Quality Management Climate Assessment in Healthcare

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by

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DEDICATION

Thank you Lord

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SUMMARY

This research developed and examined the validity and reliability of a survey instrument based on a working model of Quality Management Climate in hospitals. The purpose for development of this survey instrument is to provide a low-cost and simple way for hospitals to understand and monitor how Quality Management has penetrated the organization by focusing on Quality Management Climate. The research population included 994 hospital professionals, including physicians, from seven hospitals in the southeastern United States. The proposed working model of Quality Management Climate is built on Quality Management theory, healthcare quality theory, and related management and organizational climate studies. Hospital performance theory is reviewed to develop an appropriate selection of variables for assessing criterion-related validity. Sixty-four survey items have been constructed for under four groupings: intra-group dynamics, intergroup dynamics, and working relationships with immediate manager and hospital administration. Structural equation modeling provided evidence of construct validity. Analysis of variance provided evidence of ability of the latent dimensions to discriminate among hospitals. Evidence of criterion-related validity is also demonstrated. Possible threats to validity and future research needs are discussed throughout the text.

CHAPTER I

AN OVERVIEW

Across the world, companies have been introducing Quality Management principles into everyday work life. Some variously call these implementations Total Quality Management (TQM), Company-wide Quality Control (CWQC), or Continuous Quality Improvement (CQI). These implementations are referred to in this research as *Quality Management.*

This research consisted of developing a multivariate survey instrument for hospitals. Completion of this survey by hospital personnel provided a way for hospital management to internally assess elements of *Quality Management Climate*, as defined in this research. This research had the following objectives:

- To review the important literature on Quality Management;
- To propose a working model of *Quality Management Climate* which focuses the theoretical basis for the survey development;
- To investigate possible ways to assess the criterion-related validity of Quality Management Climate specifically in healthcare;
- To establish validity and reliability for several Quality Management Climate latent variables;

- To assess differences in Quality Management Climate among the participating hospitals;
- To seek evidence of criterion-related validity for the latent variables associated with Quality Management Climate; and,
- To suggest future research related to Quality Management Climate and hospital performance.

CHAPTER II

QUALITY MANAGEMENT THEORY

In this and the next three chapters, the literature review establishes links to major lines of thinking: 1) general literature on Quality Management theory, 2) literature on hospital quality, 3) literature on management evaluation of organizations, 4) literature on hospital performance, and 5) general literature on survey construction and analysis techniques. This chapter specifically reviews the major points made by prominent researchers of Quality Management.

Literature Review Objectives

The following list contains six literature review approaches that are followed, followed by four approaches that are not followed by this research. First, the literature review covers the major five areas indicated above, considered to be those areas relevant given the overall research objective to develop a working conception of an aspect of Quality Management consistent with past research.

Second, the literature review cites a comprehensive body of common references. The original source material is cited as applicable; for example, the original works of Deming (1986, 1994) are cited first as opposed to work not by Deming. After these primary sources are examined, other secondary works are examined for additional insight. For example, the books by Walton (1986, 1990) provided an excellent example of good secondary material on Deming.

Third, the literature review emphasizes the iterative, evolutionary understanding of Quality Management. For example, by Deming's own revelation, his understanding of a management system continued to be refined until his death (Deming, 1994). It may be important for future research to capitalize on the latest research and study related to Quality Management in order to develop better research objectives for future study; this limitation represents a possible threat to validity of not only the survey results but the survey construction itself, since the survey is based on current Quality Management theories.

Fourth, the literature review establishes the need for additional investigation, especially empirical. Many of the sources cited provide extensive conceptual work and understanding of Quality Management, based in many cases on years of consulting and working with companies making the quality transformation. However, many statements related to Quality Management may be properly referred to as hypotheses in academic literature; some hypotheses are specifically identified as such in this research because they needed to be investigated empirically. Future empirical investigations may examine the circumstances, industries, and processes under which these claims tend to be valid.

Fifth, the literature review constructively examines the existing literature available. It is necessary to investigate the extent to which some specific studies achieved their objectives. Many concepts, including the term *quality*, have yet to be understood further in the academic arena. This research supports an evolving understanding of theory and practice in Quality Management, and to reach that overall objective it is necessary to closely examine the premises and assumptions made in the current literature. This literature review, then, endeavors to highlight potential solutions as further understanding of Quality Management evolves.

Sixth, the literature review stresses the need for interdisciplinary approaches to studying Quality Management. As stated, a number of different areas within academic literature are examined. No one person can claim to have total expertise in all these areas, however it is possible to gain expertise in a specific area or application of Quality Management. For example, this research focuses on the evaluation of some aspects of Quality Management in hospitals.

Having described the six approaches that are taken by the literature review, there are four other approaches which are not taken. First, the literature review may not always cite the first author of a specific idea. The major Quality Management theory authors who are cited have been generally credited as the first either to *combine* or widely *popularize* certain specific ideas related to Quality Management.

Second, the literature review (and the research generally) did not extol management or systems models above reality. Modeling, whether done statistically or through flow diagrams, has the advantage of demonstrating parsimony, or simplicity, in evaluating complex systems; arguably, simple models and exercises created by Deming and Juran helped popularize many concepts of Quality Management. This research demonstrated the generally accepted method of establishing validity and reliability for empirically-based models, and recognized the possible biases connected with any model's assumptions.

Third, the literature review does not cite all material or concepts related to Quality Management, but only those areas specifically related to the research objectives. The approach is interdisciplinary in searching for materials, and many more materials related to Quality Management have not been cited.

Fourth, the literature review does not insist that a single particular research approach, mode of investigation, or statistical technique or application is best under all circumstances. This research built on the premise that many appropriately defended research approaches could be created to examine specific aspects of Quality Management, with each approach providing specific threats to validity or reliability. It is hoped that future research would broaden the variety, scope and extent of appropriate techniques applied for further understanding. Therefore, the following literature review is based on the above stated principles.

W. Edwards Deming

Dr. Deming helped introduce statistical process control (SPC) in the context of systems improvement to Japanese corporate industrial leaders in the 1950s (Deming, 1986). When Dr. Deming taught these top industrialists, he used the following figure, which highlights Dr. Deming's emphasis on the system (Deming, 1986, 1994):

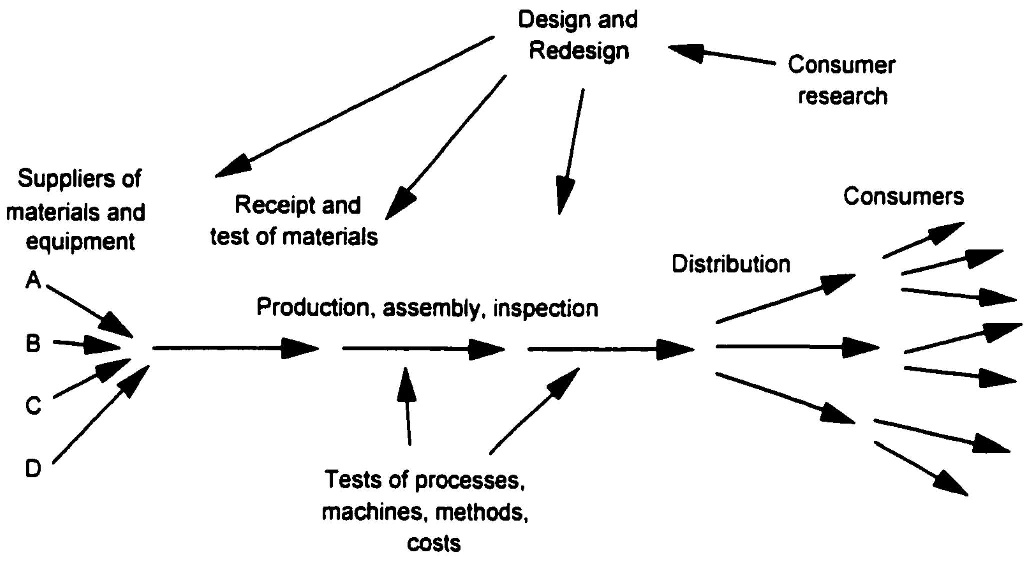

Figure 1. Production Viewed as a System (Deming 1986, 1994)

Dr. Deming has extracted a number of important lessons from his system diagram, including:

1) Elements in the diagram have a dynamic relationship with each other;
2) The role of the company includes discovering new ways to satisfy customer needs;
3) How a business decision or action may affect the system can be predicted from the system diagram;

4) The true organizational linkages within the company are described by the diagram (as opposed to the organizational chart);

5) The diagram shows people what their jobs are, or how they should interact with one another as part of the system;

6) Workers can receive joy as the system diagram helps them engage their minds in how their labor affects others; and,

7) Using this diagram can help a company produce quality goods and services (Deming, 1994).

Dr. Deming's thoughts included a model that emphasized one important element: responsibility of management. Dr. Deming argued that his System of Profound Knowledge can transform management. This system of interrelated elements includes:

- Appreciation for a system,
- Knowledge about variation,
- Theory of knowledge, and
- Psychology (Deming, 1994).

An excellent summary of Dr. Deming's philosophy, summarizing his life events, four-day seminars, major publications, and contributions to the field of statistics, can be found in Boardman (1994). Some practical applications are described by Walton (1986, 1990).

Joseph M. Juran

Dr. Juran has similarly enjoyed a widespread favorable reputation in Japan; along with Dr. Deming and other consultants, he helped the Japanese rebuild their industries, and had similar notoriety by Japanese industrialists (Juran, 1995). Dr. Juran has defined quality as *fitness for use*, meaning that users of a product or service should be able to count on it for what they need or want to do with it. Thus, a product or service with defects does not meet this standard of quality (Juran and Gryna, 1993).

Juran (1995) presented what he called a *managerial breakthrough sequence*, a list of steps for managers who want to produce quality goods and services; like Deming, Juran also emphasized focusing on management. Juran's most recent model the Juran Trilogy, consists of three successive phases: planning, control, and improvement. These phases allow managers to use run charts to distinguish between sporadic and chronic defect causes, and allow for a feedback of experience in planning new innovations (Juran 1988, 1989, 1992).

Kaoru Ishikawa

Dr. Ishikawa has held a number of distinguished posts in Japan, including Professor of Engineering at the Science University of Tokyo and the University of Tokyo, and President of Musashi Institute of Technology in Tokyo. Ishikawa emphasizes the need for top management to:

1) clearly communicate general company policies based on data;

2) express concrete goals in terms of figures, and assign a clear-cut deadline;

3) instruct workers to use the goals to prioritize which problems a company wishes to solve;

4) write and widely distribute policies and goals throughout the company (Ishikawa and Lu, 1985)

Perhaps Ishikawa is best known by Westerners for his development of the fishbone, or cause-and-effect diagram, a tool widely used by quality circles around the world. This tool allows workers to model how to accomplish pre-defined goals. Ishikawa stresses searching for the important causal factors, and the need to focus on the two or three most important causal factors (Ishikawa and Lu, 1985).

Armand Feigenbaum

Dr. Feigenbaum created the "Total Quality" concept in the 1950's and defined total quality control (TQC) as follows:

> An effective system for integrating the quality-development, quality-maintenance, and quality-improvement efforts of the various groups in an organization so as to enable marketing, engineering, production, and service at the most economical levels which allow for full customer satisfaction (Feigenbaum, 1983).

Feigenbaum's concept of TQC focuses on good management, achieving competitive leadership in customer satisfaction, and above all, encouraging everyone in the organization to focus almost obsessively upon serving all customers. Toward this end, he writes about the need to work TQC into the strategic center of the organization as well as making empowerment a front-line priority. Overall, he focuses on systematic, long-term implementation of the total quality system.

Philip Crosby

Philip Crosby founded Philip Crosby Associates, Inc., in 1979, and has since had thousands of American executives attend his Crosby Quality College. Crosby has defined quality as *conformance to requirements*, emphasizing the need to consistently reproduce a product according to design specifications. Crosby is best known for two important ideas:

- Quality is free, because if quality were improved, total costs would inevitably fall allowing companies to increase profitability; and,
- Zero defects is the goal of quality improvement, a goal which can help a company to develop a philosophy and program (Crosby, 1979).

Reengineering

Business process reengineering (BPR) is a concept made famous in the book *Reengineering the Corporation* by Michael Hammer and James Champy (1993). The book has been based on the thesis that American corporations should undertake nothing less than a radical reinvention of how they do their work.

Reengineering summarizes much of what top management can and should do to examine and improve overall business processes. To more fully demonstrate the linkages between reengineering and the quality movement, statements from Hammer and Champy (1993) are contrasted in the following table with Deming (1986), Juran (1995, reprinted from 1964), and Ishikawa and Lu (1985). This table clearly shows that the underlying concepts of reengineering have been previously stated in other literature:

Table 1. Reengineering Concepts are Built on Past Literature

Hammer and Champy (1993)	Ishikawa and Lu (1985)	Juran (1995, reprinted from 1964)	Deming (1986)
Reengineering is about dramatic, radical change; TQM involves incremental adjustment. (page 219)	Quality control is a thought revolution in management, and must be conducted as such. (page 126) Top management must assume leadership in brining about a breakthrough. (page 128)	Breakthrough means change, a dynamic, decisive movement to new higher levels of performance. (page 3) Breakthrough improvement is clearly distinguished from operational improvement. (page 388)	Western style of management must change to halt the decline of Western industry, and to turn it upward. The purpose of this chapter and of the next one is to explain the elements of transformation that must take place. There must be an awakening to the crisis... (page 18)
TQM, once it is built into a company's culture, can go on working without much day-to-day attention from management. (page 219)	Assume leadership in quality and quality control. Always be a vanguard promoting them. Just issuing policies does not do anything for the company. Top management must be in the forefront of activities and assume the leadership position. (page 125)	Next as to active participation. The chief executive does need to become personally involved in urging major births -- new markets, products, acquisitions. (page 389)	Management that faces seriously the following questions will perceive the need of an overall integrated plan: 1) Where do you hope to be five years from now? 2) How may you reach this goal? By what method? What is needed is sustained involvement and participation. (page 19)
Conventional methods, from exhorting the troops to establishing incremental quality programs, can dig a company out of a 10-percent hole. Reengineering should be brought in only when a need exists for heavy blasting. (page 33)	In implementing quality control, do not seek merely to fulfill national standards and company standards, but set your goals to meet the quality requirements of consumers. (page 55)	The few really big changes must come from the management -- a new product which leap-frogs all competition, a new process which can out-produce its predecessor by 4 to 1. (page 146)	Western industry is satisfied to improve quality to a level where visible figures may shed doubt about the economic benefit of further improvement. As someone inquired, "How long may we go in quality without losing customers?" This question packs a mountain of misunderstanding into a few choice words. (page 2)

Reengineering has great benefit as a practical application of Quality Management for top management. Given the objectives of this research, however, it is necessary to extend the principles of reengineering that apply to all employees, not just top management. Misapplication of reengineering has been a topic of recent discussion (Adams, 1990; Hammer and Stanton, 1995).

Malcolm Baldrige National Quality Award (National Institute of Standards and Technology)

The criteria for the Malcolm Baldrige National Quality Award derive from the expert opinion of Baldrige examiners and industry consultants, an ever-changing group of experts, who have yearly refined the criteria since its inception in 1987. The seven part model below is reproduced from the draft of the recently announced Health Care Pilot (NIST, 1995), and is similar to the general Baldrige model:

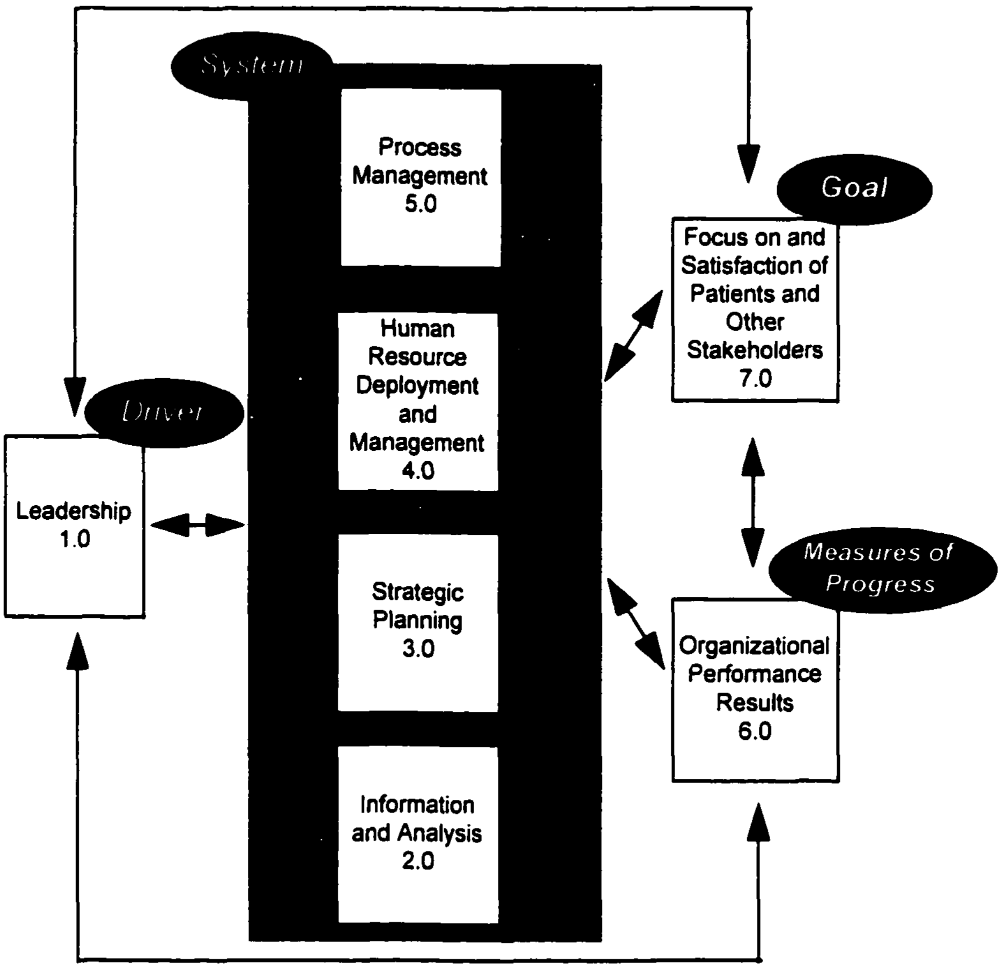

Figure 2. Health Care Pilot Criteria Framework (NIST, 1995)

Several important lessons emerge from this diagram:

1) The seven major categories are already widely considered distinct latent measures, each with detailed subcomponents;

2) These elements are assumed to be linked with specific causal relationships;

3) The elements dynamically feedback and influence each other through the organization's management system; and,

4) Leadership is the key force making the results happen.

The Baldrige criteria have been successful at identifying Quality Improvement in a generally accepted model across a wide number of industries (NIST, 1994).

Consensus is currently building behind the Malcolm Baldrige criteria as being the best overall description of Quality Management (Dean and Bowen, 1994; Juran, 1994); for example, the European Quality Award has been fashioned after the Baldrige standards, and several other nations are patterning their awards based on the Baldrige. This popularity results from the criteria's emphasis on techniques over tools, as well as the consensual dynamics that have yearly refined these criteria.

The Baldrige criteria currently require an entrance fee from companies desiring to compete in the yearly assessment, as well as an extensive on-site audit provided by trained Baldrige auditors.

Conceptualizing Quality Management

It is proposed that defining *Quality Management* stems from the more general and immediate problem of how to produce quality goods and services. In other words, Quality Management literature is motivated by the profound central question "How can we continue (or start) to produce quality goods and services?" Establishing a working conception for Quality Management results from extracting common themes from the literature.

As demonstrated, Ishikawa's writings largely summarized what Deming, Juran, and other academics and consultants taught the Japanese, blended with what Japanese academics and consultants discovered through experience and research. The Baldrige standards likewise represent an iterative consensus in applying and evaluating critical features of Quality Management. Thus, there is no final source of definitive understanding of what Quality Management is, a clear fact which may provide a serious validity threat to any research performed in this area.

Benchmarking

In addition to the quality literature, a major force shaping the consensual definition of Quality Management is the practice of benchmarking. As operationally defined for this research, benchmarking is comparing similar business processes or principles from one organization to another. In practice, this concept has brought together leaders from different industries to learn about Quality Management. For example, in the past decade Quality Management conferences have increasingly attracted not only quality control specialists, but also top executives from many different industries. The Baldrige award echoes this cross-industrial interest through the various awards in large and small manufacturing, service industry, education and healthcare.

In principle, benchmarking suggests that companies who are serious about Quality Management should examine a variety of "best" writings on the subject, instead of focusing solely on a specific author. Many companies who practice Quality Management follow this approach. For example, the American Society for Quality Control (ASQC) offers quality-related books by many authors, including those reviewed in this chapter. In another example, the popular journal *Quality Progress* also captures the desire to present a variety of practical and sometimes conflicting ideas facing Quality Management professionals. This research joins ASQC in choosing to examine and synthesize ideas from several authors for the following reasons:

1) For empirical investigation, there is the need to validate any theory against practice;
2) Increasing numbers of organizations are choosing to manage based on a variety of Quality Management (and other management) authors; thus,
3) It is impossible to empirically demonstrate that a particular organization follows only one specific philosophy, unaffected or untainted by what other writers offer (even if the Quality Management program is launched personally by a major quality author).

A case in point is Ford Motor Company, which had some parts coached by Deming, but which also has studied Hammer and Champy's powerful concept of reengineering. In the true spirit of a learning organization, they have chosen to search out truth wherever it exists. So while it may be possible to empirically examine how an organization follows specific concepts of specific writers (in an attempt to validate a particular quality expert), this research focuses on concepts and principles generally accepted by the Quality Management community. Other studies have attempted to validate the claims of specific authors; the goals of this research, however, lean less to validating specific theory and more towards validating generally accepted theory since the desired output is a practical measurement instrument for hospitals.

Industry leaders generally accept that when comparing two quality systems, there may be some common ground, and some difference. Despite these often obvious differences (either in definition, implementation or practice), many companies have found value in studying specific common processes (such as distribution) that organizations with very different products, services, strategies, and customers might share.

The growth of benchmarking shows that some companies are practicing active learning, not only from their industry but also other industries, to provide higher quality goods and services. Benchmarking has extended from not only product delivery systems, but also to other organizational or management characteristics, including organizational and reporting structure, leadership style, strategy, and system development (Walton, 1986, 1990). Thus, benchmarking not only helps affect how a company delivers quality goods and services but also affects management and organizational structure. Benchmarking not only describes how managers learn practical steps for improving specific processes and methods, but also the more general learning of principles that occur among organizations. In affecting the way companies do business, it is therefore proposed that benchmarking is a major force in developing a refined definition of Quality Management.

ASQC offers several serial publications, including *Quality Progress*, *Quality Management Journal*, and *Technometrics*, which adopt the philosophy of learning Quality Management and control by studying various theories and applications independent of first authorship. Future research may further investigate the specific nature of how benchmarking affects the definition of Quality Management.

A Working Description of Quality

Having summarized some major points from the Quality Management literature, it is important to next ask the following question: What is *quality*? Different authors and organizations have proposed varying definitions of the concept (Dean and Bowen, 1994; Reeves and Bednar, 1994). Some examples of the more commonly used quality definitions follow:

- Quality is fitness for use (which has five major dimensions: quality of design, quality of conformance, availability, safety, and field use) (Juran, 1995).
- Quality is conformance to requirements (Crosby, 1979).
- Quality is what the customer says it is (Feigenbaum, 1983).
- A product or service possesses quality if it helps somebody and enjoys a good and sustainable market (Deming, 1994).

This blurring of concepts makes it difficult to completely separate ideas of quality goods and services and Quality Management. Adding to this rich complexity is the freedom individuals and groups within an organization have to formulate their own working conceptions of quality. Indeed, in some instances a model of the word *quality* may be more operationally correct than a simple definition.

Given these complexities, this research does not search for a specific definition or model of the word *quality*. Within the specific goals of this research, it is sufficient to establish a working description of *quality*: Quality describes desirable characteristics of an organization's goods and services.

It is chosen to establish a working description instead of definition since the statement above does not select among the generally accepted definitions of *quality*, but instead highlights the operational use of the term. While this description is weaker in revealing the role the term quality can have in revealing the underlying management philosophy, the description above has the power of being more widely applicable in a variety of organizations. Locking onto one of the specific quality definitions above may be a threat to survey validity, and for this purpose the term *quality* does not appear in the developed survey.

Again, the focus for the singular term *quality* is on both goods and services, the organization's output, as opposed to an organization's management structure, style or system. This blended focus on goods and services applies therefore to all organizations, whether they are categorized as manufacturing or service.

This working description of quality omits the term *customer* under the assumption that only customers drive the definition (and redefining) of *quality*. In other words, non-customers have no opinion about an organization's goods or services. Thus, *desirable* (as used in the above definition) depends on the opinion (objective and/or subjective) of the customer. Additionally, it is proposed that depending on the history of a particular industry or organization, all customers affect the quality definition by different mechanisms. In the United States, healthcare quality tends to be determined by mechanisms controlled largely by its own healthcare professionals and staff coupled with a sense of community health standards (which includes government); other industries may be different.

Thus, this research departs from delving into the arguments cogently articulated by Reeves and Bednar (1994) who discuss the various advantages and disadvantages of conceptualizing quality according to specific definitions proposed by quality experts. In the end, multiple definitions of quality appear within the hospital context, and even one professional may have multiple conceptions based on specific applications. Confounding these conceptions is the proposition that individuals have the liberty and sometimes the obligation to redefine their conception of *quality*, and thus the definition quickly becomes a moving target.

The term *quality* in healthcare has already been extended beyond a one sentence definition, and into more complex models relating medical services to outcomes. The general description of *quality* given above emphasizes the direct linkage between *quality* and goods and services, a sufficient baseline conception for the present research objectives. While this conception has the advantage of a wide range of application, it suffers from the power of specific applicability, and thus remains a conservative description of *quality*. Future studies may pursue how more specific definitions of quality have application, and may investigate the following questions:

- How does the definition of *quality* affect organizational performance?
- How does changing the definition of *quality* too frequently or too infrequently affect the production of goods and services?
- Do individuals inside an organization have multiple conceptions or models of *quality*?
- Do groups inside an organization have multiple conceptions of *quality*?
- Do variations on conceptions of *quality* improve or reduce general performance?

A Working Description of Quality Management

Various acronyms that represent a Quality Management system include Total Quality Control (TQC), Total Quality Management (TQM), Company-Wide Quality Control (CWQC), or Continuous Quality Improvement (CQI). It is important to note that Dr. Deming (1986, 1994) shunned the use of these terms because of the variety of definitions which people attached to them.

The Total Quality Control (TQC) concept has been first described by Feigenbaum in the 1950's (Feigenbaum 1983), who emphasized that all company employees should be involved in the quality process. Others have modified the original TQC acronym to highlight other aspects of the quality system. For example, the TQM acronym implies both a focus on management as well as total involvement by all employees. The CWQC acronym focuses on the need for quality to be the responsibility of the whole company. The CQI acronym focuses on the need to continuously look for improved solutions. In general, many of the consensual elements of Quality Management have been captured in the Malcolm Baldrige National Quality Award (NIST, 1995), which continues to undergo redefinition.

Given these complexities, this research does not search for a specific definition or model of the term *Quality Management*. Within the specific goals of this research, it is sufficient to establish a working description of *Quality Management*: Quality Management describes the operational philosophy used to improve desirable characteristics of an organization's goods and services.

It is chosen to establish a working description instead of definition since the statement above does not select among the generally accepted definitions and acronyms of *Quality Management*, but instead highlights the common association between the term and an operational philosophy. While this description is weaker in revealing the specific underlying management philosophy in a particular setting, the description above has the power of being more widely applicable in a variety of organizations. Locking onto one of the specific Quality Management definitions above may be a threat to survey validity, and for this purpose neither the term *Quality Management* nor any of the commonly used acronyms do not appear in the developed survey.

Health services researchers have taken the term *quality* beyond single sentence definitions, typically proposed by the quality experts reviewed above, into some general dynamic models. These models account for the rise in quality assurance departments in every major American hospital. As well, many health services studies and research initiatives have been based on these previous (and definitely evolving) notions of *quality medical service*. Given the widespread industry value within healthcare for assuring quality medical practice, there has been a natural transition from focusing only on quality medical service provided by specific medical providers, to the broader issues of how Quality Management can help produce and improve the quality provided by the hospital as a system. Healthcare is perhaps beyond many industries in the expectation that Quality Management feeds into larger dynamic models of health outcomes and service. It is clear that many medical professionals take a systems approach to producing goods and services, and while reduction of specific variation continues to be a flagship mandate, the history of medical systems demonstrates a broader improvement focus than many industries. These issues are important to investigate before developing a working definition of *Quality Management Climate*.

CHAPTER III

HEALTHCARE QUALITY THEORY

As the previous chapter demonstrated, *quality* may have different meanings. Regardless of the source, *quality* generally refers, as proposed, to desirable characteristics of an organization's goods and services. This chapter specifically focuses on the healthcare industry, an industry that has grown much faster than the rate of inflation in the United States in the past thirty years.

Health services providers and researchers have developed a rich literature modeling what quality means for health and how quality service delivery leads to desirable outcomes. Historically, quality departments have been an important part of American hospitals since the 1950s, but only recently has Quality Management theory transformed the role of these departments, renewed their original quality mandate, and empowered them to logically restructure fundamental hospital processes to produce better quality. Hospitals have historically modeled quality according to a systems paradigm, but only recently have been able to benefit from benchmarking important new management theory from other industries (Berwick, et al., 1990). And, as a result, the rate of adoption of Quality Management within healthcare in the United States has been almost uniform (sometimes identical) in every state and even the smallest hospitals.

This chapter documents this history and literature, and describes how quality has been modeled by health services researchers.

Why Improve Healthcare Quality?

The healthcare industry accounts for about 14% of the 1994 GNP of the United States; consider that this percentage has mushroomed from a mere 5% in 1960, as shown in the following figure (data after 1991 are estimated):

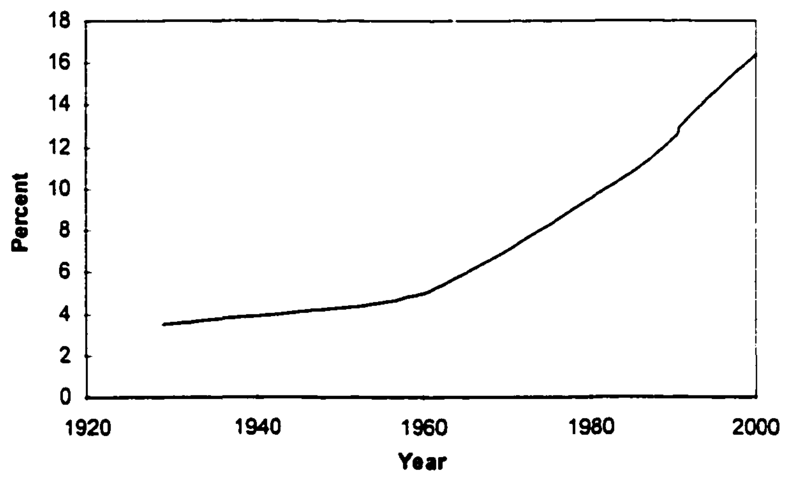

Figure 3. Health Expenses as Percent of GNP (Meadors, 1993)

Also, over 52% of 1991 healthcare costs has been covered by state and federal money, thus creating additional pressure on taxpayers (Meadors, 1993). These data have helped drive federal legislative efforts, by both parties, to restructure healthcare financing.

With so many dollars involved, even incremental gains in productivity could amount to millions saved annually. The following figure illustrates the rise in government spending in the healthcare industry:

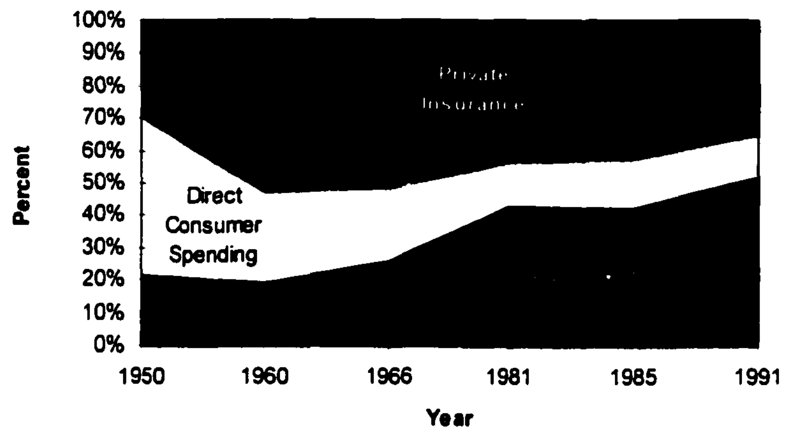

Figure 4. Funding of Health Expenses by Source (Meadors, 1993)

Yet, the benefits from improving healthcare delivery extend far beyond financial gain. First, dollars saved may translate into greater healthcare system access. Second, the functional status of patients may be aided by improvements to the system. Third, resources may be made available for additional clinical research (e.g. expanded AIDS research). Healthcare professionals strongly defend such gains as being critical our healthcare system at the world-class level.

Currently, the United States has what is considered to be the best healthcare system in the world by many standards (Smalley, 1982; Al-Assaf and Schmele, 1993). Despite this global leadership, health leaders consider it mandatory to seek to improve the system and provide better access and quality while reducing cost.

Models of Quality in Healthcare

Many health services researchers have struggled with defining or modeling *quality* for healthcare. It is important to recognize the systems focus of even the earliest formulations of medical system improvement.

Historically, medical professionals consider Ernest Codman, a surgeon at Massachusetts General Hospital at the beginning of the century, to be the father of the search for quality health care (Donabedian, 1989; Al-Assaf and Schmele, 1993). Codman proposed follow-up exams one year after surgery to assess the long-term impact of hospital treatment. Codman's work resulted in the creation of the Hospital Standardization Program in 1918. Nevertheless, Codman's greater vision consisted of tracking the end results of medical care, but he has been generally shunned by contemporaries. Only recently have researchers turned to his writings for philosophical guidance since clinical outcomes research has become a hot topic today (Codman, 1914a, 1914b, 1916a, 1916b; Donabedian, 1989; Mulley, 1989; Berwick, 1989b; Al-Assaf and Schmele, 1993).

Though Codman's greater vision has only recently begun to be addressed, his desire for standardization lived on and eventually resulted in the creation of the Joint Commission on Accreditation of Hospitals (JCAH) in 1952. Since then, the JCAH has changed its name to the Joint Commission on Accreditation on Healthcare Organizations (JCAHO) to reflect a broader healthcare mission beyond the physical structure of individual hospitals. Still, hospitals continue to be the central focus of the American healthcare system amidst a set of new entities including Health Maintenance Organizations (HMOs), Managed Care Networks, physician group practices, home health care, and free-standing ambulatory care units. This research proceeded under the assumption that the hospital continues to be the major focus of healthcare management.

In the United States, about 5 of every 6 hospitals voluntarily request accreditation through the JCAHO. While not a requirement, JCAHO accreditation has the advantages of: 1) certifying hospitals to receive Medicare dollars, 2) allowing the management of the hospital to receive a systematic assessment of hospital practices on a regular basis, and 3) demonstrating to the healthcare and government agencies a body of consistent nationwide standards of hospital care.

Using quality assessment departments and numerical standards developed by JCAHO, hospitals have been assuring patient quality since 1953, based on work that began with Codman and the Hospital Standardization Program. In the 1950s, the Joint Commission had a one-page list of accreditation standards; through the 1980s, the

JCAHO had expanded its quality monitoring and measurement regulations to fill several hundred pages, mainly from a retrospective basis (Roberts, 1987; Weitzman, 1990).

Historically, accreditation requirements have focused on quality assurance activities; thus, all JCAHO accredited hospitals have an ongoing effort in quality assurance. It is important, then, to understand the role that quality assurance has had in hospitals. It is a reasonable assumption that hospital professionals view *quality* and *Quality Management* activities based on the historical paradigm of JCAHO initiated quality assurance. Hospitals now implementing Quality Management need to integrate quality assurance and Quality Management within the organization.

Traditional quality assessment has focused almost exclusively on technical quality by taking a retrospective look at quality care delivered (Donabedian, 1988a, 1988b) or the setting in which care is provided (the structure). However, traditional models have proven to be incomplete since many health providers today are realizing that technical quality not only depends on the skill of the physician, but also of the other health professionals (such as nurses) and the support staff (such as laboratory) that provide important pieces to the whole picture of medical care (Berwick, 1990) as well as the processes involved in delivery. Also ignored are the larger system complexities introduced by increasing government scrutiny and a greater push toward larger managed care networks. In many settings, physicians still take the credit or blame for health outcomes, rather than looking for process or system causal factors (Berwick, 1989a; Berwick, et al., 1990); only recently have significantly more medical professionals started to consider the elements as still distinct yet interdependent elements in larger contexts.

Avedis Donabedian, a leader of healthcare quality assurance, has modeled quality processes into a dynamic systems framework of three components: structure, process, and outcome. The *structure* refers to the material and health resources, operational characteristics, and organizational characteristics of the healthcare facility. The *process* refers to the actual giving and receiving of care by the health provider and other parts of the system. *Outcome* refers to the health status, both of individual patients and of entire communities (Donabedian, 1988b).

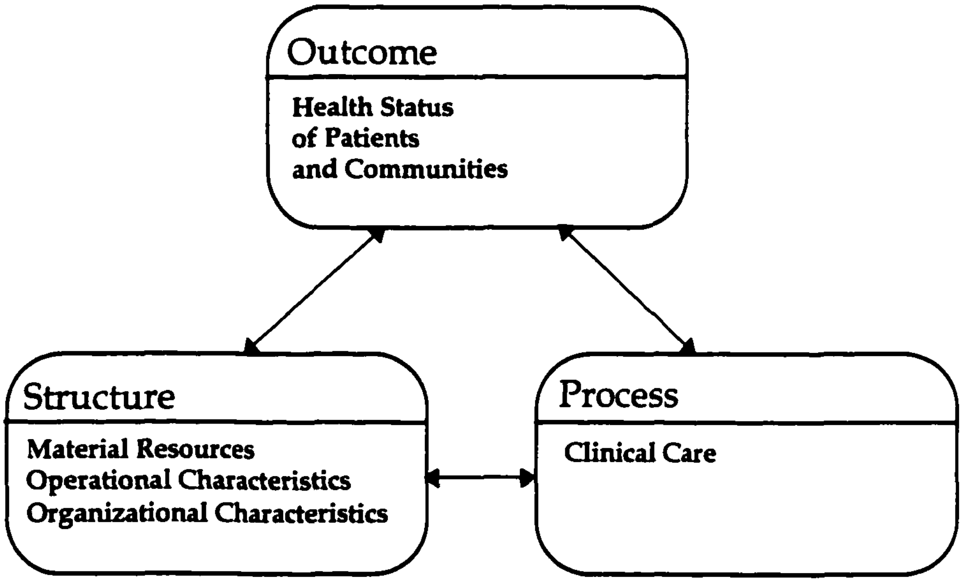

Figure 5. Quality Assurance Model (Donabedian, 1988b)

In the above figure, Donabedian's model illustrates how healthcare quality has been defined over the last century; of particular interest to researchers has been the relationships among structure, process and outcome. Research relating structure and process, and research relating structure and outcome have originated from organizational sciences and industrial engineering, where some of the first gains in health systems research have been realized (Smalley, 1982). With such disparate but interrelated components, the above model helps explains why many health systems researchers prefer to take an interdisciplinary (rather than multidisciplinary) approach to health systems research (Howland, 1975).

Why Hospitals are Implementing Quality Management

The healthcare community became widely aware of Quality Management when Dr. Donald Berwick, a physician for the Harvard Community Health Plan, spearheaded a research project called the National Demonstration Project (NDP) in the late 1980s. This project, funded by the John A. Hartford Foundation, has been designed to answer the following major question: Can the tools of modern quality improvement (with which other industries have achieved breakthroughs in performance) solve major hospital service delivery problems? (Berwick, et al., 1990) Twenty-one major hospitals along with quality advisors from companies including Xerox, Corning Glass, and Hewlett Packard participated in 1987 and 1988. Each hospital has been instructed to bring to the first meeting a long-standing significant problem that could not historically be solved.

