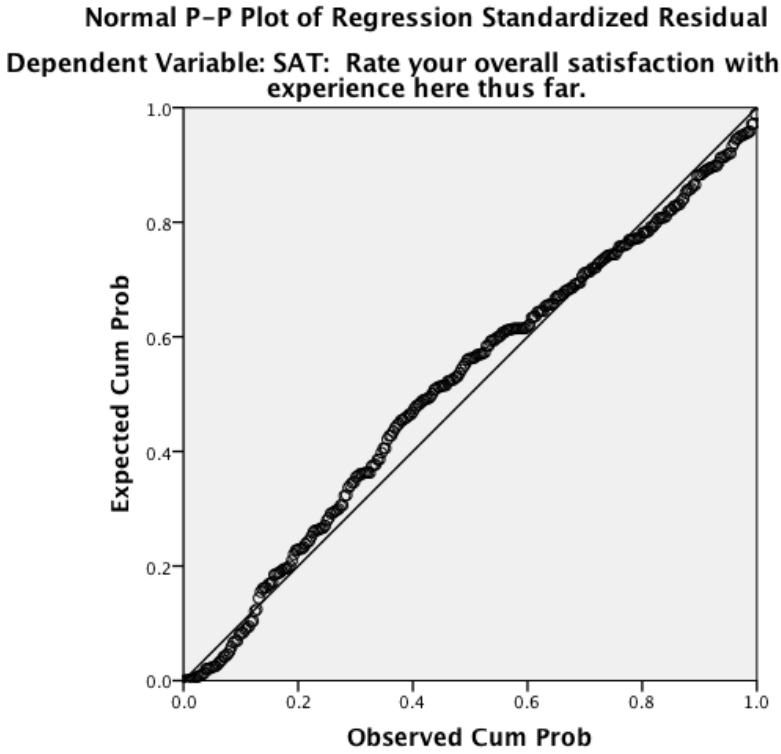


Figure 15. Normal P-P plot of standardized residuals NL SAT factors x SAT.

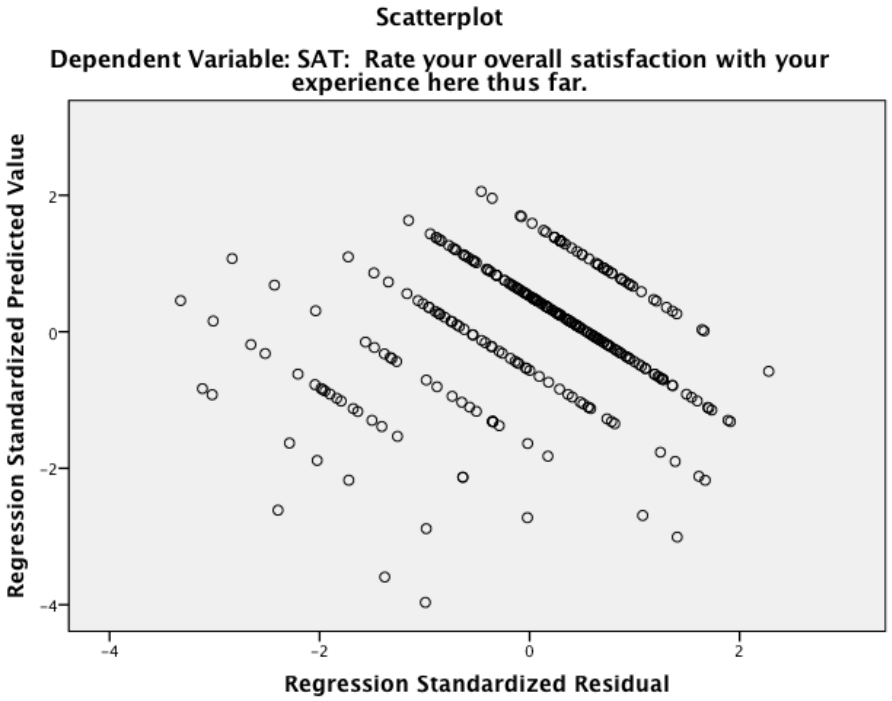


Figure 16. Scatter plot of standardized residuals - ZRES x ZPRED NL SAT factors x SAT.

Mean of the Service Quality Items and Overall Satisfaction

The third linear regression assessed the predictive efficacy of the mean of the service quality items in predicting overall satisfaction as represented by the overall satisfaction item, SAT100. Using the enter method, a significant model emerged, $F_{1,292}=140.619$, $p < 0.0001$, Adjusted R square=.323.

Table 60

Mean of the Service Quality Items X Overall Satisfaction Linear Regression Model Summary

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.57[a]	.33	.32	1.04

a. Predictors: (Constant), QUALITEMS_SAT

b. Dependent Variable: SAT100

Table 61 summarizes the model coefficients and collinearity diagnostics.

Table 61

Mean of the Service Quality Items X Overall Satisfaction Linear Regression Coefficients and Collineary Statistics

Coefficients[a]										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	1.79	.32		5.64	.00	1.16	2.41		
	QUALITEMS_SAT	0.68	.06	.57	11.86	.00	0.57	0.79	1.00	1.00
a. Dependent Variable: SAT100										

A review of the histogram in Figure 17 shows no significant departure from normality and the normal probability plot in Figure 18 and the residuals plot in Figure 19 show no significant violations of the assumptions.

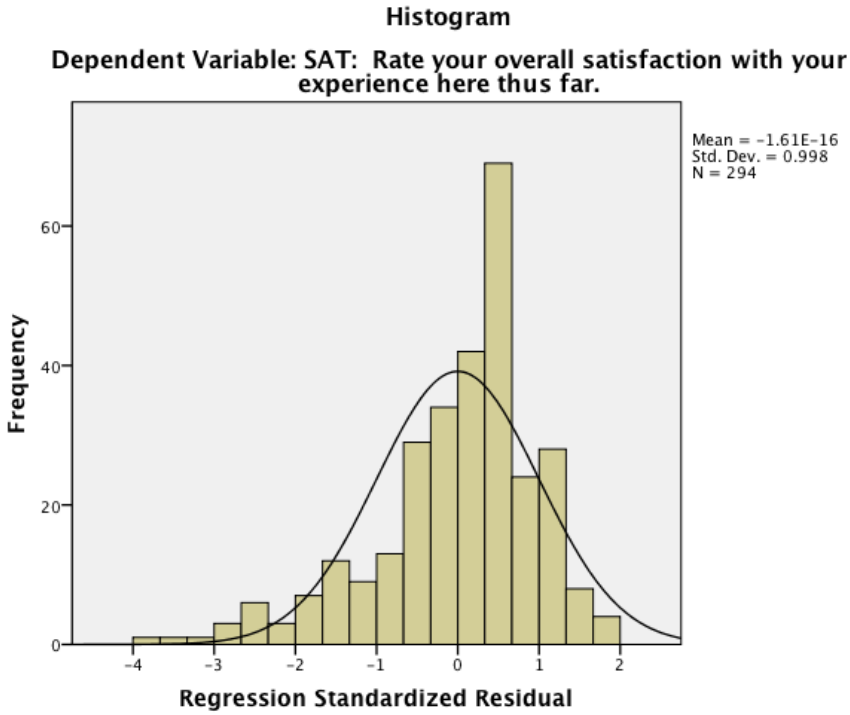


Figure 17. Histogram of standardized residuals service quality items x SAT.

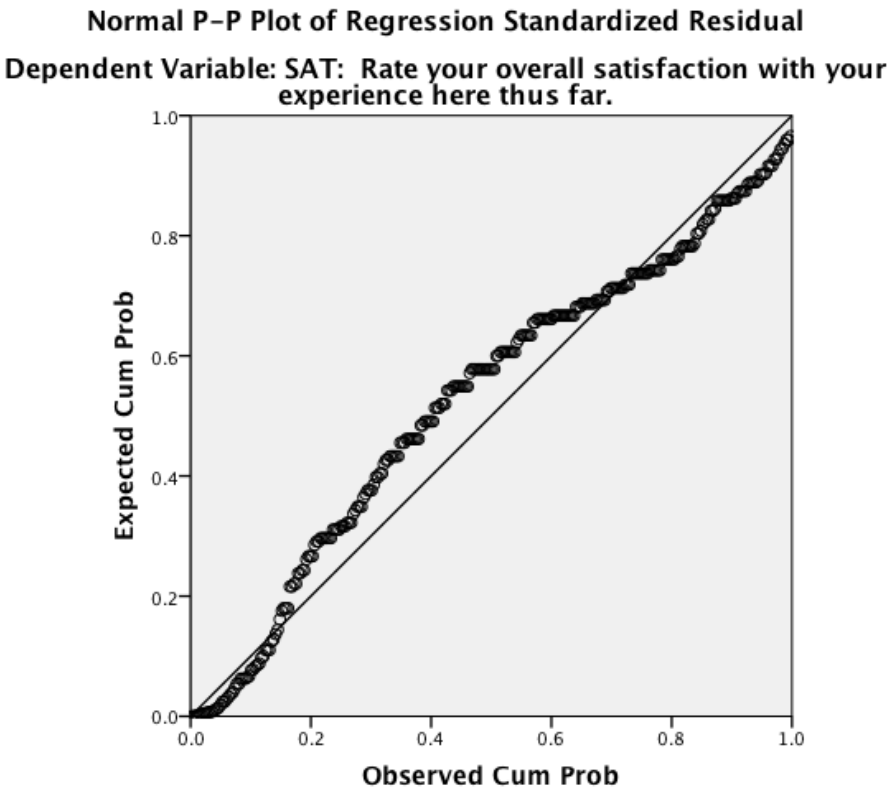


Figure 18. Normal P-P plot of standardized residuals service quality items x SAT.

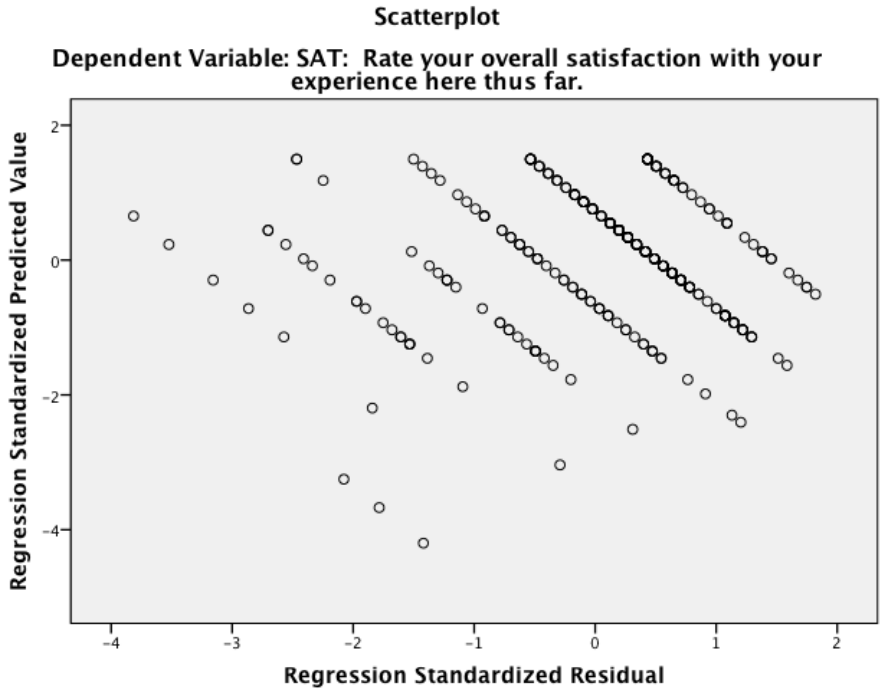


Figure 19. Scatter plot of standardized residuals - ZRES x ZPRED service quality items x SAT.

Mean of the Service Quality Items and Overall Quality

The fourth linear regression assessed the predictive efficacy of the mean of the service quality items in predicting overall quality as represented by the composite overall quality measure, OVERALLQUAL_SAT. Using the enter method, a significant model emerged, $F_{1,301}$=607.586, p < 0.0001, Adjusted R square=.668. Table 62 summarizes the model.

Table 62

Mean of the Service Quality Items X Overall Quality Linear Regression Model Summary

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.82[a]	.67	.67	.71

a. Predictors: (Constant), QUALITEMS_SAT

b. Dependent Variable: OVERALLQUAL_SAT

Table 63 summarizes the model coefficients and collinearity diagnostics.

Table 63

Mean of the Service Quality Items X Overall Quality Linear Regression Coefficients and Collinearity Statistics

Coefficients[a]										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	0.46	.21		2.17	.03	0.04	0.88		
	QUALITEMS_SAT	0.95	.04	.82	24.65	.00	0.88	1.03	1.00	1.00

a. Dependent Variable: OVERALLQUAL_SAT

A review of the histogram in Figure 20 shows no significant departure from normality and the normal probability plot in Figure 21 and the residuals plot in Figure 22 show no significant violations of the assumptions.

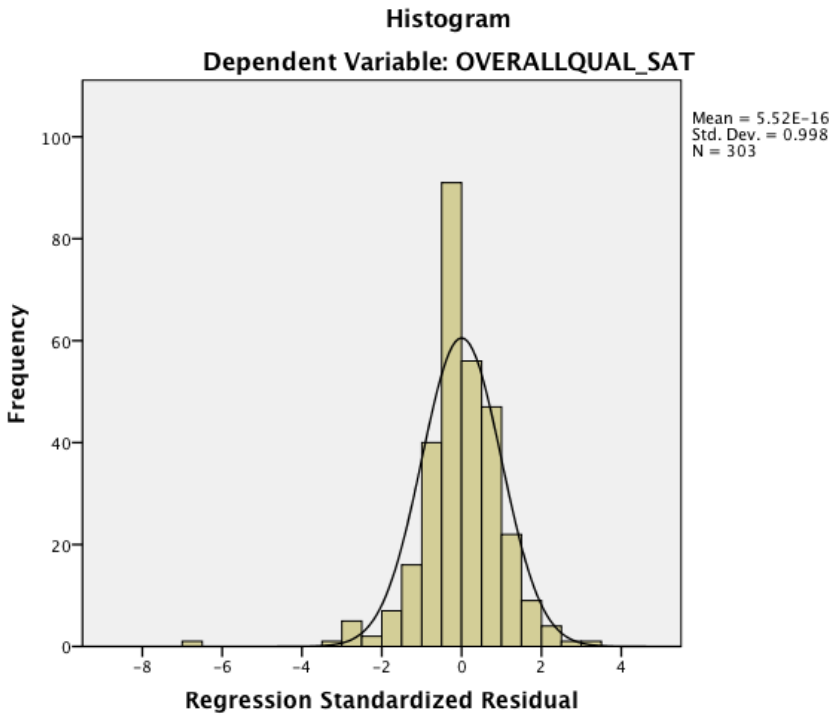


Figure 20. Histogram of standardized residuals service quality items x OVERALLQUAL_SAT.

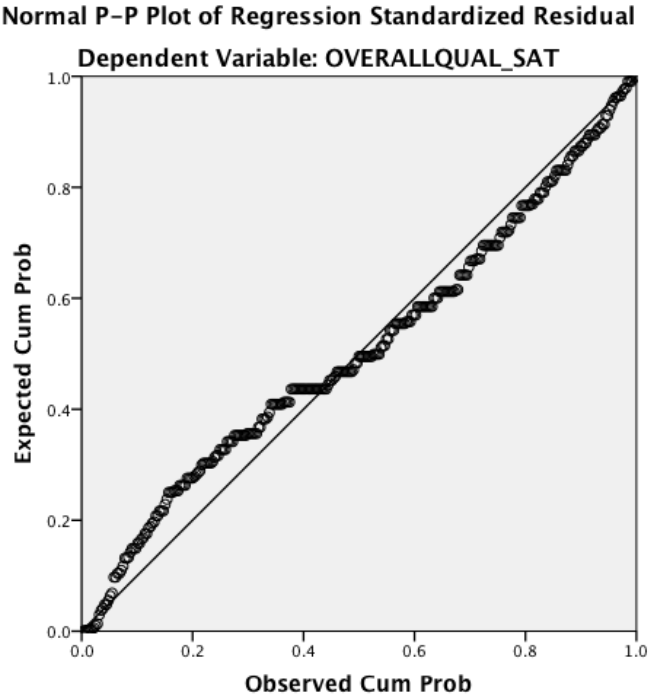


Figure 21. Normal P-P plot of standardized residuals service quality items x OVERALLQUAL_SAT.

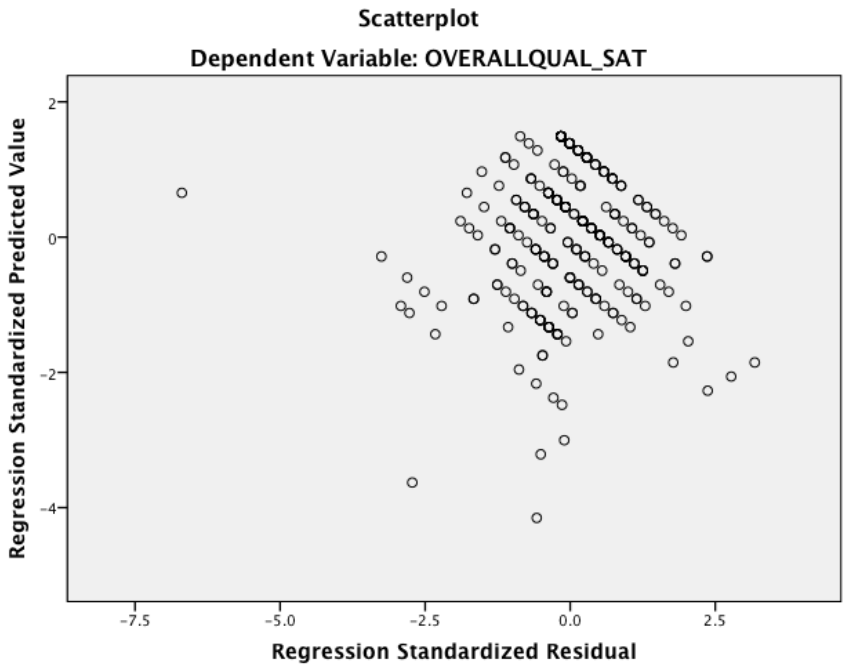


Figure 22. Scatter plot of standardized residuals - ZRES x ZPRED service quality items x OVERALLQUAL_SAT.

Overall Service Quality and Overall Satisfaction

The fifth linear regression assessed the predictive efficacy of overall service quality in predicting overall satisfaction as represented by the overall satisfaction item, SAT100. Using the enter method, a significant model emerged, $F_{1,301}=218.062$, $p < 0.0001$, Adjusted R square=.418.

Table 64

Overall Service Quality X Overall Satisfaction Linear Regression Model Summary

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.65a	.42	.42	.96
a. Predictors: (Constant), OVERALLQUAL_SAT				
b. Dependent Variable: SAT100				

Table 65 summarizes the model coefficients and collinearity diagnostics.

Table 65

Overall Service Quality X Overall Satisfaction Linear Regression Coeffients and Collineary Statistics

Coefficients[a]										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	1.776	.258		6.881	0	1.268	2.284		
	OVERALLQUAL_SAT	0.662	.045	.648	14.767	0	0.574	0.75	1	1
a. Dependent Variable: SAT100										

A review of the histogram in Figure 23 shows no significant departure from normality and the normal probability plot in Figure 24 and the residuals plot in Figure 25 show no significant violations of the assumptions.