After a year, each hospital had demonstrated objectively demonstrated progress in solving these problems, typical and in some cases identical to problems faced by many other major American hospitals. The results of this challenge have been widely published, and many healthcare professionals subsequently became adopters of Quality Management (Berwick, et al., 1990; Laffel and Berwick, 1992). JCAHO quickly became interested in these concepts and began to write new standards; in less than a decade, most hospitals today have a functioning Quality Management department.

American Hospitals and Quality Management Standards

The greatest promise for continuing this momentum came from the JCAHO, as noted above, and has recently incorporated many Quality Management concepts into its accreditation process, specifically in the leadership criteria but also throughout the standards. In order to gain Medicare reimbursement, these new standards have caused almost all American hospitals to base their strategic plan and departmental level plans on Quality Management principles. This shift effectively has accomplished the following (JCAHO, 1994):

- Hospitals are now focused on accomplishing specific objectives to comply with new Quality Management standards;

- The framework for the presenting the standards reflects a shift in the hospital's need to oversee, coordinate, and integrate units, rather than being a loose collection of independent units;
- The standards emphasize actual performance, not simply the capacity to perform
- The standards address the care provided to the patient and management of the organization;
- The standards focus on important activities or functions that significantly influence, directly or indirectly, patient outcomes;
- The standards are set forth in a quality improvement context, with the intent to improve internal systems within organizations;
- As introduced, the Joint Commission allows for great latitude in developing plans consistent with Quality Management principles, and thus hospitals have much flexibility in transitioning earlier approaches to meet these new standards.

The Joint Commission expects that all hospitals, at least in intent, subscribe to these new standards, with the organizational and performance gains to come for many hospitals at the turn of the century. At most, some facilities are wholeheartedly adopting Quality Management as a cultural standard and have already internally demonstrated some level of objective performance improvement; at least, some facilities pay lip-service to the concept to continue to receive financial reimbursement (Al-Assaf and Schmele, 1993).

While JCAHO Quality Management standards are in their infancy, and with many hospitals understanding that the Joint Commission intends to refine their criteria, the specific standards are expected to expand in scope and specificity, as all accredited hospitals introduce specific Quality Management functions and budgets. Since JCAHO has been traditionally associated with retrospective quality assurance (QA), the Joint Commission has had some struggles in communicating the difference between traditional QA and Quality Management (O'Leary, 1993); however, as more hospitals adopt these principles and begin to benchmark with each other as well as other industries, the hesitation is expected to lessen. Possible future research may investigate specifically the process of adoption of Quality Management within different hospital contexts, and perhaps link methods or forms of adoption with specific performance gains.

In a similar development, the National Institute of Standards and Technology (NIST) has announced the development of a new Malcolm Baldrige award for health service providers. This pilot award is based on existing Malcolm Baldrige standards for service industries, and as well, has been based on input from hospitals and significant health-related agencies, such as the American Medical Association (NIST, 1995).

With the new quality movement in force, and some hospitals reporting successful examples of process improvement, the healthcare community has reawakened a need for more understanding of processes within the hospital. Quality Management has provided more understanding about how structure, process, and outcome relate together (Berwick, 1991). Berwick believes the door is open for new and innovative research, based on Quality Management but covering traditional health systems research areas (Berwick, 1989c; Laffel and Blumenthal, 1989; Coffey, et al., 1992).

To promote Quality Management, Berwick calls for the development of sound measurement tools by quality engineers to primarily help producers (as opposed to patients) enhance the efficacy of technologies and procedures related to the process of care (Berwick, 1989a). As well, he supports furthering decision support systems, the computerized patient record, and operations research to further improve quality of medical care (Berwick 1988, 1992). Research literature is limited since this area is relatively young, and while refinement of this technique for health care has yet to mature, many defining principles are now in place (Berwick, et al., 1990; Al-Assaf and Schmele, 1993).

Despite widespread voluntary adoption of Quality Management (or ironically perhaps because of it), in the past few years many hospitals, state hospital associations, and major medical associations (including the American Hospital Association and the American Medical Association) have expressed disapproval with several Joint Commission operating policies. A conversation with David Burda (a reporter for *Modern Healthcare* magazine which first broke this story in March 1994), revealed that hospitals are generally happy with the Quality Management principles, but have been quite unhappy with specific ways that the Joint Commission has structured its accreditation process. The Joint Commission is a non-profit organization which survives on the fees collected from member hospitals; still, the organization has posted large profits, leading to investigations by the Internal Revenue Service on whether the organization should retain non-profit status (Burda, 1994).

Common suggestions for JCAHO improvement include the following (Burda, 1995; Morrissey, 1995): 1) same pricing for accreditation surveys; 2) not releasing untested indicator monitoring data to the mass media; 3) allowing more control by the representative medical association board, rather than the JCAHO officers; 4) development of regional standards, administered by regional service representatives, who would also provide coaching on how to meet standards before survey time; and, 5) a consistent message delivered during the exit interview and on the final accreditation results.

Hospitals want more say in how they are accredited; they do not desire to abandon Quality Management, nor do they want to see the end of accreditation altogether. Ironically, Quality Management theory emphasizes front-line decision making and process improvement, and may well be the underpinning for the current criticism of JCAHO.

Among hospitals, there is growing sentiment that the Joint Commission does not see them as the immediate customers; the Joint Commission claims to serve an indirect customer, the general public. However, there is not a demonstrated relationship via ongoing market research among this claimed customer base; in other words, there are no known specific data proving that this is what the general public wants. In the end, the JCAHO lives on the support of member hospitals, and may be forced to radically alter the accreditation process.

Thus, research of the type herein may play a role within the healthcare industry which is clearly moving toward internal self-assessment standards and improvement. Hospitals want to measure and track clinical outcomes, assess the impact of Quality Management, and investigate the relationships between the two. As information technology improves, hospitals will be moving toward collecting, analyzing, and interpreting more data on their own local information systems networks.

In conclusion, this chapter demonstrated that ideas of healthcare quality have existed for decades, but with a recent boost by the National Demonstration Project and the Joint Commission, most American hospitals have established a Quality Management department with the intention of integrating Quality Management principles with existing conceptions of quality medical delivery.

CHAPTER IV

RESEARCH IN QUALITY MANAGEMENT

This chapter discusses specific research studies in Quality Management (and other closely related areas) which directly relate to this research.

Attitudes versus Behaviors in Quality Management

Organizational development focuses on intervention methods for effecting change in organizations. Since these methods have roots in psychology, sociology, organizational behavior and management, the field is not well bounded (Beer and Walton, 1990; Beer and Walton, 1987; Sashkin and Burke, 1987). Organizational development assumes that organizations are multidimensional social systems (Beer and Walton, 1990). Thus, intervention in structure, systems, and human processes is necessary for changing attitudes and behavior (Beer and Walton, 1990; Beer, 1980). Organizational development focuses on the change process in organizations.

While some researchers may look at behavior changes (e.g. quality circles) as evidence of a Quality Management implementation, organizational development experts would argue also for the need to look for attitudinal change, as reflected in the organizational norms and reward systems. For example, this attitudinal dimension can be seen in the following definition by Murrin, an organizational development expert of the Quality Management culture at Westinghouse: "It is an attitude and a commitment by all the company's employees that the most important priority in their job is to provide quality in whatever they do."(Murrin, 1988) Murrin analyzed Quality Management Westinghouse in the 1980s (Murrin, 1988). Motivated by a need to compete globally, Westinghouse had implemented more than 600 quality circles by 1979. However, Murrin claims that the company is still unable to match the productivity levels with their offshore competitors.

Westinghouse needed to shift toward more employee involvement, despite the its extensive quality circle program. Murrin (1988) concludes that Westinghouse made a shift from quality-related behaviors (quality circles) to attitude or cultural change, after which Westinghouse saved over $1 million annually in scrap and rework. Selected productivity levels then began to match that of the competition (Murrin, 1988).

Building on Organizational Climate

In conceptualizing the hypothesized latent variables of interest for this research, it is important to build on the concept of organizational structure described in James and Jones (1974, 1976) and James et al. (1988). Specifically, James and Jones (1974) stated that there is a distinct difference between an organizational attribute and an individual attribute. They stated that while psychologists tend toward studying individual differences, the study of organizations necessarily refocuses the attention on organizational climate issues; it is consistent with the goals of this research to not focus on individual differences, but instead on organizational climate issues.

James and Jones (1976) explicitly operationalized organizational structure as "the enduring characteristics of an organization reflected by the distribution of units and positions within the organization and their systematic relationships to each other." (James and Jones 1976, page 76) This research then necessarily hypothesized that a model which describes the systematic relationships between organizational units can aid in assessing the effectiveness of Quality Management. James and Jones (1976) continued:

> Interdependence of subsystems and major departments is a highly important aspect of organizational structure as evidenced in the earlier definition of structure, which included systematic relationships between organizational subsystems. What little information is available concerning the relationships of interdependence and other structural dimensions is theoretical and primarily concerned with the effect of interdependence on centralization, configuration, and formalization. (James and Jones 1976, page 88)

Thus, it is important in this research to investigate the relationships among the subsystems of the organization, an explicit need which is possible through structural equation modeling.

While James et al. (1988) describe organizational climate as being different from a definable concept of psychological climate (James and Jones, 1974), there is a strong argument made for organizational climate necessarily including psychological aspects and not purely structural characteristics (like size and authority reporting structure).

Thus, their concept of organizational climate encompasses both structural and psychological variables, and form an important conceptual backbone for the survey developed in the present research. The following diagram illustrates how, for this research, organizational climate is nested within Quality Management Climate:

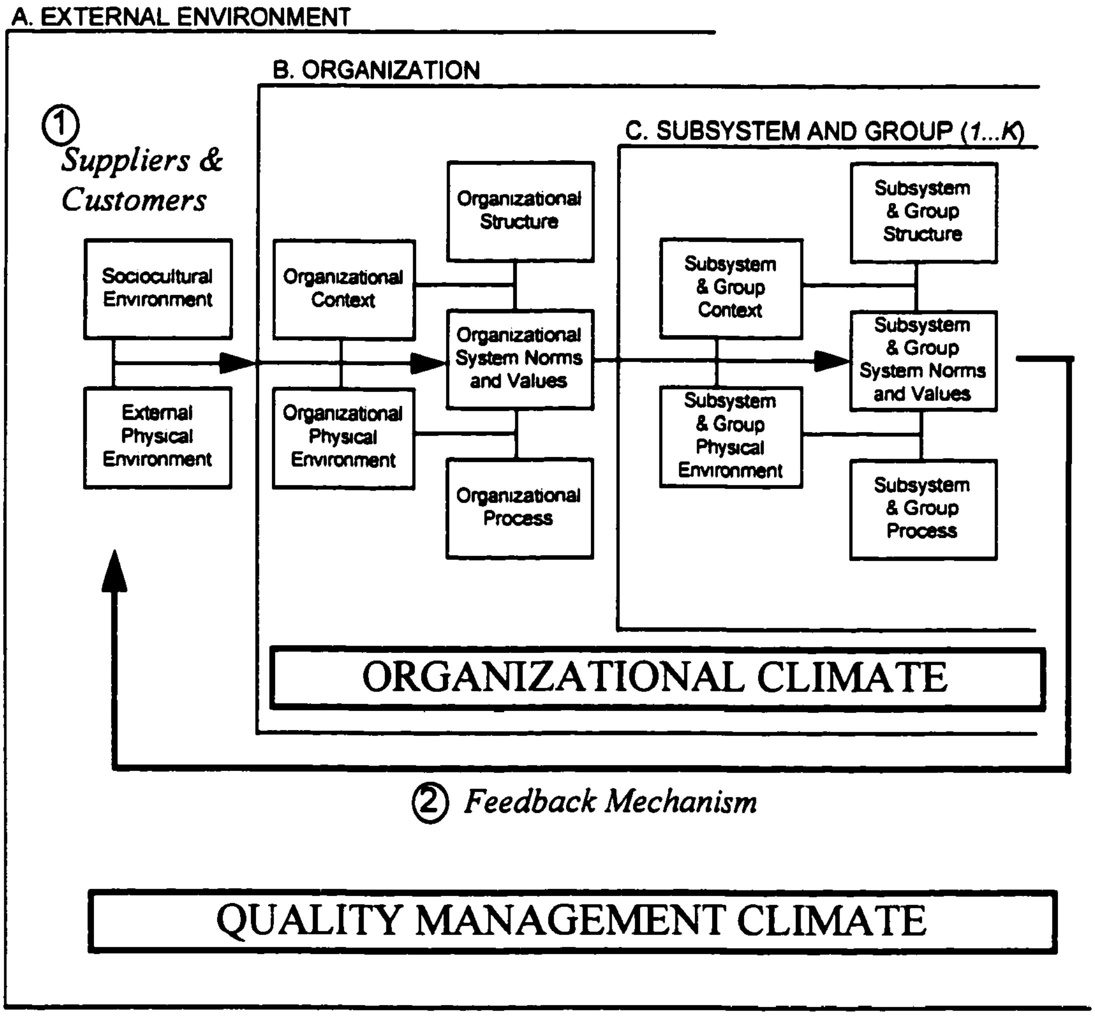

Figure 6. Relationship between Organizational Climate and Quality Management Climate

The above diagram has been modified from James and Jones (1976), a paper which synthesizes decades of organizational climate research. One purpose of the diagram includes defining *organizational climate*, which encompasses the organization and subsystem variables (as shown in the diagram); also, organizational climate is distinguished from psychological climate (which focuses on the individual and is not included on the diagram). James and Jones propose that the elements under *Organizational climate* (in the diagram) dynamically interact with each other, and as well have an impact on the *k* subsystems; also, the group elements are proposed to dynamically interrelate with each other.

Quality Management Climate, as defined for this research, has three major differences from general organizational climate theory. First, suppliers and customers are considered part of the external environment (number one on the graph). To contrast, most Quality Management theory has emphasized the interaction between the organization and customers and suppliers. Further, it is proposed that the norms and processes guiding this interaction are similar to the norms and processes within the organization, thus leading to the designation of internal customers (individuals or groups inside the organization for whom goods and services are provided) and external customers (individuals or groups outside the organization for whom goods and services are provided). Even though these external players (outside the organization) do not necessarily fall under the same type of control that internal groups do (those groups inside the organization), this research stresses management's role as being responsible also for this interface, perhaps in some cases more so than the organization's subsystems. The inclusion of the customer is critical for this present study on healthcare since, for example, physicians are often considered customers of the hospital; sometimes physicians are clearly internal customers, but other times their function and role makes them more external to several hospitals simultaneously. In any case, an organizational climate approach would necessarily ignore most admitting physicians as being outside the study parameters.

A second distinction is the feedback mechanism proposed by this research, thus completing the systems loop (number two on the graph). The organizational climate diagram in James and Jones (1976) ends with individual behavior and criteria. However, Quality Management theory generally completes the loop not necessarily with criteria, but with people and groups at the beginning and end of the organization. Customers end the loop, and suppliers start the loop; sometimes, it may be possible for suppliers and customers to be the same group, and this possibility is reflected on the above model. Feedback is not explicitly studied in the present research, since longitudinal data would be necessary for such a demonstration of causality.

A third difference is quality management's focus on group performance criteria over individual criteria. The overall systems focus of quality management necessarily focuses on group performance criteria either at the subsystem or organizational level. However, this choice does not assume that quality management theory ignores individual performance, but instead that individual performance takes meaning only within a larger systems context. The premise is that individual ability and talent generally have a relatively minor role to play within the context of overall management strategy and structure (Juran, 1995).

In conclusion, *Quality Management Climate*, as defined for this research, builds on the concepts of organizational climate, but adds customers and suppliers to the dynamic processes, and as well focuses on groups and not just individuals.

The Need for Managerial Involvement

Michael Beer, a researcher in organizational development, described some important cultural shift elements involved in Quality Management (Beer, 1988). Beer chronicled a past, when information flowed to the top where all important decisions have been made; then, Beer argued, implementation is channeled down through individuals and groups whose work is precisely described by job descriptions. By contrast, in the Quality Management framework, factory employees have been given broader responsibilities and are increasingly involved in critical decisions (Beer, 1988).

Beer studied six large corporations with sales ranging from $3 billion to $10 billion (Beer, 1988). The purpose of his study is to describe reasons why certain companies have been relatively more successful in making the change or transformation to Quality Management. While a number of differences among companies have been noted, one major advantage that the successful companies had is a synergistic working relationship between top management and other managers. For a successful corporate transformation, top management neither could lead nor lag lower level managers in the change. In other words, whether the Quality Management change originated from the top, from the bottom, or from both, successful companies demonstrated a reciprocal learning process among top and lower level managers. Unsuccessful companies have been relatively less able to penetrate the behaviors and attitudes of either top or lower level management (Beer, 1988).

Beer's study indicates that management refers not only to the necessary involvement of top management, but also the sustaining effort by lower level management. The focus of this study is the penetration of Quality Management attitudes among departmental level managers as well as hospital administration, in other words the typical hospital reporting hierarchy.

Stability Requirement for Evaluation

As discussed earlier, organizational development studies have shown that once Quality Management penetrates employee behaviors and attitudes, then a company can begin to make substantial performance gains. Hess, et al. (1988), studied Greymoor, Inc., a $100 million manufacturing company. Under pressure to become more productive, the company had adopted a Quality Management model based on the Deming philosophy. The change effort soon became, "a mad almost aimless scramble for instant solutions." (Hess et al., 1988) Hess, et al., concluded that Greymoor, as sincere as they have been at attempting to get into Quality Management, held up the unrealistic expectation of magical change, fostered by a media that focuses on the success stories and benefits of change rather than on the problems inherent in any organizational change. While Quality Management is relatively new to many companies, some problems inherent in organizational change have been investigated in organizational development.

Hess, et al. (1988), concluded that the assessment of top management's commitment to Quality Management had not been tested with actual experience in the change process. In other words, the organization's funding for Quality Management is cut before full implementation. This study led to key features of what Hess, et al., called the RCP (Realistic Change Process) involved: 1) reviewing the problems and difficulties involved by companies implementing Quality Management, and 2) reviewing the company history on change and transformation.

The first feature focused the attention of management on all the costs, including the time investment and corporate flexibility needed to change the culture and reward system, especially among lower level managers (Kilmann, 1988). The second feature focused on judging the change relative to other change efforts at that same company; total implementation time of Quality Management depends not only on what organizational elements are in place but also on how quickly the normative organizational culture responds to the transformation.

Even once an organization adopts Quality Management, Kilmann (1988) argued that the improvement is generally not immediately evident in the standard performance measures. Kilmann (1988) stated that improving the quality of decisions and actions may not necessarily translate into one-for-one increments in performance; it may require a certain combination or series of Quality Management practices to bring about the desired performance gains. Kilmann added that the time lag between decisions made and performance gains should also be considered; it takes time before serious organizational evaluation occur.

Review and Analysis of Related Research Studies

This section analyzes several research studies related to this research effort. The purposes of this section include: 1) synthesizing related concepts and approaches relevant to this research; 2) critiquing approaches and limitations of past research efforts; and 3) describing approaches which are taken by this research.

Tatro (1974)

Tatro (1974) has written a dissertation entitled *Professional Organizational Climate and Job Satisfaction of Nurses Employed in Hospitals.* Her survey consists of sampling 334 full-time day shift nurses at eight Chicago-area hospitals (averaging 41 nurses per hospital) using Stern's (1970) Organizational Climate Index (OCI). This index involves administering 300 true/false items, which compose 30 scales of ten items each. The objectives of her research is to assess the degree to which hospitals could be categorized as two types labeled Bureaucratic (Merton, 1957) and Professional (Buchler and Stelling, 1969).

The basic strengths of her study include a well-defined research population and good set of statistical approaches to answer her basic question. The weaknesses included a blurring between the two hospital types, and an unclear agenda for how this research has specific and direct implications on hospital administration.

Critical to the outputs of her research is a table which listed the characteristics of the previously defined types of Bureaucratic (Merton, 1957) and Professional (Buchler and Stelling, 1969) organizations. It is assumed in the study that these two types of organizations represent extremes on a continuum of management that includes the following attributes: role, authority, decision making, vocational security, power, structure, communication, and interpersonal characteristics. While the source references may be more clear in distinguishing the differences between these types of organizations, it is not clear from this table that these two organizational types are necessarily distinct. For example, the bureaucratic organization is characterized as having "methodologic performance of routine activities" and "limitations of individual authority." What is unclear is where the "methodologic performance" came from, whether from top management or from the individual. Also, there is the assumption that "limitations on individual authority" hamper the effectiveness of the organization, but this limitation should be examined in context with how the system's goals are being achieved; individuals may need to be limited (local loss) for system gain (overall).

Where this present research differs is the acknowledgment that the hospital organization works less like a typical top-down organization, in that autonomy in job decision making is made at two levels: the top management, and the individual department. For example, how a physical therapist helps a patient toward recovery may not be the direct concern of the hospital administrator; instead, the administrator may affect the resources or population base served by the therapist, thus perhaps having a profound but indirect effect.

To contrast, Tatro (1974) considers only three major groups: top management, physicians, and nursing. Other departments and functions are seen as being of secondary importance. This present research considered the *system* as a whole, including all departments. Also, Tatro's survey development does not focus on the leadership role of physicians specifically, except in the context of how hospital administration works as a group; additionally, there is a role to be played by nursing leadership internally, and thus "manager" must include nurses.

Anderson (1985)

Darlene Anderson's (1985) dissertation is entitled *Hospital Characteristics and Their Relationship to the Quality of Nurses' Work Climate.* The purposes of her research are as follows (Anderson, 1985, page 3):

- To examine the characteristics of selected, contemporary, non-profit general hospitals;
- To analyze the extent to which environmental conditions and contextual factors determine structural-functional characters of the selected hospitals;
- To explore the relationships between selected hospital characteristics and the quality of nurses' work climate; and,
- To develop descriptive baseline data for future theoretical and empirical work.

Survey data collected by Anderson (1985) covered six hospital sites, with a total of six hospital administrators, six directors of nursing service, six assistant or associate directors, and 544 critical care and medical-surgical staff nurses. The survey developed by Anderson include open and closed ended items covering important hospital characteristics and perceptions of the work climate.

Anderson (1985) builds her conceptual framework on contingency theory. As applied to organizational climate, Anderson's application of contingency theory assumed that there needs to be an appropriate fit between the organization and its environment, as well as among the various subsystems. The framework of contingency theory also underlies this present research, inasmuch as the developed survey instrument suggests that management could use the survey results to develop and maximize congruence.

Anderson (1985) cites Kast and Rosenzweig (1979) who summarizes the contingency view of organizations:

> The contingency view of organizations and their managements suggests that an organization is a system composed of subsystems and delineated by identifiable boundaries from its environmental suprasystem. The contingency view seeks to understand the interrelationships within and among subsystems as well as between the organization and its environment and to define patterns of relationships or configurations of variables. It emphasizes the multivariate nature of organizations and attempts to understand how organizations operate under varying conditions and in specific circumstances. Contingency views are ultimately directed toward suggesting organizational designs and managerial actions most appropriate for specific situations. (p. 115)

A strong undercurrent of contingent analysis includes the need to understand patterns of relationships among organizations. Also important in contingency theory is the search for differences and similarities among organizations. The output of contingency theory points organizations towards specific managerial action based on the local situation.

Anderson (1985) also states that the contingency view shuns the notion that there is one magical "best way" to run an organization. Important to the contingency view is the need to analyze: 1) the organization's strategy, 2) the (changing) environment in which the organization operates, and 3) the resources (financial and human) available to the organization; once this analysis has been conducted, then a thorough plan of action can be built on this systems perspective. Another salient feature of contingency theory is the belief that organizations need the external environment to survive. The earlier description of how the proposed Quality Management Climate adds the external component to organizational climate is consistent with this view.

Anderson (1985) conducts extensive data collection among top management working in nursing. Anderson's data set can be alternatively described as six standardized case studies in which the interview questions posed to each facility are the same. Many of the Anderson items touch on important systems issues within Quality Management Climate, but they also explore job satisfaction issues which may have a personal as opposed to organizational focus; for example, the item "People cannot afford to relax" may be because the individuals have bills to pay and do not want to lose their job, as opposed to employees who have over-bearing supervisors. On the other hand, some of Anderson's items do point to relationships completely within the realm of the hospital, for example, the item "Supervisors usually compliment an employee who does something well."

Saraph, Benson and Schroeder (1989)

This study develops an instrument for measuring the critical factors of Quality Management. Their survey instrument initially measures 78 items using 162 respondents; their final survey instrument contains 64 items with 162 respondents composed of general managers or quality managers of 89 divisions at 20 companies.

These authors propose that Deming and Juran are two of the few who attempt to theoretically demonstrate a conceptual basis for Quality Management. However, they omit certain statements during their review of Deming and Ishikawa, and such omissions may have some bearing on the validity of their survey development process. Deming (1986) wrote on the role of the quality department on pages 466-470 describing the organization of quality. Also, product and service design are discussed on pages 167-182 where design can be learned from the consumer. Ishikawa and Lu (1985) discuss the role of top management leadership on pages 103-113 where Total Quality Control is conceptualized as a thought revolution, and pages 121-136 describe his list of "Do's and don'ts for managers." Product and service design is described on page 208. Finally, supplier quality management is described on pages 213 and 214.

The authors' eight constructs demonstrate an ability to distinguish between 56% and 100% of the variance among the items. Reliability coefficients also support the notion that the individual subscales are indeed related in content. The authors conclude with a discussion of the need for larger sample sizes. Their statistical method does not attempt to show the relationships among the subscales, but instead show evidence of discriminant and construct validity for each subscale; this present research by contrast not only establishes evidence of validity but also investigates the connections among the dimensions.

Demouy (1990)

Richard Demouy's (1990) dissertation has been entitled *Development of a Model for Total Quality Management in Health Care* consists of selecting a population of 5,678 short-term acute care hospitals, and sending a mail-in survey to a sample of 565 of these hospitals. Total cost per survey sent is estimated at 85 cents; the response is 45 surveys, for a response rate of 7.96%.

His survey contains questions about the Quality Management program at the different facilities, and based the knowledge of TQM on whoever filled in the survey. The survey assesses particular knowledge of quality tools, like flow sheets and pareto charts, then asked a series of questions relating to the quality of care provided by the hospital. While the Demouy survey provides some useful information on the 45 hospitals surveyed, the research in general does not provide strong enough conceptual links.

An important premise of his research is that the speculation that there would be by 1995, "an adequate definition of quality" cited from Arthur Anderson and the

American College of Healthcare Executives, 1988; this prediction has not come true. Demouy (1990) admitted, "The health industry is acknowledging it cannot yet define what 'quality of care' is, nor can they determine how to measure it."

The heart of the Demouy (1990) model is the description of Quality Function Deployment (QFD), also known as the "House of Quality," as applied to health care. A few questions arise related to the assumption that QFD is central to Total Quality Management in health care. The first issue revolves around QFD as a tool or technique. He did not fully demonstrate why should QFD be a preferred method of obtaining customer information as opposed to other tools. An assumption of his dissertation is that all hospitals should apply QFD. To contrast, the conceptual work behind the survey departs from the recommendation of using specific tools, and instead retains the more general need to emphasize customer research and feedback as a principle. Admittedly, there is a need for future research to evaluate the effectiveness and appropriateness of specific quality methods like QFD, but such studies gain relevance only with a demonstration of the implementation.

Benson, Saraph and Schroeder (1991)

This study is an extension of the earlier Saraph et al. (1989) study, which investigates specific contextual variables with the originally derived subscale on management. Originally, the study describes eight subscales related to Quality Management, and the study correlates these eight scales of Quality Management with some externally derived criterion-related variables.

Perhaps a weakness in interpreting the results of the MANCOVA (multiple analysis of covariance) presented by this study is that the original study only examined convergent validity but not discriminant validity, since the original items are not all subjected to a single factor analysis. Thus, the eight subscales are likely correlated but not empirically demonstrated to be such. They conclude that manufacturing and service companies have different contextual concerns.

However, most of their items deal include the term *quality*; given the vagueness of the *quality* term, and the continual redefinition of the term depending on industry and context, it may not be the most effective way of independently assessing organizational context for a Quality Management scale. For these reasons, this present research specifically does not mention the terms *quality* or *Quality Management*.

Reagan (1992)

Gaylord Reagan (1992) has published a Total Quality Management (TQM) Inventory for use by businesses. This instrument is explicitly developed for use by managers, and thus states that it is based only on face validity (no studies are performed). The citations for this instrument include Crosby, Deming, Feigenbaum, and Juran. However, the specific criteria listed are from the Federal Quality Institute material published by the Office of Management and Budget.

The criteria listed for the inventory are: 1) Top-Management Leadership and Support; 2) Strategic Planning; 3) Focus on the Customer; 4) Employee Training and Recognition; 5) Employee Empowerment and Teamwork; 6) Quality Measurement and

Analysis; 7) Quality Assurance; and, 8) Quality- and Productivity- Improvement Results. There is some similarity between this list and the Malcolm Baldrige National Quality Award criteria (NIST, 1995).

His survey assesses these major categories by asking one question for each concept, instructing the employee to decide at what Quality Management implementation level the organization has achieved. For example, the levels of the highly weighted *Focus on the Customer* criterion appear in the following table:

Table 2. Levels of Customer Focus (Reagan, 1992)

Level	Item
A.	A variety of effective and innovative methods are used to obtain customer feedback on all organizational functions.
B.	Effective systems are used to obtain feedback from all customers of major functions.
C.	Systems are in place to solicit customer feedback on a regular basis.
D.	Customer needs are determined through random processes rather than by using systematic feedback.
E.	Complaints are the major methods used to obtain customer feedback.
F.	No customer focus is evident.

In this case, Reagan makes several assumptions: 1) these six levels represent a hierarchy of levels within customer focus; 2) these levels do not overlap; and, 3) having employees pick from this list adequately assesses the organization's focus on the customer. Reagan assumes that an administrator would moderate a small group discussion, which itself allows for more feedback than the instrument provided; indeed, in some cases, this type of survey and feedback forum may provide a good combination of assessment techniques.

However, Reagan's limitations include assuming a survey administrator who is knowledgeable enough about Quality Management theory to lead a group discussion. Another limitation is the assumption of interval weights assigned to each criterion. These weights are related to the Federal Quality Institute award at the time, and also rated each level; thus, the rating matrix had six levels times eight criterion, providing an assumed matrix of 48 cells.

The major advantage of Reagan (1992) is that it did provide a quick means for assessing Quality Management, especially in a small group setting. The lack of validity or reliability behind the survey, and the other assumptions made by the survey lead to some criticism.

Sashkin and Kiser (1992)

Sashkin and Kiser (1992) have published the *Total Quality Management Assessment Inventory* (copyrighted in 1992 by Marshall Sashkin and Kenneth J. Kiser). This assessment asks participants to assess how the organization operates, not how it should operate. The inventory is divided into two parts, one describing the "tools" and techniques commonly associated with TQM, and one describing the management operations and "culture" associated with TQM. The assessment is designed for the entire organization, not just one department or division; the authors specifically ask the participants to assess the largest part of the organization that they are familiar with.

Several concerns are raised by this tool. For example, under the first section, Quality Tools and Techniques, the inventory considers "design of experiments" and "Taguchi method" to be synonymous; actually, these are two different schools of thought on the application of the analysis of variance table, and the item should have read either one method or the other.

The Sashkin and Kiser (1992) survey presupposes three dimensions, Culture, Customer Quality, and Tools and Techniques, and assigned point values based on respondent's answers. Later there are five Quality Checkpoints provided on a systems diagram. Finally, in the interpretation section, there is open text on how to interpret the different scales; note that "open text" is defined as text which has many hypotheses embedded such as:

> One way to encourage teamwork is to set up organizational systems that recognize and reward team accomplishments. This encourages and supports teamwork and collaboration...Of course, the reward system should not create inter-group conflicts any more than it should foster conflicts among individuals by creating competition for limited rewards (Sashkin and Kiser, 1992, page 19).

The issue of competition, and even conflict, is still being debated in the organizational behavior literature (Gray and Starke, 1988); thus, it may be better to qualify these recommendations. In general, the items on the inventory could be improved for validity purposes by factor analyzing data and publishing the results.

Sluti (1992)

Donald Sluti's (1992) dissertation entitled *Linking Process Quality with Performance: An Empirical Study of New Zealand Manufacturing Plants* makes an empirical linkage between quality and performance (proxy variables are chosen to measure each concept). Sluti distributes a survey to 897 manufacturing plants in New Zealand, and in addition advertises the research in a monthly manufacturing newsletter. The response from this survey is 228 plants, and after throwing out surveys which are incomplete or incorrectly filled out, the final sample size is 184, a net usable response rate of 20.51%.

Sluti then develops a theoretical model of quality and performance, and then tests this model using structural equation modeling. Statistical goodness-of-fit testing revealed that some of the models chosen adequately fit the variables used for the study. Sluti's definitions of the hypothetical variables *quality* and *performance* are described in the following table:

Table 3. Proposed Operational Measures (Sluti, 1992)

Sluti's (1992) Proposed Operational Measures (page 82)	
QUALITY MEASURES *Internal* • Scrap and rework level • Quality costs *External* • Returns (for poor quality) • Complaints (product quality) • Warranty costs • Field service costs	MANUFACTURING PERFORMANCE MEASURES • Work-in-process (WIP) levels • On-time delivery (of customer orders) • Unit manufacturing cost • Responsiveness (to demand changes) • Responsiveness (to product changes)
MANUFACTURING PRODUCTIVITY MEASURES *Process Utilization* • Equipment downtime • Worker idle time • Manufacturing lead time *Process Output* • Labor volume (per unit of output) • Labor cost (per unit of output)	BUSINESS PERFORMANCE MEASURES • Return on sales • Return on assets • Sales volume growth • Market share growth

Thus, Sluti basically used defects as a measure of *quality*, focusing on Garvin's (1984) earlier conception of product quality. Sluti's research design calls for a survey to be sent to individual manufacturing firms. It is important to note that managers, mostly top management, have responded to the survey.

Next, Sluti reports a debatable conclusion based on his table reprinted below (note that rows add to 100 percent):

Table 4. Implementation Barriers to Quality Improvement (Sluti, 1992)

	Extent of difficulty encountered (in percentages)			
Barrier	**none**	**some**	**much**	**very much**
Top management commitment	60	34	4	2
Foreman commitment	27	61	9	2
Worker commitment	16	71	9	4
Suppliers	22	57	16	5
Skills and training	6	70	20	4
Costs of improvements	35	48	11	5

Clearly, the sampled group do not see top management commitment as a major problem, but do recognize worker commitment, suppliers, and skills and training as major barriers. Sluti disregards this fact in his discussion of this item:

> The very high percentage of responses which indicate that there is little problem with top management commitment to quality is consistent with other opinions expressed in the questionnaire...with only 48% of manufacturers reporting regular use of SQC methods, there are some indications that the opinion of top management commitment may be overstated. Lack of worker commitment is a barrier to a large degree for 13% of the respondents, with a further 71% stating that worker attitudes pose a difficulty to a lesser degree. According to management rankings (Question 29), worker performance is viewed as the primary determinant of "quality" by 41% of the respondents. Therefore, it is reasonable to expect that this area should be a priority for management concentration. (pages 120-121)

Again, Sluti concludes that not only is worker performance the primary contributor to overall product quality, but also that worker commitment is an important area of concern to the plants participating in the study. However, since top management is the primary contributor to the research sample, Sluti's conclusion amounts to top management blaming poor quality on the workers.

Genovich-Richards (1993)

Joann Genovich-Richards (1993) research is entitled *Organization Design and Performance: An Investigation of the Hospital Quality Management Function.* The purpose of her dissertation is to examine the different design or organizational structures used at different hospitals, and then by controlling for certain variables, see if there is any connection between the organizational design and performance. Her survey used for data collection is condensed from her larger study conducted in 1989.

The major advantage of this work is that it carefully constructs specific statistical tests to examine these relationships. However, the major disadvantages include compromising on the choice of manifest variables to represent hypothetical constructs, the coding and statistical assumptions made for testing hypotheses, and the lack of solid conclusions about Quality Management.

It is important to note that this research is largely exploratory. In order to understand the statistical conclusions, it is important to note that the author developed a model assuming that hospital characteristics (including governance level quality, medical and nursing staffs, and hospital features) and the Quality Management function (including the general and specific design characteristics) lead to higher performance (defined as a combination of quality and productivity).

The point of the research clearly comes from a hospital administration perspective: if a hospital administrator knew what organizational structures are associated with better performance (correlation), then maybe those structures lead to better performance (causality).

Of the several hypotheses tested, the one of most interest is how the hospital organized its quality improvement structure; the following table reproduces this question:

Table 5. Continuous Quality Improvement Levels (Genovich-Richards, 1993)

Please indicate below with one check the status and structure, if any, of your hospital's adoption of continuous quality improvement:	
_______ 1.	No initiation of continuous quality improvement.
_______ 2.	Beginning to initiate continuous quality improvement, but without a formal organizational structure for the activities.
_______ 3.	Beginning to initiate continuous quality improvement using an organizational structure separate from the traditional areas of quality, utilization review, and risk management.
_______ 4.	Beginning to initiate continuous quality improvement as an integrated activity of the current organizational structure for quality, utilization review, or risk management.

At the time the survey is distributed, many hospitals had just started using CQI (continuous quality improvement) as a management philosophy, largely because of the JCAHO initiative. The levels have debatable validity as interval or ordinal measures.

In Genovich-Richards (1993), performance is seen as a combination of quality and productivity; all three of these variables are considered at the hospital level. Quality and productivity are defined as follows:

Table 6. Quality and Productivity Defined (Genovich-Richards, 1993)

Variable	How it is Calculated
Quality	Data from the Michigan Peer Review Organization (PRO) (complaints registered based on nurse review of medical records): Total number of medical cases reviewed (under the Third PRO Scope of Work contract with the Health Care Financing Administration) Number of cases with confirmed problems (there is adverse effects on patients as confirmed by a second physician) Number of cases with pended problems (there is no chance for adverse effects on patients Then: **Confirmed problem rate** = confirmed cases / total cases **Pended problem rate** = pended cases / total cases **Total problem rate** = (confirmed + pended) / total cases
Productivity	a. Calculate the total FTEs (Full time employees) (averaged for a specific year) b. Calculate the total Admissions (for a year) c. Divide Admissions by FTEs d. **Productivity** = residuals from the division calculation (organizations above the regression iine assumed to be more productive)

In the table above, the definition of *quality* is based on complaints. This is perhaps an acceptable measure of quality, though proxies exist. However, the handling of the term *productivity* raises questions. The research based its assumptions that the residual error in the above calculation leads to a meaningful statistic. However, if these residuals could be shown to be independent and identically distributed normal, then perhaps these variances came from random error, and a "highly productive" hospital this year could be next year's "unproductive" hospital.

In the following diagram, Genovich-Richards further mixed her definition of quality and productivity to get a variable defined as performance. First, the hospitals are divided into two groups of *quality*: low and high (in other words, the total problem rate is used to make a categorical variable). Second, the productivity residual is similarly used to categorize hospitals into low and high groups. Then, the variable performance is calculated from the following figure:

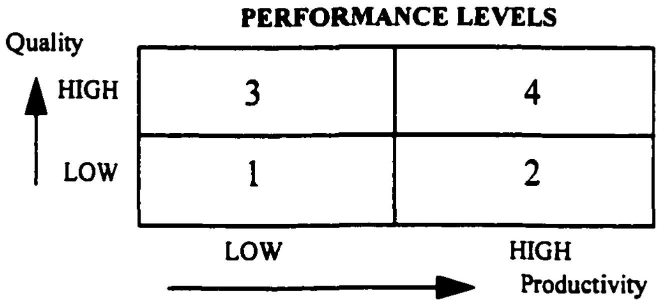

Figure 7. Construction of Performance Measure (Genovich-Richards, 1993)

Productivity is categorized into two groups, and these categorical groups now stood for the original continuous variables. There is no need to do this because the later statistics included multiple linear regression and analysis of covariance. She could have left the total rate as a variable, then admissions as a variable, with FTEs (full time employees) as a covariate (there are other control variables on the study).

The paper argued that hospitals with more committees devoted to Quality Management exhibited significantly higher performance (based on the 1/3 dichotomization, page 145). The author concluded that this result is counter-intuitive and perhaps is reached by chance, because she associated the word *committee* with *bureaucracy* (similar to Tatro, 1974). In other words, *committees* are assumed to be organizational forms which hampered organizational effectiveness, rather than today's *cross-functional teams* which are (arguably) a sign of progress. The survey studied another important aspect, not just the existence or flourishing of work groups (or teams or committees or cross-functional entities) but more importantly how these work groups both acted and interacted. In other words, the mere existence of teams may or may not be related to performance; what is important according to the quality experts is how these teams interact and act together.

On page 165, Genovich-Richards (1993) admitted that there are no significant differences in performance for hospitals based on the levels of CQI implementation. She theorized that since hospitals have had CQI imposed from the outside, there is not enough variability in the number of available designs; in other words, she would have liked to define more levels of CQI implementation.

Hong (1993)

Hong's (1993) work entitled *Development of an Instrument to Measure the Levels of Total Quality Management (TQM) Implementation in Manufacturing Organizations* identified several area manufacturing organizations who are involved in some level of TQM implementation. His objective is to survey employees at these organizations to be able to detect differences on several predetermined dimensions:

- Leadership (9 items)
- Customers (9 items)
- Involvement (9 items)
- Continuous Improvement (4 items)
- Statistical Methods (3 items)
- Relationships with Suppliers (4 items)

These six a priori dimensions are assigned between three and nine items each. It is assumed in advance that these dimensions would not only exhibit discriminant validity but also are orthogonal (inasmuch as the data are subjected to a principal components analysis with varimax rotation). It is also assumed that these items would, by scale, demonstrate a level of reliability.

In the end, the study revealed indeed strong reliabilities for the subscales developed, mostly because the items did display a large amount of related item content.

The sample size is 134 employees, which represented 17 organizations. These seventeen organizations are further classified as small, medium or large, then also categorized by the number of months that they had implemented TQM.

The factor analysis revealed that the dimensions did not match the predetermined a priori conceptualization. This reality highlighted an important weakness in the study, that of assuming orthogonal discriminant validity even though the research acknowledged the lack of empirical survey development. The sample size for his study is small relative to the number of variables. His research generally supported one distinct factor for TQM, one factor with an eigenvalue of 3.54 which explained 94.2 percent of the variance. On the surface, this result indicates that many employees simply chose the same number for all the items, whether it is a "3" for example or a "5" and the same is done for the entire list. In short, the items did not discriminate as well as had been intended.

The final part of the research considered different comparisons among the companies based on the individual items. Even though numerous authors have cautioned against the indiscriminate use of factor scores (Bollen 1989), it would have been better to compare the organizations based on the factor scores for the a priori dimensions of interest, inasmuch as these specific scales did display a level of reliability using Cronbach's alpha. Instead, Hong chose to compare individual organizations based on tenure with TQM and size of company (both of which are arbitrary categories); the tenure with TQM variable could have remained continuous, but the size of company is perhaps best done by category since organizations in different industries have different employee requirements to be considered "small" versus "large."

Also, the study would have benefited from analyzing the data using a non-orthogonal rotation, and perhaps attempting a goodness-of-fit analysis with structural equation modeling. In this way, the study would not have been completely exploratory but also have a measure for estimating the overall construct validity of the items.

Thiemann (1995)

Thiemann (1995) research entitled *Staff Perceptions of Quality Improvement Programs: Characterization of Organizational Barriers and Supports to Implementation of Quality Improvement Strategies in Health Care Organizations* is typical of many polling-type surveys which compared groups only on individual items which are not subjected to psychometric statistical approaches to demonstrate construct or discriminant validity. The study classified five distinct phases of Quality Management implementation, with phase one representing a hospital just starting and phase five representing long-term institutionalization. His survey development assumed that successful hospitals already practice much of what the Quality Management literature discusses, independent of formalization of a specific program, or membership on specific cross-functional teams or other Quality Management related tools; thus, detaching from the tools is additionally important in this investigation, because even Thiemann (1995) demonstrated that 115 of 119 hospitals classified themselves as being a phase two hospital. Thiemann's results indicated the following conclusions:

> The findings of this study emphasize a major concern with poor communication, lack of effective management competence in dealing with TQM measures, insufficient knowledge by teams, and empowerment issues. Establishing a quality policy that is part of a strategic plan is an essential part of a corporate mission. A clearly defined quality policy must consider the issues recognized above; management must communicate and emphasize how quality fits in with the overall strategic plan of an organization... Managers and other staff need time and opportunity to develop an understanding of and appreciation for the potential benefits of the new system and to develop better management skills; educate, train, and orient at all levels. (Thiemann, 1995)

The only caveat perhaps to add is that Quality Management is not necessarily a "new system," meaning that the principles of successful organizations may transcend a specific TQM or CQI effort. Perhaps part of the reason why many hospitals have become independent adopters of Quality Management has been the identification that certain principles within the philosophy are already present within the organization. Thiemann's emphasis on the need to empirically continue to study empowerment, teamwork, leadership and planning is reinforced in the present research.

A Working Model of Factors Impacting Quality

Building on the concepts of the above reviewed literature, the proposed working model illustrated by following figure defines *Quality Management Climate* for this research. The purpose of developing a model is to establish a working definition of *Quality Management Climate* necessary before the construction of survey items.

The working model introduced in this section is not claimed to be the only or best way to picture these relationships. For example, the earlier model which contrasted organizational climate with Quality Management Climate also represents a possible working model. Neither model is claimed to be exhaustive or final, inasmuch as Quality Management continues to be understood better by researchers and industry alike. The value of modeling again returns to the term of *parsimony*, or an attempt to understand this complex concept in simpler terms; the tradeoff, necessarily, involves giving up accuracy to transform a real-life situation into a limited working definition or model. In other words, no one model, definition, or diagram can fully claim to cover every element of the true situation; this challenge poses a possible threat to validity for any similar research. Because of this limitation, this research followed the approach of blending a variety of models and approaches into a single working model to be used for the construction of survey items.

In the following model, there are two major branches, labeled *structural factors* and *process factors*; each of the major branches in the following diagram is assumed to cluster causal factors which produce quality goods and services. The term *Quality Management Climate* is defined as only the process factors. It is assumed that this proposed model applies across organizations and industries. Dynamic feedback relationships among the factors, and causal feedback from quality goods and services to the structural and process factors are omitted for simplicity.

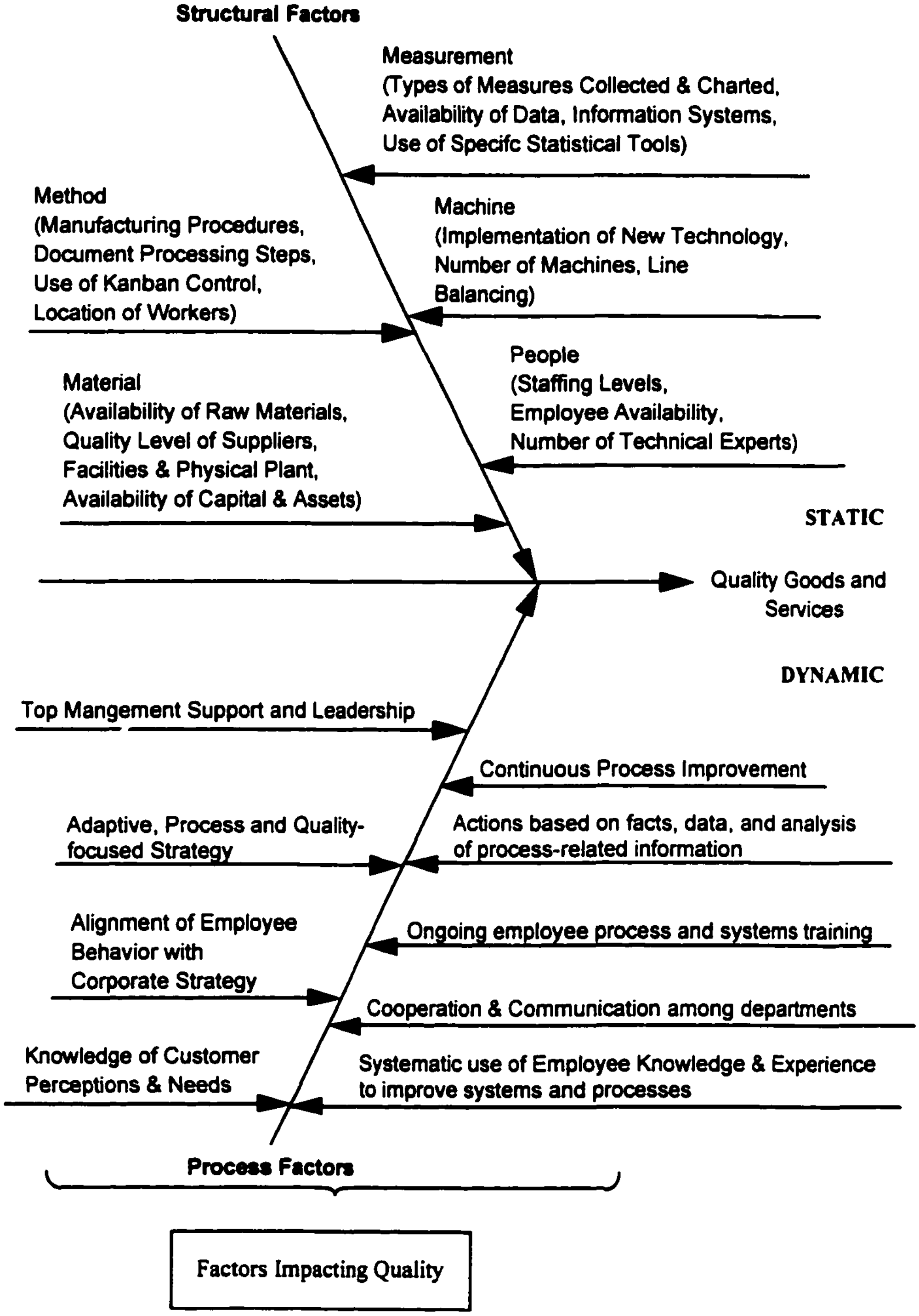

Figure 8. A Working Model of Factors Impacting Quality

A major conceptual advantage of this figure includes separating the structural elements at the top of the figure from the process elements at the bottom of the figure. This research separates structural and process elements because:

1) Separating the process elements is consistent with the Malcolm Baldrige National Quality Award standard of a non-prescriptive Quality Management implementation (NIST, 1995);
2) While structural elements are hypothesized to have a positive effect on goods and services, particular structural elements are not necessarily claimed to be an essential focus of every organization's general Quality Management philosophy;
3) The structural elements may result from Quality Management implementation (like Just-in-Time manufacturing process), but are not inherently required elements for every strategy and industry; and,
4) The process elements focus on the Quality Management Climate elements which affect human resource interaction with processes.

This research bases a survey instrument on the process elements of the preceding working model, which are defined as Quality Management Climate.

Under further analysis, the structural elements on the top part of the figure can be considered to be more *static* than the process elements at the bottom (labeled *dynamic*) because these top elements generally are considered:

1) easier to count (the number of computers is relatively easier to count than the number of workers believing that the boss communicates to them regularly on a daily basis);
2) less problematic in making longitudinal comparisons (it is easier to see the increase in the number of hospital beds over time as opposed to how training changes over time); and
3) more objective (it is easier to define the number of assets available to a hospital at time X than the company's current focus on continuous improvements).

Regardless of whether an element is categorized static or dynamic, there may be threats to validity in any research that attempts to establish a causal relationship. Causal relationships can only be accepted as an article of faith based on strong evidence that such relationships hold. Nevertheless, attempting to analyze such relationships helps provide evidence that certain elements are more likely to be causal factors than others, thus reducing the model to fewer elements than the whole universe; this principle of *parsimony* underlies good statistical modeling (Mulaik, 1972).

The purpose of defining the following four specific areas is to develop specific items for the preliminary and final survey instruments used to assess Quality Management Climate. The survey is built on a synthetic approach to instrument development (rather than analytic). The four categories are:

- Visionary and active leadership
    - Top management support and leadership;

  - Adaptive, process and quality-focused strategy.
- Interactive employee/employer relationship
  - Alignment of employee behavior with corporate strategy;
  - Ongoing employee process and systems training;
  - Systematic use of employee knowledge and experience to improve systems and processes.
- Effective work group interaction and cooperation
  - Cooperation and communication among departments;
  - Knowledge of customer perceptions and needs.
- Effective work group action and process management
  - Continuous process improvement;
  - Actions based on facts, data, and analysis of process-related information.

These four areas are used to develop the major survey category subscales.

Research Focus on Dynamic Elements

Many believe that the defined elements of Quality Management Climate also cause the company to not only put in place appropriate static elements, but also organize and balance emphasis among these elements in a way that maximizes the level of quality production. An example would be a quality improvement team that decides how to spend the information systems budget by allocating resources among competing hardware and software purchases; the number of computers or level of computing technology indeed may be proven to impact quality production, but the Quality Management Climate balanced the computing needs based on the experience and data available to the information systems professionals.

This research focused on the dynamic portion of the climate factors. Historically, healthcare services management has tended to focus on static factors. A rich and important history of research has attempted to establish relationships between static factors and quality, as can be seen by the JCAHO accreditation standards (Al-Assaf and Schmele, 1993). Perhaps future study of dynamically balancing these static elements would become significant as:

1) company employees gain experience;
2) company strategy is modified;
3) consumer demands change;
4) employees become better trained;
5) employees learn more about how to use data, facts, and analysis;
6) employees develop team networks within the company;
7) technology marches forward, making what is formerly impossible, possible.

An important premise of this research is that the process elements of Quality Management Climate are dynamic, and when in place allow the company to dynamically respond to changing needs, resources and opportunities, both within and outside the company walls. Based on this premise, a company which implemented Quality Management may necessarily start with fluctuation in static system elements as workers attempt to reduce overall variation, and then more to stabilization of those static system elements as workers learn how to best produce quality goods and services. In other words, fine tuning how the structural elements are used in the company may be a mechanism with which Quality Management produces quality goods and services. Another mechanism may be considered: fine tuning the process elements. The study of how these mechanisms operate may open a broad range of future empirical organizational development studies.

Quality Management Climate as a Multivariate Scale

The need for a multivariate scale versus a univariate measure of Quality Management Climate has been demonstrated. The Baldrige criteria are supported on a multivariate model (NIST, 1995), and other work has been done in general (Saraph, et al., 1989) and specifically with hospitals (Tabladillo and Canfield, 1994) to demonstrate valid and reliable Quality Management modeling.

In this research, *measure* is defined as a manifest variable (or survey item), which can be included in a *dimension*, defined as a latent variable. These dimensions together define the *scale* which is developed as illustrated in the following figure:

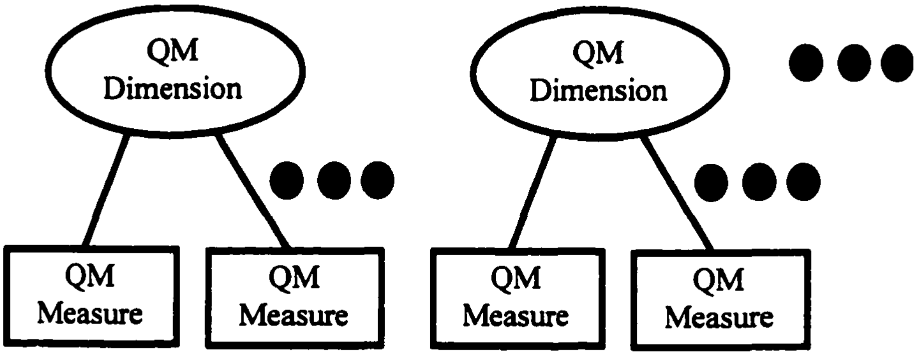

Figure 9. Multi-dimensional Scale of Quality Management Climate

The collection of dimensions, thus, combined into a scale of Quality Management Climate, which is the product of the developed survey instrument. The process of proposing dimensions focused on distinct constructs within the working model of Quality Management Climate. The following table describes how the measures, dimensions, and scale are implemented:

Table 7. Measure, Dimension and Scale Implemented

Concept	Definition	How Implemented
Measure (or Manifest Variable)	a univariate indicator	one survey item
Dimension (or Latent Variable)	a multivariate indicator	one factor scale, composed of several related manifest variables
Scale	collection of distinct dimensions	group of factor scales, reported with interfactor correlations (and some with interdimensional loadings)

Currently, the best method to analyze latent variables is structural equation modeling (James, Mulaik and Brett, 1982; Bollen, 1989; Breckler, 1990). This body of statistical techniques involves developing a hypothethical model, and then testing the items for goodness-of-fit (Mulaik et al., 1989; Bentler, 1990). The survey development, therefore, is a scale hypothesized to be composed of latent variables, each of which is hypothesized to have specific relationships with the manifest variables. The pool of items are generated based on the proposed working model of Quality Management Climate.

Details of survey item construction, validation and reliability assessment appear in a later chapter, which also describes the research methodology, data collection procedures, and research results. This later chapter describes the construct validation of the survey items, both a convergent validation and divergent validation.

It is additionally decided to investigate criterion-related validity along with investigating the construct validity of the survey; thus it is necessary as part of the literature review to consider hospital performance theory and develop some working conceptual models to describe the issues involved in hospital performance evaluation specifically related to Quality Management Climate.

CHAPTER V

HOSPITAL PERFORMANCE THEORY

This chapter demonstrates that the subject of hospital performance is undergoing continual evolution. For the present survey, this assumption indicates that any criterion-related validity investigation of the developed survey has possible biases due to the lack of understanding of general hospital performance; this chapter investigates these possible bias sources.

What is "Hospital Performance?"

Performance of hospitals has been traditionally a difficult concept. Much data is collected in hospitals, including mortality data, employee FTE (full-time equivalent) statistics (and related productivity measures), morbidity rates, DRG (diagnostic-related group) classification data, Medicare reimbursement data (often collected by state Peer Review Organizations), and general statistics, such as that collected by the American Hospital Association (1993). What performance means to a hospital depends on the context, whether strategic, financial, operational, or clinical. Each area is currently a focus of some research group, with clinical or other outcome measures receiving the most attention from physicians. Many standardized terms like *mortality rate* generally have different working definitions.

One of the difficulties has been the hesitancy among health providers in measuring quality on anything else but a high level of aggregation, as can be seen from physician reaction to the Health Care Financing Administration's publishing of hospital mortality data (Berwick, 1990; Hartz, et al., 1989). In this case, hospitals could be compared with one another based on mortality, much as sports teams or stocks are compared in the newspaper; little attention, in this case, is given to adjusting the statistics for hospitals that had "sicker" patients, a procedure known as case mix adjustment.

Factors Affecting Hospital Performance

Flood and Scott (1987) provided a comprehensive review of the current understanding of comparing hospital performance, which examined the use of financial, or cost measures, to assess hospital performance. While their thirty year historical review of cost and quality studies (and the flaws) concluded that the relationship between cost and quality of care is not well understood, they did conclude that cost and quality seem to have some positive correlation. Yet, the mechanisms which relate the two continue to challenge health services researchers to develop new operating models. Flood and Scott (1987) do provide a list of some external and internal factors which are known to affect hospital costs.

Based on their research, it is hypothesized that the full impact of Quality Management Climate on hospital performance could not be fully assessed without assessing the degree to which external sources affect the process; a similar conclusion is recently reached by Counte et al. (1995). Despite this lack of direct control, health services researchers tend to favor the hospital as the focus of improvement and control, even in this age of mega-system mergers and health system alliances. Flood, Shortell and Scott (1994) argued that hospital managers should go beyond the boundaries of "traditional" health administration paradigms that define a manager's responsibility as being within the hospital's walls. They argued that the key to managing and improving overall organizational performance is in managing subsystems beyond the direct control of the health administrator. Their emphasis of team management and accountability sounds Deming-inspired (1986, 1994), and demonstrated the evolving systems oriented approach.

What is lacking is broad-based performance research on health services. Flood and Scott (1987) clearly summarize efforts to investigate certain features of hospital performance. Even though their research resulted in several articles, presentations, and dissertations, their research is based on a selected sample of specific cases, considered to be an excellent sample for health services research but inadequate to judge the merits of various performance measures available in a variety of settings. In other words, performance may be reasonably understood for subsystems, but much has yet to be understond for systems integration.

Control of Hospital Performance

Hospital consumers are gradually being educated about such measures as *severity-adjusted indices* as more corporations and agencies are studying new ways to compare hospital effectiveness and efficiency. As a result, hospital administrators are working to identify the quality of care factors (such as severity of case mix) that are not under the direct control of the hospital, but do have a significant role in outcome measures and comparative cost data.

Based on the earlier work described above, Flood, Shortell and Scott (1994) presented a range of factors which may affect hospital performance. The following table contrasts those factors which hospitals have relatively little control (which tend to be external factors) and those factors which the hospitals have relatively more control:

Table 8. Degree of Control of Factors Affecting Performance (Flood, Shortell and Scott, 1994)

Relatively uncontrollable				Relatively controllable
• Natural disasters • International relations • National economic policy (e.g. inflation, unemployment) • Population demographics (e.g. changing age mix of the population) • Stock market • Social problems (e.g. riots) • Immigration patterns	• Health care system • External regulation and accreditation • New technological developments • Competition • Physician surplus or shortage • Nurse surplus or shortage • New legal developments • Societal preferences and tastes	• Consolidation • System growth • Organization size • Ownership status • Third-party payment trends • Teaching affiliation • Medical staff organization and characteristics • Purchaser demands for preferential conditions	• Organizational mission and culture • Labor mix • Human resources development • New product development or new market development • Vertical and horizontal integration (e.g. acquisitions, alternative delivery system development) • Organization design (e.g. coordination, centralization of decision making)	• Wage and salary administration • Capital investment strategy • Financial goals • Marketing plans • Patient care policies and practices • Problem identification and management • Conflict management practices • QA practices and policies

This table emphasized their earlier conclusions that hospital administrators cannot control all factors; their research indicated that more and more hospitals and hospital systems will need to consider external forces, outside the structural elements which define an organization.

Also, they suggested that the proper tool for coping with this lack of control is Quality Management; following their suggestion, perhaps Quality Management within hospital walls may be only the first phase of Quality Management practice. Already, hospital administrators have to work with a tangled mix of internal and external forces, expectations and demands. However, Deming's system diagram (1986) still provided a simplified, but powerful conceptual structure for organizing the customer voices and aligning the hospital functions under a manageable strategy.

Of interest, then, is identifying current common measures that hospitals use to track performance. The following table outlines measures which have collectively developed by hospitals and hospital agencies to track what are believed to be important comparative measures, and represents decades of research and practice in performance measure monitoring.

The column at the left is labeled with Donabedian's categorization of structure, process and outcome; although Donabedian's original categories applied to clinical measures, they apply equally to nonclinical categories also. The term *efficiency* refers to cost per unit output, *productivity* refers to the ratio of outputs to inputs, and *effectiveness* refers to ascertaining the quality with which a service is carried out, assuming that the service is both *efficacious* (the health service, under ideal conditions and applied to the right problem, could produce the desired effect) and *appropriate* (the efficacious treatment is applied to the right patient at the right time).

Table 9. Examples of Performance Measures by Category (Flood, Shortell and Scott, 1994)

	Domain of Activity		
	Clinical Care	**Financial Management**	**Human Resources Management**
Structure	*Effectiveness* • Percent of active physicians who are board certified • JCAHO accreditation • Number of residencies and filled positions • Presence of council for quality improvement planning	*Effectiveness* • Qualifications of administrators in finance department • Use of preadmission criteria • Presence of an integrated financial and clinical information system	*Effectiveness* • Ability to attract desired registered nurses and other health professionals • Size (or growth) of active physician staff • Salary and benefits compared to competitors • Quality of inhouse staff education
Process	*Effectiveness* • Rate of medication error • Rate of nosocomial infection • Rate of postsurgical wound infection • Rate of normal tissue removed *Productivity* • Ratio of total patient days to total full-time (FTE) nurses • Ratio of total admissions to total FTE staff • Ratio of physician visits to total FTE physicians *Efficiency* • Average cost per patient • Average cost per admission	*Effectiveness* • Days in accounts receivable • Use of generic drugs and drug formulary • Market share • Size (or growth) of shared service arrangements *Productivity* • Ratio of collection to FTE financial staff • Ratio of total admissions to FTE in finance department • Ratio of new capital to fund-raising staff *Efficiency* • Cost per collection • Debt/equity ratio	*Effectiveness* • Grievances • Promotions • Organizational climate *Productivity* • Ratio of line staff to managers *Efficiency* • Cost of recruiting
Outcome	*Effectiveness* • Case-severity-adjusted mortality • Patient satisfaction • Patient functional health status	*Effectiveness* • Return on assets • Operating margins • Size (or growth) of federal, state, or local grants for teaching and research • Bond rating	*Effectiveness* • Turnover rate • Absenteeism • Staff satisfaction

Flood, Shortell, and Scott (1994) made several important comments about these performance classes. First, they emphasized objective internal measures, rather than the public's relatively uninformed perceptions of service delivery. They offer the hypothesis that the public perception of quality may differ significantly from the trained physician or caregiver. Second, they suggested that different groups may be interested in different structure, process or outcome aspects. Structural measures may be of primary concern to hospital managers, since it is their area of control. Similarly, the process measures may be the primary domain of caregivers (including physicians, nurses, and other clinical providers), since it is these areas that they can influence. The public, including the accrediting agencies and the government, may care more about outcome measures. The authors urged hospital managers to focus also on these visible measures because of public perception, despite the reality that licensing boards and accreditation agencies may focus on other areas.

Flood, Shortell and Scott (1994) advanced earlier work with a conceptual development of hospital organizational performance within the Quality Management context. Their evolution in thinking started with the classical Donabedian Quality Assurance model, moved to the analysis of shortcomings of traditional Quality Assurance, and ended with hypothesizing that hospitals would be better managed within the framework of Quality Management. Specifically, they end their discussion with how hospital managers achieve the results through transformational leadership (elements similar to this research's concept of *Quality Management Climate*).

Flood, Shortell and Scott (1994) emphasized several points summarizing current theoretical conceptions of hospital performance:

1) organizational performance is not only a *multivariate* concept (meaning there are many variables of interest) but also *multi-dimensional*, thus requiring a conceptual model in several dimensions;
2) performance improvement is meaningless outside the knowledge of the entire *system* dynamics;
3) hospital managers make decisions and optimize the organization based on what performance measures are gathered (which increasingly encompass elements outside the traditional hospital structure);
4) quality assurance efforts have played an important role in defining and assessing *quality*, but have done relatively little to transform organizational processes or caregiver behavior (a comment on the need for further understanding about how a hospital works internally);
5) And perhaps, most importantly, health services researchers and managers alike do not know "how changes in the process of care may affect outcomes" (Flood, Shortell, and Scott, 1994).

A Practical Implementation of Hospital Performance

In the early 1990's, West Paces Medical Center (WPMC) developed an approach to performance reporting using a spider diagram. This diagram illustrates some current strengths and weaknesses in understanding hospital performance. Their spider diagram modeled the following types of performance indicators on a hospital-wide basis:

- Survey perception -- what percentage would "brag about" West Paces Medical Center (employee, patient, physician)
- Financial indicators (number of days in accounts receivable (AR), earnings before taxes)
- Hospital census
- Planning indicators (number of new business contacts, physician recruitment)

No clinical indicators are used. These measures have been then rescaled and tracked on a spider diagram to show whether the measure had passed either an *expected* or *ideal* level. For example, for the survey perception data, 80% is considered *expected* and 95% is considered *ideal*. Thus, if 89% of physicians said they would brag about WPMC, then the target would fall between the *expected* and *ideal* range. Graphically, this scenario looks like the following:

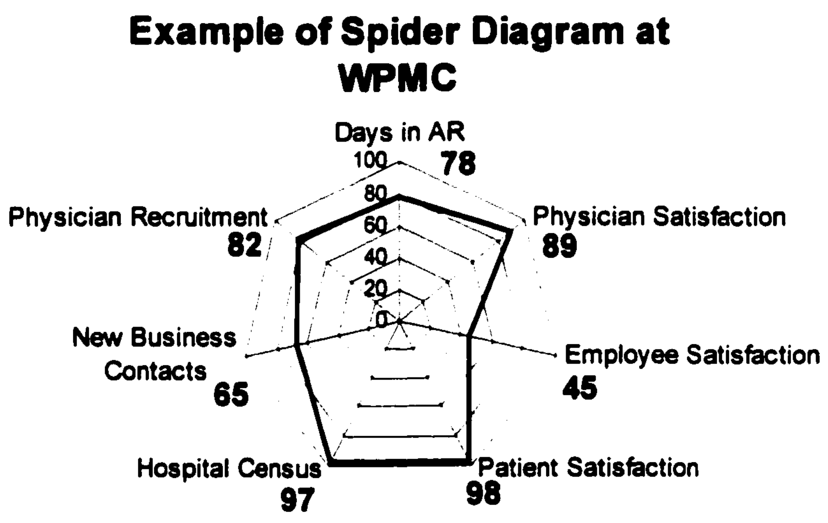

Figure 10. Example of WPMC Spider Performance Diagram

Data for this figure is often rescaled so that it made sense using the *expected* and *ideal* percentages (80% and 95%, respectively). In the end, each department or functional manager had the freedom to choose what the *expected* and *ideal* levels are. This reliance on manager judgment is necessary because there is not, in many cases, historical data or accurate benchmarking data (with hospitals in similar circumstances) that would allow for the designation of what is *expected* and what is *ideal.*

This difficulty highlights a major problem today in health services research, where researchers and administrators alike struggle to define what the *expected* and *ideal* levels should be. It is too easy to rely on the "bigger is better" heuristic; in some cases, more is not better and may not be possible for all measures. Using hospital census as an example, is it really better to have more people in the hospital? Medicare and other health care financing plans have established financial incentives to reduce length-of-stay (and thus hospital census), meaning that hospitals have an incentive to provide treatment as quickly as possible.

As hospitals change their operating procedures, payors continue to change the rules, which amounts to moving the target. Hitting this target -- developing a procedure to determine the optimum level of services -- becomes a difficult challenge. It is not surprising that hospitals often benchmark the policies of similar hospitals in order to set financial goals and policy statements.

It is important to note that the above spider diagram approach has the following advantages:

- It allows for a quick way to easily compare different performance indicators with each other.
- It forces hospital administrators and managers to think of performance as multivariate.
- It allows the hospital management to emphasize which performance indicators are more important than others.
- It covers different categories of indicators, not just financial.
- It brings physicians into the hospital system.

At the same time, the spider approach has the following disadvantages:

- It is hard to set rescaling parameters to meet the *expected* and *ideal* targets.
- It does not cover clinical indicators like mortality rate or cesarean-section rate.

- It does not convey information about the correlation among the indicators.
- It does not allow for reporting of variance over time (like a trend chart could).

It could be argued that the reliance on manager judgment for the *expected* and *ideal* targets is also a disadvantage. However, this reliance is due more to lack of sound, reliable, and consistent historical data or benchmarking data, and is a separate issue from the performance metrics involved.

When a hospital chooses to monitor a specific type of performance indicator, and this same indicator remains constant in definition (same assumptions and method of calculation), then a hospital can have a greater assurance that the indicator may be compared over time. However, in many cases, including patient satisfaction and some financial indicators, different hospitals simply do not collect the same performance indicators, making comparisons of these indicators a difficult and perhaps impossible.

Still, many hospitals (like the ones cited in this section) have focused on a limited set of performance indicators that will remain constant in definition over time. Doing this will allow hospitals to amass a database of performance information that can be used in the future to help develop new guidelines for financial and operational policy. Over time, hospitals are interested in gaining a picture of performance that integrates the different categories, illustrated in the following diagram:

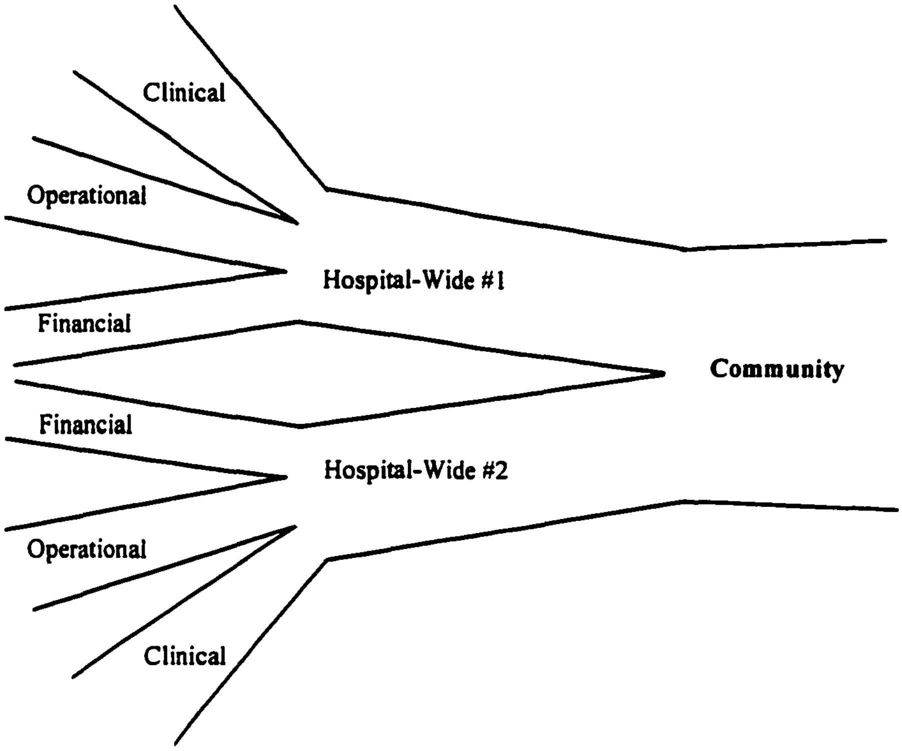

Figure 11. Current Components of Hospitalwide Indicators

What may happen is that hospitals will continue to collect data individually (for the large systems, and HMOs), and continue to publish results relating the empirical data to specific statistical models. Necessary for better statistical analyses are:

1) standardized data definitions,

2) consistent data assumptions, and

3) common data protocol for collecting field information.

These needs may contribute eventually to a common conception of reporting community health performance to the public at large.

The above figure links individual performance indicators into an overall picture of overall hospital performance in the community. This is a current objective of many large HMOs which own hospitals, which need to collect financial and other data to dynamically establish premiums for its member base. Still, this community-level information has value to all the customers mentioned earlier; even hospitals need some of these community measures to evaluate their own effectiveness.

Relating Quality Management Climate to Hospital Performance

Despite the lack of conceptual knowledge about the multi-dimensional nature of organizational performance and the lack of related empirical research in health services, it is still helpful to collect important performance measures during this research. It is not be possible to definitively model certain aspects of performance, let alone link these performance dimensions with the current Quality Management scale under construction. Yet, future studies could examine how the organizations change over time with regards to the Quality Management scale, and how these changes relate to the evolving research on how to comparatively judge hospital performance.

Conceptually, the Quality Management literature would lead to some notion that Quality Management could increase performance in the healthcare industry. Deming (1986) and Juran (1995) specifically mention healthcare as a major industry that could benefit from using Quality Management principles. Yet, how this actually occurs is perhaps less clear than the connection between Quality Management and quality goods and services. In other words, does Quality Management itself mean better performance, or does Quality Management through a dynamic systems relationship via better goods and services result in better performance?

To help solve the current problem, some proposals are made to help solve the problem of linking Quality Management Climate (and specifically the survey for hospitals) with appropriate performance measures. Process indicator measurement provided an important area for looking for immediate results to a Quality Management program. Financial measures may not necessarily provide an immediate indication of improvement from Quality Management. Also, since most of the hospital industry is subsidized by the government (at federal or state levels) may contribute great error in the variance of total financial returns. The flip side of the argument is that HMOs and for-profit institutions have good budgeting ability, and in many cases, do show a profit at year end from financial controls. The case could go either way.

Given these complexities, a list of suggested performance metrics for hospital-wide performance (see Appendix C) have been obtained in collaboration with discussions with hospital professionals working at the hospital sites for the data collection. However, since all the participating hospitals did not desire to share all the information requested, and also since the sample size required to demonstrate statistically meaningful correlations would be about 40 hospitals, these performance metrics have not been collected for any hospitals. The list has been retained for possible consideration by future research.

Though the decision has been made to abandon the hospital-wide metrics, a smaller set of work group related metrics have been retained. The performance metrics chosen have been based on the National Survey of Hospital's Efforts to Improve Quality (AHA, 1993c), the results of which have yet to be published in academic journals. However, working drafts have been obtained with the authors' permission (O'Brien et al., 1995 Shortell et al., 1994). Their hospital survey (AHA, 1993c) asks hospital Administrators to rate their hospital's performance based on perceptions of impact; this method of collecting independent metrics has a threat to validity since this data have been collected simultaneously with dependent variables. However, the advantage includes being able to assess quality management from the limited scope of the perception of the survey recipient. Based on this major initiative, the performance metrics chosen for this research have been based on a question which asked administrators to indicate the degree of impact which their quality assurance or improvement activities have had to date.

With the hospital *work group* (operationally defined on the survey as the people that the individual worked with on a regular basis, usually their department) in mind, the research proceeded with considering which of the above factors that hospital employees would be able to determine for their individual work group. It has been determined that individuals would be likely to respond to the four following general categories: 1) reducing costs, 2) reducing work errors, 3) reducing complaints, and 4) increasing satisfaction. The chosen performance metrics appear in Appendix A, in the final survey.

Study Limitations

It is possible to envision a relationship between a multivariate measure of Quality Management (of which Quality Management Climate is a subset) and different performance measures. If there are, say *n* dimensions of Quality Management, and *m* specific performance measures, then there are a possible (n x m) possible relationships between Quality Management dimensions and performance measures. These relationships are demonstrated on the following graph:

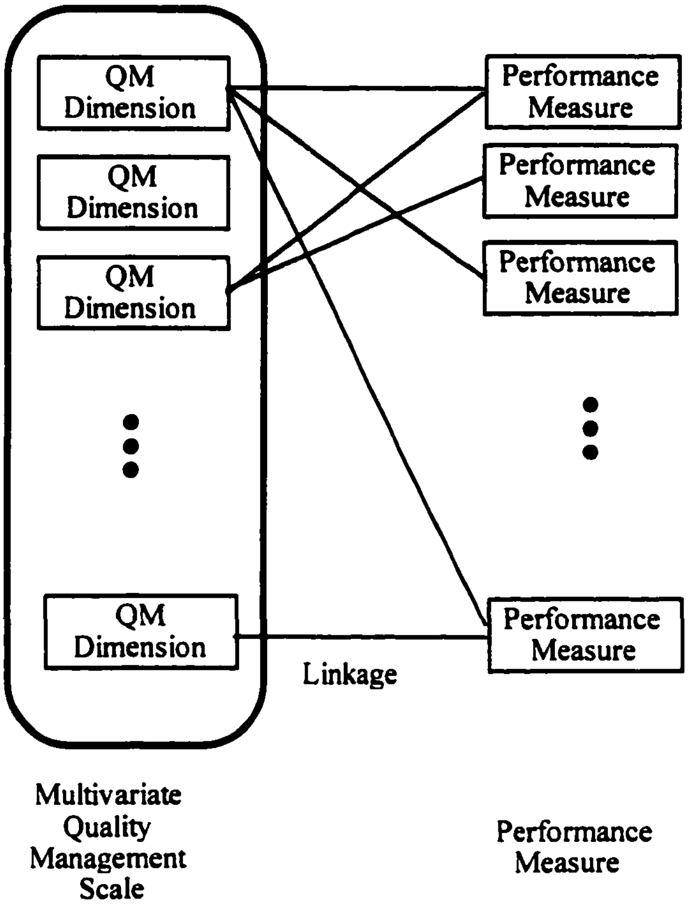

Figure 12. Linkages between Quality Management Measures and Performance

These nxm relationships grow geometrically as more Quality Management dimensions or performance measures are included for consideration.

Nevertheless, the simple figure above ignores the relationships among the Quality Management dimensions, which total $n(n-1)$, and the relationships among the performance measures, which total $m(m-1)$. Also ignored are the dynamic feedback relationships among the relationships, both between the Quality Management dimensions and performance measures, and among the Quality Management dimensions and performance measures respectively. Add to this the influence of outside error factors on each of the Quality Management dimensions and performance measures, and the model becomes much more complex. In short, not all dimensions of Quality Management or performance have necessarily been established.