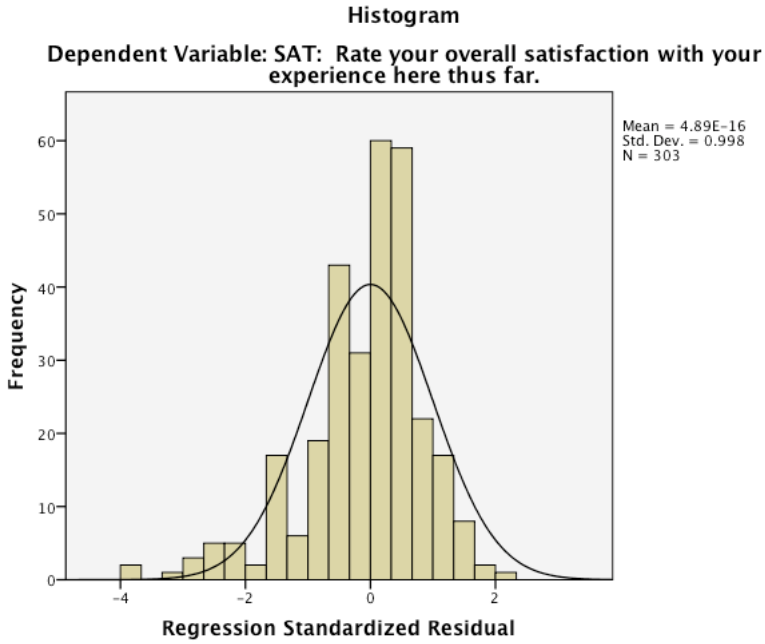


Figure 23. Histogram of standardized residuals OVERALLQUAL_SAT x SAT.

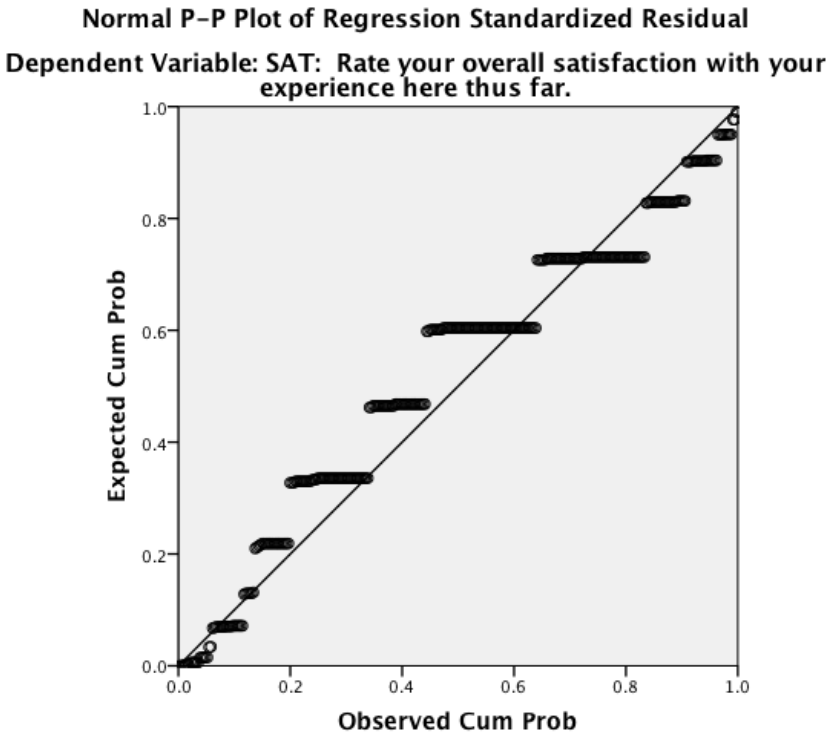


Figure 24. Normal P-P plot of standardized residuals OVERALLQUAL_SAT x SAT.

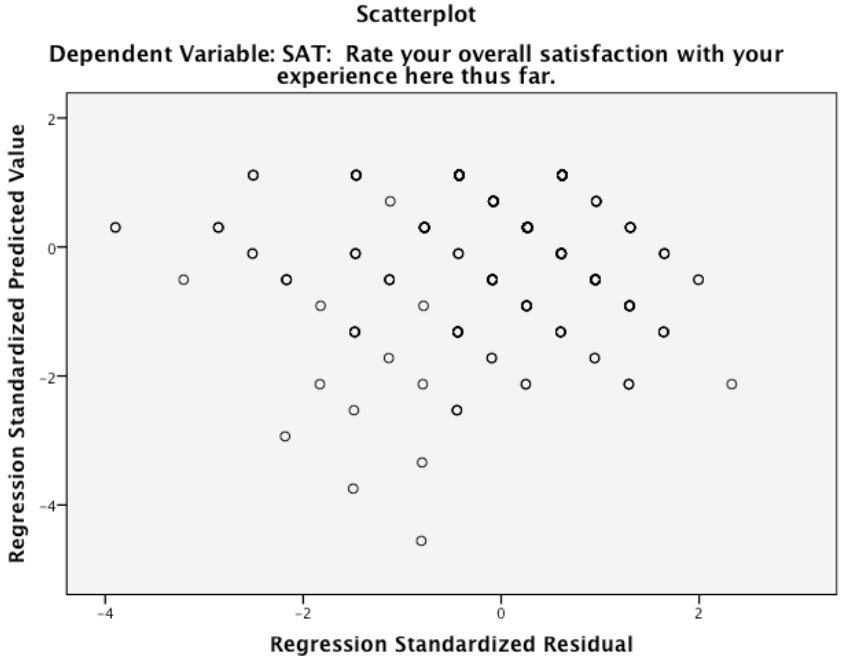


Figure 25. Scatter plot of standardized residuals - ZRES x ZPRED OVERALLQUAL_SAT x SAT.

SAT Item Set EFA 6 Factor Model and Overall Service Quality

The sixth linear regression assessed the predictive efficacy of the 6 factor SAT model in predicting overall service quality as represented by the composite overall service quality item, OVERALLQUAL_SAT. Using the stepwise method, a significant model emerged, $F_{2,277}$=357.608, p < 0.0001, Adjusted R square=.719.

Table 66

SAT Item Set EFA 6 Factor Model X Overall Service Quality Linear Regression Model Summary

Model Summary[c]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.85[a]	.72	.72	.65
2	.85[b]	.72	.72	.65
a. Predictors: (Constant), SAT_F1				
b. Predictors: (Constant), SAT_F1, SAT_F6				
c. Dependent Variable: OVERALLQUAL_SAT				

The model found was comprised of two predictor variables SAT_F1 and SAT_F6. SAT_F1 accounted for 8 times the variance in the model of the second predictor, SAT_F6. Table 67 summarizes the model coefficients and collinearity diagnostics.

The tolerance values are greater than .2 and the variable inflation factor (VIF) are less than 4, indicating that the model does not have a high degree of multicollinearity. A review of the histogram in Figure 26 shows no significant departure from normality and the normal probability plot in Figure 27 and the residuals plot in Figure 28 show no significant violations of the assumptions.

Table 67

SAT Item Set EFA 6 Factor Model X Overall Service Quality Linear Regression Coefficients and Collinearity Statistics

Coefficients[a]										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	0.30	.21		1.47	.14	-0.10	0.70		
	SAT_F1	0.99	.04	.85	26.47	.00	0.92	1.07	1.00	1.00
2	(Constant)	0.21	.21		1.03	.31	-0.20	0.62		
	SAT_F1	0.95	.04	.81	23.02	.00	0.87	1.03	.81	1.23
	SAT_F6	0.06	.03	.08	2.22	.03	0.01	.11	.81	1.23
a. Dependent Variable: OVERALLQUAL_SAT										

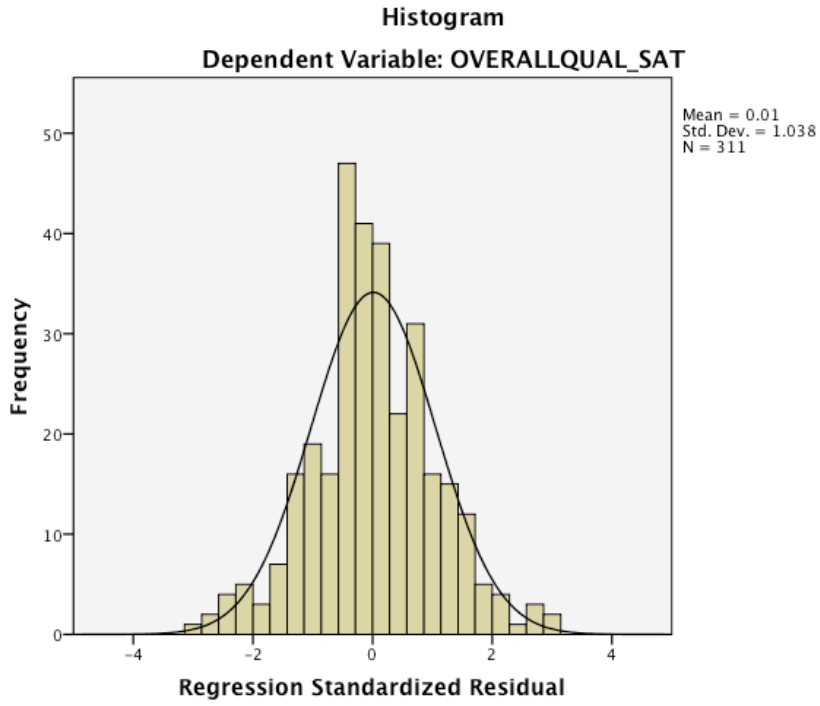


Figure 26. Histogram of standardized residuals SAT factors x OVERALLQUAL_SAT.