The survey development proceeded with these limitations in mind, along with the limitations of the scope and appropriateness of using certain performance metrics. Demonstrating criterion-related validity for the scale may not be fully demonstrated for every possible hospital performance metric. It is left to future research to discover possible combinations and hypothesize interpretations based on the metrics chosen.

Although it would be preferable to take a longitudinal approach (Kilmann, 1978; Counte et al., 1995), this research has been only able to take a limited snapshot, or sample, of performance. Such results however may help launch future research initiatives. In general, survey creations can be followed by a number of validation (or validity) studies which examine the validity of the survey in different populations and experimental conditions.

In conclusion, this chapter first dealt with a theoretical framework for hospital performance theory, then after presenting a specific example of hospital-wide multivariate approaches, proposed a specific set of hospital-wide performance metrics (Appendix C) and the limited set collected (Appendix A). Given the stated limitations of understanding hospital performance, the results of the current research could only be considered as tentative, as researchers continue to uncover more on this subject.

CHAPTER VI

INSTRUMENT DEVELOPMENT AND RESEARCH DESIGN

This section describes the tasks accomplished to produce the multivariate Quality Management Climate scale. Also covered in this chapter is the specific research design used to collect data for the survey.

Outline of Instrument Development

As an overview, the following process flowchart outlines the minimal necessary steps for instrument development, and has been used as an aid to track progress during this research.

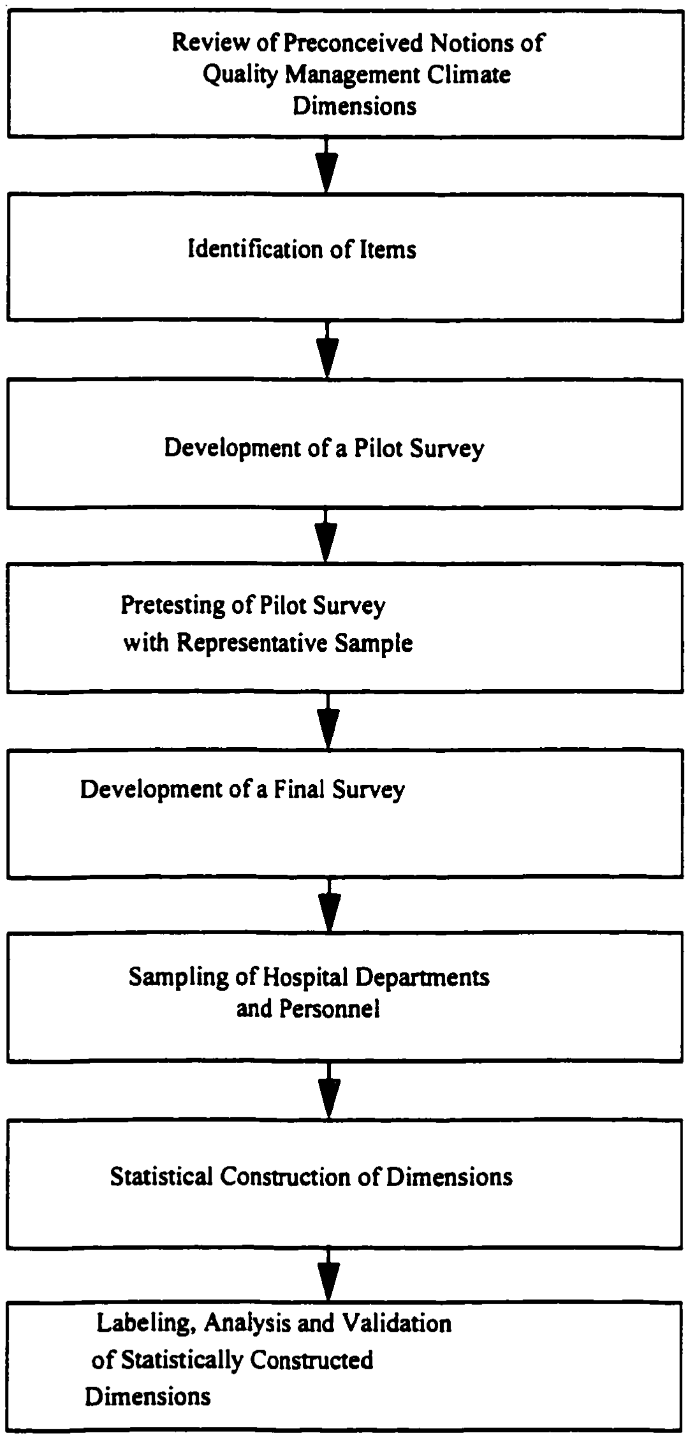

Figure 13. Stages of Multivariate Scale Development

Identification of Quality Management Climate Measures

Quality Management Climate measures have been identified based on a synthesis of the literature review. This selection process started with an initial assumption about what the generally accepted dimensions are. A guide to the expected dimensions are found in Saraph, et al. (1989) and Tabladillo and Canfield (1994).

While it is not known what dimensions may result from the statistical analysis, the following list gives examples of what these factors are hypothesized to be based on the earlier more detailed discussion of a model of Quality Management Climate:

- Visionary and active leadership
- Interactive employee/employer relationship
- Effective work group interaction and cooperation
- Effective work group action and process management

This research assessed Quality Management Climate by use of a survey instrument. Future advantages of the survey format include:

1) being relatively inexpensive;
2) being readily implemented within existing information technology;
3) because of the low cost, and ease of administration, being able to systematically track and report on an ongoing basis.

Possible disadvantages include:

1) being subject to poor analysis by the hospital;
2) being subject to poor implementation by the hospital; and,

3) being subject to research bias by the hospital.

Any of the above disadvantages, however, could also result from a Baldrige assessment or even ISO 9000. In the end, none of these assessment methods can provide an absolute guarantee for continuous improvement, thus highlighting a weakness inherent in all Quality Management assessment activities, whether they focus on climate or more broadly defined concepts.

Zikmund (1991) provided a list to be examined when planning to survey by use of a questionnaire. The following sections address Zikmund's criteria, and demonstrate why these areas each may be a source of bias.

What to Ask

What to put on the survey has been motivated by the problem definition of this research, which involves assessing Quality Management Climate in an organizational setting (a field experiment as opposed to the laboratory setting). The initial phases of this research involved gathering and listing the number of Quality Management Climate measures that span what is hypothesized to be important to a healthcare Quality Management program. Questionnaire relevance has been based on an exhaustive literature review and review by several content experts. Also, the survey has been reviewed during the pilot testing phase by several hospitals, and this pilot survey has been further refined into a final format. Systematic bias could have resulted from a poor choice of literature, poor choice of content experts, and poor choice of pilot project participants.

Phrasing Questions

The survey used only fixed-alternative questions since this allows for ease of tabulation and application of various statistical techniques. This research used the Likert scale, making the standard assumption of ordinal variables.

The developed surveys tried to avoid complexity by using simple, conversational language. Along this line, the survey did not use the vague terms *quality* or *Quality Management*, nor any of the popularly associated buzzwords such as any references to quality tools, reengineering, CQI or TQM. Even the instructions did not mention these terms because of the difficulties inherent in universally defining these concepts. Collectively, it has been assumed that the items on the survey summarized the process-related dynamic elements which feed into the definition of *Quality Management Climate*, which is a distinct subset of many conceptions of Quality Management. Even with these cautions, it has been possible that the survey's use of some terms may have provided a source of misunderstanding. The survey did define four terms which might have lead to misunderstanding. These terms include *work group, manager, supplier,* and *hospital administration.*

Second, the developed survey tried to avoid leading or loaded questions. A leading question suggests or implies a certain answer. A possible related bias may be that all the items (except for Q15 and Q16) are written in the positive direction; perhaps future surveys might intentionally mix the direction of the items.

Third, the developed survey avoided "double-barreled" items. These types of items cover two concepts or questions at once. Finally, the developed survey attempted to avoid making assumptions. Each survey item has been screened using these criteria before and during the assessment of the pilot to help prevent ambiguities and misleading statements.

Question Sequence

Order bias could result from an alternative answer's position in a set of answers or from the sequencing of questions; in order to help minimize the effect of order biasing, randomization of items occurred. Operationally this resulted in two versions of the survey being distributed among a random sample of hospital employees; these versions had identical questions, but in a different order. A possible bias could have been introduced by using these specific orders in the survey distribution; future research could investigate the effect of having items arranged in a different order to determine the validity of different orders.

Questionnaire Layout

The layout and physical attractiveness of the questionnaire has been considered important in self-administered surveys. Both surveys are printed in small booklet format. Also, the layout of the fixed-scale items allowed for easier data entry. A possible bias could involve assessing the vague concept of *attractiveness*; the quality management directors have been consulted and previous surveys used in other management research have been examined to reduce this possible bias.

Questionnaire Pretesting

Two surveys are developed for this research, a pilot survey and final survey (the final survey has been administered in two phases). The pilot survey had 130 fixed-alternative items of Quality Management measures developed by the researcher based on the previously mentioned four categories. These items are intentionally paired in two ways: first, an item would (for example) evaluate departments in general, and the following item would evaluate a specific department; and second, an item would describe top management in general, and the second item would describe the immediate manager.

A special pilot package has been developed to communicate the basic information used in this study. The first survey involved direct feedback from five Atlanta hospitals: Gwinnett Medical Center, Crawford Long Hospital, Emory University Hospital, Georgia Baptist Hospital, and DeKalb Medical Center. Each of these hospitals had a Quality Management director who coordinated the distribution of the survey to several hospital employees at each hospital (the goal is ten). In addition to completing the survey, the respondents are also asked to provide specific feedback to aid in further refining of the survey. This process helped reduce possible researcher bias.

In addition to gathering feedback from five hospitals, a pool of representative quality participants has been selected to evaluate this preliminary scale of Quality Management Climate measures. This pool has been selected from hospitals whose employees are assumed to have some knowledge of Quality Management. A number of professional contacts, including Georgia Tech Health Systems faculty, graduates and students volunteered. In addition to the reading committee members, reviewers included a Health Administration faculty member at Mercer University and a former CEO of another major hospital in Atlanta.

This pool also has been assumed to possess some working experience of the measures that impact on what they consider critical to their conception of healthcare Quality Management Climate. Many of these members interacted directly with the investigator to provide suggestions for refining the survey.

The pilot also had some specific demographic questions directed at physicians, nurses, and other hospital professionals. It has been decided that this format has been too confusing for a general anonymous survey questionnaire since many participants either filled in the wrong section, or could not interpret the items presented (assessed by the written comments on the survey which indicated unclear words or questions); thus, these items are dropped, and instead a new more common and general set of demographic items are developed which would be pertinent to all hospital participants.

Analysis of Preliminary Questionnaire

The pilot data has been analyzed and a report has been generated to hospitals in return for their participation. The final sample size has been 39 participants at five hospitals. The major feedback has been that the survey is too long for general use. However, the items in general have presented strong face validity especially among the professionals who had attended Quality Management seminars (such as Dr. Deming's seminar) or who had read the quality experts reviewed in an earlier section. Also, hospital managers immediately have identified the relevance for reporting this information to the Joint Commission (which required some amount of benchmarking against other facilities); by completing this project, hospital directors are hoping to simultaneously accomplish several goals.

Validity and Reliability of the Final Instrument

This section discusses the issues related to validity and reliability of the final survey instrument.

Instrument Validity

Validity means having a conclusion correctly defined from the premises (Davis and Cosenza, 1985; DeVellis, 1991; Mitchell, 1985). In this case, it means that the survey items measure what they are supposed to measure. Three types of validity are addressed by the current research: content, criterion-related, and construct (which includes convergent and discriminant validity).

First, the *content* validity has been assessed by 1) reviewing the pertinent literature related to Quality Management, and 2) assessment of the preliminary survey by experts in quality (i.e., hospital professionals who have worked with Quality Management and faculty who have taught classes in Quality Management). Second, the *criterion-related* validity, or predictive validity, has been addressed by gathering associated hospital performance data. Third, the *construct* validity has been assessed by using structural equation modeling of the latent factors to establish evidence of both convergent and discriminant validity.

For additional evidence of convergent validity, the phase two survey included Kouzes and Posner's Leadership Practices Inventory (Posner and Kouzes, 1988, 1993; Kouzes and Posner, 1987, 1993), designed to assess five independent dimensions of leadership. There are two related instruments, the LPI-Self and the LPI-Other, which are a self-assessment and an assessment of someone else's leadership, respectively. The LPI-Other instrument has been chosen to be consistent with the general research design.

Research performed by Simpson (1944) and Hakel (1968) indicates that the "Once in a While" and "Sometimes" categories of the original LPI-Other are closer than they need to be; a change in language would potentially affect those who would respond with a "2" or "3" based on a five level scale, but should not present major difficulties in comparing with earlier results of the LPI-Other. Both Simpson (1944) and Hakel (1968) attempted to determine the numerical frequency which accompanied such terms as "Often" or "Sometimes." The scales in the following table are used in the final instrument:

Table 10. Comparison of Scales (Posner and Kouzes, 1993; Simpson, 1944; Hakel, 1968)

Level	Posner and Kouzes (1993)	Quality Management Climate survey (1995 - 1996)
1	Rarely or very seldom (5-7%)	Rarely or almost never (2-5%)
2	Once in a while (22%)	Once in a while (22%)
3	Sometimes (29%)	About as often as not (50%)
4	Fairly often (74%)	Often (74%)
5	Very frequently or almost always (82-98%)	Very often or almost always (88-98%)

The numbers in the above parentheses represent the expected median frequency based on Simpson (1944) and Hakel (1968), and are each derived on convenient samples of students. Despite the limited nature of the sample, the above research did make a convincing argument that "About as often as not" generally represents 50% of the time to most subjects.

The approach of Posner and Kouzes (1988, 1993) had the advantage of measuring frequency of occurrence. The final phase two survey included the LPI-Other, but the scale for the Quality Management Climate survey followed a different Likert scale (listed on the above table), with the intention of describing a relatively more discriminant set of levels.

Instrument Reliability

Reliability means the degree to which measurements are free from random errors (Mitchell, 1985). A highly reliable instrument or survey accurately (with low error) measures the domain of study. While several methods of determining reliability have been used by researchers (Davis and Cosenza, 1985), this study uses a numeric measure, Cronbach's coefficient alpha (Cronbach, 1951). This measure, which ranges from 0 (low reliability) to 1 (high reliability), takes into account variance attributable to subjects and variance attributable to the interaction between subjects and items (Cortina, 1993). An advantage of using this measure of reliability includes opening the possibility for future comparative studies, since this statistic is well-known and implemented in major statistical packages.

In addition, Wolins (Efinger, 1984) developed another formula to assess dimension reliability:

$$reliability \equiv \frac{n_i\left[\frac{\left(\Sigma|loading|\right)^2}{n_i^2}\right]}{1+(n_i-1)\left[\frac{\left(\Sigma|loading|\right)^2}{n_i^2}\right]}$$

where

n_i = *number of items in factor*

loading = *factor item loading*

Figure 14. Wolins' Reliability Equation (Efinger, 1984)

This reliability equation required knowing n_i, which represented the number of items in a particular factor scale, and the absolute value of the loadings based on the factor correlations with the items. The formula also assumed that the highest loaded items would be entered first into the equation; then, comparisons among the reliabilities for different numbers of factors revealed whether or not additional items improved or reduced the overall scale reliability.

Wolins' formula could provide the advantage of helping the researcher determine when additional factors may not improve the overall reliability of an equation given the loadings of other items; by contrast, Cronbach's alpha increases in reliability even though the additional items add relatively less than the higher loading factors. Wolins' formula has been developed for traditional factor analysis, which does not have any similar feature; for the present research, this feature has not been invoked since structural equation modeling precludes the need for such a feature since several alternative models could be compared with the commonly derived goodness-of-fit indices (Bollen, 1989). Since there are advantages and disadvantages to both methods, both the Wolins' equation and the more common Cronbach's alpha have been contrasted to help assess reliability of the factor scales prior to assessing criterion-related validity.

James, Mulaik and Brett (1982) argued that factor scales cannot be reliably constructed when the squared multiple correlation coefficient is less than 0.70, since it may be possible to mathematically describe two unique estimated factor scales which may have zero or negative correlations with one another. Given the desirability of computing factor scores for further analysis of latent variables, they suggested computing factor scales only for squared multiple correlations at 0.80 or higher; this heuristic has been generally achieved by the scales constructed.

The reliability of the measures has been directly affected by the sample size, which ideally is 10 subjects per factor scale (Gorsuch, 1983). At a minimum, the sample size should be 5 or 6 subjects per dimension. Finally, for structural equation modeling, it is desirable to have a minimum of three items per factor scale, which allows for each latent variable being just identified (at three items) or over identified with four or more items (James, Mulaik and Brett, 1982; Bollen, 1989). Adding more items per latent variable also increases the degrees of freedom and conditions for over identification, thus reducing the possibility that a particular structural equation model has an artificially improved goodness of fit index (Mulaik, 1990); thus, increasing the variables also has a corresponding impact on validity.

Additionally, Bollen (1989) argued that for structural equation modeling, an appropriate measure of reliability of the structural model is the value of R^2, the squared multiple correlation coefficient which can be generated for each manifest variable. These values have been reported in appropriate appendices to allow assessment of this measure of reliability.

Selection of Data Source and General Research Design

This section discusses the hospital professional as the unit of analysis, and the types of hospitals surveyed.

Internal Customers

Internal customers, or hospital professionals, have been chosen as the unit of analysis, and as such, the data source; the term *hospital professional* included both hospital employees and admitting physicians. Based on Beer (1988), a rational comparison of Quality Management implementation (and thus the effect on climate) follows managerial penetration among all levels of management. The importance of this factor has been repeatedly emphasized by quality experts (Deming, 1986, 1994; Juran, 1964; Feigenbaum, 1983).

First, this research assumed that the internal customer (hospital professional) is most knowledgeable about what Quality Management behaviors and attitudes have penetrated the organization. Surveying the employees assesses a manager's effectiveness in translating Quality Management theory into practice. This external assessment of management effectiveness is similar to the research design in Kouzes and Posner (1987).

Second, since the current research proposed that managerial penetration is an important issue, selection of the data source included an assessment of CEO and lower level managerial turnover. Also included in the survey are demographic questions relating to the individual's length of experience with a particular supervisor and institution.

Third, consideration has been given to what level of knowledge the hospital professional had about the Quality Management implementation. Higher level managers may be more aware of the implementation issues and general approaches to managing the cultural shift, and may provide insight into these central issues. However, lower level employees could provide information as to the extent of training in Quality Management as well as the penetration of these principles into daily activities; for example, these employees are assumed to be able to judge how Quality Management had affected their behaviors as demonstrated in the procedures and reward systems present in the hospital. Along with managerial status, length of employment in the specific department, length of employment in the particular hospital, and length of employment in healthcare in general are all important demographic variables to collect.

External Customers

For this research, patients (external customers) are not selected as a data source because the relatively short stay typical of the hospital patient (6 days) and the average patient exposure to the organization did not allow for an adequate assessment of the dimensions of interest. In other words, patients as a group are assumed to be relatively unaware of the penetration of Quality Management into daily hospital practices as they relate to specific departmental processes and overall corporate strategy. However, patients have been used as the subject of quality studies relating to the term *quality*, referring to the services provided them by the hospital. Future investigation may also attempt to describe classes of patients who can adequately assess aspects of Quality Management other than climate, perhaps due to frequency of visits to a hospital or exposure to Quality Management Climate under other settings. Thus, future Quality Management research may follow objectives that necessitate the use of the patient as a data source.

External Assessors

External assessors are not selected as a data source, based on the initial research objectives of providing a low cost, ongoing assessment of Quality Management Climate. Beer (1988) served as an external assessor of several major quality programs, and a similar study could be replicated in the healthcare environment. Some of the characteristics that could result from such an analysis have been described (Berwick, et al., 1990; Al-Assaf and Schmele, 1993). To date, hospitals have yet to standardize parameters for judging Quality Management Climate, as demonstrated by JCAHO's changing accreditation standards (1994). A Baldrige-type assessment has provided many organizations with helpful information on the state of its managerial practice; however, such assessment tends to be costly and have long times between assessments; additionally, these assessments may have interrater biases. Tabladillo and Canfield (1994) demonstrated that monthly assessments in hospitals could provide statistically significant differences. These tradeoffs are demonstrated in the following table:

Table 11. Comparison of Assessment Methods

	Advantages	Disadvantages
Patient Assessment	• Consumer-driven • Process-oriented • Able to focus on quality outcomes (goods and services received)	• Lack of expertise in Quality Management principles • (Typically) Short evaluation time • Limited interaction with employees • Impressions may be compounded or biased by morbidity (or morbidities) or functional outcomes
External Assessment	• Comprehensive • Data-driven	• Periodic • (Often) Costly • Assumes trained auditors • May be auditor-biased
Internal Self-Assessment	• Comprehensive • Data-driven • Specific to the institution • More flexibility in dealing with sensitive performance issues • Ongoing and sensitive	• Labor intensive • Needs to be dynamically supported by all management levels

Hospital Selection

The American Hospital Association (AHA) (1993b) classification standards are used in selecting the hospitals to be used in this research. The hospital population chosen are AHA accredited hospitals which fell under:

- classification control codes 21 (nongovernmental, not-for-profit, church related), 23 (nongovernmental, not-for-profit, non-church related), or 33 (investor owned, for-profit, corporation);
- service code 10 (General medical and surgical); and,
- stay code S (short-term, average length of stay for all patients is less than 30 days or over 50 percent of all patients are admitted to units where average length of stay is less than 30 days).

These codes collectively describe the general community hospital, whether for-profit or not, and account for the majority of AHA-accredited hospitals in the United States.

Second, hospitals within the following counties in Georgia are targeted (for research convenience): Cobb, Fulton, DeKalb, Gwinett, and Clayton. The following table lists the pilot and final project participants. One hospital from Mississippi, the University of Mississippi Medical Center approached the investigator after reading the research summary on the World Wide Web; its similarity in size and mission to Emory University, and geographic similarity by being located in the Southeastern United States are considered desirable characteristics for including in the study.

Pilot surveys are collected between April and May of 1995, and represented the opportunity for hospital directors and employees to provide feedback on the original pool of 130 items. Phase one surveys are collected between June and November 1995, and are collected as a convenient sample. Phase two surveys are collected between November 1995 and April 1996, and are collected as a random sample. Each survey administration actually lasted approximately six weeks at each institution, with the intervening time spent in contacting Quality Management directors and gaining approval from various committees. The total surveys collected for each of the three administrations appear in the following table:

Table 12. Sample Sizes of Survey Administrations

Hospital	Beds	Pilot	Phase One	Phase Two
Georgia Baptist Hospital	589	9		
DeKalb Medical Center	464	10		
Crawford Long Hospital	494	7	221	52
Emory University Hospital	540	5	78	40
Gwinnett Medical Center	330	8	159	96
Piedmont Hospital	467		51	160
University of Mississippi Medical Center	485			98
TOTAL		39	509	446

Given the low number of surveys returned from Emory and Crawford Long during phase two, it has been decided to pool these hospitals together, inasmuch as these two hospitals had joint ownership, had the same quality management director, and also shared other hospital administrators.

<u>Hospital Departments vs. Work Groups</u>

Within these similar hospitals, five generally accepted groupings of departments are developed for comparison. First, specific categorization of hospital departments has been achieved following a scheme developed MECON Associates (by permission), a healthcare consulting firm, which had a survey database named PeerX. This database classified about 250 different types of hospital departments (including teaching hospitals) for the purposes of comparing operational performance of a specific hospital and specific department with a large database of hospitals with comparative demographic characteristics. In general, the quality management directors had no problem in classifying the departments according to the description of the five groupings provided on the survey, and thus the master list from MECON is not directly referenced during the study.

After the distribution of the pilot survey, it has been determined that the concept of *department* is not appropriate for the goals given in the research, specifically to assess the interaction among the employees. Thus, the alternate term *work group* has been chosen as a substitute, and this relatively unfamiliar term has been operationally defined at the top of each page of the survey to state: "Work group refers to people you work with regularly (usually your department)."

Development of Final Survey

Based on a preliminary statistical and content analysis of the pilot (which included verbal discussion with health professionals involved in Quality Management), the final survey has been developed. The pretesting process helped remove many of the wording ambiguities present in the first scale after statistical testing revealed anomalies. Also, some reviewers are asked which items might reveal important differences in

Quality Management Climate. Blending these opinions along with the objective to make the survey much shorter, the final survey had 64 items, or less than half of the original survey. The items are contained in the final survey (Appendix A). The survey items are paired by design, so that the intra-group and intergroup subscales each had 14 items. Similarly, the items evaluating immediate management and hospital administration each had 18 items.

The phase one data are collected based on a convenient sample, with each hospital given the goal of collecting 200 surveys; for phase two, the hospitals are required to obtain a complete list of employees and physicians, from which participants would be randomly selected. Piedmont Hospital generated its own random list using a Microsoft Excel spreadsheet. All the phase two hospitals had the goal of 100 surveys collected, and Piedmont promised 200 surveys since they joined the project late.

Possible Implications of Systematic Non-Response Bias

In the end, the number of surveys sent to guarantee the above amounts is between three and four times the number returned, for a total response rate of about 25 to 30 percent at each hospital. There may be a number of rival hypotheses with respect to the relatively low response rate, which may include some systematic bias among the respondents. It is known that the five group distribution of the second phase is similar to a census performed by Gwinnett Medical Center (15% respondents in Business Departments, 12% Physicians on staff, 40% Nurses, 21% from Ancillary Departments, and 12% from Support Departments). However, any of the following could possibly account for a systematic bias in nonresponse:

- Age
- Sex
- Years with the hospital
- Years in healthcare
- Group membership
- Perception of the Quality Management department
- Past negative or positive experiences with the Quality Management department
- Race
- Classification as manager or non-manager
- Lack of exposure to a particular hospital system
- Regional healthcare culture

Further research could address the question of non-response to this survey, but would only achieve reliable results if 100% of the participants are involved in the process, thus perhaps trading off the anonymous feature of the present research design. Hospital management and researchers would have to weigh the importance of gaining such information against the relative value of what that information may provide. In addition, a systematic investigation of non-response may itself have potential biases, for example, being invalid in different hospital settings or even in the same hospital setting over time; thus, there may be potential biases in investigating biases.

As a practical response, some researchers have chosen to adjust for non-response by statistically adjusting the response pool based on a selected subset of criteria, such as age or sex or organizational grouping. For this present research, these methods have not been employed, not only because there is debate on the relative merits of these methods for general linear models, but also because there are not yet established guidelines for how to apply non-response correction to structural equation modeling, which the current research is based. Johnson and Wichern (1988) claim that there are no statistical techniques developed handling missing responses when the pattern of missing values is closely tied to the value of the response.

In general, many structural equation modelers are reluctant to make general claims for the results of any modeling research much beyond the population and under the conditions investigated. For this reason, leading journals in applied psychometric modeling generally accept validation (or validity) studies under different population and experimental conditions as new research; historically, some surveys have been validated hundreds of times. Such validation studies typically follow the development of new surveys; such studies raise a number of theoretical issues, not only whether the survey itself may be biased towards certain subpopulations, but also whether certain methods of administration are more or less effective. In a larger scale, some may be able to construct a plausible argument linking general biases with the conception of Quality Management Culture itself, and may for example develop additional survey items, follow-up interviews, or longitudinal analyses to investigate such options.

As a practical matter, it is suggested that future users of this instrument use a statistician trained in survey analysis recognizing that a number of potential rival hypotheses could invalidate the administration due to the factors listed above as well as changes in experimental conditions; at the same time, it is necessary to stress that there are major disadvantages using a newly developed psychometric instrument due to the lack of validation studies performed in a variety of settings and conditions. Such studies may provide additional quantitative insight into the nature of possible bias.

Phase Two Alterations

After phase one, about 20 participants and several quality directors indicated that it would be useful to add a "Don't Know or Not Applicable" category to all of the survey items. The respondents often wrote on the survey that they did not know the answer, since the phase one survey attempted to force responses for each item. It has been determined that since two phases are planned, that the phase two survey would relax this restriction, and allow respondents to intentionally enter missing data. In general, this major modification fell in line with the original objectives of the survey, which allow for anonymous and voluntary participation; extending this voluntary notion is the explicit invitation to not respond on certain items.

Knowing that the survey would need to be changed, the investigator also changed some wording in phase one items to more succinctly describe the original research objectives. These changes followed a preliminary factor analysis of the phase one data (not reported) which revealed that some items failed to load as expected. The earlier listing of items in four groups has been consistent with the phase two survey used to construct the structural equation models. The following table lists the six items modified between phase one and phase two:

Table 13. Items Altered for Phase Two

Item	Phase One	Phase Two
11	There is open communication between our work group and hospital administration.	Our work group communicates openly with hospital administration.
12	I have open communication with my manager.	I communicate openly with my manager.
13	When our work group is given responsibility for a project, we also have the authority to carry it out.	When hospital administration gives our work group a responsibility, we also have the authority to carry it out.
14	When I am given responsibility for a project, I also have the authority to carry it out.	When my manager gives me a responsibility, I also have the authority to carry it out.
27	Our work group understands how our responsibilities fit within our hospital.	Hospital administration understands our work group's responsibilities.
28	I understand how my responsibilities fit within my work group.	My manager understands my responsibilities.

None of the modified items came from the intra-group or intergroup subscales. Also, two ordered versions of the survey were developed for phase two (identical questions with a different order); the ordering of these two versions appears at the end of Appendix A.

Protection of Research Participants

The anonymity of the participants has been preserved and data are reported only in aggregate (Berwick, 1991). These sensitivities are expressed to the quality management directors by the researcher, both verbally and in writing; the quality management directors, in turn, assured confidentiality to the participants in cover letters which accompanied the surveys (see Appendix B). Also, confidentiality has been maintained by data entry being only performed by the researcher, who maintains possession of the original surveys. Summary or executive reports presented the results in a way that would allow for anonymous comparison among hospitals.

Notes on Efficient Data Collection

A special information package has been developed to communicate with the hospitals during the final data collection. This packet included:

1) A two-page summary of the research objectives and expected results;
2) Copies of the final instrument; and,
3) A sample copy of the pilot research results which illustrated that hospital data would be reported only in aggregate, and also provided ideas for how the survey results might be used by Quality Management directors.

Several communication methods, including having a pager, fax machine and e-mail, are made available to allow for efficient interaction between researcher and hospitals.

In conclusion, this chapter covered the major research design aspects for the data collection, the pilot survey, and phases one and two of the final survey. Having discussed these details, the next chapter describes the results of the survey and a discussion of what has been learned from analyzing the data.

CHAPTER VII

DATA ANALYSIS AND INTERPRETATION

This section contains the statistical analysis and interpretation of the data collected. First, however, it is necessary to justify the usage of latent variable analysis for the research objectives presented.

Statistically Constructing the Dimensions

An appropriate statistical methodology has been identified to connect similar quality measures into dimensions. This methodology addressed 1) the degree to which the dimensions are distinct, and 2) the reliability of the dimensions. Factor analysis met the necessary requirements for constructing such dimensions (Nunnally, 1978; Mulaik, 1972; James, Mulaik and Brett, 1982; Gorsuch, 1983). This technique constructed factor analytic dimensions based on the individual survey items.

Latent variable analysis allowed both 1) analysis of the entire interdependent set, and 2) analysis of the individual items. Starting with the entire set of pairwise correlations among items, factor analysis can group items that are highly interdependent into a factor, which is represented or defined by the list of survey items. Most items typically belong to one factor, but some few may have multiple factor membership. In addition, factor analysis defines factors, represented by item groupings, in a way that makes the factors distinct from one another. While the items composing one factor are highly related, the factors themselves tend to be distinct.

The pairwise correlation matrix has been chosen for analysis. Other methods for handling missing values in the correlation matrix include listwise deletion (which may cause severe loss of data), and estimation of missing values for individual subjects (which has the disadvantage of having larger error variance than the original, and also creates a heteroscedastic error matrix, meaning that there is an autocorrelated disturbance). Bollen (1989) discusses the merits of such methods when used with structural equation modeling, and concludes that simulation studies have provided conflicting evidence in evaluations of these methods. As a result, Bollen (1989, pp. 372-373) also concludes that it is difficult to make general statements about the seriousness and magnitude of effects due to missing data, though it is clear that the smaller the original sample and the larger the percentage of missing data, the more grave the consequences.

Theoretically, factors represent hypothetical constructs, which help explain why respondents tend to link certain concepts of Quality Management Climate together (Mulaik, 1972; Gorsuch, 1983; Tabladillo and Canfield, 1994). Factor analysis helps increase the survey instrument's construct validity, defined as the degree to which the survey items correctly measure an underlying construct (Mulaik, 1972; Mitchell, 1985; Hayes 1992, 1994). Also, the research proceeded with the maximum likelihood extraction (as opposed to principal components analysis).

The rotation method is non-orthogonal, since there has been no predetermined theoretical justification for an orthogonal rotation, such as the varimax. A number of non-orthogonal rotation methods are available in statistical packages, such as promax and direct oblimin; factor analytic experts agree that promax generally gives better results, and is thus chosen for this research (Gorsuch, 1983; Stevens, 1986). Also, allowing for moderate correlations between factors allowed for structural equation modeling.

The analysis then proceeded with structural equation modeling to determine both convergent and discriminant validity among the dimensions (Bollen, 1989; Loehlin, 1992). Unlike factor analysis, structural equation modeling allows for the creation of hypotheses which assign individual survey items to specific factors. Structural equation modeling also allowed for assessing construct validity (both convergent and discriminant) by contrasting various goodness-of-fit indices (Mulaik, et al., 1989).

Cronbach's alpha (or coefficient alpha) and the squared multiple correlation are used to assess the dimension validity. Also, Wolins' reliability equation (Efinger, 1984) is also provided for contrast.

A Note on Factor Indeterminacy

Statisticians and researchers have wrestled with the problem of factor indeterminacy, the inability to uniquely define factor scores (Mulaik, 1972; Schönemann and Wang, 1972; Steiger and Schönemann, 1978; Steiger, 1979).

Historically, this issue has been investigated several times, with a number of different response approaches by proponents, as traced by Mulaik (1987). Stevens (1986) proposed that principal components is the only tenable extraction method because it provides determinate factor scores. However, Mulaik (1987) argued that the factor indeterminacy issue is part of a more general issue known as the empirical underdetermination of theory, which meant that data alone could never sufficiently provide unique theories by induction; thus, the researcher would always impose a concept to define the relationships among the data, based on normative standards of usage (Mulaik, 1991). For example, the current study based conclusions on normative conceptions of management hierarchy and Quality Management Climate.

The determinate nature of principal component analysis makes the results more sensitive to additional data than common factor analytic techniques (such as maximum likelihood extraction). As well, Mulaik (1987) argued that principal component analysis presupposes that the underlying factor structure relies on a linear combination of the empirical items; different sets of data may then provide different underlying factors. Factors derived from component analysis cannot represent inductive generalizations beyond the data since determinate methods provide distinct artifacts, thus limiting insight into the necessarily indeterminate underlying factors.

Common factor analysis can mathematically partition item variance into common and unique parts, following the fundamental equation of factor analysis (Mulaik, 1972; Malhotra, 1993). An additional benefit of common factor analysis included the potential of testing an augmented set of variables for conformity with the original model (Mulaik, 1987; Mulaik and McDonald, 1978). If a future investigation are to add variables, the same loadings for the original variables should result if the factors are correct; if the item loadings are similar, then this technique fails to reject (rather than accept) the hypothesis that the factors are consistent (Mulaik, 1987).

As Mulaik (1991) argued, researchers define how to describe nature, beginning with the construction of language and choice of questionnaire items. Thus, the process of scale development beyond the mathematical construction of scales provided the essential context to help solve this factor indeterminacy issue. Some may argue that this freedom allows researchers to define the universe of possible factors in any way; however, factor analysis properly reduced the number of possible explanations from an infinite to finite set, and any plausible explanations necessarily logically should conform to the factor patterns extracted. Once formed, these conceptions could be tested in future structural equation modeling (Bollen, 1989; Mulaik, 1987).

The factor labels are built from conceptions from the relevant theory reviewed. Structural equation modeling provided an additional means for statistically validating the chosen factors.

Exploring the Relationships Among Dimensions

Based on the procedure to evaluate the preliminary instrument, factor analysts generally consider the distinct dimensions to represent a single scale, with no additional statistical justification other than reporting the correlation matrix among dimensions. In the future, linear causal modeling may provide insight into how these dimensions relate to one another. This statistical technique, based on maximum likelihood estimates, allows researchers to hypothesize relationships between dimensions. Such modeling can be performed contingent on certain reliability conditions from the factor analysis. If such conditions are met for this Quality Management Climate scale, such modeling could provide important conceptual understanding about the relationships among these dimensions.

With such future modeling in mind, individual factor scales are chosen to have a minimum of three items. This minimum allows for sufficient degrees of freedom in path analysis, with more items allowing for extra degrees of freedom. In addition to this advantage of potential linear causal modeling, longer factor scales (with four or more items) allow for higher reliabilities of the scales. Both advantages allow for better factor analytic results, and the higher reliabilities can lead to more robust scales under a wider variety of future conditions (Mulaik, 1972).

The data collection on the LPI-Other fail to demonstrate the author's original five dimensions when the data are subjected to principal components extraction and varimax rotation (the analysis instead suggested three factors). Given that the present study already has other sources of validation, no further analysis of these leadership items appears for the purposes of this research. It is unknown whether the research design is partly responsible for the lack of discrimination (since fewer factors are derived than the original), or perhaps that the sample size is low compared with the original paper, which had included over 36,000 participants. Since the five dimensions are not attainable through factor analysis alone, and since there is no strong evidence for a particular reason why these dimensions did not appear, no structural equation modeling is performed on this data.

Data Cleaning Procedures

The data from both phase one and phase two have been subjected to the same data cleaning procedures. Since a lower number of responses have been obtained from Emory University Hospital and Crawford Long Hospital for the second phase, these hospitals have been pooled together under a variable renamed "HOSPXFM" (standing for hospital transformation). This pooling is done under the justification that these two hospitals are under one ownership and that one Quality Management director serves both hospitals, and that for the phase two collection, Emory has returned only 42 surveys and Crawford Long has returned only 50 surveys (when the goal is 100 for each). This classification allows for tests of significant differences among hospitals.

Demographic Analysis of Phase Two

Surveys for phase two have been filled out by 314 women and 114 men, with 15 not reporting gender data. The following three figures illustrate percent of surveys returned by hospital, group membership of respondents, and age category of participants.

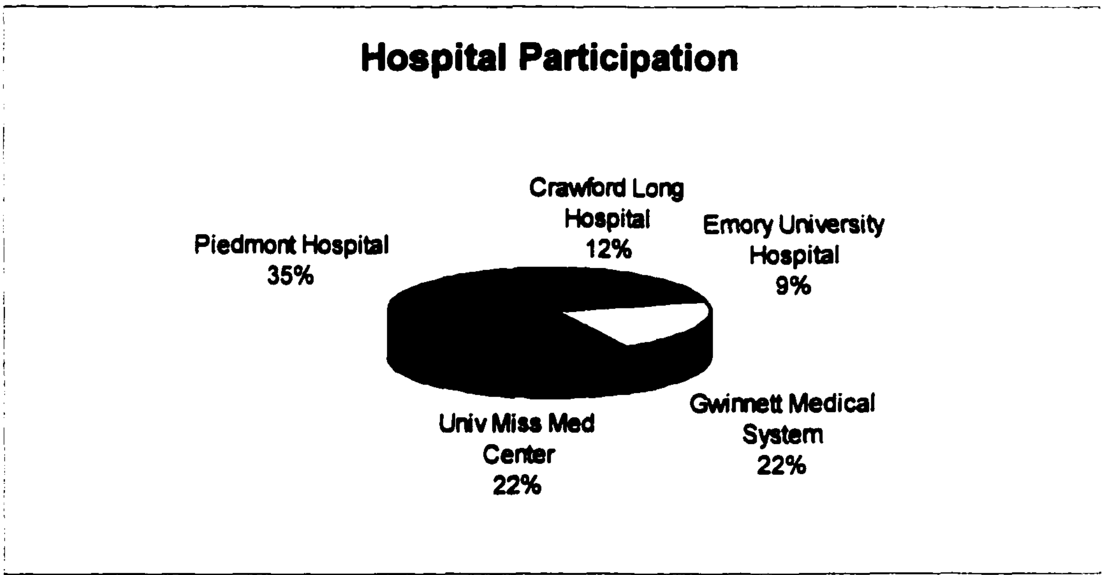

Figure 15. Hospital Participation in Random Sample

The hospital participation figure shows that combining Emory and Crawford Long as one unit roughly makes this group comparable in size to the other hospitals. This hospital identification variable is complete for all 446 respondents.

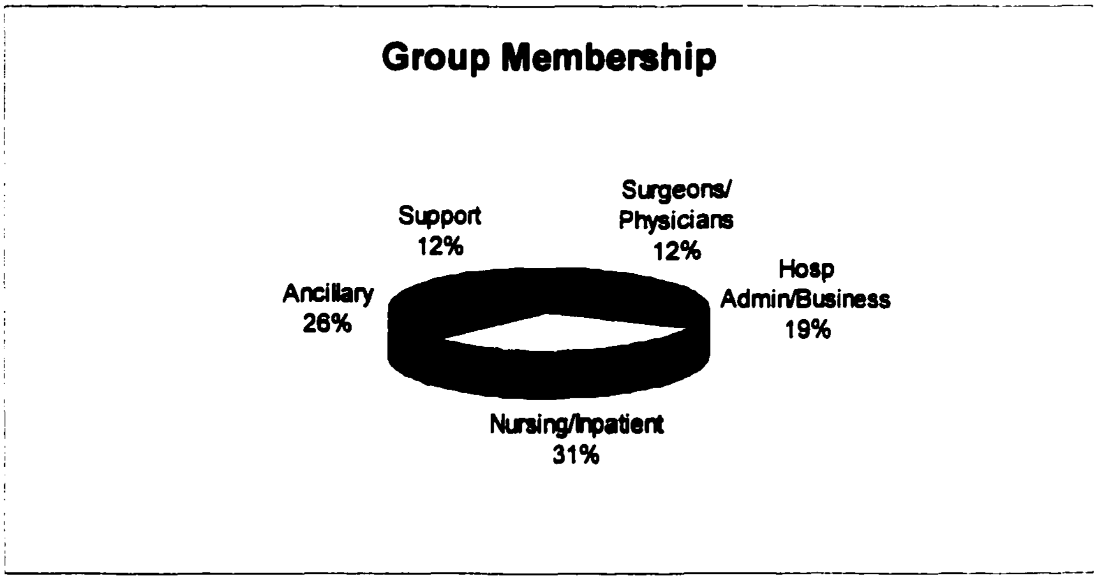

Figure 16. Group Membership of Random Sample

The group participation figure demonstrates that the five department groupings developed for this research roughly divide the hospital into comparably sized sections. A total of 442 of 446 respondents have filled in a group designation.

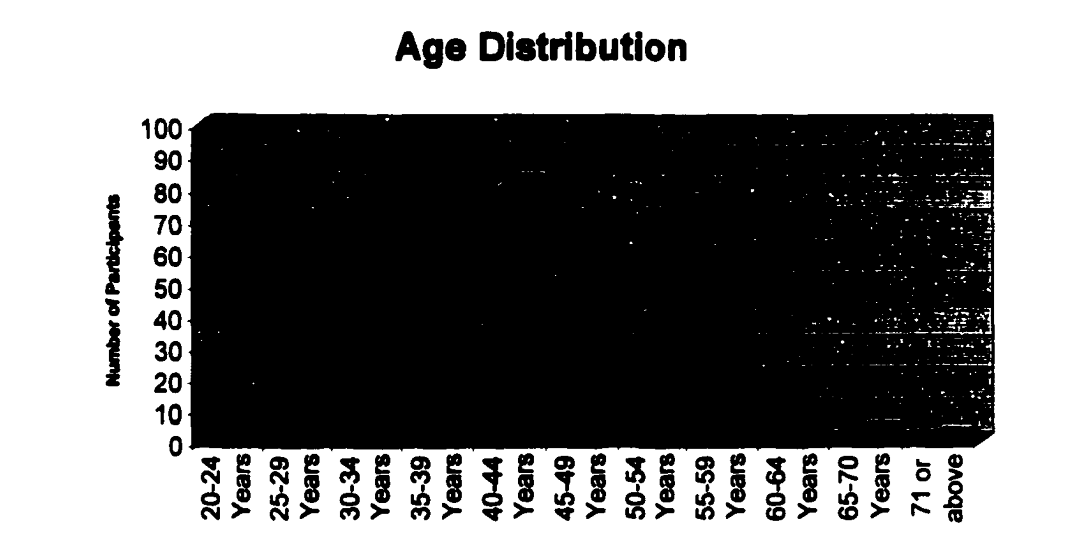

Figure 17. Age Distribution of Random Sample

The frequency data on age demonstrates a smooth distribution. Again, the specific age of respondents is not asked on the survey, but instead the participants are asked to classify their age according to five age intervals. This intentional categorization is done to increase anonymity of survey results. Specific years are asked on the question of length of hospital employment, but these variables are not considered as obvious as age is. In total, 435 of 446 respondents have filled in the age variable.

The means, sample size, and standard deviation for the numeric variables appear in Appendix D, along with cumulative frequency distributions for the variables on years of experience, and two-way frequency distributions for hospitals against selected categorical demographic variables.

Developing Hypotheses for Structural Equation Modeling

In the synthetic development of latent variables related to quality management, the data have been explored to reveal meaningful dimensions according to the literature reviewed.

A statistical analysis of phase one data has revealed useful but not essential information for analysis of phase two. Factor analysis of the phase one data (not presented) has revealed that the 64 items would be best subjected to four separate subscale analyses; each of the four would have a companion pair for validation. Analysis of this phase one data indicates that the data would be best analyzed as four subscales (intra-group, intergroup, managerial and hospital administration). However, this phase one data have not been used to construct or hypothesize any structural equation models, which unlike factor analysis allow the researcher to hypothesize a zero relationship between a manifest item and a latent variable. Thus, has been considered possible to test the structural equation models (constructed from phase two data) against the phase one data as a source of validation. This validation involves assessing the degree of fit of the phase one data to the phase two structural models; thus, this validation does not explicitly compare the data sets with each other, nor is this validation a necessary or even defendable test of the strength of the phase two models. Also, there is not an associated metric to measure the strength of the relationship between phase one and two, but assessing how well the phase one data fits the phase two models. Also, later in the results section, a statistical test is performed to verify that there are statistically more non-responses in randomly collected phase two data compared with the conveniently collected phase one data, thus casting caution on any results from phase one data alone.

Exploratory factor analysis has been performed on the four subscales from the phase two random sample. A frequency distribution of the number of missing data from the 64 items has been obtained, and it has been determined to retain subjects with 20 or fewer total missing items (for the work group subscales) and 4 or fewer missing items out of the 18 hospital administration subscale (for the manager and hospital administration analyses); the frequency distribution of the missing data counts appears at the end of Appendix D. The total amount of missing data may severely affect the construction of the correlation matrix, and subsequent structural equation modeling (Bollen, 1989).

These retained subjects have been used to develop a pairwise correlation matrix, which has then been used for subsequent analyses. A maximum likelihood extraction method with promax rotation has been employed. The number of factors extracted has been performed according to the "eigenvalues greater than one" rule, but the same result would have applied from examination of the scree plot.

An examination of the factor analysis and comparison with the a priori conceptions of Quality Management Climate developed in earlier chapters has lead to the development of several testable hypotheses. It is important to note that hypotheses one through six are tested using structural equation modeling, and as such are not statistically assessed the same way as hypotheses testing using general linear models. Structural equation modeling assesses hypotheses based on fit, while general linear models assess hypotheses based on rejecting a null hypothesis given a certain *p*-value. Nevertheless, even though these usages of the term *hypothesis* are different, this research retains this term to be consistent with the generally accepted literature in these two distinct areas.

The following list of hypotheses describes the investigations made.

Hypothesis 1A: There are two dimensions among the intra-group items.

Hypothesis 1B: One dimension of the work group subscale relates items describing <u>intra-group interaction</u>.

Hypothesis 1C: One dimension of the work group subscale relates items describing <u>intra-group action</u>.

Analysis of the subscale relating to general work groups in the hospital revealed the following hypotheses, which propose parallel dimensions to the intra-group case:

Hypothesis 2A: There are two dimensions among the intergroup items.

Hypothesis 2B: One dimension of the multiple work group subscale relates items describing <u>intergroup interaction</u>.

Hypothesis 2C: One dimension of the multiple work group subscale relates items describing <u>intergroup action</u>.

Analysis of the subscale relating to managerial items revealed that the following hypotheses would be tested:

Hypothesis 3A: *There are three distinct dimensions among the managerial items.*

Hypothesis 3B: *One dimension of the managerial subscale relates to active guidance.*

Hypothesis 3C: *One dimension of the managerial subscale relates to managerial dependent actions.*

Hypothesis 3D: *One dimension of the managerial subscale relates to managerial independent actions.*

Analysis of the subscale relating to hospital administration revealed the following testable hypotheses:

Hypothesis 4A: *There are three distinct dimensions among the hospital administration items.*

Hypothesis 4B: *One dimension of the hospital administration subscale relates to active guidance.*

Hypothesis 4C: *One dimension of the hospital administration subscale relates to customer project input.*

Hypothesis 4D: *One dimension of the hospital administration subscale relates to customer project output.*

Also, it is possible to test whether the items among the two work group subscales are distinct:

Hypothesis 5: There are four distinct dimensions among the two work group subscales.

And another test can be performed for the management items.

Hypothesis 6: There are six distinct dimensions among the managerial and hospital administration subscales.

Finally, tests are performed on the ability of the subscales to distinguish among the hospitals, given that the group membership is nested inside the hospital.

Hypothesis 7A: The dimension of <u>intra-group action</u> produces statistically significant differences among groups nested in hospitals.

Hypothesis 7B: The dimension of <u>intra-group interaction</u> produces statistically significant differences among groups nested in hospitals.

Hypothesis 7C: The dimension of <u>intergroup action</u> produces statistically significant differences among groups nested in hospitals.

Hypothesis 7D: The dimension of <u>intergroup interaction</u> produces statistically significant differences among groups nested in hospitals.

Hypothesis 7E: *The dimension of managerial active guidance produces statistically significant differences among groups nested in hospitals.*

Hypothesis 7F: *The dimension of managerial dependent action produces statistically significant differences among groups nested in hospitals.*

Hypothesis 7G: *The dimension of managerial independent action produces statistically significant differences among groups nested in hospitals.*

Hypothesis 7H: *The dimension of hospital administration active guidance produces statistically significant differences among groups nested in hospitals.*

Hypothesis 7I: *The dimension of hospital administration customer project input produces statistically significant differences among groups nested in hospitals.*

Hypothesis 7J: *The dimension of hospital administration customer project output produces statistically significant differences among groups nested in hospitals.*

Also, with some perceptual performance data collected, it is also possible to assess the relationship between the performance data (as a dependent variable) and the multiple dimensions of each subscale as independent variable. This type of test is established to examine the percent of variance associated with each performance metric as a function of four Quality Management Climate dimension groupings: intra-group, intergroup, individual managers, and hospital administration. These four groupings are used to test the independent variables, a decision made due to the moderate to large intercorrelations among the distinct dimensions, as well as the need to investigate the extent to which each performance variable could be assigned to each of the four groupings. Though separate tests are run for each of the eleven variables, the hypotheses below simply group each set of eleven tests into one of the four groupings:

Hypothesis 8: *The independent dimensions of the <u>intra-group subscale</u> account for a statistically significant percentage of variance for each hospital performance criterion.*

Hypothesis 9: *The independent dimensions of the <u>intergroup subscale</u> account for a statistically significant percentage of variance for each hospital performance criterion.*

Hypothesis 10: *The independent dimensions of the managerial subscale account for a statistically significant percentage of variance for each hospital performance criterion.*

Hypothesis 11: *The independent dimensions of the <u>hospital administration subscale</u> account for a statistically significant percentage of variance for each hospital performance criterion.*

The above eleven hypothesis are subsequently tested.

Hypotheses One through Four

Hypotheses one through four demonstrated strong evidence of construct validity (which includes convergent and discriminant validity) among the four chosen dimension groupings (intra-group, intergroup, managerial, and hospital administration). Output from the structural equation modeling appears in Appendix E.

Hypotheses Five and Six

The point of hypotheses five and six is to establish discriminant validity among the work group dimensions (hypothesis five) and among the manager and hospital administration dimensions (hypothesis six). Structural equation modeling provided strong evidence of construct validity (including discriminant validity among the dimensions), as shown in Appendix E.

Hypothesis Seven

This hypothesis examined differences among the original hospitals (assuming that groups are nested inside hospitals according to the traditional hospital administration model) based on using the factor dimensions derived as the dependent variables. The statistical procedure used is a general linear models approach. The factor dimensions used for each test are derived from the output of hypotheses one through four.

Factor scores are calculated by first subjecting the correlation matrix to common factor analysis, and extracting the number of appropriate factors (two for the work group dimensions and three for the managerial dimensions). This procedure also calculates a squared multiple correlation coefficient for each factor (which appear in a table below), as well as regression coefficients for weighting the different variables (weights for the regression factor scores appear in Appendix F). This regression method is contrasted with the unit weight method, in which each item within a factor is equally weighted.

Both scoring methods are applied to phase two data. The regression method has the restriction of full data (no missing data). The unit weight method is applied to allow for a moderate level of missing data, always requiring more than half of the items in the scale for a calculation to be made. For both methods, dividing the sum by the number of items in the scale allows for equivalent comparison among participants, particularly with missing data allowed; also, the resultant calculation may be compared with the original 1 to 5 survey response scale.

Factor Reliability

James, Mulaik and Brett (1982) caution the use of factor scores when the squared multiple correlation coefficient is equal to or less than 0.70. The following table lists three measures for each dimension tested: the squared multiple correlation coefficient, Cronbach alpha, and the Wolins' reliability equation (Efinger, 1984). Together, these three methods provide a picture of the reliability of the individual dimensions.

Table 14. Reliability Coefficients for Factor Scales

Quality Management Dimension	Squared Multiple Correlation	Cronbach Alpha	Wolins
Work Group Interaction	0.882	0.877	0.880
Work Group Action	0.855	0.799	0.801
Multiple Group Interaction	0.839	0.818	0.824
Multiple Group Action	0.854	0.832	0.838
Managerial Active Guidance	0.849	0.844	0.847
Managerial Dependent Actions	0.868	0.888	0.876
Managerial Independent Actions	0.855	0.843	0.838
Hosp Adm Active Guidance	0.865	0.862	0.860
Hosp Adm Cust Proj Input	0.832	0.768	0.766
Hosp Adm Cust Proj Output	0.883	0.886	0.884

The table above demonstrates consistency among the three methods for determining scale reliability. Most dimensions pass the 0.80 heuristic for computing factor scores, thus providing evidence of reliability for calculation of factor scores.

The analysis of variance tests for comparing each of the dimensions (by two scoring methods) with the independent variables of hospital and groups nested in hospital appear in Appendix G. For each of these tests, Crawford Long Hospital and Emory University Hospital are pooled together to allow for comparable total hospital sizes; this pooling is chosen because the phase two collection resulted in only 40 total surveys from Emory and 52 total surveys from Crawford Long, with even smaller numbers for each of the five nested groups (a complete breakdown of hospitals by group appears in Appendix D).

The table below summarizes the results of the analysis of variance runs by listing the *p*-values associated with the SAS Type III sums of squares, a partial sums of squares in which the hypothesis for each effect did not involve parameters of other effects except for containing effects, and the testing of which is invariant to the ordering of effects in the model (SAS, 1990):

Table 15. Summary of *p*-values for Dimensions by Hospital and Group

Dimension	Regression Scoring Hospital	Regression Scoring Group	Unit Weight Scoring Hospital	Unit Weight Scoring Group
Intra-group Interaction	0.0194	0.1004	0.0186	0.0144
Intra-group Action	0.0607	0.1698	0.1474	0.2732
Intergroup Interaction	0.0045	0.0929	0.0001	0.0378
Intergroup Action	0.0001	0.0855	0.0202	0.1270
Managerial Active Guidance	0.0540	0.4485	0.1453	0.4528
Managerial Independent Actions	0.0018	0.1949	0.0002	0.0059
Managerial Dependent Actions	0.4211	0.0349	0.3871	0.0154
Hosp Adm Active Guidance	0.0002	0.0587	0.0350	0.0334
Hosp Adm Cust Proj Input	0.0009	0.7739	0.0005	0.3292
Hosp Adm Cust Proj Output	0.0029	0.0321	0.0041	0.0333

The above table demonstrates that the dimensions developed in this research are generally able to distinguish differences among hospitals, and most of the *p*-values are significant at the 0.05 level; some scales are unable to distinguish among either hospitals or groups. In the regression scoring case, the hospitals are statistically distinguishable in every case; in the unit weight scoring case, the hospitals are distinguishable in all but two cases. For all tests the total R^2 value, however, is relatively low, indicating that the dimensions captured a relatively small effect, despite the general statistical significance; this small effect may relate to the original research design in which the hospitals themselves are the product of convenience rather than random selection (and are judged to be similar in Quality Management practices to participate in the first place); future studies may provide a stronger effect by:

- explicitly selecting hospitals at random, or,
- intentionally choosing hospitals which are thought to vary in Quality Management Climate.

Nevertheless, the above tests indicate that the items of the survey provide evidence of discriminant validity of Quality Management Climate dimensions among hospitals. For hospitals, this means that the survey has provided evidence that it can capture differences in Quality Management Climate among hospitals, and did so even among hospitals judged to be approximately similar in climate. The means and standard deviations of each of the ten dimensions overall and by group appear in Appendix H.

Further Investigation of Hypothesis Seven

In addition to the above analysis of variance, it is possible to determine the impact that all the demographic variables collectively had on the various constructed dimensions. The following table lists the demographic variables available for investigation (other than hospital and group membership):

Table 16. Demographic Variables Available

Label	Description	Coding	Frequency
MANHA	Manager in Hospital Administration	1=True, 2=False	True = 52.2%
MAN	Manage or Supervise Others	1=True, 2=False	True = 59.5%
WITHG1	Works with Physicians	0=No, 1=Yes	Yes = 56.4%
WITHG2	Works with Business	0=No, 1=Yes	Yes = 29.5%
WITHG3	Works with Nursing	0=No, 1=Yes	Yes = 42.0%
WITHG4	Works with Ancillary	0=No, 1=Yes	Yes = 44.1%
WITHG5	Works with Support	0=No, 1=Yes	Yes = 41.1%
GENDER	Sex	1=Female, 2=Male	Female = 73.5%
AGE	Age	Categorical Years	Median: 35-39
YHOSP	Years at this Hospital	Continuous Years	Avg = 8.5 years
YHEALTH	Years in Healthcare, Total	Continuous Years	Avg = 14.2 years
YPOS	Years at Current Position	Continuous Years	Avg = 8.4 years
YMAN	Years with Current Manager	Continuous Years	Avg = 3.8 years
YWG	Years with Current Work Group	Continuous Years	Avg = 4.8 years

In the above table, the variables labeled WITHG1 (for example) are coded as *Yes* for individuals who worked with physicians but who are not physicians.

The ten analysis of variance investigations which corresponded to dimensions by demographic variables appear in the following table. The table lists *p*-values associated with the SAS Type III sums of squares, a partial sums of squares in which the hypothesis for each effect did not involve parameters of other effects except for containing effects, and the testing of which is invariant to the ordering of effects in the model (SAS, 1990):

Table 17. Constructed Dimensions by Demographic Variables

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HOSP	0.0796	0.0796	**0.0109**	**0.0003**	0.9193	**0.0182**	0.3430	**0.0001**	**0.0001**	**0.0004**
GROUP	0.3555	0.3555	0.1218	**0.0406**	0.7547	0.7927	0.9398	**0.0051**	0.0941	0.0674
GROUP* HOSP	0.0735	0.0735	0.3803	0.6568	**0.0010**	0.1330	0.3634	0.0854	0.0859	0.7728
MANHA	0.5455	0.5455	0.6645	0.3748	0.2157	0.5761	0.5028	0.7716	0.0724	0.2482
MAN	0.8780	0.8780	0.0995	0.1910	0.5077	0.3112	0.1488	0.9236	0.2397	0.6328
WITHG1	0.0917	0.0917	0.5752	0.3030	0.4854	0.4936	0.8942	0.5395	0.1849	0.2354
WITHG2	0.3980	0.3980	0.0898	0.2417	0.5081	0.9377	0.2258	0.2894	0.2017	0.2009
WITHG3	0.4512	0.4512	0.4138	0.1028	0.9050	0.3349	0.4958	0.0647	0.4447	0.1659
WITHG4	0.6572	0.6572	0.7586	0.6092	0.2866	0.6277	0.7829	0.0619	0.2982	0.8416
WITHG5	0.5782	0.5782	0.7655	0.5782	0.6963	0.9096	0.7893	0.0663	**0.0265**	0.1105
GENDER	0.7062	0.7062	0.2615	0.3614	0.6387	0.8477	0.7060	0.1545	0.4436	0.0669
AGE	0.5829	0.5829	0.0509	0.1428	0.5579	0.8273	0.2315	0.2800	0.1432	0.0763
YHOSP	0.6511	0.6511	0.7533	0.2631	0.7132	0.7807	0.8694	0.5757	0.5411	0.8651
YHEALTH	0.7561	0.7561	**0.0128**	0.2760	0.3768	0.7100	0.2875	0.0737	0.2278	0.0559
YPOS	0.2681	0.2681	0.3909	0.9550	0.4485	0.7114	0.5104	0.2684	0.3329	0.8600
YMAN	0.2388	0.2388	0.3322	0.1021	0.2044	**0.0292**	0.1103	**0.0323**	**0.0374**	0.3454
YWG	0.5225	0.5225	0.7962	0.9710	0.0971	0.0754	0.2968	0.9018	0.4249	0.8904
R^2	0.1703	0.1459	0.2855	0.3399	0.2352	0.2451	0.2024	0.4346	0.5025	0.3754
n	247	247	182	182	194	194	194	121	121	121
Overall *p*-value	0.1226	0.3310	**0.0101**	**0.0004**	0.0554	**0.0348**	0.2005	**0.0048**	**0.0002**	**0.0467**

The table above shows in bold the *p*-values which are less than 0.05; all the coefficients between the demographic variables and the dimensions are positive. Also, the R^2, N (sample size), and overall *p*-value are listed at the bottom. In general, the table illustrates that hospital continued to be a significant factor for most dimensions, even when other demographic variables are added to the model.

The sample size is reduced by the following two requirements:

1. the dimensions could not have missing data, and
2. the demographic variables could not be missing either.

This reduction is almost 75% for the hospital administration dimensions. There might have been a systematic bias among the missing respondents which may lead to alternate hypotheses which explain the relationship among the dimensions and the demographic variables; to contrast, relatively larger sample sizes are available for the earlier investigation of hospital and group membership. Thus, no definitive conclusions are claimed for the relationship between dimension and the collective demographic variables, given the sparsity of the data and the need to investigate possible systematic errors in missing values; an investigation to understand the relationship between missing variables for dimensions and demographic items appears in Appendix I.

Specific Comparison of Hospitals

Fisher's LSD (least significant difference) has been used to compare each of the hospitals on the ten dimensions stated. The results of these comparisons appear in Appendix H. In summary, this procedure reveals statistically significant pairwise differences among the hospitals on each of the ten dimensions.

Graphical Comparison of Hospitals

Having established evidence of reliability for the factor scales as well as evidence of a statistically significant difference in dimensions across hospitals, it is possible to construct graphical displays of the averages of the dimensions by hospitals and groups. The purpose of displaying such graphs is to provide a visual means of reporting the data; however, it is important that these graphs merely support statistical conclusions made in other sections and tables, and cannot be used alone to make any decisions about statistically significant differences. In the following graphs, the hospitals are anonymously coded one through four; also, the groups are coded as follows:

- P = Physicians
- B = Business departments and hospital administration (e.g., Accounting, Information Systems, Marketing, Medical Records, Personnel, Purchasing)
- N = Nursing (e.g., Medical, Pediatric, Surgical)
- A = Ancillary (e.g., Outpatient, Clinics, Anesthesia, Emergency Room, Laboratory, Operating Room, Pharmacy, Physical Therapy, Occupational Therapy, Radiology)
- S = Support (e.g., Food, Housekeeping, Laundry, Maintenance, Plant Operations)

The following figure displays the average of the intra-group interaction dimension plotted against the average of the intra-group action dimension:

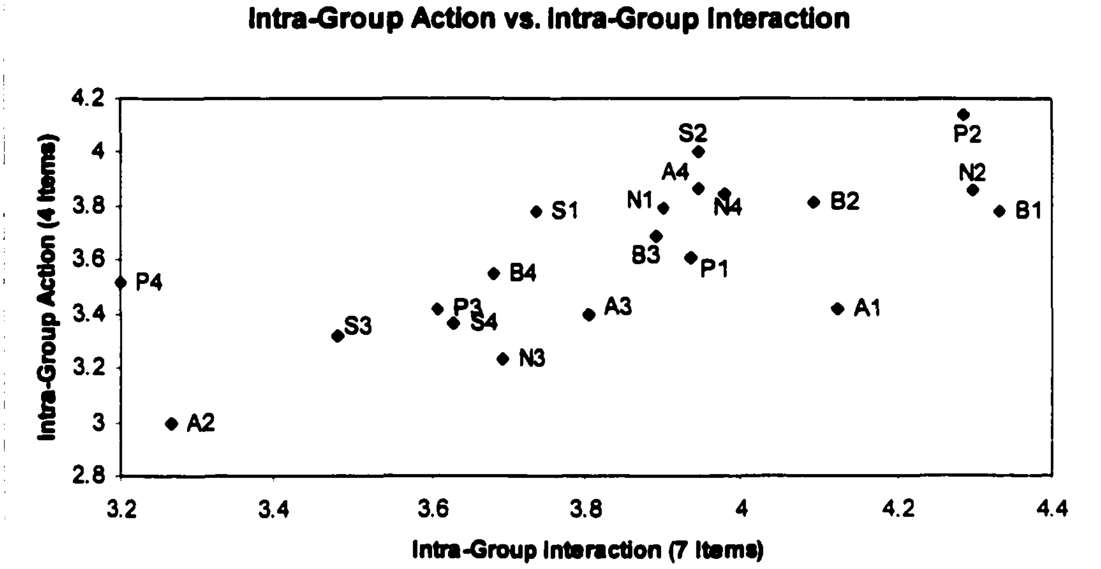

Figure 18. Intra-group Action versus Intra-group Interaction

Statistical comparisons have been performed using Fisher's LSD, the results of which appear in Appendix H; the reader is warned against making statistical inferences from the above graph alone. Also in Appendix H is the table of means and standard deviations used to construct the above graph. In the above figure, hospitals one and three tended to cluster together. The other two hospitals had a more dispersed pattern. The above figure supports the earlier analysis of variance which indicated that hospitals are more distinct than groups; additionally, the above figure shows a general correlation among the two plotted dimensions, a result which is described by the structural equation modeling. Also interesting on the above figure is that hospital two has four groups which are clustered together, with its Ancillary component significantly separated from the other four clusters; this is an example of intra-hospital variance which may lead to appropriate management action upon further investigation.

The next figure displays the plot of intergroup action versus intergroup interaction:

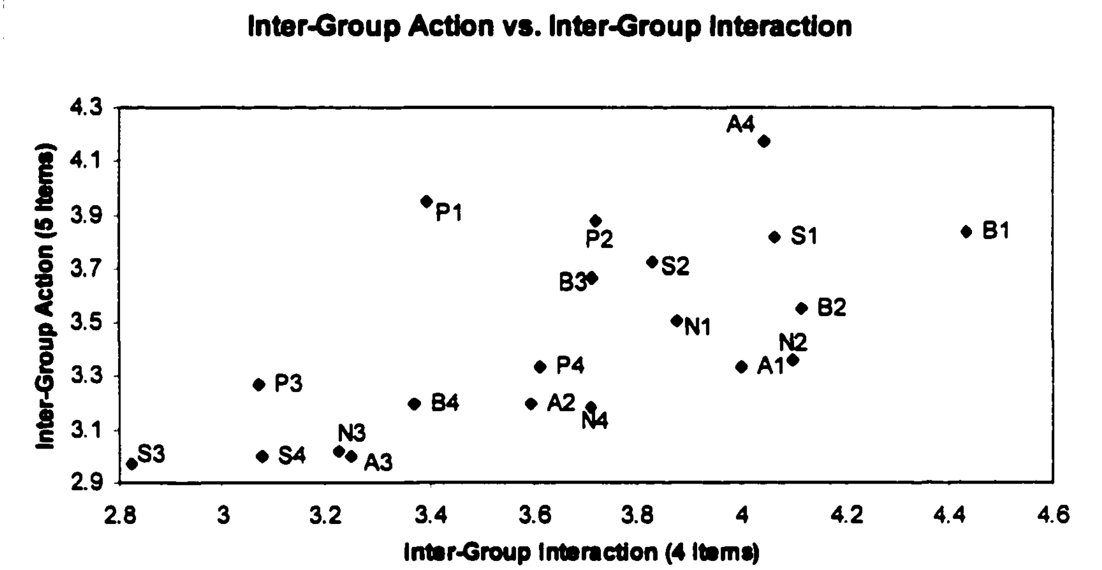

Figure 19. Intergroup Action versus Intergroup Interaction

Statistical comparisons have been performed using Fisher's LSD, the results of which appear in Appendix H; the reader is warned against making statistical inferences from the above graph alone. Also in Appendix H is the table of means and standard deviations used to construct the above graph. Again, hospitals one and three tended to fall into groups, and in this instance hospital two also clustered as a group. The strong correlation between the intergroup action and interaction items can be seen in the above figure.

The next figure plots manager dependent action versus manager independent action:

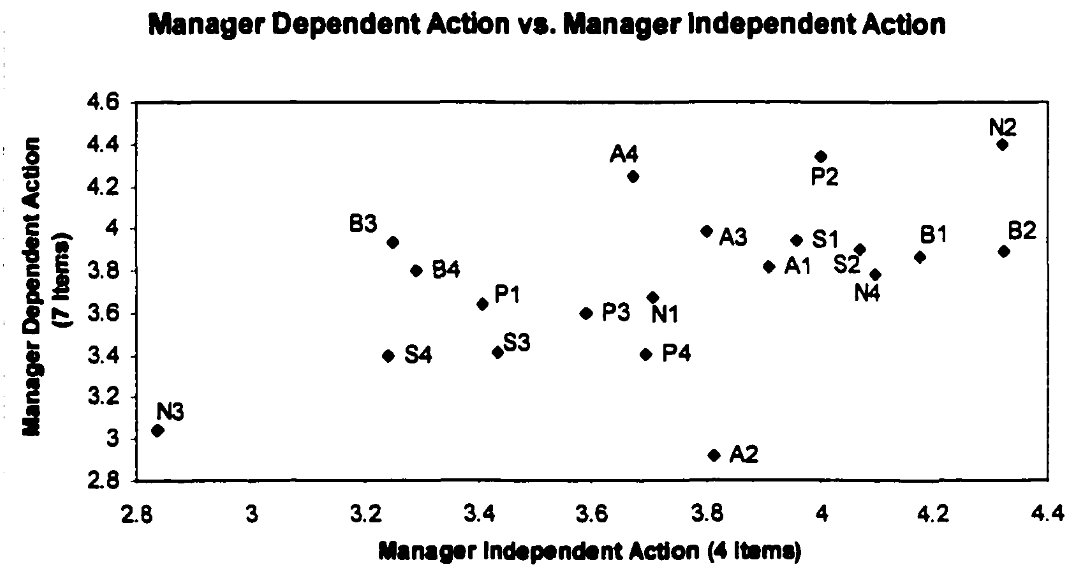

Figure 20. Manager Dependent Action versus Manager Independent Action

Statistical comparisons have been performed using Fisher's LSD, the results of which appear in Appendix H; the reader is warned against making statistical inferences from the above graph alone. Also in Appendix H is the table of means and standard deviations used to construct the above graph. Hospitals one and three again appeared to cluster as groups; also, hospital four emerged as a cluster in this example. There is a general positive correlation between the independent action dimension and the dependent action dimension, supporting the earlier derived structural path coefficients.

The next figure plots two hospital administration dimensions:

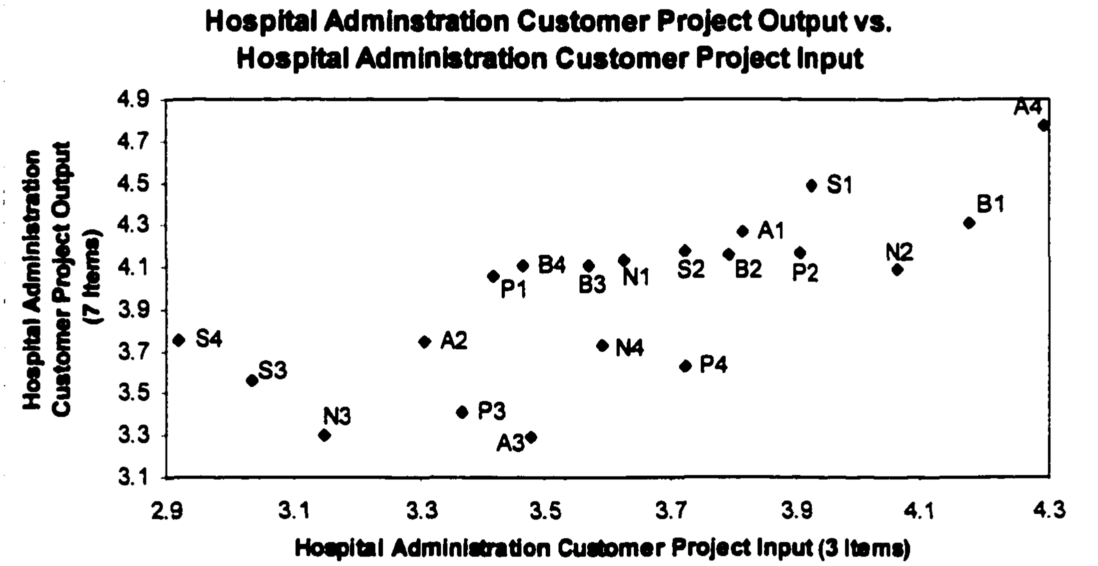

Figure 21. Hospital Administration Customer Project Output versus Hospital Administration Customer Project Input

Statistical comparisons have been performed using Fisher's LSD, the results of which appear in Appendix H; the reader is warned against making statistical inferences from the above graph alone. Also in Appendix H is the table of means and standard deviations used to construct the above graph. The above figure also displayed the clusters among groups in hospitals one and three. The fact that these hospitals tended to consistently cluster across all four figures is consistent with the structural equation model correlations, which showed the dimensions to be highly interrelated. Other related graphs appear in Appendix H. In general, none of the figures clearly showed a particular hospital to be completely distinct from the other hospitals, which is consistent with the relatively low R^2 values associated with the first analyses of variance; this small effect may be due to the convenient rather than random selection of hospitals under phase two.

Hypotheses Eight through Eleven

Hypotheses eight through eleven dealt with making the Quality Management Climate dimensions as independent variables and the eleven hospital performance measures as dependent variables. It is important to note up front that the performance metrics have been based on the National Survey of Hospital's Efforts to Improve Quality (AHA, 1993c), in which the performance metrics and structural characteristics of the organization are simultaneously collected on the same survey; by a similar procedure, the performance metrics and the elements of the developed Quality Management Climate scale have been assessed using the same survey, a factor which may be a threat to the internal validity of the results. Thus, the hypotheses tested assessing the connection between Quality Management Climate and performance should be interpreted with caution.

As in hypothesis seven, there are two computation methods for the factor scores, one using regression coefficients and the other using unit weights, each method applied only to phase two data (since performance variables are not collected in phase one). Also, it has been decided to pool similar dimensions together, so that the comparison would consider each of four possible sources of Quality Management Climate variance:

- intra-group
- intergroup
- individual managers
- hospital administration

Matching these four sources, times eleven performance variables, times two methods of factor scoring results in a total of 88 analyses of variance. For these tests, interactions are not considered mostly because the results already showed a high degree of statistical significance. An independent examination provided statistically significant positive correlations between the individual dimensions and the individual performance criteria.

Instead of reprinting the 88 analyses of variance, the following table reprints only the R-squared value for each of 88 runs. This R-squared value represents the total amount of variance accounted for by the particular dimension grouping:

Table 18. Comparison of Performance Variance (R-squared value) Accounted for by Dimension Grouping

	Intra Group		Intergroup		Manager		Hospital Administration	
Variable	Regression	Unit Weight	Regression	Unit Weight	Regression	Unit Weight	Regression	Unit Weight
Reducing Patient Costs	0.210	0.212	0.120	0.117	0.206	0.203	0.152**	0.137*
Reducing Overall Costs	0.301	0.302	0.196	0.188	0.247	0.251	0.229	0.223
Reducing Work Errors	0.340	0.334	0.144	0.154	0.292	0.289	0.193	0.199
Reducing Hosp. Admin. Complaints	0.211	0.210	0.199	0.201	0.196	0.179	0.225	0.226
Reducing Physician Complaints	0.260	0.253	0.200	0.201	0.193	0.190	0.222	0.228
Reducing Nursing Complaints	0.245	0.240	0.181	0.183	0.142	0.140	0.249	0.250
Reducing Patient Complaints	0.207	0.196	0.114	0.108	0.144	0.137	0.191	0.196
Increase Hosp Admin Satisfaction	0.210	0.209	0.202	0.208	0.212	0.209	0.291	0.288
Increase Physician Satisfaction	0.319	0.318	0.172	0.176	0.267	0.259	0.220	0.221
Increase Nursing Satisfaction	0.289	0.287	0.199	0.209	0.188	0.183	0.326	0.325
Increase Patient Satisfaction	0.293	0.284	0.111	0.109	0.207	0.205	0.198	0.207
For all tests $p<0.0001$, except *$p=0.0011$ **$p=0.0004$								

Thus, the dimension groupings accounted for about 10 to 30 percent of the variance of different hospital performance measures. This table also highlighted an important design feature of the survey, namely that the administrator could focus efforts in specific directions rather than relatively vague management concepts alone. The above table could be used to understand the relationship between Quality Management Climate dimensions with the specific organizational units (work group) and reporting relationships (manager and hospital administration) of the hospital.

The above table is even more insightful when comparisons are made for specific performance variables across the different dimensions. For example, note that hospital administration activity accounts for over 30% of the variance in increasing nursing satisfaction. As seen in the chart, individual work group interaction and action accounted for the majority of the variance of most variables, in many cases even more than the individual managers. These results would support the popular Quality Management notion that hierarchical structure cannot guarantee the gains that interactive work teams can (and for this research the work group is generally cross-functional, spanning several departments). These results do not imply that managers act independently of work groups, nor that managerial activity is not a necessary condition for work group effectiveness; these issues could however be investigated in future research.

Nevertheless, the test for hypothesis eight provided an important demonstration of criterion-related validity which James (1973) argues is necessary for constructing a nomological network, originally proposed by Cronbach and Meehl (1955). This network has been described in this present work partly by the proposed model of Quality Management Climate, in which the process factors are hypothesized to have a positive impact on the production of quality goods and services. Additionally, the earlier diagram linking specific Quality Management dimensions with various performance measures captured another aspect of the nomological network. As McArdle (1996) described, a complete nomological network also includes causal variables to demonstrate a level of exogenous validity; his proposal indicates that structural equation modeling can provide a means of testing the hypothesis that various latent dimensions result from other external influences. While this research does not cover the scope of McArdle's proposal, it demonstrated a high degree of statistical significance for selected hospital performance criteria.

For hospitals, hypotheses eight through eleven provided a limited demonstration of how hospital performance could be attributed to a specific dimension grouping. The information above could indicate patterns in Quality Management Climate in many hospitals, which in general indicate that intra-group dynamics generally have a strong effect on the hospital performance metrics chosen. These dynamics included not only intra-group action, but also intra-group interaction; the strong correlation among these two dimensions indicated that both are important to the included variables of hospital performance. The general case would include expanding the scope and definition of hospital performance variables used to examine other possible relationships.