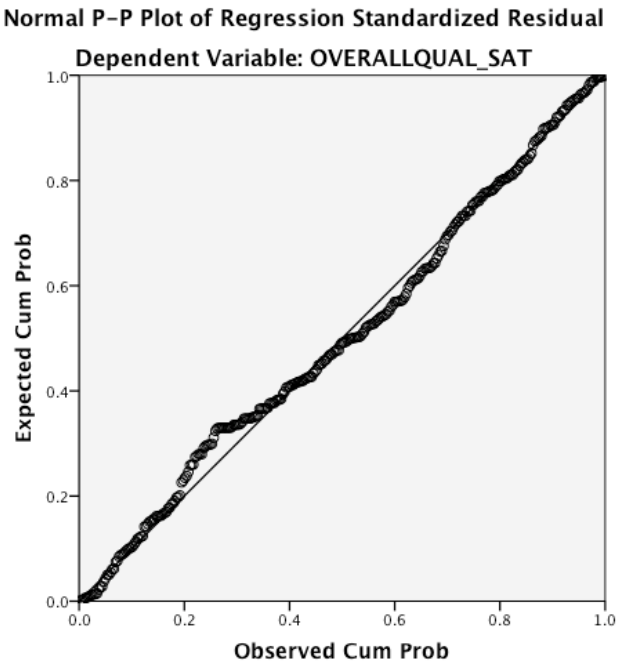


Figure 27. Normal P-P plot of standardized residuals SAT factors x OVERALLQUAL_SAT.

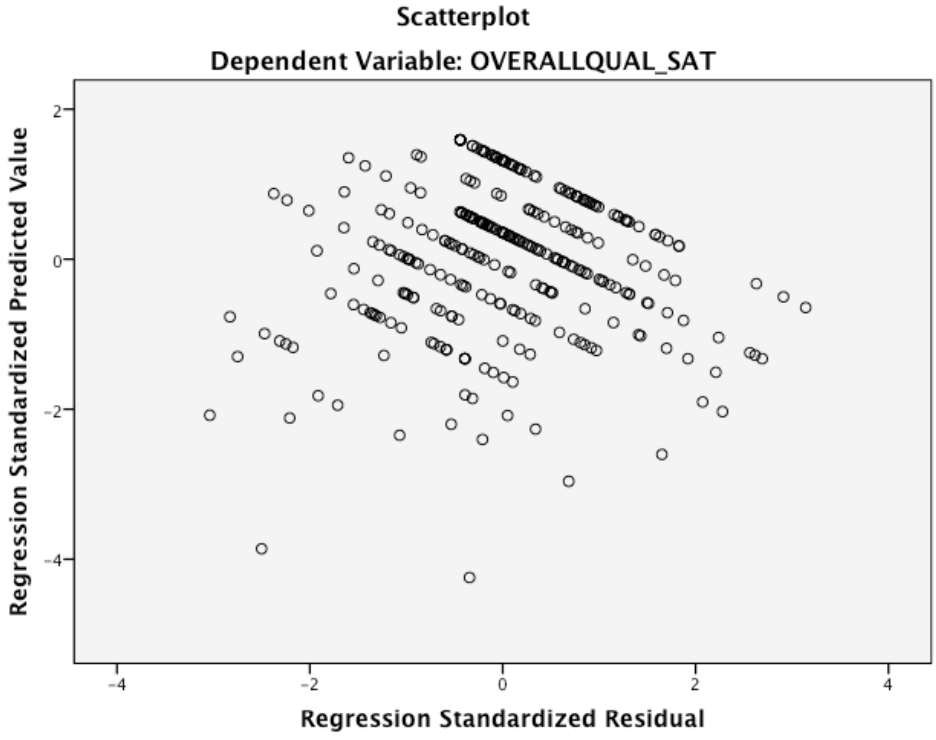


Figure 28. Scatter plot of standardized residuals - ZRES x ZPRED SAT factors x OVERALLQUAL_SAT.

NL SAT 12 Factor Model and Overall Service Quality

The seventh and final linear regression assessed the predictive efficacy of the 12 factor SAT model specified by Noel-Levitz in predicting overall service quality as represented by the composite overall service quality item, OVERALLQUAL_SAT. Using the stepwise method, a significant model emerged, $F_{2,260}=278.200$, $p < 0.0001$, Adjusted R square=.679.

Table 68

NL SAT 12 Factor Model X Overall Service Quality Linear Regression Model Summary

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.81[a]	.66	.66	.70
2	.83[b]	.68	.68	.68

a. Predictors: (Constant), SAT_NL_F3

b. Predictors: (Constant), SAT_NL_F3, SAT_NL_F12

c. Dependent Variable: OVERALLQUAL_SAT

The model found was composed of two predictor variables SAT_NL_F3 and SAT_NL_F12. The variables each accounted for about the same amount of variance in the model. Table 69 summarizes the model coefficients and collinearity diagnostics.

The tolerance values are greater than .2 but the variable inflation factor (VIF) is greater than 4, indicating that the model has some multicollinearity. A review of the histogram in Figure 29 shows no significant departure from normality and the normal probability plot in Figure 30 and the residuals plot in Figure 31 show no significant violations of the assumptions.

Table 69

NL SAT 12 Factor Model X Overall Service Quality Linear Regression Coefficients and Collinearity Statistics

Coefficients[a]										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	0.56	.23		2.43	.02	0.11	1.01		
	SAT_NL_F3	0.94	.04	.81	22.61	.00	0.86	1.03	1.00	1.00
2	(Constant)	0.48	.23		2.13	.04	0.04	0.92		
	SAT_NL_F3	0.63	.09	.54	7.07	.00	0.45	0.80	.21	4.80
	SAT_NL_F12	0.35	.09	.31	3.99	.00	0.18	0.52	.21	4.80
a. Dependent Variable: OVERALLQUAL_SAT										

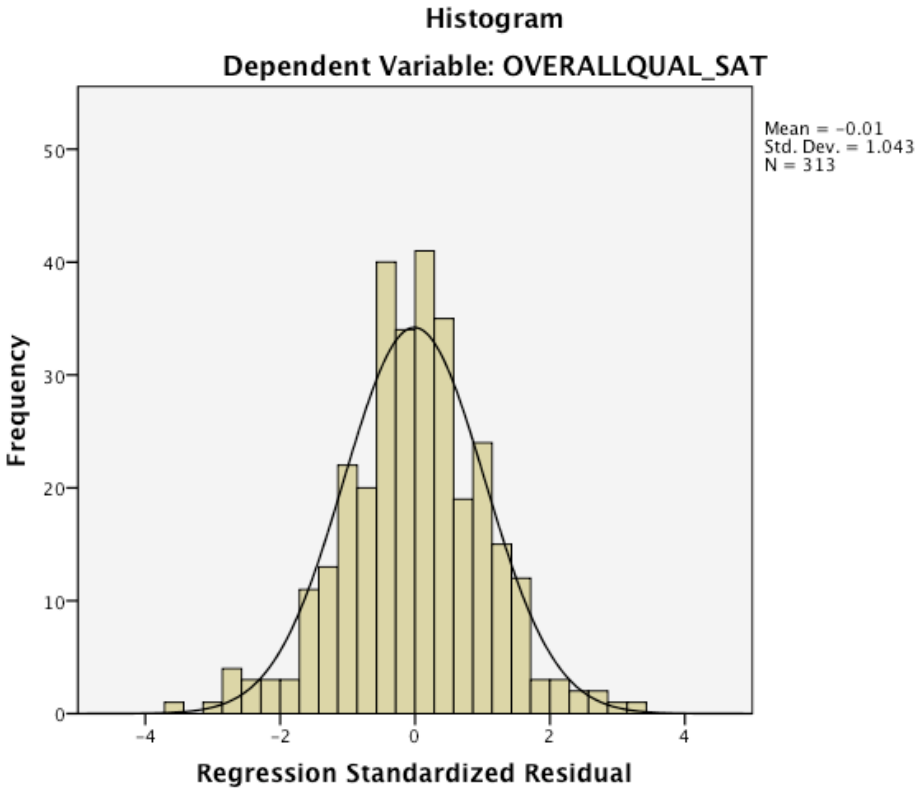


Figure 29. Histogram of standardized residuals NL SAT factors x OVERALLQUAL_SAT.

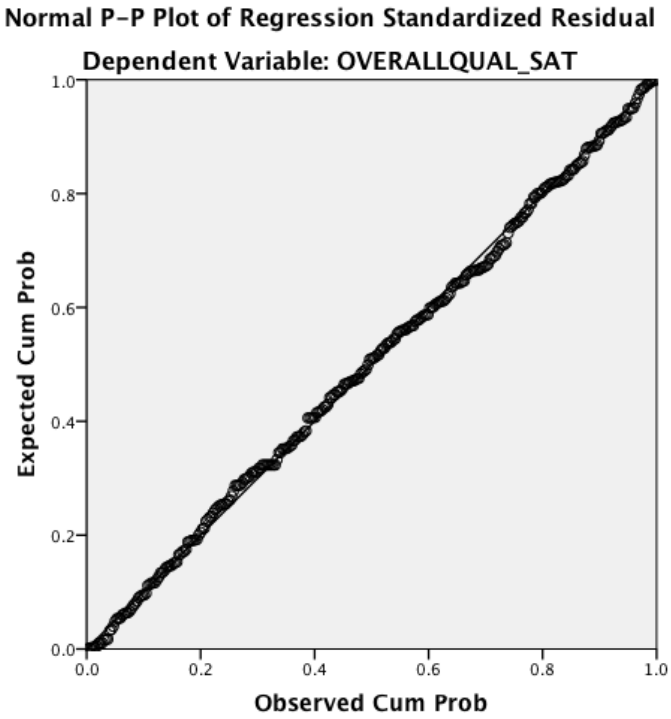


Figure 30. Normal P-P plot of standardized residuals NL SAT factors x OVERALLQUAL_SAT.

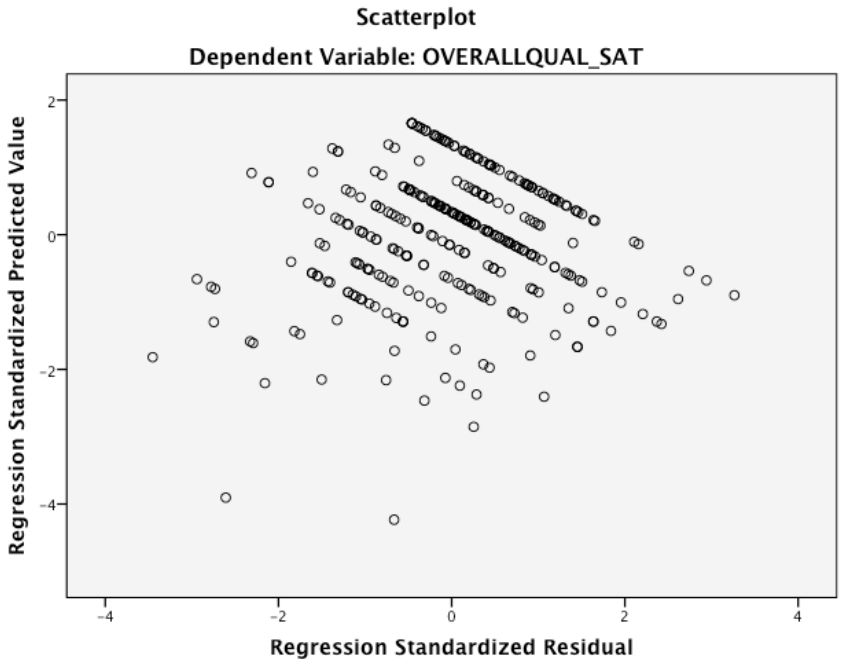


Figure 31. Scatter plot of standardized residuals - ZRES x ZPRED NL SAT factors x OVERALLQUAL_SAT.

Hypotheses Testing

The hypothesis under investigation in this research are addressed below:

H01 - There is no statistically significant relationship between any underlying latent dimension(s) of the student satisfaction survey items and the item representing overall student satisfaction.

H1 - There is a statistically significant relationship between any underlying latent dimension(s) structure of the student satisfaction survey items and the item representing overall student satisfaction.

Based on the results, the null hypothesis H01 was rejected and the alternate hypothesis, H1, was supported for the empirically derived model ($F_{2,272}$=163.372, $p < 0.0001$, Adjusted R square=.542) and the Noel-Levitz specified model ($F_{4,253}$=69.331, $p < 0.0001$, Adjusted R square=.515). These results support the existence of a statistically significant relationship between the dimensions of student satisfaction and the overall student satisfaction item. In the empirically derived model, two factors from the six found in the EFA contributed to the regression variate, Academic and Campus Environment and Library Resources and Staff, with Academic and Campus Environment contributed more than 6 times the variance of Library Resources and Staff. In the Noel-Levitz specified model, four of the twelve specified factors contributed to the regression variate, Student Centeredness, Instructional Effectiveness, Service Excellence, and Campus Climate.

H02 - There is no statistically significant relationship between the mean of all service quality items and the item representing overall student satisfaction.

H2 - There is a statistically significant relationship between the mean of all service quality items and the item representing overall student satisfaction.

Based on the results, the null hypothesis H02 was rejected and the alternate hypothesis, H2, was supported ($F_{1,292}$=140.619, $p < 0.0001$, Adjusted R square=.323).

These results indicate the existence of a statistically significant relationship between the mean of all service quality items and the overall student satisfaction item.

H03 - There is no statistically significant relationship between the mean of all service quality items and the composite item representing overall service quality.

H3 - There is a statistically significant relationship between the mean of all service quality items and the composite item representing overall service quality.

Based on the results, the null hypothesis H03 was rejected and the alternate hypothesis, H3, was supported ($F_{1,301}$=607.586, $p < 0.0001$, Adjusted R square=.668). These results indicate the existence of a statistically significant relationship between the mean of all service quality items and the composite item representing overall service quality.

H04 - There is no statistically significant relationship between the composite item representing overall service quality and the overall satisfaction item.

H4 - There is a statistically significant relationship between the composite item representing overall service quality and the overall satisfaction item.

Based on the results, the null hypothesis H04 was rejected and the alternate hypothesis, H4, was supported ($F_{1,301}$=218.062, $p < 0.0001$, Adjusted R square=.418). These results indicate the existence of a statistically significant relationship between the composite item representing overall service quality and the overall satisfaction item.

H05 - There is no statistically significant relationship between any underlying latent dimension(s) of the student satisfaction survey items and the composite item representing overall service quality.

H5 - There is a statistically significant relationship between any underlying latent dimension(s) of the student satisfaction survey items and the composite item representing overall service quality.

Based on the results, the null hypothesis H05 was rejected and the alternate hypothesis, H5, was supported for the empirically derived model ($F_{2,277}$=357.608, $p < 0.0001$, Adjusted R square=.719) and the Noel-Levitz specified model ($F_{2,260}$=278.200, $p < 0.0001$, Adjusted R square=.679). These results indicate the existence of a statistically significant relationship between the dimensions of student satisfaction and the composite item representing overall service quality. In the empirically derived model, the same two factors from the six found in the EFA contributed to the regression variate, Academic and Campus Environment and Library Resources and Staff, with Academic and Campus Environment contributed more than 8 times the variance of Library Resources and Staff. In the Noel-Levitz specified model, two of the twelve specified factors contributed to the regression variate, Instructional Effectiveness and Campus Climate.

CHAPTER 5

SUMMARY AND CONCLUSIONS

Introduction

The aim of this study was to investigate the relationships between student satisfaction and service quality and to use reduction techniques to develop a parsimonious instrument capable of measuring both student satisfaction and service quality. Five research questions guided this research and 5 hypotheses were employed to investigate the relationships between student satisfaction and service quality. Several quantitative statistical methods were used to examine each of the hypotheses including exploratory factor analyses and bivariate and multivariate linear regressions.

This chapter summarizes the study and discusses the findings that were the subject of the previous chapter in light of the driving research questions. Limitations of the current study are then restated and expanded on in light of the study findings. The chapter concludes by discussing the implications of this study and recommendations for future research.

Summary of Findings

In order to assess the presence and structure of any latent dimensions of student satisfaction at the researcher's university, three EFA's were conducted. Three parsimonious factor models were developed and analyzed. The first model was developed from the importance assessments that students provided for each item. The second was developed from the satisfaction assessments that students provided for each item. The third model was developed using scores calculated by subtracting the satisfaction scores for each item from the importance scores. All of the models were

sufficiently reliable and explained similar proportions of variance. This research focused on the performance based satisfaction model for further analyses. The satisfaction model is summarized in Table 70.

Table 70

Satisfaction Factor Model Summary

Factor	Percent of Variance Explained	Cronbach's Alpha
F1 Academic and Campus Environment	24.97	.95
F2 Commitment to Non-Traditional Students	8.82	.90
F3 Living Conditions	8.35	.87
F4 Academic Advising	6.85	.90
F5 Financial Aid	4.37	.79
F6 Library Resources and Staff	3.32	.81

This model contains five fewer dimensions than were originally posited by Juillerat (1995) and half of the twelve specified in the current version of the Noel-Levitz instrument. Table 71. Summarize shows at a high level how the models compare.

Table 71

Side by Side Comparison of Factor Models

Empirical Model	Juillerat (1995) Model	Noel Levitz Model
Academic and Campus Environment	Campus Climate	Student Centeredness
Commitment to Non-Traditional Students	Campus Organization and Activities	Campus Life
Living Conditions	Responsiveness to Diverse Populations	Instructional Effectiveness
Academic Advising	Curriculum and Instruction	Recruitment and Financial Aid
Financial Aid	Financial and Billing	Campus Support Services
Library Resources and Staff	Campus Support Services	Academic Advising
	Academic Advising	Registration Effectiveness
	Resident Life	Safety and Security
	Student Acclimation	Concern for the Individual
	Safety and Security	Service Excellence
	Faculty Effectiveness	Responsiveness to Diverse Populations
		Campus Climate

The satisfaction factor model was empirically developed in order to explore the relationship between student satisfaction and service quality in the context of the

researcher's institution in the hopes of shedding light on the relationship of these constructs more generally. Linear regressions were conducted using the resultant satisfaction factor model as well as the 12-factor model specified by the current Noel-Levitz instrument for comparison purposes. Seven linear regressions were performed and the results analyzed as presented in the preceding chapter. The results of the linear regressions are summarized in Table 72.

Table 72

Linear Regression Summary

Regression	Adjusted R square	Standardized Regression Equation
Empirical SAT Factors X Overall Satisfaction	.54	OVERALLSAT = .903 + .955 SAT_F1 - .097 SAT_F6
Noel-Levitz SAT Factors X Overall Satisfaction	.52	OVERALLSAT = 1.067 + .381 SAT_NL_F1 + .339 SAT_NL_F3 -.372 SAT_NL_F10 + .463 SAT_NL_F12
Mean of Service Quality Items X Overall Satisfaction	.32	OVERALLSAT = 1.788 + .681 QUALITEMS_SAT
Mean of Service Quality Items X Overall Service Quality	.67	OVERALLQUAL_SAT = .461 + .950 QUALITEMS_SAT
Overall Service Quality X Overall Satisfaction	.42	OVERALLSAT = 1.776 + .662 OVERALLQUAL_SAT
Empirical SAT Factors X Overall Service Quality	.72	OVERALLQUAL_SAT = .213 + .953 SAT_F1 + .057 SAT_F6
Noel-Levitz SAT Factors X Overall Service Quality	.68	OVERALLQUAL_SAT = .477 + .629 SAT_NL_F3 + .348 SAT_NL_F1

Dimensions Participating in the resulting regression equations:

SAT_F1	Academic and Campus Environment
SAT_F6	Library Resources and Staff
SAT_NL_F1	Student Centeredness
SAT_NL_F3	Instructional Effectiveness
SAT_NL_F10	Service Excellence
SAT_NL_F12	Campus Climate

The analyses suggest that the least successful predictors of overall satisfaction were the mean of the service quality items and the composite item representing overall service quality with adjusted R square of .323 and .418 respectively. The best prediction of overall satisfaction was obtained by regressing the empirically derived satisfaction factor model with overall satisfaction, which resulted in an adjusted R square of .542. The Noel-Levitz model provided similar predictive efficacy with an R square of .523, albeit with twice as many factors With respect to service quality, it appears from the

analyses that the mean of the service quality items provided very good prediction of overall service quality with an adjusted R square of .668. The best predictors of overall service quality were the empirical satisfaction model, with an R square of .719 and the Noel-Levitz model with an R square of .679. SAT_F6 in the first equation and SAT_NL_F10 in the second equation are negatively weighted indicating a negative relationship between these factors and overall satisfaction. In the case of the empirical factor model, the relative contribution of the factor, Library Resources and Staff, is small as can be seen by comparing the standardized beta weights of the two factors, .785 and -.128, respectively. In the case of the Noel-Levitz model, however, the factor, Service Excellence, is comparable in its contribution to the other factors in the equation.