Examining the Structural Nature of Hospital Performance

As an extension of the above investigation, this study next asks about the relationship between the demographic variables and the performance variables. For this study, it has been decided to classify the demographic variables into two groups, modifiable and non-modifiable; these classifications appear in the following table:

Table 19. Classification of Demographic Variables

Label	Type	Description	Coding
MANHA	Modifiable	Manager in Hospital Administration	1=True, 2=False
MAN	Modifiable	Manage or Supervise Others	1=True, 2=False
WITHG1	Modifiable	Works with Physicians	0=No, 1=Yes
WITHG2	Modifiable	Works with Business	0=No, 1=Yes
WITHG3	Modifiable	Works with Nursing	0=No, 1=Yes
WITHG4	Modifiable	Works with Ancillary	0=No, 1=Yes
WITHG5	Modifiable	Works with Support	0=No, 1=Yes
YMAN	Modifiable	Years with Current Manager	Continuous Years
YWG	Modifiable	Years with Current Work Group	Continuous Years
GENDER	Non-modifiable	Sex	1=Female, 2=Male
AGE	Non-modifiable	Age	Categorical Years
YHOSP	Non-modifiable	Years at this Hospital	Continuous Years
YHEALTH	Non-modifiable	Years in Healthcare, Total	Continuous Years
YPOS	Non-modifiable	Years at Current Position	Continuous Years

The purpose of classifying the demographic variables includes investigating the relationship between the performance variables and non-modifiable variables (such as sex and age), as contrasted with the relationship between the performance variables and variables which could be changed (such as managerial status, and with which group the individual works). The dimensions have been assumed to be modifiable.

The next table provides a summary of the analyses of variance between the non-modifiable factors and the eleven performance criteria. The table lists *p*-values associated with the SAS Type III sums of squares, a partial sums of squares in which the hypothesis for each effect did not involve parameters of other effects except for containing effects, and the testing of which is invariant to the ordering of effects in the model (SAS, 1990):

Table 20. Hospital Performance Criteria by Non-modifiable Demographic Variables

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HOSP	**0.0091**	**0.0013**	0.4305	0.1024	0.4666	0.1877	0.0906	0.1977	0.3287	**0.0254**	0.0923
GROUP	0.7058	0.6130	0.0864	0.1450	0.2755	0.9324	0.1301	0.5316	**0.0326**	0.8899	**0.0381**
HOSP* GROUP	0.0889	0.3456	0.3007	0.1761	0.2766	0.5034	0.5493	0.8036	0.8941	0.9061	0.1798
GENDER	0.4792	0.8732	0.1287	0.8111	0.8970	0.7915	0.9514	0.3095	0.1402	0.3324	0.6251
AGE	0.2100	0.2994	0.7310	0.4491	**0.0313**	0.2197	0.2537	0.5218	0.6036	0.5616	0.1460
YHOSP	0.2805	0.7201	0.1663	**0.0363**	0.1342	0.2850	0.1457	0.3578	0.3872	0.4482	0.1990
YHEALTH	0.2798	0.1462	0.2406	0.1734	0.0755	0.2891	0.2505	0.3149	0.0900	**0.0421**	**0.0093**
YPOS	0.1622	0.1343	**0.0116**	**0.0262**	0.1090	0.1587	**0.0493**	0.1462	**0.0486**	**0.0215**	**0.0014**
R^2	0.2023	0.2021	0.1102	0.1705	0.1320	0.0925	0.1312	0.0972	0.1156	0.1101	0.1797
n	209	222	303	202	251	248	241	206	254	258	249
Overall *p*-value	**0.0076**	**0.0035**	0.0895	0.067	0.0935	0.5379	0.1297	0.719	0.2037	0.2421	**0.0039**

In the above table, the bold figures indicate *p*-values which are less than 0.05; also, all of the coefficients for the demographic variables are positive. In some cases, hospital is a statistically significant factor; in many cases, years in current position had a strong correlation with the level of positive performance perception. The statistical run above, however, again demonstrated a large number of missing variables, in some cases above fifty percent; this missing data may represent a systematic bias in the results above, and perhaps represent alternative hypotheses which may explain the interpretation of the data.

Modifiable Demographic Variables

The next tables describe analyses of variance when the modifiable variables are added to each of the four groupings individually (one each for intra-group, intergroup, managerial, and hospital administration). These are not performed together in one analysis, since the dimensions are highly interrelated, and since the objective is to contrast how the R^2 value would increase with the addition of modifiable variables.

In general, the four tables below indicated that a higher amount of variance is attributed to modifiable variables as opposed to non-modifiable variables. Additionally, in general, there is only a small to moderate increase in the R^2 value when compared to the performance variables versus the dimensions alone.

The next table summarizes the results for the intra-group dimensions and modifiable demographic variables versus the performance criteria. The table lists *p*-values associated with the SAS Type III sums of squares, a partial sums of squares in which the hypothesis for each effect did not involve parameters of other effects except for containing effects, and the testing of which is invariant to the ordering of effects in the model (SAS, 1990):

Table 21. Performance Criteria versus Modifiable Demographics and Intra-group Dimensions

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Intra-Group Interaction	**0.0092**	**0.0033**	**0.0005**	**0.0005**	**0.0065**	**0.0009**	**0.0041**	**0.0001**	**0.0001**	**0.0001**	**0.0001**
Intra-Group Action	**0.0308**	**0.0002**	**0.0001**	0.2024	**0.0023**	**0.0118**	**0.0124**	0.3836	**0.0156**	**0.0062**	**0.0136**
MANHA	0.4535	0.0634	0.3567	0.2121	0.1768	0.1116	**0.0376**	0.5707	0.3262	0.2700	0.1402
MAN	0.3232	0.1238	0.4514	0.1667	0.0649	0.0539	0.0609	0.1036	0.0848	**0.0175**	0.0884
WITHG1	0.9123	0.2302	0.4258	0.1156	0.3792	0.6469	0.0602	0.2121	**0.0134**	0.7291	**0.0184**
WITHG2	0.1327	0.2015	0.5501	0.0944	0.4033	0.6484	0.2790	0.3283	0.6317	0.8596	0.4904
WITHG3	0.1998	0.3043	0.6116	0.8291	0.2590	0.7843	0.5246	0.9320	0.9346	0.3279	0.5043
WITHG4	0.4586	0.9067	**0.0097**	0.1916	0.5639	0.7713	0.4041	0.7291	0.2235	0.5670	0.1825
WITHG5	0.3198	**0.0004**	0.4354	0.4016	0.9117	0.1597	0.2659	0.2443	0.6281	**0.0467**	0.2167
YMAN	0.7965	0.0531	0.0781	0.8989	0.9078	0.9657	0.1788	0.7213	0.7934	0.6401	0.5812
YWG	0.7395	0.6380	0.0647	0.8081	0.6214	0.9798	0.1002	0.0941	0.1624	0.9134	0.6966
R^2	0.2277	0.3872	0.3742	0.2557	0.2814	0.2670	0.2721	0.2591	0.3942	0.3147	0.3361
n	168	179	226	167	198	196	190	166	191	195	190
Overall *p*-value	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0001**

The above table has in bold the *p*-values which are less than 0.05; also the underlined numbers represent effects with negative coefficients. In the above table, intra-group interaction continued to be a strong predictor of hospital performance. However, the small sample sizes reported may be due to a systematic bias, and alternative hypotheses are possible.

The next table summarizes the results for the intergroup dimensions and modifiable demographic variables versus the performance criteria. The table lists *p*-values associated with the SAS Type III sums of squares, a partial sums of squares in which the hypothesis for each effect did not involve parameters of other effects except for containing effects, and the testing of which is invariant to the ordering of effects in the model (SAS, 1990):

Table 22. Performance Criteria versus Modifiable Demographics and Intergroup Dimensions

Inter-Group Interaction	0.3164	0.0356	0.0948	0.0935	0.0643	0.1617	0.4441	0.0427	0.1827	0.0680	0.3454
Inter-Group Action	0.4408	0.4097	0.1129	0.1153	0.1870	0.1132	0.1033	0.1279	0.0759	0.2085	0.1976
MANHA	0.3326	0.4349	0.4042	0.4110	0.1852	0.4866	0.1690	0.5311	0.3124	0.7944	0.3346
MAN	0.1498	0.0435	0.5670	0.1357	0.3621	0.2020	0.1862	0.1455	0.6269	0.0746	0.2321
WITHG1	0.8754	0.2737	0.0994	0.1113	0.8695	0.9429	0.1289	0.1656	0.2658	0.6679	0.0474
WITHG2	0.0638	0.1366	0.6433	0.0173	0.1052	0.1054	0.0552	0.0758	0.3087	0.1503	0.0782
WITHG3	0.0642	0.4641	0.6611	0.1931	0.0554	0.8321	0.2131	0.0876	0.2990	0.5784	0.0831
WITHG4	0.5478	0.5771	0.0547	0.2846	0.9086	0.8614	0.9560	0.6296	0.5382	0.6695	0.3684
WITHG5	0.5706	0.0168	0.8520	0.3530	0.6955	0.5181	0.6445	0.2443	0.8432	0.2857	0.5042
YMAN	0.8437	0.2564	0.2587	0.9360	0.3882	0.7968	0.4634	0.6814	0.3780	0.9493	0.4441
YWG	0.8381	0.6251	0.2566	0.3804	0.3144	0.4480	0.6942	0.0138	0.8463	0.6296	0.7555
R^2	0.1508	0.2543	0.2056	0.2290	0.2146	0.1925	0.1731	0.2718	0.2062	0.2058	0.1733
n	130	143	169	137	155	147	141	142	153	151	142
Overall *p*-value	0.0451	0.0001	0.0001	0.0004	0.0002	0.0017	0.0081	0.0001	0.0004	0.0005	0.0075

The above table has in bold the *p*-values which are less than 0.05; also the underlined numbers represent effects with negative coefficients. In the above table, intergroup interaction is not always a strong (sole) predictor of hospital performance; this finding may indicate that intergroup dynamics are highly correlated with the modifiable demographic variables listed, since the overall *p*-value is significant. However, the small sample sizes reported may be due to a systematic bias, and alternative hypotheses are possible.

The next table summarizes the results for the managerial dimensions and modifiable demographic variables versus the performance criteria. The table lists *p*-values associated with the SAS Type III sums of squares, a partial sums of squares in which the hypothesis for each effect did not involve parameters of other effects except for containing effects, and the testing of which is invariant to the ordering of effects in the model (SAS, 1990):

Table 23. Performance Criteria versus Modifiable Demographics and Managerial Dimensions

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Manager Independent Action	0.6528	0.4483	**0.0460**	**0.0120**	0.0982	0.1656	**0.0240**	**0.0368**	**0.0039**	**0.0374**	**0.0315**
Manager Dependent Action	0.9942	0.7247	0.7777	0.2176	0.8658	0.8325	0.7034	0.8188	0.8850	0.7236	0.7414
Manager Active Guidance	**0.0014**	**0.0001**	**0.0001**	**0.0122**	0.0577	0.0766	0.2455	0.1068	**0.0319**	**0.0365**	0.1473
MANHA	0.2208	0.0874	0.4143	0.6640	**0.0342**	0.1585	0.1728	0.5481	0.2427	0.3658	0.1353
MAN	**0.0239**	**0.0171**	0.8470	0.1338	0.4990	0.4342	0.2081	**0.0463**	0.2909	**0.0390**	0.2000
WITHG1	0.9761	0.6772	0.6817	**0.0468**	0.7882	0.8015	0.1183	0.3676	0.1110	0.9858	0.0746
WITHG2	0.1275	0.1572	0.9760	0.1317	0.1895	0.0644	**0.0283**	0.0968	0.3611	0.2293	0.0592
WITHG3	0.0596	0.2034	0.8198	0.4650	0.0957	0.8640	0.1311	0.4612	0.4301	0.5578	0.1441
WITHG4	0.4929	0.4696	**0.0477**	0.5033	0.7565	0.4863	0.7993	0.3814	0.8600	0.2566	0.9630
WITHG5	0.0517	**0.0002**	0.5349	0.1105	0.7223	0.0798	0.1121	0.2416	0.6063	0.1471	0.1180
YMAN	0.5071	0.6327	0.6940	0.9905	0.7094	0.8967	0.2749	0.6486	0.9178	0.9092	0.7998
YWG	0.1514	0.1195	0.8528	0.5793	0.5280	0.4147	0.2577	0.0845	0.9443	0.5194	0.6470
R^2	0.2462	0.3290	0.2905	0.2206	0.1887	0.1565	0.2015	0.2362	0.2820	0.1916	0.2268
n	140	149	179	134	160	158	152	140	159	159	155
Overall *p*-value	**0.0002**	**0.0001**	**0.0001**	**0.0017**	**0.0015**	**0.0126**	**0.0012**	**0.0004**	**0.0001**	**0.0013**	**0.0002**

The above table has in bold the *p*-values which are less than 0.05; also the underlined numbers represent effects with negative coefficients. In the above table, managerial independent action and managerial active guidance are significant effects in many of the runs; managerial dependent action is generally not significant alone, because of the high intercorrelation among the dimensions. However, the small sample sizes reported may be due to a systematic bias, and alternative hypotheses are possible.

The next table summarizes the results for the managerial dimensions and modifiable demographic variables versus the performance criteria. The table lists *p*-values associated with the SAS Type III sums of squares, a partial sums of squares in which the hypothesis for each effect did not involve parameters of other effects except for containing effects, and the testing of which is invariant to the ordering of effects in the model (SAS, 1990):

Table 24. Performance Criteria versus Modifiable Demographics and Hospital Administration Dimensions

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hosp Admin Cust Proj Output	0.1060	0.1470	0.6228	0.6821	0.7754	0.5336	0.1496	0.1423	0.2241	0.2182	0.3099
Hosp Admin Active Guidance	0.2658	0.0558	0.4482	0.1824	0.3388	0.2381	0.8583	0.2281	0.3918	0.8172	0.9546
Hosp Admin Cust Proj Input	**0.0287**	**0.0181**	**0.0357**	0.2153	0.1711	0.1677	0.1199	0.2521	0.2610	**0.0055**	**0.0353**
MANHA	0.5975	0.3947	0.7427	0.8186	0.2673	0.8461	**0.0289**	0.5140	0.2242	0.8547	0.0792
MAN	**0.0260**	**0.0393**	0.8378	**0.0246**	0.1735	**0.0433**	**0.0353**	**0.0284**	0.2059	**0.0042**	**0.0390**
WITHG1	0.8443	0.5711	0.4380	0.4152	0.7736	0.7132	0.3632	0.7402	0.5849	0.6311	0.4340
WITHG2	**0.0039**	**0.0194**	0.5579	**0.0047**	**0.0110**	**0.0124**	**0.0016**	**0.0075**	**0.0103**	**0.0201**	**0.0047**
WITHG3	0.0591	0.3875	0.2287	0.1660	0.1555	0.9966	**0.0296**	0.0632	0.0688	0.7934	**0.0113**
WITHG4	0.7272	0.8568	0.0729	0.9030	0.3261	0.2761	0.4871	0.4507	0.9005	0.1560	0.9800
WITHG5	0.4320	**0.0065**	0.9827	0.4862	0.7987	0.4326	0.0552	0.8841	0.8075	0.4864	0.1494
YMAN	0.5563	0.4303	0.5505	0.3386	0.4371	0.2778	0.5708	**0.0211**	0.3172	0.2106	0.5093
YWG	0.6513	0.9407	0.1574	0.0706	0.1987	**0.0072**	0.8741	**0.0044**	0.4553	**0.0210**	0.1808
R^2	0.2708	0.3458	0.2542	0.3114	0.2675	0.3344	0.3425	0.4255	0.3307	0.4257	0.3343
n	93	102	114	99	107	107	100	105	105	108	103
Overall *p*-value	**0.0083**	**0.0001**	**0.0019**	**0.0007**	**0.0021**	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0001**

The above table has in bold the *p*-values which are less than 0.05; also the underlined numbers represent effects with negative coefficients. In the above table, non-managers and working with hospital administration are significant effects in many of the runs; the dimensions are generally not significant, perhaps due to the high intercorrelation between the dimensions and the modifiable variables. However, the small sample sizes reported may be due to a systematic bias, and alternative hypotheses are possible; as in earlier statistical runs, the level of data missing with hospital administration is higher than the cases for the other four groupings. An investigation to understand the level of missing data among the performance variables appears in Appendix I.

Missing Data Differences Between Phases One and Two

As mentioned previously, the survey developed for phase one is different from the phase two survey because it included the "Don't Know or N/A" category for all the items, at the request of the various hospitals that distributed the phase one survey. Thus, the validation results of the models above should be taken with caution since the surveys are technically not identical. In addition, six items are worded slightly different; this does not invalidate the overall scale validation, but does mean that the results for the additional confirmation evidence, particularly related to the managerial and hospital administration scales, should be also accepted with caution.

To test the effect of adding in a missing variable, the data from phase one and phase two are pooled together into one SAS data set (SAS, 1990). Then, dummy variables are created for each of the 64 items in the survey, with the value of one referring to missing and the value of zero referring to not missing. An additional variable is also created to track which phase a specific participant originally belonged to. Having done these steps, it is possible to propose the following hypothesis:

Hypothesis 12: ***There are no significant differences in the level of missing data between the convenient sample of phase one (which did not explicitly invite non-response) and the random sample of phase two (which added a "Don't Know or N/A" category).***

This hypothesis is tested by examining each of the 64 variables, and the chosen statistic is the chi-square test; thus, there are actually sixty-four hypotheses to test in order to investigate the general question. The following tables summarize the level of *p*-value for the 955 subjects examined (509 from phase one and 446 from phase two).

Table 25. Analysis of Missing Data for Intra-group and Intergroup Items

Intra-Group		Intergroup	
Item	*p*-value	Item	*p*-value
Q6	0.001	Q5	0.001
Q16	0.016	Q15	0.001
Q20	0.001	Q19	0.001
Q22	0.001	Q21	0.001
Q26	0.239	Q25	0.001
Q32	0.001	Q31	0.001
Q34	0.001	Q33	0.001
Q38	0.022	Q37	0.001
Q46	0.001	Q45	0.001
Q48	0.549	Q47	0.001
Q50	0.001	Q49	0.001
Q54	0.001	Q53	0.001
Q58	0.001	Q57	0.001
Q62	0.001	Q61	0.001

Overall, the above table showed a high degree of statistical significance for most variables. Q48 is an anomaly: "People within our work group cooperate with each other" which had a total of 8/509 missing in phase one and 5/446 missing in phase two. Q26 is another anomaly: "Our work group effectively improves our group's goals" which had a total of 9/509 missing for phase one and 13/446 missing for phase two. For the remaining variables, the above table provided the chi-square results for the work group items, and indeed there is statistically significant differences in rate of missing data between the two test administrations. The next table summarized the managerial and hospital administration items.

Table 26. Analysis of Missing Data for Manager and Leadership Items

Manager		Hospital Administration	
Item	*p*-value	Item	*p*-value
Q2	0.001	Q1	0.001
Q4	0.001	Q3	0.001
Q8	0.004	Q7	0.001
Q10	0.001	Q9	0.001
Q12	0.009	Q11	0.001
Q14	0.001	Q13	0.001
Q18	0.001	Q17	0.001
Q24	0.039	Q23	0.001
Q28	0.001	Q27	0.001
Q30	0.001	Q29	0.001
Q36	0.001	Q35	0.001
Q40	0.007	Q39	0.001
Q42	0.001	Q41	0.001
Q44	0.001	Q43	0.001
Q52	0.001	Q51	0.001
Q56	0.001	Q55	0.001
Q60	0.931	Q59	0.001
Q64	0.001	Q63	0.001

Item Q60 is an anomaly: "My manager provides timely feedback to me" which had a total of 13/509 missing for phase one and 11/446 missing in phase two. For the other variables, there are statistically significant differences, indicating that based on these sixty-four tests, the majority of the tests indicated that hypothesis twelve should be rejected at the 0.05 level. Collectively, the above tests provide evidence that the rate of significant differences in the two survey administrations had to do with allowing the hospital participants to not answer certain questions. Perhaps future investigations could further examine the nature of these missing variables.

Conclusion

This chapter presented the basic results of the research, by first developing the justification for using specific statistical techniques, then developing eleven testable research hypotheses consistent with the original objectives for developing the survey, and testing these eleven hypotheses. The tests revealed goodness of fit measures for the structural equation models which demonstrated construct validity (including both convergent and discriminant validity) among the manifest variables in four subscales. Subsequent tests demonstrated that the dimensions defined successfully discriminate among hospitals, as described by both analysis of variance and graphically. Finally, the Quality Management Climate dimensions account for varying amounts of variance in the collected hospital performance measures, demonstrating a level of criterion-related validity that management may act on. The analysis of phase one data needs to be taken with caution, given the statistically significant differences in missing data (probably due to the explicit invitation for non-response); also, the individual runs need to be examined with caution, as each run demonstrated varying levels of missing data within phase two, thus also opening up the possibility for alternative hypotheses.

CHAPTER VIII

COMMUNICATING RESULTS

This chapter discusses some important issues to be considered in communicating the survey results. First, this chapter identifies the stated primary customer of this research and suggests specific ideas for focusing the results. Second, this chapter identifies specific theoretical implications for researchers. Third, there are several ethical considerations associated with the reporting and usage of the information generated from this survey, chiefly anonymity.

Benefits for Hospitals

The stated goal is to focus on hospitals as the immediate direct customer, since it has been identified as a major single expense within the healthcare industry.

Basic Assessment

The overall stated goal of this research is to provide a low cost and simple way for hospitals to generate an understanding of how some Quality Management principles had penetrated the management structure of the organization and are making a difference in daily work. As such, the survey focused on the dynamic relationship processes that occur as part of daily management. The substantive content of the survey has been built from a synthesis of quality expert literature, and matched the real-world situation in which administrators and other hospital professionals must be concerned simultaneously with a variety of management issues. The construction of the dimensions has been based on what hospital professionals judged to be important, inasmuch as these professionals formed the general population under the research design.

Systems Focus

The assessment provided does not directly assess Quality Management departments. The title is not "Quality Management Director Assessment" or "Quality Management Department Assessment." Should some hospitals choose to misinterpret the results this way, it should be quickly acknowledged that the survey had four specific subscale focuses:

- Work within departments (intra-group)
- Work between departments (intergroup)
- Individual Managers (as a group)
- Hospital Administration (as a group)

Since hospital administration has been considered a major functional category within the survey development, it would be unlikely to construct a plausible argument that the Quality Management director or department would be directly responsible for the variance demonstrated on the dimensions.

Over time, however, the survey may provide a contribution to assessing the implementation of Quality Management as practiced. The limited scope and nature of the survey necessarily leads to the caveat that additional sources of assessment should be considered.

Helping Quality Management Directors

On the other hand, Quality Management directors or departments may use the results of the survey to gain a sense of how different areas within a hospital perceive the Quality Management Climate. The exhaustive listing of hospital departments by five major participant categories provides a way to contrast major subgroups within a specific hospital. Other research assessed Quality Management implementation by weeks or months, using time to distinguish among hospitals; however with the necessity to meet Joint Commission standards, being ahead will be determined not by when Quality Management has been started, but by what these Quality Management departments are doing. Knowledge, information, and skills will separate which quality management departments will surpass others, and the survey can provide insight into all three areas:

- Knowledge: Hospitals can assess Quality Management Climate on ten latent dimensions in five participant categories (this knowledge has been demonstrated by the construction of specific dimensions).
- Information: Hospitals can determine specific information regarding which management areas are strong or weak across these participant categories (this information has been provided by the graphical displays and accompanying analyses of variance which demonstrated hospital clusters).

- Skills: Hospitals can tailor its current skill base to remedy weaknesses and enhance strengths (the skills portion has been addressed by the investigation of modifiable variables and latent dimensions, areas which hospital management may be able to change).

The following diagram summarizes a basic process of using the survey as a continuous assessment tool for Quality Management Climate:

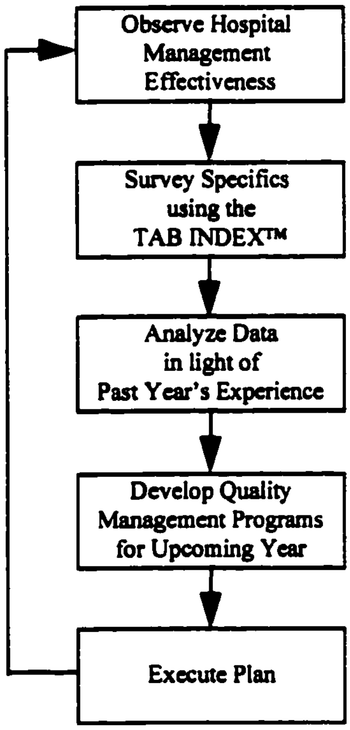

Figure 22. Continuous Quality Management Climate Assessment

Assessment may continue to be a more important challenge for many Quality Management directors. It is possible, in certain instances in the literature, to demonstrate cost savings over a period of several years based on specific quality improvement projects. Yet these tangible cost savings are based on the structural elements which feed into the production of quality goods and services, and may not continue to be a comparable metric year after year. Undoubtedly, counting specific cost savings may continue to be an important and even necessary justification for quality improvement initiatives; however, this research proposes that assessment should also include the dynamic process features, based on the proposed working model of Quality Management Climate.

The research developed a quantitative (versus qualitative) means of comparing a portion of Quality Management Climate, which may lead to hospitals not only benchmarking internally across participant categories, but also benchmarking with other hospitals. Such activity may lead to learning from other hospitals effective ways of managing, which the survey did not explicitly describe or attempt to capture.

No claim has been made regarding the survey as a guaranteed method for changing a hospital's working climate; these issues are proposed to be highly dependent on what type of management initiatives and other dynamics are used to respond to the information provided. As stated earlier, future quantitative work may further document the causal and feedback processes associated with the limited dimensions constructed for the survey; such investigations would likely require longitudinal analysis.

Also, written material on quality management has literally exploded in the past ten years. It is impossible for Quality Management directors to train all employees and clinical professionals in the nuances of every aspect published. Combining the results of this survey with a hospital's collective experience (especially from hospital administration and Quality Management), hospitals may choose among possible topics to tailor Quality Management based on what professionals say is lacking in the operational climate. A recent source for general assessment techniques within healthcare, which broadens the scope beyond survey assessment, is presented in Barber (1996); the general topic of performance assessment is discussed by Wilson and Pearson (1995). Hospitals have the flexibility of easily adding questions relating to specific Quality Management efforts of the past year, and can find out what has been effective and what is needed. Correlations may be drawn between perceptions of the Quality Management training sessions and the dimensions established by this research.

Additionally, benchmarking with other hospitals may provide information on what training goals are reasonable, and what Quality Management Climate results may be expected in a certain time frame. The quality literature often sets high expectations for practice; this type of assessment may provide a sense of which specific goals are reasonable given the progress that similar hospitals have made.

Knowing which specific management areas or types of departments are relatively weak may help a hospital improve more quickly. Instead of using a shotgun approach, hospitals may be able to more accurately target quality management resources (both human and financial). For example, hospitals may be able to investigate relationships between this survey of Quality Management Climate and internally developed performance criteria; such a study may help direct strategic financial and human resource planning decisions.

Large-Scale Change

If history is an indicator, the healthcare picture will continue to change. Independent of national healthcare reform, current management will grow in experience and some amount of managerial turnover will occur; these forces alone may drastically shape the effectiveness of hospital service. In addition, other factors include changes in hospital administration, mergers with other health systems, and turnovers in clinical personnel as the healthcare industry reforms itself for better service.

These changes may require an adjustment period, during which hospital professionals develop new working relationships; it generally takes time to build trust and communication structures. The survey may be a tool to help hospitals assess how well hospital professionals react and adjust to large-scale change, both before and after. Hospitals could easily design a specific study to assess management effectiveness at intervals after a massive management change:

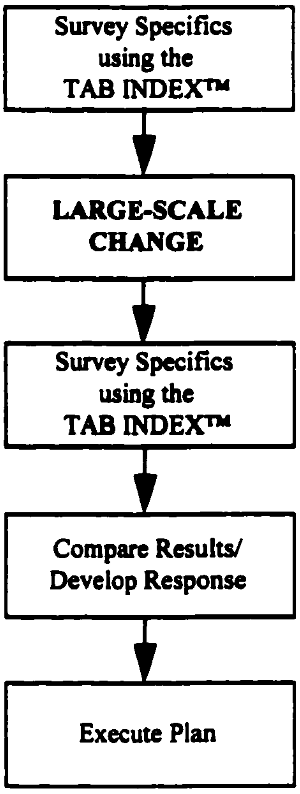

Figure 23. Proactive Preparation for Large Scale Change

Comparison with earlier data, and perhaps monitoring the survey periodically may allow hospital administration and quality management to respond with effective training or reengineering solutions. The survey may provide quantitative management information to supplement what managers may know instinctively. Teamwork and effective working relationships are a stated goal of Quality Management. The survey may help hospitals to proactively build working relationships among the hospital professionals, even in the wake of massive change.

In addition to hospitals, researchers may be able to extend the present research.

Benefits for Researchers

The survey development necessarily focused on the description of hypothetical latent variables believed to be associated with the underlying dynamic principles of Quality Management Climate.

The goals of this research are not to analyze fifteen types of feedback or contrast operating strategies within major hospitals. Both concepts are described on the survey, but the intent is to develop synthetic (as opposed to analytic) dimensions of Quality Management Climate. This systems approach still recognizes the need to analyze certain limited aspects of Quality Management Climate.

The research did provide several tools to allow future analysis, including the construction of dimensions which show evidence of discriminant validity, linkage between these theoretical latent variables with four sources of responsibility (single work groups, multiple work groups, individual managers, and hospital administration), and a classification scheme which hospital professionals can use to divide hospital departments into five participant categories (physicians, business departments, nursing, ancillary, support). These three concepts may individually or together not only aid specific hospitals in implementing Quality Management, but may also aid general health services researchers to design other multi-hospital latent variable studies.

Having provided a synthetic description of certain management dimensions, future research may extend the analysis by improving the scales based on new sets of items. Newer investigations may take the concepts and test them on different types of organizational structures than the four described here. Future structural equation modeling may specifically validate the constructs proposed, and may find new ways to demonstrate discriminant validity among the proposed variables. These activities may be important as researchers continue to investigate the general concept of Quality Management.

Also, having done preliminary analyses of hospital performance, future research may synthesize new concepts of hospital performance (especially internal). This synthesis may result in new generally accepted scales of performance to provide further criterion-related validity with the proposed dimensions.

Ethical Implementation Issues

As in the case of all appraisal-type work, there are several ethical considerations associated with the implementation of the survey. An important design feature of the survey includes protecting the anonymity of the survey participants. It is important to assure hospitals using this survey that it is not possible to identify specific hospitals, departments, administrators, or other individuals. This need to protect specific individuals has been balanced with the interest in collecting some demographic information on the survey participants not only for validity assessment but also to allow the hospital to direct its efforts in Quality Management depending on the sample used. Such issues have been previously raised by hospitals currently assessing internal performance (Tabladillo and Canfield, 1994).

The multivariate scale could potentially be a proxy measure of future performance, and there may be certain caveats that need to be adhered to in implementing such a scale. In this study, the survey results have been intended for internal reporting only, with results only reported in aggregate, as per standards set during the National Demonstration Project (Berwick, et al., 1990).

In general, hospitals need to be careful to weigh the value of asking more specific demographic questions with the need to retain individual anonymity. The demographic questions asked have been considered general enough to protect individual employees; a good example is the categorization of the age variable. In general, additional questions focus on modifiable rather than non-modifiable sources of variance; future research may attempt to isolate these constructs which may lead to definitive action.

The anonymity issue is particularly important when the sample size is small. For example, if a demographic question has only one person in a specific category, then the administrator may consider collapsing categories to hide the results of that specific individual. The raw database is controlled by only a few individuals in order to protect and assure confidentiality. Potential harm may be done to the system and hospital employees would be less likely to trust the survey process and perhaps the entire Quality Management effort if such identification of individuals occurred.

The design of the questionnaire is not to focus on specific individuals, such as the hospital administrator or any individual employee. Managers have been considered individually, but only within the context of a larger system. Some 40.5% of the random survey participants reported being a manager or supervisor of at least one other person. Thus, even if the survey response have been biased toward managers, knowing that managers would need to improve in some dimension would still necessarily require a systems type of response. The objective is to analyze the patterns seen throughout an entire organization, not to attribute variance to individuals. Likewise, it is suggested that future studies focus on larger subgroups within an organization.

Considering Threats to Validity

In general, it is recommended to consult with a statistician trained in survey development and analysis, particularly if the individual has had exposure to structural equation modeling. Any number of theoretical or practical issues may possibly bias the survey results; many of these issues have been discussed in depth throughout this document, however it is not possible to list and assess every possible practical issue which may lead to bias. It may be quite easy to build enthusiasm for using this type of survey for measuring performance, but the science of survey measurement requires attending to specific details which may impact internal and external validity. Chapter VI introduces the topics of internal and external validity with respect to this specific survey development process as well as the specific process of collecting the surveys. Therefore, the general recommendation for consulting a statistician provides the best possible and practical protection to hospitals and participants alike.

For comparable results, it is suggested that no modifications to the items, instructions, or scales occur during future data collections, and that hospitals similarly use a random population. The next paragraphs specifically examine the extent to which content, criterion-related and construct validity may be challenged by the simple administration of the survey.

First, content validity is not likely to be violated by hospitals who choose to simply administer this survey. It is expected, however, that the concepts including and surrounding Quality Management Culture would be further examined in other research, which may involve the creation of derivative or separate subscales based on the results presented here. By performing new research, other researchers should be able to extend the concepts and content introduced here. Some hospitals may choose to challenge the content validity by desiring to include other items; if such items are added, it would violate the statistical models developed in this research to include them in the developed scales without testing this relationship using a random survey base and another structural equation model. Short of changing the scales or dropping items explicitly used in scales, hospitals may find it useful to add on additional questions of local interest. Note that individual items added do not have the level of statistical stability as scales from a structural equation model.

Second, criterion-related validity may become an issue for hospitals who decide to implement their own performance metrics or measures. This may also arise from hospitals or researchers who decide to develop completely new performance metrics or scales. In these cases, it is necessary for the study to establish a new baseline expectation for whether the developed scale of Quality Management Climate shows evidence of criterion-related validity for different metrics. As the chapter on Hospital Performance demonstrates, the understanding of performance continues to evolve and the advent of more sophisticated information gathering systems should make more intensive multidimensional comparisons economically feasible in the not too distant future. It is therefore expected that future use of this survey would reassess criterion-related validity for different metrics and under different circumstances.

Third, construct validity is not likely to be challenged by simple administration of this survey. Such constructs, however, may be challenged by future random samples delivered to other hospitals in other settings; another type of investigation may involve the construction of completely new items. For example, during the data collection, a reviewing researcher pondered whether or not there would be variation among hospitals based on regional cultural differences. This type of investigation is expected to follow from other researchers, and should help extend the knowledge of Quality Management Culture.

In conclusion, this chapter discussed several practical ways that hospitals may use the Quality Management climate assessment provided by the survey for hospitals, some theoretical implications for future researchers, some ethical considerations in collecting and acting on the information provided, and a discussion on future challenges to validity. Altogether, these areas describe important considerations in communicating and refining the results of the survey development.

APPENDIX A

FINAL SURVEY INSTRUMENT

The TAB Index™ for Hospitals

Directions: Circle the best answer. Please take your time, and be as complete as possible. Read the definitions below before starting. All answers will be ***confidential***. Thank you for helping this hospital's management.

Definitions:

"Work group" = the core group of people you work with regularly (usually your department).
"Manager" = the person you are currently responsible to (for most physicians, this is your Medical Director).
"Suppliers" = people (or work groups) who directly serve you, or give you information.
"Hospital administration" = Administrators, Medical and Nursing Administration, and Vice Presidents

		1 Rarely or Almost Never	2 Once in a While	3 About as often as not	4 Often	5 Very Frequently or Almost Always	9 DON'T KNOW or Not Applicable
1.	Hospital administration builds strong relationships with our hospital's customers.	1	2	3	4	5	9
2.	My manager builds strong relationships with our work group's customers.	1	2	3	4	5	9
3.	Given what's available, hospital administration has built a strong base of human resources in our hospital.	1	2	3	4	5	9
4.	Given what's available, my manager has built a strong base of human resources in our work group.	1	2	3	4	5	9
5.	Hospital work groups study the causes of major problems.	1	2	3	4	5	9
6.	Our work group studies the causes of major problems.	1	2	3	4	5	9
7.	Hospital administration provides the information our work group needs to do a good job.	1	2	3	4	5	9
8.	My manager provides the information I need to do a good job.	1	2	3	4	5	9
9.	Hospital administration builds strong relationships with our hospital's suppliers.	1	2	3	4	5	9
10.	My manager builds strong relationships with our work group's suppliers.	1	2	3	4	5	9
11.	Our work group communicates openly with hospital administration.	1	2	3	4	5	9
12.	I communicate openly with my manager.	1	2	3	4	5	9
13.	When hospital administration gives our work group a responsibility, we also have the authority to carry it out.	1	2	3	4	5	9
14.	When my manager gives me a responsibility, I also have the authority to carry it out.	1	2	3	4	5	9
15.	Hospital work groups have problems working together.	1	2	3	4	5	9
16.	People within our work group have problems working together.	1	2	3	4	5	9
17.	Hospital administration is appropriately involved in important hospital projects.	1	2	3	4	5	9
18.	My manager is appropriately involved in important work group projects.	1	2	3	4	5	9

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Definitions:

"**Work group**" = the core group of people you work with regularly (usually your department).
"**Manager**" = the person you are currently responsible to (for most physicians, this is your Medical Director).
"**Suppliers**" = people (or work groups) who directly serve you, or give you information.
"**Hospital administration**" = Administrators, Medical and Nursing Administration, and Vice Presidents

	1 Rarely or Almost Never	2 Once in a While	3 About as often as not	4 Often	5 Very Frequently or Almost Always	9 DON'T KNOW or Not Applicable
19. Hospital work groups trust each other.	1	2	3	4	5	9
20. People within our work group trust each other.	1	2	3	4	5	9
21. Hospital work groups study customer needs.	1	2	3	4	5	9
22. Our work group studies customer needs.	1	2	3	4	5	9
23. Hospital administration communicates difficult decisions well.	1	2	3	4	5	9
24. My manager communicates difficult decisions well.	1	2	3	4	5	9
25. Hospital work groups effectively improve our hospital's goals.	1	2	3	4	5	9
26. Our work group effectively improves our group's goals.	1	2	3	4	5	9
27. Hospital administration understands our work group's responsibilities.	1	2	3	4	5	9
28. My manager understands my responsibilities.	1	2	3	4	5	9
29. Hospital administration provides job-related training when necessary.	1	2	3	4	5	9
30. My manager provides job-related training when necessary.	1	2	3	4	5	9
31. Our hospital makes major changes when necessary.	1	2	3	4	5	9
32. Our work group makes major changes when necessary.	1	2	3	4	5	9
33. Hospital work groups align their work with the overall hospital strategy (or mission).	1	2	3	4	5	9
34. People within our work group align their work with the overall work group strategy (or mission).	1	2	3	4	5	9
35. Hospital administration provides detailed feedback to our work group.	1	2	3	4	5	9
36. My manager provides detailed feedback to me.	1	2	3	4	5	9
37. There is an appropriate level of teamwork among hospital work groups.	1	2	3	4	5	9
38. There is an appropriate level of teamwork within our work group.	1	2	3	4	5	9
39. Hospital administration communicates its vision of the future to our hospital.	1	2	3	4	5	9
40. My manager communicates how our work group can support hospital administration's vision.	1	2	3	4	5	9
41. Hospital administration appropriately supports decisions made by our work group.	1	2	3	4	5	9
42. My manager appropriately supports decisions I make.	1	2	3	4	5	9

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Definitions:
"Work group" = the core group of people you work with regularly (usually your department).
"Manager" = the person you are currently responsible to (for most physicians, this is your Medical Director).
"Suppliers" = people (or work groups) who directly serve you, or give you information.
"Hospital administration" = Administrators, Medical and Nursing Administration, and Vice Presidents

	1 Rarely or Almost Never	2 Once in a While	3 About as often as not	4 Often	5 Very Frequently or Almost Always	9 DON'T KNOW or Not Applicable
43. Hospital administration reports data-based information on how well our hospital serves its customers.	1	2	3	4	5	9
44. My manager reports data-based information on how well our work group serves its customers.	1	2	3	4	5	9
45. There is strong communication among hospital work groups.	1	2	3	4	5	9
46. There is strong communication within our work group.	1	2	3	4	5	9
47. Hospital work groups cooperate with each other.	1	2	3	4	5	9
48. People within our work group cooperate with each other.	1	2	3	4	5	9
49. Our hospital adapts well to new demands.	1	2	3	4	5	9
50. Our work group adapts well to new demands.	1	2	3	4	5	9
51. Hospital administration knows who the customers of our hospital are.	1	2	3	4	5	9
52. My manager knows who the customers of our work group are.	1	2	3	4	5	9
53. Our hospital learns from the successes in our work group.	1	2	3	4	5	9
54. Our work group learns from my personal successes.	1	2	3	4	5	9
55. Hospital administration supports its vision of the future with appropriate action.	1	2	3	4	5	9
56. My manager allows our work group to support hospital administration's vision.	1	2	3	4	5	9
57. Our hospital learns from past mistakes.	1	2	3	4	5	9
58. Our work group learns from past mistakes.	1	2	3	4	5	9
59. Hospital administration provides timely feedback to our work group.	1	2	3	4	5	9
60. My manager provides timely feedback to me.	1	2	3	4	5	9
61. Our hospital learns from success stories at other hospitals.	1	2	3	4	5	9
62. Our work group learns from the success stories within our hospital.	1	2	3	4	5	9
63. Hospital administration collects important data on how well our hospital serves its customers.	1	2	3	4	5	9
64. My manager collects important data on how well our work group serves its customers.	1	2	3	4	5	9

The next section of items asks for your impressions of how well your work group performed during the last year; comparing the previous items with performance can help management develop priorities.