The results of the linear regressions analyses were discussed in more detail in the previous chapter. In addition, how those analyses apply to each of the hypotheses put forth in this research was discussed. The results of the hypothesis testing are summarized in Table 73.

Table 73

Hypotheses Testing Results

Hypothesis	Results
H01: There is no statistically significant relationship between any underlying latent dimension(s) of the student satisfaction survey items and the item representing overall student satisfaction.	Rejected
H1: There is a statistically significant relationship between any underlying latent dimension(s) structure of the student satisfaction survey items and the item representing overall student satisfaction.	Supported
H02: There is no statistically significant relationship between the mean of all service quality items and the item representing overall student satisfaction.	Rejected
H2: There is a statistically significant relationship between the mean of all service quality items and the item representing overall student satisfaction.	Supported
H03: There is no statistically significant relationship between the mean of all service quality items and the composite item representing overall service quality.	Rejected
H3: There is a statistically significant relationship between the mean of all service quality items and the composite item representing overall service quality.	Supported
H04: There is no statistically significant relationship between the composite item representing overall service quality and the overall satisfaction item.	Rejected
H4: There is a statistically significant relationship between the composite item representing overall service quality and the overall satisfaction item.	Supported
H05: There is no statistically significant relationship between any underlying latent dimension(s) of the student satisfaction survey items and the composite item representing overall service quality.	Rejected
H5: There is a statistically significant relationship between any underlying latent dimension(s) of the student satisfaction survey items and the composite item representing overall service quality.	Supported

Limitations and Recommendations for Future Studies

The researcher used quantitative methods to investigate the objects of study, student satisfaction and service quality, on the basis of prior research in diverse fields and disciplines. As discussed in the first chapter, the sample used in this study was drawn from the students attending a large, public university in the southwestern United States. The sample was both randomized and stratified proportionately by classification

and college within the university to minimize selection bias and to maximize representativeness of the sample to the population. However, the results obtained in this research may not be generalizable to dissimilar institutions. Further, also discussed in the first chapter, is the fact that the data collected in this study were collected at a given point in time. Therefore, the data are not appropriate for longitudinal analyses. In addition to these limitations, the study was not designed to investigate the qualitative dimensions of either student satisfaction or service quality and this thesis does not address qualitative research concerns. In future studies, qualitative methods are recommended to understand more deeply the nature of these constructs.

The relationship between student satisfaction and service quality is confirmed in this study, but more work needs to be done to understand this relationship. The research showed that while the mean of all service quality items and overall service quality predicted overall satisfaction to some extent (R squares of 0.323 and 0.418, respectively), the empirical satisfaction factors were a much better predictor of overall quality (R square 0.719). The SERVIMPTp-HE instrument included in this study provides researchers with a tool that is capable of assessing service quality at higher education institutions that is compact, internally consistent, and efficient. Future research can further validate the instrument and use it in additional settings.

Conclusions

An institution of higher education has been shown in literature and in this study to be an information system, a system of interacting elements, intellectual, human and computerized, that comprises a formal set of value adding processes designed to accomplish certain educational objectives, that facilitate and support meaningful human

information interactions such as creating, storing, processing and communicating information. Further, an institution of higher education is a living system, an organism, if you will, that can be meaningfully evaluated as an information system as to its health and efficiency. User satisfaction herein referred to as student satisfaction and service quality are two constructs that have been used to evaluate information systems that were successfully applied in this study.

As discussed above, there was a strong correlation between the latent dimensions of student satisfaction and overall service quality, as well as, between the mean of the service quality items and overall service quality but a much weaker correlation between the latent dimensions of student satisfaction or the mean of the service quality items and overall satisfaction. In fact, overall satisfaction was significantly less predictable than overall service quality in all of the analysis.

This research found overall satisfaction lacking efficacy as a measure. Prior research not only questioned the efficacy of measuring satisfaction (Peterson & Wilson, 1992), but also the stability of its underlying dimensions (Obiekwe, 2000; Odom, 2008). Reasons why this is the case are beyond the scope of the current study.

While this research was conducted with no intent to address causality or to investigate the psychological properties of perceptions of student satisfaction or service quality, future research should be conducted to look at both causality and the psychological properties of these constructs. In this researcher's view, student satisfaction is an intensely personal, introspective, assessment of the student's own perceptions at a particular point in time, that is dependent on such factors as recency of experience, context, timing, and mood, and as discussed in Peterson and Wilson

(1992). Whereas perceptions of service quality, tend to be more externalized and objectified as being evaluations not about personal feelings, but about an external entity with external properties. Additional future research should investigate the nature of these concepts more deeply as well as the processes of evaluating them.

Current instruments that evaluate student satisfaction in order to determine focal areas of concern within an institutional context, such as Noel-Levitz SSI, require students to respond to surveys containing more than a hundred items. They are expensive and time consuming to administer and process and students taking them are at serious risk of survey fatigue.

This research provides a much more compact instrument, SERVIMPTp-HE, that can be used for equivalent purposes of determining areas of concern at an institution, that only has 11 items. It is important to note that the Noel-Levitz SSI and SERVIMPTp-HE are measuring different, but related, constructs. Whereas Noel-Levitz SSI measures student satisfaction, SERVIMPTp-HE measures service quality and SERVIMPTp-HE is potentially much less costly to administer and process, as well as being much less susceptible to survey fatigue. SERVIMPTp-HE measures service quality, which seems to be a more stable measure than student satisfaction that is also more predictable.

Institutions of higher education should consider using SERVIMPTp-HE as a measurement instrument of service quality to gain insight into the interaction between the student and the institution at various service delivery points, ie. between the user and the information system. While student satisfaction is a construct that wholly resides with the student, service quality is situated with both the student's perceptions and with the service itself. It is in addressing the service quality interaction between the student

and service, that the overall health of the organic system of the institution can be improved. Institutions that are currently evaluating student satisfaction should consider implementing service quality evaluation in a side-by-side manner that allows for a comparative evaluation of these related but different instruments.

This research has shown the strong contribution of an information science driven approach to institutional evaluation that can be used by institutions of higher education to improve their system. This researcher has used an information theoretic perspective to analyze an institution of higher education as an information system where the student/consumer was considered a user. It was found that indeed, higher education is an information system and students can be considered as users of that system. Various statistical methods were employed that leveraged information science concepts such as that of an information space to effect a reduction of dimensionality of the data. The methodology employed in this research was found to be useful in the domain of education. This addition to the body of knowledge in information science is significant and worth exploring in future studies.

APPENDIX A

INSTITUTIONAL REVIEW BOARD APPLICATION

For IRB Use Only	
File Number:	
Approval	

Minimal Review Application

University of North Texas Institutional Review Board
OHRP Federalwide Assurance: FWA00007479

Save this file as a Word document on your computer, answer all questions completely within Word, and submit it along with all supplemental documents to the IRB Office as described in the Electronic Submission Checklist on page 4.

Section I: Does this Form Apply?

Please check the box indicating your answer to **each** of the following questions.

Will your research study involve any vulnerable populations such as children, prisoners, pregnant women or mentally disabled persons?	☐Yes ☒No
Could public disclosure of any identifiable data you collect place the participants at risk of criminal or civil liability or be damaging to the participants' financial standing, employability or reputation?	☐Yes ☒No
Will your study involve data collection procedures other than surveys, educational tests, interviews, or observation of public behavior?	☐Yes ☒No
Will your study involve any sensitive subject matters such as: abortion, criminal activity, sexual activity, sexually transmitted diseases, or victims of violence?	☐Yes ☒No
Will your study involve audio-recording or video-recording the participants?	☐Yes ☒No
Will your study involve obtaining individually identifiable information from health care plans, health care clearinghouses, or health care providers?	☐Yes ☒No

If you answered YES to any of the above questions, your study will not meet the criteria for Minimal Review. Please fill out the Expedited or Full Board Application for your study.

Section II: General Information

Type only in the yellow fields, and closely follow all stated length limits. Handwritten forms will not be accepted.

1. Title of Study

Must be identical to the title of any related internal or external grant proposal.

Survey of Student Satisfaction using Noel Levitz Student Satisfaction Inventory

2. Investigator Information

Must be: (a) a UNT faculty member; and (b) the same person as the Principal Investigator named in any related proposal for external or internal funding.

Allen	Clark	[redacted]
First Name	Last Name	E-mail Address
Institutional Research and Effectiveness	Hurley Administration Building	121
UNT Department	UNT Building	Room Number
[redacted]	[redacted]	
Office Phone Number	Fax Number	

3. Co-Investigator Information

Must be a UNT faculty member.

First Name	Last Name	E-mail Address

UNT Department	Title

4. Key Personnel
List the name of all other Key Personnel who are responsible for the design, conduct, or reporting of the study (including recruitment or data collection).
Victor Prybutok William Senn
NIH IRB Training
Have you, any Co-Investigator, and all Key Personnel completed the required NIH IRB training course ("Protecting Human Research Participants") and electronically submitted a copy of the completion certificate to untirb@unt.edu?
☒Yes ☐No
If "No," this training is required for all Key Personnel before your study can be approved. This free on-line course may be accessed at: http://phrp.nihtraining.com

5. Funding Information (if applicable)
Provide the proposal number or project ID number for any external funding or the account number for any internal funding for this project.
62019

6. Purpose of Study
In no more than a paragraph, briefly state the purpose of your study in **lay language,** including the research question(s) you intend to answer. A brief summary of what you write here should be included in the Informed Consent document.
The purpose of the study is to look at student satisfaction and the importance of campus issues to students. Noel-Levitz Student Satisfaction Inventory, an instrument that is widely used across the nation, in higher education, will be administered. The researcher hopes to identify dimensions within the data that correlate different indicators in groups of related measures.

7. Recruitment of Participants
Describe the projected number of subjects.
Approximately 1400 students
Describe the population from which subjects will be recruited (including gender, racial/ethnic composition, and age range).
The sample will reflect the total student population based on selected factors, including major, classification, gender, and ethnicity.
Describe how you will recruit subjects.
A stratified, random sample will be drawn from colleges across campus based on class sizes from 30-50 students. As noted above, the stratification will be based on the total student population.
Have you attached a copy of all recruitment materials?
☒Yes ☐No ☐ Not Applicable

8. Location of Study
Identify all locations where the study will be conducted.
In classrooms around campus.
For data collection sites other than UNT, attach a signed and dated letter on the cooperating institution's letterhead giving approval for data collection at that site.
☐Yes ☐No

9. Informed Consent
Describe the steps for obtaining the subjects' informed consent (by whom, where, when, etc.).
A letter will be sent to each faculty member along with a packet containing a survey instrument for each student. A letter to the student will be included with each survey. The letter will explain the purpose of the study, the survey procedures, and an informed consent notice.

10. Informed Consent Forms

Written Informed Consent Forms to be signed by the subject are required for most research projects with human participants (exceptions include telephone surveys, internet surveys, and other circumstances where the subject is not present; an Informed Consent Notice may be substituted). Templates for creating consent forms are located on the IRB website at http://research.unt.edu/ors/compliance/human.htm. **All informed consent documents you plan to use must be submitted before IRB review can begin.**

11. Foreign Languages

Will your study involve the use of any language other than English for Informed Consent forms, data collection instruments, or recruitment materials?

☐ Yes ☒ No

If "Yes," after the IRB has notified you of the approval of the English version of your forms, you must then submit the foreign language versions along with a back-translation for each. Specify all foreign languages below:

12. Data Collection

Which methods will you use to collect data?

- ☐ Interviews
- ☒ Surveys
- ☐ Focus Groups
- ☐ Other – Please list below.
- ☐ Internet Surveys
- ☐ Review of Existing Records
- ☐ Observation

Have you attached a copy of all data collection instruments and interview scripts to be used?

☒ Yes ☐ No

What is the estimated time for a subject's participation in each study activity?

The survey will take approximately 20 minutes to complete.

13. Compensation

Describe any compensation subjects will receive for participating in the study. Include the timing for payment and any conditions for receipt of such compensation. If extra credit for a course is offered, an alternative non-research activity with equivalent time and effort must also be offered.

None.

14. Risks and Benefits

Describe any foreseeable risks to subjects presented by the proposed study and the precautions you will take to minimize such risks.

None.

Describe the anticipated benefits to subjects or others (including your field of study).

Students will benefit from the results of this survey because it will provide insights that allow UNT and possibly other universities to plan for and address student satisfaction.

15. Confidentiality

Describe the procedures you will use to maintain the confidentiality of any personally identifiable data.

No information that will allow identification of the individual respondents will be collected.

Please specify where your research records will be maintained, any coding or other steps you will take to separate participants' names/identities from research data, and how long you will retain personally identifiable data in your research records. Federal IRB regulations require that the investigator's research records be maintained for 3 years following the end of the study.

The records will be secured in the IR&E office.

16. Publication of Results

Please identify all methods in which you may publicly disseminate the results of your study.	
☒ Academic journal ☒ Academic conference paper or public poster session ☐ Book or chapter	☒ A thesis or dissertation for one of your students ☐ Other - Please list below. (website, blog, etc.)

Investigator Signature

I certify that the information in this application is complete and accurate. I agree to conduct this study in accordance with the UNT IRB Guidelines and the study procedures and forms approved by the UNT IRB. I understand that I cannot initiate any contact with potential human subjects until I have received written UNT IRB approval.

[redacted]

Electronic Submission Checklist

1. Print and sign this page and then scan the signed document.
2. Attach all supplementary documents, including:
   a. Copies of all NIH IRB Training completion certificates not previously submitted to the IRB Office:
   b. A copy of any proposal for internal or external funding for this study;
   c. A copy of all recruitment materials;
   d. A copy of the approval letter from each data collection site (other than UNT);
   e. A copy of all informed consent forms; and
   f. A copy of all data collection instruments and interview scripts.
3. E-mail the application (including this Signature Page) and all supplementary documents to untirb@unt.edu. Please insert "Minimal Review" in the subject line of your email.

Contact [redacted] for any questions about completion of your application.

APPENDIX B

IRB MODIFICATION REQUEST

For IRB Use Only
IRB File No: _____
Date Received: _____
Date Approved: _____

MODIFICATION REQUEST

University of North Texas Institutional Review Board

Purpose: *Complete this form when you would like to change the key personnel, data collection sites, protocol (e.g., compensation, study procedures, etc.), and/or Informed Consent/Assent Form in a research study that has already received IRB approval. Submit this form along with copies of any new or modified materials or documents you describe below. If modifications are more extensive than can be easily described on this form, please submit a new IRB application (http://research.unt.edu/ors/compliance/human.htm). NOTE: You may not implement any changes to an IRB-approved study until your Modification Request has been approved.*

Please use a font size of 11 or larger. Check "No" or "Yes" on Items #1-5 and elaborate on "yes" answers as indicated.

UNT IRB Number:11-065

Title of Project: Survey of Student Satisfaction using Noel-Levitz Student Satisfaction Inventory

Principal Investigator: Allen Clark

Campus or Mailing Address: Department of Institutional Research

City: **State:** **Zip:**

Phone: [redacted] **Email:** [redacted]

Department: Institutional Research

1. Are there changes in Key Personnel assisting in the research project?

☒ No

☐ Yes - list changes below and submit a completion certificate for NIH training for all new Key Personnel (unless it is already on file with the IRB from a previous research study).

List Names and UNT affiliation of new Key Personnel

List Names of Key Personnel to be Deleted:

2. Are there any additions or changes to sites where data will be collected?

☒No

☐Yes - Identify specific data collection sites or agencies below. In addition, submit a signed letter on official letterhead approving data collection at each site.

3. Are there any proposed changes to the informed consent/assent form(s)?

☒No

☐Yes - provide a *brief* description of and rationale for proposed changes below. In addition, submit two sets of the *revised* informed consent/assent form(s). On one set, highlight everything that differs from your original, approved informed consent/assent form(s).

4. Are there any proposed changes in the protocol requested (e.g., recruitment procedures, data collection instruments or procedures, compensation)?

☐No

☒Yes – provide a description of and rationale for proposed changes below (attach an additional page if necessary). In addition, submit copies of any recruitment materials, data collection instruments, etc. that have been modified or added since your last IRB approval of this study.

Additional questions updated, faculty letter updated with new times and helpful verbiage, and major codes provided as reference sheet for subjects.

5. Are there any proposed changes not described above?

☒No

☒Yes - provide a *brief* description of and rationale for the proposed changes.

Principal Investigator Assurance: I certify that the revised information provided for this project is correct and that no other procedures or forms will be used. I confirm that no changes will be implemented until I receive written approval for the changes from the UNT IRB.

[redacted]

Submission of Your Modification Request

1. Print and sign this page.
2. Send/deliver the entire form (including two copies of the changed informed consent form if applicable) as follows:

   Option 1: Email* to [redacted]

   *Note: if emailing the entire form, image files (i.e. scanned copies) of the signature page, data collection sites approval letters, and other non-word processor documents ARE acceptable; please maintain the originals, which must be supplied to the IRB upon request.

   Option 2: Hand-deliver to: UNT Office of Research Services
   Hurley Admin. Bldg. 160

   Option 3: Mail to: UNT Office of Research Services
   1155 Union Circle #305250
   Denton, TX 76203

Contact [redacted] at [redacted] or [redacted] for any questions about your Modification Request.

Please use this sheet to select your major codes:

College of Arts & Sciences

___0101 General Studies
___0102 Social Science
___0111 Biochemistry
___0112 Biology
___0113 Cytotechnology

___0114 Environmental Sciences

___0115 Medical Laboratory Sciences
___0116 Biochemistry and Molecular Biology
___0117 Chemistry
___0118 Communication Studies

___ 0158 Linguistics

___0120 Dance
___0121 Theatre Arts
___0122 Musical Theatre
___0123 Economics
___0124 Economics Research
___0125 Labor & Industrial Relations
___0127 Engineering Physics
___0126 English
___0128 French

___0129 German

___0130 Spanish
___0131 Geography
___0132 History
___0134 Mathematics
___ 0135 Music
___0136 Philosophy
___0137 Physics

___0139 Political Science

___0140 International Studies
___0141 Psychology

___0142 Clinical Psychology
___0143 Counseling Psychology
___0144 Experimental Psychology

___0145 Health Psychology & Behavior Medicine
___0146 Industrial Psychology

___0148 Radio/TV/Film

___0150 Audiology

___0151 Speech-Language Pathology

___0152 Speech-Language Pathology/ Audiology

___ 0154 Philosophy-Environmental Ethics
___ 0155 Electronic News

___ 0156 Converged Broadcast Media
___ 0157 Creative Writing

College of Arts & Sciences

___ 0158 English as a Second Language
___ 0159 Technical Writing

College of Business

___0201 General Business

___0211 Accounting

___0212 Accounting Control Systems
___0220 Busi. Computer Info. Systems

___0221 Management Science
___0222 Decision Sciences

___0223 Operations Management Science

___0224 Economics
___0231 Finance

___0232 Risk Management & Insurance
___0233 Real Estate
___0234 Health Services Management
___0241 Management
___0242 Administrative Management
___0243 Entrepreneurship & Strategic Management
___0245 Organizational Behavior & Human Resource Management
___0246 Organization Theory & Policy
___0251 Logistics
___0252 Marketing
___0253 Decision Technologies
___0254 Financial Services
___0255 Entrepreneurship
___ 0256 Operations & Supply Chain Management
___ 0257 Information Technologies