Directions: Circle the best answer.

In the past 12 months, how successful was your work group in...

	Work Group Success during the Past Twelve Months							
	HIGHLY SUCCESSFUL						NOT SUCCESSFUL	Don't Know or N/A
Reducing **patient** costs	7	6	5	4	3	2	1	
Reducing **overall hospital** costs	7	6	5	4	3	2	1	
Reducing work errors **within our work group**	7	6	5	4	3	2	1	
Reducing **hospital administration** complaints	7	6	5	4	3	2	1	
Reducing **physician** complaints	7	6	5	4	3	2	1	
Reducing **nursing** complaints	7	6	5	4	3	2	1	
Reducing **patient complaints**	7	6	5	4	3	2	1	
Increasing **hospital administration** satisfaction	7	6	5	4	3	2	1	
Increasing **physician** satisfaction	7	6	5	4	3	2	1	
Increasing **nursing** satisfaction	7	6	5	4	3	2	1	
Increasing **patient** satisfaction	7	6	5	4	3	2	1	

This section was followed by items from the Leadership Practices Inventory (Kouzes and Posner, 1993); these items are available from the authors and are not reprinted here since statistical analysis of these items did not occur in the thesis.

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This final section gives us general information about you, so that we can group your answers with your peers' answers. We will analyze and interpret this survey by groups only, not by individuals; we will also compare similar groups across hospitals.

Directions: Please check the best answer, or fill in the blank as appropriate.

My manager is part of hospital administration (e.g. Administrator, Vice President, Medical Director).	____1 TRUE	____2 FALSE
I supervise or manage at least one other person.	____1 TRUE	____2 FALSE
Which **single** group do you belong to? (Please check the best **ONE** of the following five choices)	____ 1 Surgeons/Physicians ____ 2 Hospital Administration/Business Departments (e.g. Accounting, Info. Systems, Marketing, Med. Records, Personnel, Purchasing, CQI, QM, QA) ____ 3 Nursing/Inpatient Units (e.g. Medical, Pediatric, Surgical) ____ 4 Ancillary Departments (e.g. Outpatient, Clinics, Anesthesia, ER, Laboratory, OR, Pharmacy, PT/OT, Radiology) ____ 5 Support Departments (e.g. Central Sterile, Food, Housekeeping, Laundry, Maintenance, Plant Operations, Security & Safety, Warehouse)	
Whom do you work with regularly? (Please **check all that apply**)	____ 1 Surgeons/Physicians ____ 2 Hospital Administration/Business Departments (e.g. Accounting, Info. Systems, Marketing, Med. Records, Personnel, Purchasing, CQI, QM, QA) ____ 3 Nursing/Inpatient Units (e.g. Medical, Pediatric, Surgical) ____ 4 Ancillary Departments (e.g. Outpatient, Clinics, Anesthesia, ER, Laboratory, OR, Pharmacy, PT/OT, Radiology) ____ 5 Support Departments (e.g. Central Sterile, Food, Housekeeping, Laundry, Maintenance, Plant Operations, Security & Safety, Warehouse)	
How many years have you been working...	...at this hospital? ...in healthcare, total? ...at your current position (here, and elsewhere)? ...with your current manager? ...with (the majority of) your current work group?	________ years ________ years ________ years ________ years ________ years
What is your sex?	____1 FEMALE ____2 MALE	
What is your age?	___ Under 20 Years ___ 20-24 Years ___ 25-29 Years ___ 30-34 Years	___ 35-39 Years ___ 40-44 Years ___ 45-49 Years ___ 50-54 Years ___ 55-59 Years ___ 60-64 Years ___ 65-70 Years ___ 71 or above

Thank you for completing this survey.

The item order above is fully consistent with all references to the items throughout the entire text including all tables, graphs, and statistical printouts. Two versions of the questionnaire have been circulated in a 50/50 proportion during the random population assessment. The order of these versions appears in the following table, with the first column representing that of the above survey, and F representing for the "feedback" version (since the word "feedback" appears in the first item, 199 total surveys returned) and C representing the "cooperate" version (since the word "cooperate" appears in the first item, 248 total surveys returned).

Survey	F Version	C Version
Q1	F59	C21
Q2	F60	C22
Q3	F31	C39
Q4	F32	C40
Q5	F7	C5
Q6	F8	C6
Q7	F57	C19
Q8	F58	C20
Q9	F11	C11
Q10	F12	C12
Q11	F17	C3
Q12	F18	C4
Q13	F25	C37
Q14	F26	C38
Q15	F9	C9
Q16	F10	C10
Q17	F35	C59
Q18	F36	C60
Q19	F33	C35
Q20	F34	C36
Q21	F21	C29
Q22	F22	C30
Q23	F23	C17
Q24	F24	C18
Q25	F47	C51

Survey	F Version	C Version
Q26	F48	C52
Q27	F19	C63
Q28	F20	C64
Q29	F63	C7
Q30	F64	C8
Q31	F49	C33
Q32	F50	C34
Q33	F43	C27
Q34	F44	C28
Q35	F13	C49
Q36	F14	C50
Q37	F3	C23
Q38	F4	C24
Q39	F61	C53
Q40	F62	C54
Q41	F27	C31
Q42	F28	C32
Q43	F15	C25
Q44	F16	C26
Q45	F41	C45
Q46	F42	C46
Q47	F51	C1
Q48	F52	C2
Q49	F53	C61
Q50	F54	C62
Q51	F37	C43
Q52	F38	C44
Q53	F39	C41
Q54	F40	C42
Q55	F55	C47
Q56	F56	C48
Q57	F29	C55
Q58	F30	C56
Q59	F1	C13
Q60	F2	C14
Q61	F5	C15
Q62	F6	C16
Q63	F45	C57
Q64	F46	C58

APPENDIX B

SURVEY COVER LETTERS

This section reprints the various cover letters used to accompany the survey.

Piedmont Hospital

FROM: William Baker, Vice President Medical Services and CVI Council Chair
Sarah Shields, Director, Center of Continuous Value Improvement

TO: ______________________
DATE: ______________________
RE: Georgia Tech Research Project

Piedmont Hospital is participating in a voluntary research project with Georgia Tech. The goal of this project is to investigate how leadership works in day-to-day operations; this project will help us satisfy the Joint Commission Leadership criteria. Besides our hospital, there are several other hospitals in Atlanta participating, including Promina-Gwinnett, Crawford Long and Emory University. The CVI Council has agreed to participate in this project for the advantages this information will provide to the hospital.

You have been *randomly chosen* to participate in this project to represent your peers. Participation means filling in and returning the enclosed survey, which is both anonymous and voluntary. We are eager to know your impressions of your work environment and hope that you will choose to participate.

Since it is important that we maintain the integrity of the random sample and peer groups, please follow the specific instructions below:

DECISION TO PARTICIPATE

1. Complete the survey before __________. (it is recommended that all participants complete the survey when they can focus their attention to the questions without interruptions).
2. Remove this cover letter from your completed survey to maintain anonymity.
3. Return only the survey to Sarah Shields in the enclosed envelope.
4. Accept our thanks for participating in this project.

DECISION TO NOT PARTICIPATE

1. Return this cover letter and survey immediately to Sarah Shields via the enclosed envelope; another random participant from your peer group will be chosen.
2. Accept our thanks for considering this project.

If you have any questions regarding this survey, please contact Sarah Shields on pager xxx-xxxx and enter the number where you may be reached, or you may dial (404) xxx-xxxx. Thank you for your consideration.

University of Mississippi Medical Center

Dear Prospective Participant,

I am conducting a voluntary research project as part of my graduate studies in health care management at Mississippi College. The purpose of this project is to investigate how leadership works in day-to-day operations. Several other hospitals in the Southeast will be participating as well. Hospital Administration has granted me permission to conduct this survey. Results may be shared with H.A. if the findings are significant.

You have been randomly chosen to participate in this project to represent your peers. Participation means filling in and returning to me this survey, which is both anonymous and voluntary. I am eager to know your impressions of your work environment and hope that you will choose to participate. Completed surveys should be returned to the collection box in the Anesthesiology South Office (Rm XXX) or the mail bin on my office door in the operating room.

If you have any questions regarding the survey, please contact me at extension xxxx or on pager xxx-xxx. Thank you once again for your consideration.

Earl C. Coleman Jr., Anesthesiology
Graduate Candidate, Hospital Science
Mississippi College

Emory University Hospital & Crawford Long Hospital

Memo to: Emory Hospitals Employees
From: Robbin M. Moore, Assistant Administrator for Quality
Date: November 6, 1995
Subject: Quality Survey

Our two hospitals, as well as five other Georgia Hospitals have engaged in a collaborative project with Georgia Tech. The purpose of the project is to determine your impressions of our past, present and future quality initiatives.

You were randomly selected to provide the objective view that is necessary for future activities. Your comments will be kept confidential and anonymous. In order for all areas of the hospital to be represented, every selected employee must complete the survey and return it to either Tricia (Crawford Long) or Glenda (Emory University) in our Administration Offices. If for some reason you can not complete the survey, Crawford Long Hospital employees should please contact Tricia Hohl at xxx-xxxx, and Emory University Hospital employees should contact Glenda Doty at xxx-xxxx.

Please accept the enclosed ticket as a small token of our appreciation for you taking the time to provide us with this valuable feedback.

If you have any questions or comments, please do not hesitate to contact Tricia or myself.

Thanks in advance for your participation.

Encl.

Gwinnett Hospital System

MEMORANDUM

To: Research Participants
From: Lisa Moore, Director, CQI
RE: Research Project with Georgia Tech
Date: February 19, 1996

Gwinnett Health System, Inc. is participating in a voluntary research project with Georgia Tech; the goal of this project is to investigate how quality management works in day-to-day operations.

You have been randomly chosen to participate in this project; we are eager to know your impressions on your work environment. We ask you to please fill in this anonymous survey before March 1, 1996 and return it to René Leo, CQI Department without this cover sheet.

Besides our hospital, there are several other hospitals involved: Piedmont, Crawford Long, Emory, Grady, Tift General and East Alabama. Your survey will be pooled together in groups to allow our hospital to develop quality improvement goals for the coming year; also, the participant hospitals will be anonymously sharing data to allow everyone a better picture of what goals are reasonable. The future goal is to share this survey with hospitals across America.

If it is not possible for you to complete this survey, please return this survey with the cover sheet to René Leo, CQI Department so we can choose another random participant similar to you.

If you have any questions, please feel free to call me at xxxx. Thank you for your cooperation.

enclosure

APPENDIX C

SUGGESTED PERFORMANCE METRICS

The following hospital measures have been originally considered for investigation; however, the low sample size and low expected correlations would have required collecting data on at least 40 hospitals to demonstrate any statistical significance. Though these data are not collected, these measures are reported for possible consideration by future studies.

General Hospital Information

1) Total licensed beds
2) Teaching/Non-teaching
3) Short-term (Y/N)?
4) Ownership (Government, For-profit, Non-profit)
5) Medicare percentage = Medicare mix = (Medicare inpatient days) / (Total inpatient days)

Georgia Hospital Association CARE project (measures commonly collected by Georgia hospitals, under definition provided by the Georgia Hospital Association):

6) Mortality rate
7) Neonatal mortality rate
8) Post-operative mortality rate
9) Cesarean section rate -- primary
10) Cesarean section rate -- secondary
11) Cesarean section rate -- VBAC rate
12) Readmissions within 30 days / Total patient discharges (excluding newborn)

Other indicators:

13) FTE per adjusted occupied bed
14) Cost per CMI (All patients) adjusted discharge

The following notes clarify indicators 13 and 14.

13. **FTE per Adjusted Occupied Bed** is a measure of hospital labor utilization adjusted for the proportion of hospital outpatient business.

$$\left[\frac{(A+B)*C}{D*(E/F)}\right] \Big/ \left[\left(\frac{G}{E}\right)*\left(\frac{H}{I}\right)\right]$$

A = Total paid hours (1000s)
B = Contracted hours worked (1000s)
C = 1,000
D = 2,080
E = Days in period
F = 365
G = Total patient days excluding newborns
H = Gross patient charges
I = Total gross inpatient charges

Notes:
A. Total paid hours (1000s) is the sum of all worked hours and paid time off (i.e. sick leave, vacation, holiday, jury duty, bereavement, etc.) for all employees of the organization being reported, including corporate allocations. Total Paid Hours includes all paid personnel (except physicians) who are routinely reported in the hospital's cost centers. Hospital employees include staff who may not be directly involved in patient care operations such as medical/professional office building, outreach program, and medical education. This figure does NOT include the following: contract labor; on-call hours (unworked); physician hours (e.g. staff or salaried physicians, residents, interns, etc.); or hours associated with the generation of non-hospital charges, such as a health club, landscaping company or retail pharmacy.
B. Contracted hours worked (1000s) is the number of hours worked by contract employees, such as the hours worked by the management or employees of a department or agency staff; these hours should be rounded to the nearest thousand.

G. Total patient days excluding newborn is the total number of patient days provided by the hospital during the reporting period. Ambulatory surgical or medical care, observation patients and newborn nursery days are excluded. Neonatal Intermediate and Neonatal Intensive Care patient days are included.
H. Gross patient charges represents the sum of Total gross inpatient charges and Total gross outpatient charges. Total gross outpatient charges represents the full and customary charges generated by patient services provided to patients not formally admitted to the facility. Such items as revenues from ambulatory surgery center or same day medical or surgical patients would be included. This may also include revenues from a Skilled Nursing Facility if the hospital did not report the Skilled Nursing Facility as part of the hospital's beds in use, or patient days.
I. Total gross inpatient charges represents the full and customary charges generated by patient services provided to patients admitted to the facility.

14. **Cost per CMI (All patients) adjusted discharge** is a measure of total hospital operating expense per discharge, adjusted by Case Mix Index (All patients).

$$[A+B]/\left[\left(C/_D\right)*E\right]$$

A = Total operating expense
B = 1,000
C = CMI (All patients)
D = 100,000
E = Adjusted discharges

Notes:
A. Total operating expense represents the sum of total labor cost, depreciation, interest, bad debt, long-term lease payments, supply expense, contracted non-salary cost and all other operating expense.
C. Case mix index (CMI) is the total number of patients for each Diagnosis Related Group (DRG) multiplied by the Medicare Prospective Payment System (PPS) relative weight for that DRG, summed for all weighted DRGs, divided by total discharges. CMI (All patients) includes all discharged patients even though the Medicare Prospective Payment System excludes some psychiatric and rehabilitation patients; this measures excludes newborn discharges.

E. <u>Adjusted discharges:</u>

$$E = E1 * \left(\frac{E2}{E3} \right)$$

E = Adjusted Discharges
E1 = Total patient discharges excluding newborns
E2 = Gross patient charges
E3 = Total gross inpatient charges

E1. Total patient discharges excluding newborns is the total number of patient discharged from the hospital during the reporting period. Discharges for ambulatory surgical or medical care, observation patients and newborn nursery are excluded. Neonatal Intermediate and Neonatal Intensive Care discharges are included.

APPENDIX D

SELECTED MEANS AND FREQUENCY DISTRIBUTIONS FOR RANDOM SAMPLE

The following computer printout describes means and standard variations for specific variables. Since these variables are described elsewhere, only abbreviations of the items appear here. Additionally, the survey items are arranged by the four questionnaire groups. Finally, note that Q15 and Q16 are reversed in sign to allow consistent interpretation of the factor loadings and path coefficients.

Variable	Label	N	Mean	Std Dev
Q16	Grp probs working	429	-2.25641	1.133388
Q20	Grp trust each other	403	3.900744	1.143911
Q22	Grp study cust needs	411	3.739659	1.180268
Q26	Grp improve goals	433	3.775982	1.081484
Q32	Grp makes changes	423	3.666667	1.208187
Q34	Grp align with strat	420	3.804762	1.184617
Q38	Grp teamwork	431	3.714617	1.225597
Q46	Grp strong comm	413	3.767554	1.182072
Q48	Grp cooperates	441	4.056689	1.101221
Q50	Grp adapts	418	3.669856	1.150998
Q54	Grp learns from in	406	3.472906	1.248408
Q58	Grp learns from past	403	3.895782	1.083139
Q6	Grp studies problems	401	3.458853	1.186983
Q62	Grp learns from out	397	3.277078	1.268819

Variable	Label	N	Mean	Std Dev
Q55	HA acts on vision	374	3.783422	1.013921
Q1	HA builds cust rel	340	3.705882	1.158002
Q3	HA builds hum res	360	3.580556	1.160712
Q7	HA provides info	392	3.170918	1.349006
Q9	HA builds suppl rel	256	3.347656	1.198134
Q11	HA open communication	418	3.423445	1.229192
Q13	HA gives authority	372	3.924731	1.228472
Q17	HA involved in proj	329	3.951368	1.060979
Q23	HA comm diff decision	364	2.931319	1.331214
Q27	HA understand respnsb	385	3.371429	1.26232
Q29	HA provide training	389	3.416452	1.227409
Q35	HA details feedback	384	3.367188	1.281752
Q39	HA comm vision	387	3.635659	1.19761
Q41	HA supports decision	359	3.506964	1.296463
Q43	HA reports cust data	369	3.338753	1.286062
Q51	HA knows customers	356	4.047753	1.05642
Q59	HA timely feedback	393	2.954198	1.187923
Q63	HA collects cust data	350	3.788571	1.089615
Q5	Hosp studies problems	351	3.396011	1.161224
Q15	Hosp probs working	384	-2.627604	1.029268
Q19	Hosp trust each other	352	3.627841	1.186639
Q21	Hosp study cust needs	350	3.702857	1.14193
Q25	Hosp improve goals	384	3.552083	1.015491
Q31	Hosp makes changes	390	3.335897	1.161726
Q33	Hosp align with strat	358	3.444134	1.214274
Q37	Hosp teamwork	381	3.238845	1.189057
Q45	Hosp strong comm	378	3.624339	1.147776
Q47	Hosp cooperates	409	3.665037	1.140938
Q49	Hosp adapts	391	3.716113	1.147448
Q53	Hosp learns from in	370	3.208108	1.199566
Q57	Hosp learns from past	360	3.65	1.168171
Q61	Hosp learns from out	351	3.304843	1.294363

Variable	Label	N	Mean	Std Dev
Q2	Mgr builds cust rel	384	3.695313	1.221384
Q4	Mgr builds hum res	390	3.579487	1.236792
Q8	Mgr provides info	431	3.969838	1.195542
Q10	Mgr builds suppl rel	349	3.593123	1.184458
Q12	Mgr open communication	440	4.106818	1.036882
Q14	Mgr gives authority	409	4.286064	0.99204
Q18	Mgr involved in proj	389	3.758355	1.204893
Q24	Mgr comm diff decision	427	3.667447	1.306159
Q28	Mgr understand respnsb	423	3.825059	1.228661
Q30	Mgr provide training	412	3.509709	1.25851
Q36	Mgr details feedback	425	3.663529	1.154242
Q40	Mgr comm vision	423	3.638298	1.215675
Q42	Mgr supports decision	416	3.699519	1.245174
Q44	Mgr reports cust data	414	3.502415	1.387856
Q52	Mgr knows customers	407	4.093366	1.027278
Q56	Mgr acts on vision	398	3.929648	1.006315
Q60	Mgr timely feedback	435	3.62069	1.253947
Q64	Mgr collects cust data	390	3.720513	1.145614
S1	Reducing Patient Costs	252	4.607143	1.533305
S2	Reducing Overall Costs	266	4.665414	1.557964
S3	Reducing Work Errors	359	4.880223	1.3243
S4	Reducing HA Complaints	242	4.847107	1.404414
S5	Reducing Phys Complaints	293	4.679181	1.475651
S6	Reducing Nurs Complaints	297	4.313131	1.631488
S7	Reducing Pat Complaints	289	4.920415	1.430289
S8	Increase HA Satis	241	4.842324	1.414226
S9	Increase Phys Satis	293	4.836177	1.445513
S10	Increase Nurs Satis	301	4.335548	1.652382
S11	Increase Pat Satis	293	5.010239	1.425032

Variable	Label	N	Mean	Std Dev
L01	C1 Seeks challenges	355	3.574648	1.31996
L02	V1 Describes future	410	3.421951	1.391559
L03	A1 Involves in plans	414	3.570048	1.393055
L04	M1 Clear lead philos	407	3.574939	1.436217
L05	H1 Celebr milestones	411	3.301703	1.430153
L06	C2 Stays up-to-date	407	4.027027	1.18561
L07	V2 Shares dreams	388	3.280928	1.484092
L08	A2 Treats with respect	426	4.065728	1.283524
L09	M2 Has proj steps	378	3.698413	1.271624
L10	H2 Recognizes contrib	416	3.516827	1.365568
L11	C3 Challenges stat quo	417	3.426859	1.20697
L12	V3 Comm + outlook	422	3.575829	1.389709
L13	A3 Allows decisions	424	3.709906	1.282099
L14	M3 Ensures values	403	3.444169	1.261262
L15	H3 Gives praise	429	3.540793	1.406374
L16	C4 Looks for innovatns	415	3.585542	1.3448
L17	V4 Common vision	389	3.169666	1.39661
L18	A4 Develops cooperatn	422	3.646919	1.329718
L19	M4 Comm Belief/Values	414	3.596618	1.297824
L20	H4 Gives team apprec	426	3.474178	1.395974
L21	C5 Asks what to learn	410	3.302439	1.338263
L22	V5 Forecasts future	403	3.478908	1.310663
L23	A5 Creates trust	412	3.487864	1.397721
L24	M5 Practices values	402	3.68408	1.346352
L25	H5 Finds celebr ways	420	3.157143	1.453847
L26	C6 Experiments	372	3.201613	1.327583
L27	V6 Excited for future	410	3.204878	1.383442
L28	A6 Gives proj ownrshp	395	3.374684	1.400278
L29	M6 Sets clear goals	397	3.403023	1.359141
L30	H6 Tells others of wrk	396	3.482323	1.365837

Variable	Label	N	Mean	Std Dev
manha	Mgr in Hosp Admin	431	1.5220418	0.5000944
man	Manager	425	1.5952941	0.4914135
group	Group ID	442	3.0497738	1.1903857
g1	Work with Physicians	439	0.6810934	0.4665845
g2	Work with HA/Business	439	0.4806378	0.500195
g3	Work with Nursing	439	0.7129841	0.4528852
g4	Work with Ancillary	439	0.6810934	0.4665845
g5	Work with Support	439	0.5170843	0.5002782
withg1	Work with Physicians	438	0.5639269	0.4964636
withg2	Work with HA/Business	438	0.2945205	0.4563482
withg3	Work with Nursing	438	0.4200913	0.4941377
withg4	Work with Ancillary	438	0.4406393	0.4970315
withg5	Work with Support	438	0.4109589	0.4925704
gender	Sex	431	1.2645012	0.4415798
age	Age Category	435	5.5908046	1.8941842
mwgroup	Missing q(W Group)	446	0.9304933	1.9653431
mhosp	Missing q(Gen Hosp)	446	2.3206278	3.1441582
mhadmin	Missing q(H Admin)	446	3.2533632	4.2411494
mmgr	Missing q(Manager)	446	1.4932735	2.7865971
mdem	Missing Demographic	446	0.6008969	1.397397
mcosts	Missing Costs	446	0.838565	0.9245426
mwerrs	Missing Work Errors	446	0.1950673	0.3966975
mcomp	Missing Complaints	446	1.4865471	1.648574
msatis	Missing Satisfaction	446	1.470852	1.6194888
msucc	Missing Success Vars	446	3.9910314	3.9768895
mlpi	Missing LPI	446	2.6681614	5.7722482
yhosp	Yrs at this hospital	435	8.519651	7.384903
yhealth	Yrs in healthcare	439	14.180162	9.35526
ypos	Yrs in current pos	381	8.428165	7.87324
yman	Yrs w current mgr	386	3.821946	4.067885
ywg	Yrs w current group	387	4.764101	4.212129

The following charts contain the computer printout for the cumulative frequency distribution for the years questions:

```
            Cumulative Distribution of Years at this Hospital

   YHOSP                                     Cum.              Cum.
  Midpoint                            Freq   Freq   Percent   Percent
             |
 0.000000    |******                   129    129     29.66     29.66
             |
 8.000000    |***************          193    322     44.37     74.02
             |
16.000000    |******************        69    391     15.86     89.89
             |
24.000000    |********************      36    427      8.28     98.16
             |
32.000000    |********************       5    432      1.15     99.31
             |
40.000000    |********************       2    434      0.46     99.77
             |
48.000000    |********************       1    435      0.23    100.00
             |
             ----+---+---+---+---+
                20  40  60  80 100

              Cumulative Percentage
```

```
             Cumulative Distribution of Years in Healthcare

 Yrs in healthcare                           Cum.              Cum.
 Midpoint                             Freq   Freq   Percent   Percent
             |
 0.000000    |**                        45     45     10.25     10.25
             |
 8.000000    |**********               165    210     37.59     47.84
             |
16.000000    |**************           107    317     24.37     72.21
             |
24.000000    |******************        83    400     18.91     91.12
             |
32.000000    |*******************       24    424      5.47     96.58
             |
40.000000    |********************      13    437      2.96     99.54
             |
48.000000    |********************       2    439      0.46    100.00
             |
             ----+---+---+---+---+
                20  40  60  80 100

              Cumulative Percentage
```

```
               Cumulative Distribution of Years in Current Position

              Yrs in current pos                     Cum.                Cum.
            Midpoint                          Freq   Freq   Percent   Percent
                           |
           0.000000        |*******            126    126     33.07     33.07
                           |
           8.000000        |***************    161    287     42.26     75.33
                           |
          16.000000        |******************  56    343     14.70     90.03
                           |
          24.000000        |*******************  24   367      6.30     96.33
                           |
          32.000000        |********************  10  377      2.62     98.95
                           |
          40.000000        |********************   3  380      0.79     99.74
                           |
          48.000000        |********************   1  381      0.26    100.00
                           |
                           ----+---+---+---+---+
                              20  40  60  80 100

                            Cumulative Percentage
```

```
          Cumulative Distribution of Years with Current Manager

          Yrs w current mgr                         Cum.               Cum.
        Midpoint                              Freq  Freq  Percent   Percent
                      |
      0.000000        |*******                 141   141    36.53     36.53
                      |
      4.000000        |****************        162   303    41.97     78.50
                      |
      8.000000        |******************       50   353    12.95     91.45
                      |
     12.000000        |*******************      15   368     3.89     95.34
                      |
     16.000000        |********************     11   379     2.85     98.19
                      |
     20.000000        |********************      6   385     1.55     99.74
                      |
     24.000000        |********************      1   386     0.26    100.00
                      |
                      ----+---+---+---+---+
                         20  40  60  80 100

                        Cumulative Percentage
           Cumulative Distribution of Years with Current Group

         YHOSP                                      Cum.               Cum.
        Midpoint                              Freq  Freq  Percent   Percent
                      |
      0.000000        |******                  129   129    29.66     29.66
                      |
      8.000000        |***************         193   322    44.37     74.02
                      |
     16.000000        |******************       69   391    15.86     89.89
                      |
     24.000000        |********************     36   427     8.28     98.16
                      |
     32.000000        |********************      5   432     1.15     99.31
                      |
     40.000000        |********************      2   434     0.46     99.77
                      |
     48.000000        |********************      1   435     0.23    100.00
                      |
                      ----+---+---+---+---+
                         20  40  60  80 100

                        Cumulative Percentage
```

The next frequency distributions are two-way analyses of specific hospitals by certain categorical demographic variables:

TABLE OF HOSP BY MANHA

HOSP MANHA(Mgr in Hosp Admin)

Frequency / Percent / Row Pct / Col Pct	1	2	Total
C	24 5.57 48.00 11.65	26 6.03 52.00 11.56	50 11.60
E	19 4.41 48.72 9.22	20 4.64 51.28 8.89	39 9.05
G	45 10.44 47.37 21.84	50 11.60 52.63 22.22	95 22.04
M	42 9.74 44.68 20.39	52 12.06 55.32 23.11	94 21.81
P	76 17.63 49.67 36.89	77 17.87 50.33 34.22	153 35.50
Total	206 47.80	225 52.20	431 100.00

Frequency Missing = 15

TABLE OF HOSP BY MAN

HOSP / Frequency / Percent / Row Pct / Col Pct	MAN (Manager) 1	2	Total
C	21 4.94 42.86 12.21	28 6.59 57.14 11.07	49 11.53
E	12 2.82 30.77 6.98	27 6.35 69.23 10.67	39 9.18
G	33 7.76 35.11 19.19	61 14.35 64.89 24.11	94 22.12
M	48 11.29 52.17 27.91	44 10.35 47.83 17.39	92 21.65
P	58 13.65 38.41 33.72	93 21.88 61.59 36.76	151 35.53
Total	172 40.47	253 59.53	425 100.00

Frequency Missing = 21

TABLE OF HOSP BY GROUP

HOSP GROUP(Group ID)

Frequency / Percent / Row Pct / Col Pct	1	2	3	4	5	Total
C	8	12	20	6	6	52
	1.81	2.71	4.52	1.36	1.36	11.76
	15.38	23.08	38.46	11.54	11.54	
	14.55	14.12	14.60	5.31	11.54	
E	3	10	8	15	4	40
	0.68	2.26	1.81	3.39	0.90	9.05
	7.50	25.00	20.00	37.50	10.00	
	5.45	11.76	5.84	13.27	7.69	
G	10	20	32	22	12	96
	2.26	4.52	7.24	4.98	2.71	21.72
	10.42	20.83	33.33	22.92	12.50	
	18.18	23.53	23.36	19.47	23.08	
M	17	9	21	36	11	94
	3.85	2.04	4.75	8.14	2.49	21.27
	18.09	9.57	22.34	38.30	11.70	
	30.91	10.59	15.33	31.86	21.15	
P	17	34	56	34	19	160
	3.85	7.69	12.67	7.69	4.30	36.20
	10.63	21.25	35.00	21.25	11.88	
	30.91	40.00	40.88	30.09	36.54	
Total	55	85	137	113	52	442
	12.44	19.23	31.00	25.57	11.76	100.00

Frequency Missing = 4

TABLE OF HOSP BY GENDER

HOSP GENDER(Sex)

Frequency / Percent / Row Pct / Col Pct	1	2	Total
C	36	14	50
	8.35	3.25	11.60
	72.00	28.00	
	11.36	12.28	
E	29	10	39
	6.73	2.32	9.05
	74.36	25.64	
	9.15	8.77	
G	75	20	95
	17.40	4.64	22.04
	78.95	21.05	
	23.66	17.54	
M	63	31	94
	14.62	7.19	21.81
	67.02	32.98	
	19.87	27.19	
P	114	39	153
	26.45	9.05	35.50
	74.51	25.49	
	35.96	34.21	
Total	317	114	431
	73.55	26.45	100.00

Frequency Missing = 15

TABLE OF HOSP BY AGE

HOSP AGE(Age Category)

HOSP	Frequency / Percent / Row Pct / Col Pct	2	3	4	5	6	7	Total
C	Frequency	2	3	6	12	10	5	50
	Percent	0.46	0.69	1.38	2.76	2.30	1.15	11.49
	Row Pct	4.00	6.00	12.00	24.00	20.00	10.00	
	Col Pct	20.00	6.38	7.89	12.63	12.35	9.43	
E	Frequency	1	4	3	10	6	5	40
	Percent	0.23	0.92	0.69	2.30	1.38	1.15	9.20
	Row Pct	2.50	10.00	7.50	25.00	15.00	12.50	
	Col Pct	10.00	8.51	3.95	10.53	7.41	9.43	
G	Frequency	1	13	12	18	16	17	95
	Percent	0.23	2.99	2.76	4.14	3.68	3.91	21.84
	Row Pct	1.05	13.68	12.63	18.95	16.84	17.89	
	Col Pct	10.00	27.66	15.79	18.95	19.75	32.08	
M	Frequency	3	17	19	24	16	8	95
	Percent	0.69	3.91	4.37	5.52	3.68	1.84	21.84
	Row Pct	3.16	17.89	20.00	25.26	16.84	8.42	
	Col Pct	30.00	36.17	25.00	25.26	19.75	15.09	
P	Frequency	3	10	36	31	33	18	155
	Percent	0.69	2.30	8.28	7.13	7.59	4.14	35.63
	Row Pct	1.94	6.45	23.23	20.00	21.29	11.61	
	Col Pct	30.00	21.28	47.37	32.63	40.74	33.96	
Total		10	47	76	95	81	53	435
		2.30	10.80	17.47	21.84	18.62	12.18	100.00

(Continued)

TABLE OF HOSP BY AGE (Continued)

HOSP AGE(Age Category)

Frequency / Percent / Row Pct / Col Pct

HOSP		8	9	10	11	12	Total
C	Frequency	6	5	0	0	1	50
	Percent	1.38	1.15	0.00	0.00	0.23	11.49
	Row Pct	12.00	10.00	0.00	0.00	2.00	
	Col Pct	15.00	25.00	0.00	0.00	100.00	
E	Frequency	6	3	2	0	0	40
	Percent	1.38	0.69	0.46	0.00	0.00	9.20
	Row Pct	15.00	7.50	5.00	0.00	0.00	
	Col Pct	15.00	15.00	22.22	0.00	0.00	
G	Frequency	9	5	4	0	0	95
	Percent	2.07	1.15	0.92	0.00	0.00	21.84
	Row Pct	9.47	5.26	4.21	0.00	0.00	
	Col Pct	22.50	25.00	44.44	0.00	0.00	
M	Frequency	5	2	0	1	0	95
	Percent	1.15	0.46	0.00	0.23	0.00	21.84
	Row Pct	5.26	2.11	0.00	1.05	0.00	
	Col Pct	12.50	10.00	0.00	33.33	0.00	
P	Frequency	14	5	3	2	0	155
	Percent	3.22	1.15	0.69	0.46	0.00	35.63
	Row Pct	9.03	3.23	1.94	1.29	0.00	
	Col Pct	35.00	25.00	33.33	66.67	0.00	
Total		40	20	9	3	1	435
		9.20	4.60	2.07	0.69	0.23	100.00

Frequency Missing = 11

The next frequency distributions describe how many variables were missing. There are five tables below, the first four counting the missing variables by evaluation area (work group, general hospital, immediate manager, and hospital administration) and the fifth table provides the total number of missing variables among the core survey items:

Missing q(W Group)

MWGROUP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	286	64.1	286	64.1
1	78	17.5	364	81.6
2	29	6.5	393	88.1
3	20	4.5	413	92.6
4	11	2.5	424	95.1
5	6	1.3	430	96.4
6	4	0.9	434	97.3
7	2	0.4	436	97.8
9	2	0.4	438	98.2
10	2	0.4	440	98.7
11	5	1.1	445	99.8
14	1	0.2	446	100.0

Missing q(Gen Hosp)

MHOSP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	193	43.3	193	43.3
1	65	14.6	258	57.8
2	42	9.4	300	67.3
3	32	7.2	332	74.4
4	24	5.4	356	79.8
5	23	5.2	379	85.0
6	16	3.6	395	88.6
7	6	1.3	401	89.9
8	13	2.9	414	92.8
9	11	2.5	425	95.3
10	5	1.1	430	96.4
11	10	2.2	440	98.7
12	2	0.4	442	99.1
13	2	0.4	444	99.6
14	2	0.4	446	100.0

Missing q(Manager)

MMGR	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	235	52.7	235	52.7
1	87	19.5	322	72.2
2	43	9.6	365	81.8
3	25	5.6	390	87.4
4	12	2.7	402	90.1
5	12	2.7	414	92.8
6	8	1.8	422	94.6
7	5	1.1	427	95.7
8	4	0.9	431	96.6
9	3	0.7	434	97.3
11	5	1.1	439	98.4
14	1	0.2	440	98.7
15	2	0.4	442	99.1
17	3	0.7	445	99.8
18	1	0.2	446	100.0

Missing q(H Admin)

MHADMIN	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	152	34.1	152	34.1
1	77	17.3	229	51.3
2	40	9.0	269	60.3
3	31	7.0	300	67.3
4	31	7.0	331	74.2
5	19	4.3	350	78.5
6	15	3.4	365	81.8
7	13	2.9	378	84.8
8	12	2.7	390	87.4
9	8	1.8	398	89.2
10	9	2.0	407	91.3
11	7	1.6	414	92.8
12	6	1.3	420	94.2
13	4	0.9	424	95.1
14	6	1.3	430	96.4
15	7	1.6	437	98.0
16	3	0.7	440	98.7
17	3	0.7	443	99.3
18	3	0.7	446	100.0

MTOT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	113	25.3	113	25.3
1	37	8.3	150	33.6
2	39	8.7	189	42.4
3	40	9.0	229	51.3
4	17	3.8	246	55.2
5	14	3.1	260	58.3
6	14	3.1	274	61.4
7	14	3.1	288	64.6
8	10	2.2	298	66.8
9	9	2.0	307	68.8
10	15	3.4	322	72.2
11	9	2.0	331	74.2
12	12	2.7	343	76.9
13	9	2.0	352	78.9
14	6	1.3	358	80.3
15	10	2.2	368	82.5
16	6	1.3	374	83.9
17	4	0.9	378	84.8
18	4	0.9	382	85.7
19	2	0.4	384	86.1
20	9	2.0	393	88.1
21	3	0.7	396	88.8
22	6	1.3	402	90.1
23	2	0.4	404	90.6
24	5	1.1	409	91.7
25	3	0.7	412	92.4
26	3	0.7	415	93.0
27	2	0.4	417	93.5
28	3	0.7	420	94.2
29	6	1.3	426	95.5
30	2	0.4	428	96.0
32	2	0.4	430	96.4
33	1	0.2	431	96.6
34	1	0.2	432	96.9
35	2	0.4	434	97.3
39	1	0.2	435	97.5
40	1	0.2	436	97.8
42	1	0.2	437	98.0
44	1	0.2	438	98.2
46	2	0.4	440	98.7
48	1	0.2	441	98.9
49	1	0.2	442	99.1
51	1	0.2	443	99.3
52	2	0.4	445	99.8
57	1	0.2	446	100.0

The choice of twenty as a cutoff value has been made in accordance with the above table, which indicates that nine participants had exactly 20 missing values in total, and a total of 393 participants with 20 or fewer responses (88.1% retained). This cutoff of twenty has been employed for the correlation matricies associated with the immediate work group, the general hospital, and the immediate manager items (hypotheses one, two, three, and five). Since the hospital administration items have a higher rate of missing data, the heuristic of four has lead to retention of 331 subjects for hypothesis four (74.2% retained); this same criteria has also been applied in the investigation of immediate managers and hospital administration combined (hypothesis six).