___ 0258 Aviation Logistics
___ 0259 Logistics & Supply Chain Management
___ 0260 Business
___ 0261 Business Administration
___ 0262 Taxation

College of Public Affairs & Community Service

___0310 Applied Arts & Sciences

___0322 Long-Term Care, Senior Housing & Aging Services

___0323 Applied Gerontology

___0330 Behavioral Analysis

___0340 Criminal Justice

___0351 Emergency Admin. & Planning

___0352 Public Administration
___0361 Rehabilitation Services
___0362 Rehabilitation Studies

College of Public Affairs & Community Service

___0363 Social Work
___0371 Sociology
___0381 Anthropology
___0391 Applied Economics
___0392 Applied Anthropology

___0393 Delivery in Community Based Services
___ 0395 Rehabilitation Counseling
___ 0396 Applied Behavior Analysis

College of Education

___ 0397 Public Administration & Management
___ 0397 Human Service Management & Leadership
___0403 Counseling
___0403 Higher Education

___0404 Development & Family Studies
___0405 Early Childhood Education
___0411 Health Promotion
___0412 Kinesiology
___0413 Recreation & Leisure Studies
___0422 Curriculum & Instruction

___0425 Elementary Education

___0427 Educational Administration
___0428 Interdisciplinary Studies
___0429 Reading Education
___0430 Secondary Education
___0443 Educational Research
___0445 Special Education
___ 0147 School Psychology

___ 0447 Educational Psychology

Toulouse School of Graduate Studies

___0501 Interdisciplinary Studies

College of Information

___0601 Information Science
___0602 Library Science

___0401 Educational Computing

___0441 Applied Technology, Training & Development
___0442 Computer Education & Cognitive Systems

School of Merchandising & Hospitality Management

___0701 Hospitality Management

___0702 Home Furnishings Merchandising
___0703 Industrial – Tech. Merchandising & Fabric Design
___0704 Merchandising
___ 0705 Digital Retailing
___ 0706 International Sustainable Tourism

College of Music

___0801 Composition
___0803 Jazz Studies
___0804 Music
___0805 Music Education
___0806 Music History & Literature
___0807 Musicology

___0809 Performance
___ 0810 General, Choral & Instrumental Music

College of Visual Arts & Design

___0901 Art

___0902 Art Education
___0903 Art History

___0904 Ceramics
___0905 Communication Design
___0906 Drawing & Painting
___0907 Fashion Design
___0908 Fibers
___0909 Interior Design

___0910 Metalsmithing & Jewelry
___0911 Photography
___0912 Printmaking
___0913 Sculpture
___0914 Visual Arts Studies
___ 0915 Visual Arts Studies

College of Engineering

___0950 Engineering Technology
___0951 Computer Engineering
___0952 Materials Science and Engineering
___0953 Computer Science
___0954 Electrical Engineering
___ 0955 Computer Science & Engineering
___ 0956 Information Technology
___ 0957 Engineering Systems

___ 0958 Electrical Engineering Technology
___ 0959 Manufacturing Engineering Technology
___ 0960 Mechanical Engineering Technology
___ 0961 Construction Engineering Technology
___ 0962 Nuclear Engineering Technology
___ 0963 Mechanical and Energy Engineering

School of Journalism

___0133 Journalism

February 2011

To: Professor [redacted]
Dept/School/College: Economics
Class: ECON-4630-1
Qty: 31

Subject: Spring 2011 Student Satisfaction Inventory

The Office of Institutional Research and Accreditation is collaborating with UNT faculty to administer the *Student Satisfaction Inventory.* The survey instrument is designed to examine student satisfaction and the importance of campus issues to students. The *Student Satisfaction Inventory*, a product of Noel-Levitz, Inc., has been widely used by institutions of higher education to identify issues relevant to student retention rates.

The data collected will be used to support research in the area of student satisfaction and in support of "**Excellence in Student-Centered Education**," the first Strategic Goal for the University of North Texas.[1] Noel-Levitz will provide data from our selected peer group and all responding national public four year institutions for comparison.

Students in your class have been selected as a part of the survey sample, which was drawn from the current student population by applying a stratified random sampling technique. Please be advised that your class has been chosen to reflect the total student population based on selected factors, including the major, classification, gender, and ethnicity of the students.

Please administer the Student Satisfaction Inventory in the class period of your choice between now and April 1st. It should take students about 20 minutes to complete the survey. If you are unable to administer this survey, please notify the Office of Institutional Research and Accreditation at x-2085 by March 11th, so we can enlist another class from your department. Please keep in mind that this is a commissioned project, and we cannot allow any surveys to be unused; please return any blank surveys to our office along with the completed surveys.

To administer the Student Satisfactory Inventory:

1. Please find the surveys from the packet and distribute them to the students during the class period. Most of the students will complete in less than 20 minutes. Survey instructions are printed on the form in a self-explanatory format. Please have students review the "Additional Questions" insert found in the questionnaire prior to beginning the survey. Please remind the students to use pencil only (Do not use ink or ball point pen).
2. Please collect the completed surveys from students and place the survey forms back in this envelope and seal the envelope.
3. Please cross out your name at the top and circle the Institutional Research and Accreditation address at the bottom of the page.
4. Please return the envelope to the Institutional Research and Accreditation through campus mail.

The surveys are very important to the university. If you have any questions with regard to this request, please feel free to contact [redacted].

We appreciate your participation.

Please Return to: Institutional Research and Accreditation
Administration Building, Room 121

[1] For more information, please see page 19 of the Strategic Plan 2006-2011, Appendix at http://vpaa.unt.edu/StrategicPlan.htm

Additional Questions

Please DO NOT mark this sheet with your answers. Please mark your answers to these questions on appropriate response area of the full questionnaire. Items 74—83 are provided below. Please make an effort to make a decision and not to select neutral (4) as an answer for these questions:

74. The campus facilities are appealing.

75. The campus has convenient operating hours.

76. Campus services are dependable.

77. The university keeps me informed about the availability of its services.

78. The university is ready to respond to my requests.

79. University faculty are courteous to me.

80. University staff are courteous to me.

81. University staff care about me.

82. Rate the overall quality of service provided to you by the institution.

83. There is a commitment to quality at this institution.

Reminder:

Please remember to record your answer in the response area of the questionnaire.

Please DO NOT mark this sheet.

APPENDIX C

IRB APPROVAL LETTERS

UNT
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OFFICE OF THE VICE PRESIDENT FOR RESEARCH AND ECONOMIC DEVELOPMENT
Research Services

February 15, 2011

Dr. Allen Clark
Department of Institutional Research and Effectiveness
University of North Texas

RE: Human Subjects Application No. 11-065

Dear Dr. Clark:

In accordance with 45 CFR Part 46 Section 46.101, your study titled "Survey of Student Satisfaction using Noel Levitz Student Satisfaction Inventory" has been determined to qualify for an exemption from further review by the UNT Institutional Review Board (IRB).

No changes may be made to your study's procedures or forms without prior written approval from the UNT IRB. Please contact Jordan Harmon, Research Compliance Analyst, ext. 3940, if you wish to make any such changes. Any changes to your procedures or forms after 3 years will require completion of a new IRB application.

We wish you success with your study.

Sincerely,

Brad Hesdan for PLK

Patricia L. Kaminski, Ph.D.
Associate Professor
Chair, Institutional Review Board

PK:jh

1155 Union Circle #305250 | Denton, Texas 76203-5017 | TEL 940.565.3940 | FAX 940.565.4277
TTY 940.369.8652 | http://research.unt.edu

Noel-Levitz Student Satisfaction Survey

Informed Consent Notice

The purpose of this research study is to look at student satisfaction with the university experience. You are being asked to complete a survey that will take about 20 minutes to complete. Completion of the survey involves no foreseeable risks. Participation is voluntary and you may stop at any time without penalty. Participation is limited to those 18 years of age or older.

No individual responses will be seen by anyone other than the researchers. Any data will be reported only on a group basis. You give consent to participating in the study by completing the survey.

This project has been reviewed and approved by the University of North Texas Institutional Review Board (IRB). You may contact the UNT IRB at (940) 565-3940 if you have any questions about your rights as a research participant.

VERY IMPORTANT - Please <u>do not</u> provide your social security number, as requested on the back page of the survey instrument.

We recognize that your class time is very important and we want to thank you for taking 20 minutes to answer this survey instrument. Please watch the UNT campus publications to see how these data are used in the future.

If you have any questions about this study, please contact [redacted], Institutional Research and Effectiveness, UNT, [redacted].

Regards,

Allen Clark, Principal Investigator

APPROVED BY THE UNT IRB
DATE: 2-15-10

UNT
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OFFICE OF THE VICE PRESIDENT FOR RESEARCH AND ECONOMIC DEVELOPMENT
Research Services

March 11, 2011

Dr. Allen Clark
Department of Institutional Research
University of North Texas

Institutional Review Board for the Protection of Human Subjects in Research (IRB)
RE: Human Subject Application #11-065

Dear Dr. Clark:

The UNT IRB has received your request to modify your study titled "Survey of Student Satisfaction using Noel-Levitz Student Satisfaction Inventory." As required by federal law and regulations governing the use of human subjects in research projects, the UNT IRB has examined the request to modify your data collection instrument and your recruitment letter. The modification to this study is hereby approved for use with human subjects.

Please contact [redacted], Research Compliance Analyst, at [redacted], or [redacted], Director of Research Compliance, at [redacted], if you wish to make changes or need additional information.

Sincerely,

Patricia L. Kaminski, Ph.D.
Associate Professor
Chair
Institutional Review Board

PK/ jh

1155 Union Circle #305250 | Denton, Texas 76203-5017 | TEL 940.565.3940 | FAX 940.565.4277
TTY 940.369.8652 | http://research.unt.edu

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