Such heuristics have been used to prevent violation of the assumptions of structural equation modeling (Bollen, 1989); also, it is not inconsistent with the modeling literature to apply different heuristic criteria to each of the four functional areas, which in themselves may be considered separate subscales.

APPENDIX E

SAS OUTPUT OF STRUCTURAL EQUATION MODELS FOR HYPOTHESES ONE THROUGH SIX

This appendix contains the chosen structural equation models for each of the first six hypotheses. Also included here are the path diagrams, and the associated tables summarizing the goodness of fit statistics. The reader is referred to the *SAS/STAT User's Guide: Version 6* (SAS, 1990) for elaboration on the details of the CALIS procedure, which estimates parameters and tests the appropriateness of linear structural equation models using covariance structure analysis.

Hypothesis One (Intra-Group Dimensions)

```
Covariance Structure Analysis: Maximum Likelihood Estimation

Fit criterion . . . . . . . . . . . . . . . . . .      0.4750
Goodness of Fit Index (GFI) . . . . . . . . . . .      0.9211
GFI Adjusted for Degrees of Freedom (AGFI). . . .      0.8789
Root Mean Square Residual (RMR) . . . . . . . . .      0.0481
Parsimonious GFI (Mulaik, 1989) . . . . . . . . .      0.7201
Chi-square = 172.9092      df = 43      Prob>chi**2 = 0.0001
Null Model Chi-square:     df = 55             1949.2910
RMSEA Estimate  . . . . . . 0.0911  90%C.I.[0.0771, 0.1055]
Probability of Close Fit  . . . . . . . . . . . .      0.0000
ECVI Estimate . . . . . . . 0.6057  90%C.I.[0.5035, 0.7295]
Bentler's Comparative Fit Index . . . . . . . . .      0.9314
Normal Theory Reweighted LS Chi-square  . . . . .    171.4508
Akaike's Information Criterion. . . . . . . . . .     86.9092
Bozdogan's (1987) CAIC. . . . . . . . . . . . . .   -123.7864
Schwarz's Bayesian Criterion. . . . . . . . . . .    -80.7864
McDonald's (1989) Centrality. . . . . . . . . . .      0.8370
Bentler & Bonett's (1980) Non-normed Index. . . .      0.9123
Bentler & Bonett's (1980) NFI . . . . . . . . . .      0.9113
James, Mulaik, & Brett (1982) Parsimonious NFI. .      0.7125
Z-Test of Wilson & Hilferty (1931). . . . . . . .      8.2817
Bollen (1986) Normed Index Rho1 . . . . . . . . .      0.8865
Bollen (1988) Non-normed Index Delta2 . . . . . .      0.9319
Hoelter's (1983) Critical N . . . . . . . . . . .         126
```

Residual Matrix

	Q50	Q34	Q48	Q26		
Q50	0.00000	-.02610	0.00328	0.01262	Grp	adapts
Q34	-.02610	0.00000	0.12481	-.02978	Grp	align with strat
Q48	0.00328	0.12481	0.00000	-.03577	Grp	cooperates
Q26	0.01262	-.02978	-.03577	0.00000	Grp	improve goals
Q62	0.01378	-.00596	-.00506	-.09337	Grp	learns from out
Q58	0.03512	0.08938	-.08352	0.04097	Grp	learns from past
Q32	-.01161	-.05972	-.03295	0.07546	Grp	makes changes
Q46	0.00051	-.01613	-.01659	-.01248	Grp	strong comm
Q6	0.05981	-.04286	0.06715	-.03021	Grp	studies problems
Q22	-.02727	0.04155	-.06555	-.01842	Grp	study cust needs
Q38	-.03651	0.16181	0.08475	-.04174	Grp	teamwork

	Q62	Q58	Q32	Q46		
Q50	0.01378	0.03512	-.01161	0.00051	Grp	adapts
Q34	-.00596	0.08938	-.05972	-.01613	Grp	align with strat
Q48	-.00506	-.08352	-.03295	-.01659	Grp	cooperates
Q26	-.09337	0.04097	0.07546	-.01248	Grp	improve goals
Q62	0.00000	0.03175	-.06164	0.05673	Grp	learns from out
Q58	0.03175	0.00000	-.00218	-.00376	Grp	learns from past
Q32	-.06164	-.00218	-.00000	-.07114	Grp	makes changes
Q46	0.05673	-.00376	-.07114	0.00000	Grp	strong comm
Q6	0.06880	-.01924	-.01889	0.04081	Grp	studies problems
Q22	-.03674	0.03231	0.02294	-.05217	Grp	study cust needs
Q38	-.04172	-.04047	-.02895	0.02066	Grp	teamwork

	Q6	Q22	Q38		
Q50	0.05981	-.02727	-.03651	Grp	adapts
Q34	-.04286	0.04155	0.16181	Grp	align with strat
Q48	0.06715	-.06555	0.08475	Grp	cooperates
Q26	-.03021	-.01842	-.04174	Grp	improve goals
Q62	0.06880	-.03674	-.04172	Grp	learns from out
Q58	-.01924	0.03231	-.04047	Grp	learns from past
Q32	-.01889	0.02294	-.02895	Grp	makes changes
Q46	0.04081	-.05217	0.02066	Grp	strong comm
Q6	0.00000	0.00570	0.10345	Grp	studies problems
Q22	0.00570	0.00000	-.01491	Grp	study cust needs
Q38	0.10345	-.01491	0.00000	Grp	teamwork

Average Absolute Residual = 0.03451
Average Off-diagonal Absolute Residual = 0.04141

Rank Order of 10 Largest Residuals

Q38,Q34	Q48,Q34	Q38,Q6	Q62,Q26	Q58,Q34	Q38,Q48	Q58,Q48
0.1618	0.1248	0.1034	-0.0934	0.0894	0.0848	-0.0835

Q32,Q26	Q46,Q32	Q6,Q62
0.0755	-0.0711	0.0688

Asymptotically Standardized Residual Matrix

	Q50	Q34	Q48	Q26		
Q50	0.0000	-0.9963	0.1647	0.5546	Grp	adapts
Q34	-0.9963	0.0000	3.9071	-1.6270	Grp	align with strat
Q48	0.1647	3.9071	0.0000	-1.2500	Grp	cooperates
Q26	0.5546	-1.6270	-1.2500	0.0000	Grp	improve goals
Q62	0.6416	-0.1777	-0.1739	-3.0895	Grp	learns from out
Q58	2.1176	3.1246	-3.6169	1.6243	Grp	learns from past
Q32	-0.4903	-3.0517	-1.1168	4.9098	Grp	makes changes
Q46	0.0321	-0.5759	-0.7429	-0.5068	Grp	strong comm
Q6	2.0409	-1.6076	1.9190	-1.3918	Grp	studies problems
Q22	-1.0814	1.9236	-2.1150	-1.0714	Grp	study cust needs
Q38	-2.4223	5.9537	3.9891	-1.7570	Grp	teamwork

Asymptotically Standardized Residual Matrix

	Q62	Q58	Q32	Q46		
Q50	0.6416	2.1176	-0.4903	0.0321	Grp	adapts
Q34	-0.1777	3.1246	-3.0517	-0.5759	Grp	align with strat
Q48	-0.1739	-3.6169	-1.1168	-0.7429	Grp	cooperates
Q26	-3.0895	1.6243	4.9098	-0.5068	Grp	improve goals
Q62	0.0000	1.2811	-1.9815	2.3650	Grp	learns from out
Q58	1.2811	0.0000	-0.0836	-0.2007	Grp	learns from past
Q32	-1.9815	-0.0836	0.0000	-2.7873	Grp	makes changes
Q46	2.3650	-0.2007	-2.7873	0.0000	Grp	strong comm
Q6	1.8804	-0.6073	-0.8184	1.3126	Grp	studies problems
Q22	-1.1274	1.1689	1.2458	-1.9288	Grp	study cust needs
Q38	-1.8262	-2.2799	-1.1734	1.2081	Grp	teamwork

	Q6	Q22	Q38		
Q50	2.0409	-1.0814	-2.4223	Grp	adapts
Q34	-1.6076	1.9236	5.9537	Grp	align with strat
Q48	1.9190	-2.1150	3.9891	Grp	cooperates
Q26	-1.3918	-1.0714	-1.7570	Grp	improve goals
Q62	1.8804	-1.1274	-1.8262	Grp	learns from out
Q58	-0.6073	1.1689	-2.2799	Grp	learns from past
Q32	-0.8184	1.2458	-1.1734	Grp	makes changes
Q46	1.3126	-1.9288	1.2081	Grp	strong comm
Q6	0.0000	0.2253	3.4178	Grp	studies problems
Q22	0.2253	0.0000	-0.5691	Grp	study cust needs
Q38	3.4178	-0.5691	0.0000	Grp	teamwork

Average Standardized Residual = 1.383

Average Off-diagonal Standardized Residual = 1.659

Rank Order of 10 Largest Asymptotically Standardized Residuals

Q38,Q34	Q32,Q26	Q38,Q48	Q48,Q34	Q58,Q48	Q38,Q6	Q58,Q34
5.9537	4.9098	3.9891	3.9071	-3.6169	3.4178	3.1246

Q62,Q26	Q32,Q34	Q46,Q32
-3.0895	-3.0517	-2.7873

Distribution of Asymptotically Standardized Residuals
(Each * represents 1 residuals)

```
-3.75000 -   -3.50000   1   1.52% | *
-3.50000 -   -3.25000   0   0.00% |
-3.25000 -   -3.00000   2   3.03% | **
-3.00000 -   -2.75000   1   1.52% | *
-2.75000 -   -2.50000   0   0.00% |
-2.50000 -   -2.25000   2   3.03% | **
-2.25000 -   -2.00000   1   1.52% | *
-2.00000 -   -1.75000   4   6.06% | ****
-1.75000 -   -1.50000   2   3.03% | **
-1.50000 -   -1.25000   2   3.03% | **
-1.25000 -   -1.00000   5   7.58% | *****
-1.00000 -   -0.75000   2   3.03% | **
-0.75000 -   -0.50000   5   7.58% | *****
-0.50000 -   -0.25000   1   1.52% | *
-0.25000 -          0   4   6.06% | ****
       0 -    0.25000  14  21.21% | **************
 0.25000 -    0.50000   0   0.00% |
 0.50000 -    0.75000   2   3.03% | **
 0.75000 -    1.00000   0   0.00% |
 1.00000 -    1.25000   3   4.55% | ***
 1.25000 -    1.50000   2   3.03% | **
 1.50000 -    1.75000   1   1.52% | *
 1.75000 -    2.00000   3   4.55% | ***
 2.00000 -    2.25000   2   3.03% | **
 2.25000 -    2.50000   1   1.52% | *
 2.50000 -    2.75000   0   0.00% |
 2.75000 -    3.00000   0   0.00% |
 3.00000 -    3.25000   1   1.52% | *
 3.25000 -    3.50000   1   1.52% | *
 3.50000 -    3.75000   0   0.00% |
 3.75000 -    4.00000   2   3.03% | **
 4.00000 -    4.25000   0   0.00% |
 4.25000 -    4.50000   0   0.00% |
 4.50000 -    4.75000   0   0.00% |
 4.75000 -    5.00000   1   1.52% | *
 5.00000 -    5.25000   0   0.00% |
 5.25000 -    5.50000   0   0.00% |
 5.50000 -    5.75000   0   0.00% |
 5.75000 -    6.00000   1   1.52% | *
```

Manifest Variable Equations

```
Q50       =     0.7918*F1       +  1.0000 E50
Std Err         0.0454 LAMB150
t Value        17.4396

Q34       =     0.6902*F2       +  1.0000 E34
Std Err         0.0485 LAMB234
t Value        14.2219

Q48       =     0.6498*F1       +  1.0000 E48
Std Err         0.0488 LAMB148
t Value        13.3030

Q26       =     0.7744*F2       +  1.0000 E26
Std Err         0.0465 LAMB226
t Value        16.6538

Q62       =     0.5987*F1       +  1.0000 E62
Std Err         0.0499 LAMB162
t Value        12.0000

Q58       =     0.7388*F1       +  1.0000 E58
Std Err         0.0468 LAMB158
t Value        15.7943
```

```
Q32      =    0.7535*F2      +  1.0000 E32
Std Err       0.0470 LAMB232
t Value      16.0255

Q46      =    0.7526*F1      +  1.0000 E46
Std Err       0.0464 LAMB146
t Value      16.2104

Q6       =    0.5940*F2      +  1.0000 E6
Std Err       0.0506 LAMB26
t Value      11.7495

Q22      =    0.7160*F2      +  1.0000 E22
Std Err       0.0479 LAMB222
t Value      14.9392

Q38      =    0.7712*F1      +  1.0000 E38
Std Err       0.0460 LAMB138
t Value      16.7838
```

Variances of Exogenous Variables

Variable	Parameter	Estimate	Standard Error	t Value
F2		1.000000	0	0.000
F1		1.000000	0	0.000
E34	THE34	0.523675	0.044789	11.692
E26	THE26	0.400352	0.038115	10.504
E58	THE58	0.454132	0.039366	11.536
E32	THE32	0.432234	0.039741	10.876
E6	THE6	0.647158	0.052107	12.420
E22	THE22	0.487344	0.042729	11.405
E50	THE50	0.373012	0.034708	10.747
E62	THE62	0.641591	0.050963	12.589
E46	THE46	0.433528	0.038150	11.364
E48	THE48	0.577778	0.046940	12.309
E38	THE38	0.405226	0.036513	11.098

Covariances among Exogenous Variables

Parameter			Estimate	Standard Error	t Value
F1	F2	GAM12	0.840796	0.025433	33.059

Equations with Standardized Coefficients

```
Q50    =    0.7918*F1      + 0.6107 E50
                   LAMB150

Q34    =    0.6902*F2      + 0.7237 E34
                   LAMB234

Q48    =    0.6498*F1      + 0.7601 E48
                   LAMB148

Q26    =    0.7744*F2      + 0.6327 E26
                   LAMB226

Q62    =    0.5987*F1      + 0.8010 E62
                   LAMB162

Q58    =    0.7388*F1      + 0.6739 E58
                   LAMB158
```

```
Q32    =    0.7535*F2      + 0.6574 E32
              LAMB232

Q46    =    0.7526*F1      + 0.6584 E46
              LAMB146

Q6     =    0.5940*F2      + 0.8045 E6
              LAMB26

Q22    =    0.7160*F2      + 0.6981 E22
              LAMB222

Q38    =    0.7712*F1      + 0.6366 E38
              LAMB138
```

Squared Multiple Correlations

Variable		Error Variance	Total Variance	R-squared
1	Q50	0.373012	1.000000	0.626988
2	Q34	0.523675	1.000000	0.476325
3	Q48	0.577778	1.000000	0.422222
4	Q26	0.400352	1.000000	0.599648
5	Q62	0.641591	1.000000	0.358409
6	Q58	0.454132	1.000000	0.545868
7	Q32	0.432234	1.000000	0.567766
8	Q46	0.433528	1.000000	0.566472
9	Q6	0.647158	1.000000	0.352842
10	Q22	0.487344	1.000000	0.512656
11	Q38	0.405226	1.000000	0.594774

Correlations among Exogenous Variables

Parameter			Estimate
F1	F2	GAM12	0.840796

The items and the corresponding dimensions appear in the following table:

Table 27. Items Tested under Hypothesis One

Factor	Item
Action	22. Our work group studies customer needs.
Action	26. Our work group effectively improves our group's goals.
Action	32. Our work group makes major changes when necessary.
Action	6. Our work group studies the causes of major problems.
Interaction	20. People within our work group trust each other.
Interaction	38. There is an appropriate level of teamwork within our work group.
Interaction	46. There is strong communication within our work group.
Interaction	48. People within our work group cooperate with each other.
Interaction	50. Our work group adapts well to new demands.
Interaction	58. Our work group learns from past mistakes.
Interaction	62. Our work group learns from the success stories within our hospital.
dropped	16. People within our work group have problems working together.
dropped	34. People within our work group align their work with the overall work group strategy (or mission).
dropped	54. Our work group learns from my personal successes.

The labeling of dimensions proceeded from examination of the related items. The interaction items include topics like communication and cooperation as well as teamwork, activities which are interactive in nature; by contrast, the items for the action dimension focus on the group studying certain problems or making changes, the types of activities that an entire group would perform.

The structural equation model is shown below (the variance of the latent variables is assumed to be one, and the measurement errors for the manifest variables are not displayed):

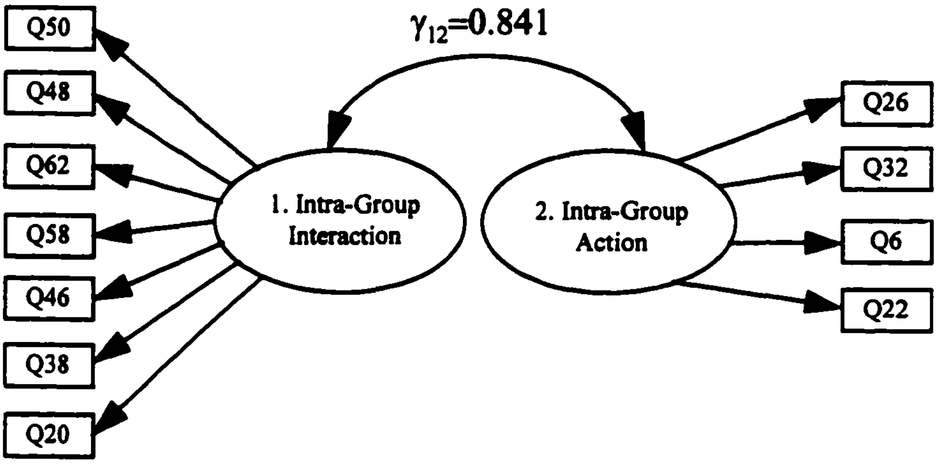

Figure 24. Structural Equation Model Tested under Hypothesis One

In addition to testing the above model, the phase two data are compared to phase one data as a source of validation; as mentioned in the main text, phase one data are not used to construct structural models, and validation based on phase one are not necessary to establish the above model. Additionally, phase two data are shown to have more missing variables, and thus the phase one results should only be interpreted with caution.

Following McArdle's (1996) suggestion, the data are compared to an alternative hypothesis in which Q34 is added to the action dimension. The table below provides a comparison structural equation model which included Q34 within the action dimension; both models are also tested using the phase one data, resulting in four structural equation models presented:

Table 28. Comparison of Fit Indices for Hypothesis One

	Phase Two without Q34	Phase One without Q34	Phase Two with Q34	Phase One with Q34
χ^2	128.6264	201.2371	203.9778	220.5976
df	43	43	53	53
Null χ^2	1980.2103	3705.0424	2247.2225	4189.6282
Null df	55	55	66	66
GFI	0.9378	0.9231	0.9143	0.9244
AGFI	0.9045	0.8819	0.8739	0.8888
RMR	0.0422	0.0368	0.0469	0.0352
PGFI	0.7332	0.7217	0.7342	0.7423
CFI	0.9555	0.9566	0.9308	0.9594
NFI	0.9350	0.9457	0.9092	0.9473
PNFI	0.7310	0.7394	0.7301	0.7607

The goodness of fit indices indicate strong fit with the data, thus supporting the hypothesis that the intra-group dimensions are as proposed.

Hypothesis Two (Intergroup Dimensions)

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit criterion	0.1967
Goodness of Fit Index (GFI)	0.9594
GFI Adjusted for Degrees of Freedom (AGFI). . . .	0.9298
Root Mean Square Residual (RMR)	0.0344
Parsimonious GFI (Mulaik, 1989)	0.6929
Chi-square = 64.8998 df = 26 Prob>chi**2 =	0.0001
Null Model Chi-square: df = 36	1410.4561
RMSEA Estimate . . . . . . 0.0673 90%C.I.[0.0470,	0.0881]
Probability of Close Fit	0.0779
ECVI Estimate . . . . 0.3154 90%C.I.[0.2545,	0.4004]
Bentler's Comparative Fit Index	0.9717
Normal Theory Reweighted LS Chi-square	62.7833
Akaike's Information Criterion.	12.8998
Bozdogan's (1987) CAIC.	-111.9553
Schwarz's Bayesian Criterion.	-85.9553
McDonald's (1989) Centrality.	0.9429
Bentler & Bonett's (1980) Non-normed Index. . . .	0.9608
Bentler & Bonett's (1980) NFI	0.9540
James, Mulaik, & Brett (1982) Parsimonious NFI. .	0.6890
Z-Test of Wilson & Hilferty (1931).	3.9487
Bollen (1986) Normed Index Rho1	0.9363
Bollen (1988) Non-normed Index Delta2	0.9719
Hoelter's (1983) Critical N	199

Residual Matrix

	Q49	Q25	Q53	Q61	Q57	
Q49	0.00000	-.01608	0.00564	-.02350	0.00267	Hosp adapts
Q25	-.01608	0.00000	0.00100	-.00284	-.02849	Hosp improve goals
Q53	0.00564	0.00100	0.00000	0.10397	0.02860	Hosp learns from in
Q61	-.02350	-.00284	0.10397	0.00000	-.00944	Hosp learns from out
Q57	0.00267	-.02849	0.02860	-.00944	0.00000	Hosp learns from past
Q31	-.05279	0.02255	-.00593	0.03747	0.02982	Hosp makes changes
Q45	0.03062	0.00942	-.07589	-.00500	0.00326	Hosp strong comm
Q21	0.01800	0.02123	-.01943	-.03257	-.04089	Hosp study cust needs
Q37	0.02987	-.02086	-.01121	0.01878	0.01787	Hosp teamwork

	Q31	Q45	Q21	Q37	
Q49	-.05279	0.03062	0.01800	0.02987	Hosp adapts
Q25	0.02255	0.00942	0.02123	-.02086	Hosp improve goals
Q53	-.00593	-.07589	-.01943	-.01121	Hosp learns from in
Q61	0.03747	-.00500	-.03257	0.01878	Hosp learns from out
Q57	0.02982	0.00326	-.04089	0.01787	Hosp learns from past
Q31	0.00000	-.10094	0.02275	-.02130	Hosp makes changes
Q45	-.10094	0.00000	-.02685	0.09704	Hosp strong comm
Q21	0.02275	-.02685	0.00000	0.00535	Hosp study cust needs
Q37	-.02130	0.09704	0.00535	0.00000	Hosp teamwork

Average Absolute Residual = 0.02222

Average Off-diagonal Absolute Residual = 0.02778

Rank Order of 10 Largest Residuals

Q61,Q53	Q45,Q31	Q37,Q45	Q45,Q53	Q31,Q49	Q21,Q57	Q31,Q61
0.1040	-0.1009	0.0970	-0.0759	-0.0528	-0.0409	0.0375

Q21,Q61	Q45,Q49	Q37,Q49
-0.0326	0.0306	0.0299

Asymptotically Standardized Residual Matrix

	Q49	Q25	Q53	Q61	Q57	
Q49	0.0000	-0.7122	0.2279	-1.1958	0.2247	Hosp adapts
Q25	-0.7122	0.0000	0.0643	-0.1086	-1.4573	Hosp improve goals
Q53	0.2279	0.0643	0.0000	3.6819	1.3140	Hosp learns from in
Q61	-1.1958	-0.1086	3.6819	0.0000	-0.6100	Hosp learns from out
Q57	0.2247	-1.4573	1.3140	-0.6100	0.0000	Hosp learns from past
Q31	-2.0257	1.3357	-0.3043	1.2691	1.2909	Hosp makes changes
Q45	1.5497	0.3594	-2.6785	-0.2070	0.2093	Hosp strong comm
Q21	0.6248	1.0811	-0.8653	-1.0103	-1.5805	Hosp study cust needs
Q37	1.0743	-1.1184	-0.5239	0.6010	0.7187	Hosp teamwork

	Q31	Q45	Q21	Q37	
Q49	-2.0257	1.5497	0.6248	1.0743	Hosp adapts
Q25	1.3357	0.3594	1.0811	-1.1184	Hosp improve goals
Q53	-0.3043	-2.6785	-0.8653	-0.5239	Hosp learns from in
Q61	1.2691	-0.2070	-1.0103	0.6010	Hosp learns from out
Q57	1.2909	0.2093	-1.5805	0.7187	Hosp learns from past
Q31	0.0000	-3.4079	0.9441	-0.9266	Hosp makes changes
Q45	-3.4079	0.0000	-0.8304	3.0962	Hosp strong comm
Q21	0.9441	-0.8304	0.0000	0.2040	Hosp study cust needs
Q37	-0.9266	3.0962	0.2040	0.0000	Hosp teamwork

Average Standardized Residual = 0.8763

Average Off-diagonal Standardized Residual = 1.095

Rank Order of 10 Largest Asymptotically Standardized Residuals

Q61,Q53	Q45,Q31	Q37,Q45	Q45,Q53	Q31,Q49	Q21,Q57	Q45,Q49
3.6819	-3.4079	3.0962	-2.6785	-2.0257	-1.5805	1.5497

Q57,Q25	Q31,Q25	Q57,Q53
-1.4573	1.3357	1.3140

```
Distribution of Asymptotically Standardized Residuals
        (Each * represents 1 residuals)

 -3.50000 -  -3.25000   1   2.22% | *
 -3.25000 -  -3.00000   0   0.00% |
 -3.00000 -  -2.75000   0   0.00% |
 -2.75000 -  -2.50000   1   2.22% | *
 -2.50000 -  -2.25000   0   0.00% |
 -2.25000 -  -2.00000   1   2.22% | *
 -2.00000 -  -1.75000   0   0.00% |
 -1.75000 -  -1.50000   1   2.22% | *
 -1.50000 -  -1.25000   1   2.22% | *
 -1.25000 -  -1.00000   3   6.67% | ***
 -1.00000 -  -0.75000   3   6.67% | ***
 -0.75000 -  -0.50000   3   6.67% | ***
 -0.50000 -  -0.25000   1   2.22% | *
 -0.25000 -         0   2   4.44% | **
        0 -   0.25000  14  31.11% | **************
  0.25000 -   0.50000   1   2.22% | *
  0.50000 -   0.75000   3   6.67% | ***
  0.75000 -   1.00000   1   2.22% | *
  1.00000 -   1.25000   2   4.44% | **
  1.25000 -   1.50000   4   8.89% | ****
  1.50000 -   1.75000   1   2.22% | *
  1.75000 -   2.00000   0   0.00% |
  2.00000 -   2.25000   0   0.00% |
  2.25000 -   2.50000   0   0.00% |
  2.50000 -   2.75000   0   0.00% |
  2.75000 -   3.00000   0   0.00% |
  3.00000 -   3.25000   1   2.22% | *
  3.25000 -   3.50000   0   0.00% |
  3.50000 -   3.75000   1   2.22% | *


          Manifest Variable Equations

Q49      =    0.7675*F3       +  1.0000 E49
Std Err       0.0490 LAMB349
t Value      15.6678

Q25      =    0.7944*F4       +  1.0000 E25
Std Err       0.0481 LAMB415
t Value      16.5324

Q53      =    0.7523*F4       +  1.0000 E53
Std Err       0.0492 LAMB453
t Value      15.2955

Q61      =    0.6900*F3       +  1.0000 E61
Std Err       0.0509 LAMB361
t Value      13.5468

Q57      =    0.8244*F3       +  1.0000 E57
Std Err       0.0475 LAMB357
t Value      17.3563

Q31      =    0.7242*F4       +  1.0000 E31
Std Err       0.0499 LAMB431
t Value      14.5109

Q45      =    0.6876*F3       +  1.0000 E45
Std Err       0.0510 LAMB345
t Value      13.4867

Q21      =    0.6569*F4       +  1.0000 E21
Std Err       0.0515 LAMB412
t Value      12.7481
```

```
Q37      =     0.6829*F4     +  1.0000 E37
Std Err        0.0509 LAMB437
t Value       13.4108
```

Variances of Exogenous Variables

Variable	Parameter	Estimate	Standard Error	t Value
F4		1.000000	0	0.000
F3		1.000000	0	0.000
E25	THE25	0.368949	0.037647	9.800
E31	THE31	0.475563	0.043651	10.895
E21	THE21	0.568518	0.049391	11.510
E53	THE53	0.434115	0.041216	10.533
E37	THE37	0.533659	0.047204	11.305
E57	THE57	0.320390	0.036284	8.830
E49	THE49	0.410874	0.040510	10.143
E61	THE61	0.523961	0.046973	11.154
E45	THE45	0.527153	0.047166	11.176

Covariances among Exogenous Variables

Parameter			Estimate	Standard Error	t Value
F3	F4	GAM34	0.859290	0.026301	32.671

Equations with Standardized Coefficients

```
Q49     =     0.7675*F3     + 0.6410 E49
                  LAMB349

Q25     =     0.7944*F4     + 0.6074 E25
                  LAMB415

Q53     =     0.7523*F4     + 0.6589 E53
                  LAMB453

Q61     =     0.6900*F3     + 0.7239 E61
                  LAMB361

Q57     =     0.8244*F3     + 0.5660 E57
                  LAMB357

Q31     =     0.7242*F4     + 0.6896 E31
                  LAMB431

Q45     =     0.6876*F3     + 0.7261 E45
                  LAMB345

Q21     =     0.6569*F4     + 0.7540 E21
                  LAMB412

Q37     =     0.6829*F4     + 0.7305 E37
                  LAMB437
```

Squared Multiple Correlations

Variable		Error Variance	Total Variance	R-squared
1	Q49	0.410874	1.000000	0.589126
2	Q25	0.368949	1.000000	0.631051
3	Q53	0.434115	1.000000	0.565885
4	Q61	0.523961	1.000000	0.476039
5	Q57	0.320390	1.000000	0.679610
6	Q31	0.475563	1.000000	0.524437
7	Q45	0.527153	1.000000	0.472847
8	Q21	0.568518	1.000000	0.431482
9	Q37	0.533659	1.000000	0.466341

Correlations among Exogenous Variables

Parameter			Estimate
F3	F4	GAM34	0.859290

The items and the corresponding dimensions appear in the following table:

Table 29. Items Tested under Hypothesis Two

Factor	Item
Action	21. Hospital work groups study customer needs.
Action	25. Hospital work groups effectively improve our hospital's goals.
Action	31. Our hospital makes major changes when necessary.
Action	37. There is an appropriate level of teamwork among hospital work groups.
Action	53. Our hospital learns from the successes in our work group.
Interaction	45. There is strong communication among hospital work groups.
Interaction	49. Our hospital adapts well to new demands.
Interaction	57. Our hospital learns from past mistakes.
Interaction	61. Our hospital learns from success stories at other hospitals.
dropped	15. Hospital work groups have problems working together.
dropped	19. Hospital work groups trust each other.
dropped	47. Hospital work groups cooperate with each other.
dropped	5. Hospital work groups study the causes of major problems.
dropped	33. Hospital work groups align their work with the overall hospital strategy (or mission).

The interaction dimension loaded highly with items similar to the individual work group dimensions analyzed under hypothesis one. The action dimension included items such as studying customer needs, improving goals, and making major changes. The similarity in the validated structural models (made possible by the original design which paired items) allows for further validation that the dimensions are conceptually related.

The structural equation model is shown below (the variance of the latent variables is assumed to be one, and the measurement errors for the manifest variables are not displayed):

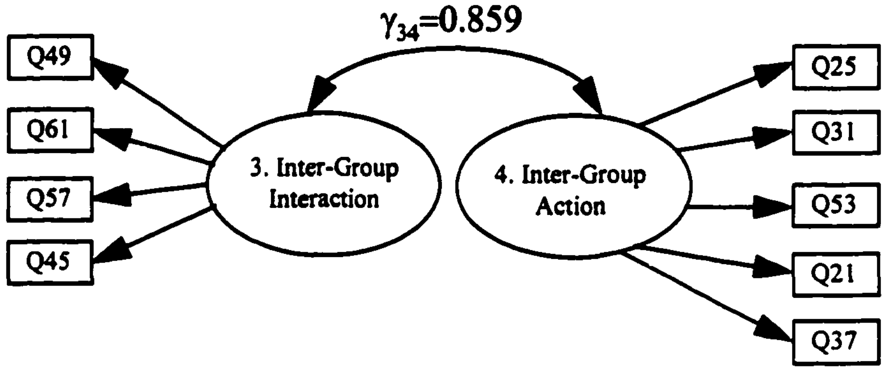

Figure 25. Structural Equation Model Tested under Hypothesis Two

In addition to testing the above model, the phase two data are compared to phase one data as a source of validation; as mentioned in the main text, phase one data are not used to construct structural models, and validation based on phase one are not necessary to establish the above model. Additionally, phase two data are shown to have more missing variables, and thus the phase one results should only be interpreted with caution.

Following McArdle's (1996) suggestion, the data are compared to an alternative hypothesis in which Q19 is added to the interaction dimension. The table below provides a comparison structural equation model which included Q19 within the interaction dimension; both models are also tested using the phase one data, resulting in four structural equation models presented:

Table 30. Comparison of Fit Indices for Hypothesis Two

	Phase Two without Q19	Phase One without Q19	Phase Two with Q19	Phase One with Q19
χ^2	64.8998	149.0372	118.2299	201.6732
df	26	26	34	34
Null χ^2	1410.4561	2352.1869	1616.1236	2666.7804
Null df	36	36	45	45
GFI	0.9594	0.9339	0.9271	0.9158
AGFI	0.9298	0.8856	0.8821	0.8638
RMR	0.0344	0.0397	0.0459	0.0427
PGFI	0.6929	0.6745	0.7005	0.6919
CFI	0.9717	0.9469	0.9464	0.9360
NFI	0.9540	0.9366	0.9268	0.9244
PNFI	0.6890	0.6765	0.7003	0.6984

The goodness of fit indices indicate strong fit with the data, thus supporting the hypothesis that the intergroup dimensions are as proposed.

Hypothesis Three (Managerial Dimensions)

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit criterion	0.7911
Goodness of Fit Index (GFI)	0.9038
GFI Adjusted for Degrees of Freedom (AGFI). . . .	0.8674
Root Mean Square Residual (RMR)	0.0403
Parsimonious GFI (Mulaik, 1989)	0.7489
Chi-square = 221.5156 df = 87 Prob>chi**2 =	0.0001
Null Model Chi-square: df = 105	2630.2223
RMSEA Estimate . . . . . . 0.0743 90%C.I.[0.0623,	0.0865]
Probability of Close Fit	0.0007
ECVI Estimate . . . . 1.0411 90%C.I.[0.8953,	1.2162]
Bentler's Comparative Fit Index	0.9467
Normal Theory Reweighted LS Chi-square	223.4215
Akaike's Information Criterion.	47.5156
Bozdogan's (1987) CAIC.	-356.0212
Schwarz's Bayesian Criterion.	-269.0212
McDonald's (1989) Centrality.	0.7871
Bentler & Bonett's (1980) Non-normed Index. . . .	0.9357
Bentler & Bonett's (1980) NFI	0.9158
James, Mulaik, & Brett (1982) Parsimonious NFI. .	0.7588
Z-Test of Wilson & Hilferty (1931).	7.2827
Bollen (1986) Normed Index Rho1	0.8984
Bollen (1988) Non-normed Index Delta2	0.9471
Hoelter's (1983) Critical N	140

Residual Matrix

	Q56	Q2	Q4	Q10	Q64	
Q56	-.00000	-.02663	0.04649	-.06441	-.06166	Mgr acts on vision
Q2	-.02663	0.00000	0.11772	0.07939	0.01465	Mgr builds cust rel
Q4	0.04649	0.11772	-.00000	-.01808	-.03704	Mgr builds hum res
Q10	-.06441	0.07939	-.01808	0.00000	-.02365	Mgr builds suppl rel
Q64	-.06166	0.01465	-.03704	-.02365	0.00000	Mgr collects cust data
Q24	-.05606	0.02528	-.04090	0.00175	-.01974	Mgr comm diff decision
Q40	0.02043	-.00975	-.01561	-.00518	0.02168	Mgr comm vision
Q36	-.02238	0.00203	-.03414	-.02457	0.02284	Mgr details feedback
Q18	0.03098	-.02878	0.02055	0.01220	0.04751	Mgr involved in proj
Q30	0.06410	0.06630	0.08029	0.02708	-.01371	Mgr provide training
Q8	-.08847	0.04757	0.02829	0.00765	-.01652	Mgr provides info
Q44	-.01634	-.02395	-.00271	-.04938	0.04032	Mgr reports cust data
Q42	0.04137	-.04546	0.04895	-.03693	-.02889	Mgr supports decision
Q60	-.00090	-.02128	-.02142	0.04173	0.05657	Mgr timely feedback
Q28	0.07854	-.05242	0.04527	-.05824	-.00928	Mgr understand respnsb

Residual Matrix

	Q24	Q40	Q36	Q18	Q30	
Q56	-.05606	0.02043	-.02238	0.03098	0.06410	Mgr acts on vision
Q2	0.02528	-.00975	0.00203	-.02878	0.06630	Mgr builds cust rel
Q4	-.04090	-.01561	-.03414	0.02055	0.08029	Mgr builds hum res
Q10	0.00175	-.00518	-.02457	0.01220	0.02708	Mgr builds suppl rel
Q64	-.01974	0.02168	0.02284	0.04751	-.01371	Mgr collects cust data
Q24	0.00000	-.04050	0.05334	-.01577	-.04137	Mgr comm diff decision
Q40	-.04050	0.00000	0.01662	0.04534	0.02089	Mgr comm vision
Q36	0.05334	0.01662	-.00000	-.00258	0.03188	Mgr details feedback
Q18	-.01577	0.04534	-.00258	0.00000	-.06655	Mgr involved in proj
Q30	-.04137	0.02089	0.03188	-.06655	0.00000	Mgr provide training
Q8	0.00670	-.06052	0.05909	-.03755	-.00191	Mgr provides info
Q44	0.02103	0.05416	0.11035	-.03831	-.01314	Mgr reports cust data
Q42	-.02425	-.03587	0.00315	0.04402	0.00921	Mgr supports decision
Q60	0.07369	-.11269	-.02618	-.03632	-.02115	Mgr timely feedback
Q28	-.02208	-.04500	-.05322	0.04127	0.01536	Mgr understand respnsb

	Q8	Q44	Q42	Q60	Q28	
Q56	-.08847	-.01634	0.04137	-.00090	0.07854	Mgr acts on vision
Q2	0.04757	-.02395	-.04546	-.02128	-.05242	Mgr builds cust rel
Q4	0.02829	-.00271	0.04895	-.02142	0.04527	Mgr builds hum res
Q10	0.00765	-.04938	-.03693	0.04173	-.05824	Mgr builds suppl rel
Q64	-.01652	0.04032	-.02889	0.05657	-.00928	Mgr collects cust data
Q24	0.00670	0.02103	-.02425	0.07369	-.02208	Mgr comm diff decision
Q40	-.06052	0.05416	-.03587	-.11269	-.04500	Mgr comm vision
Q36	0.05909	0.11035	0.00315	-.02618	-.05322	Mgr details feedback
Q18	-.03755	-.03831	0.04402	-.03632	0.04127	Mgr involved in proj
Q30	-.00191	-.01314	0.00921	-.02115	0.01536	Mgr provide training
Q8	0.00000	-.01286	0.01325	0.06518	0.00908	Mgr provides info
Q44	-.01286	0.00000	-.03592	-.04270	-.05991	Mgr reports cust data
Q42	0.01325	-.03592	0.00000	-.01366	0.04339	Mgr supports decision
Q60	0.06518	-.04270	-.01366	0.00000	0.01236	Mgr timely feedback
Q28	0.00908	-.05991	0.04339	0.01236	0.00000	Mgr understand respnsb

Average Absolute Residual = 0.03101
Average Off-diagonal Absolute Residual = 0.03544

Rank Order of 10 Largest Residuals

Q4,Q2	Q60,Q40	Q44,Q36	Q8,Q56	Q30,Q4	Q10,Q2	Q28,Q56
0.1177	-0.1127	0.1104	-0.0885	0.0803	0.0794	0.0785

Q60,Q24	Q30,Q18	Q30,Q2
0.0737	-0.0666	0.0663

Asymptotically Standardized Residual Matrix

	Q56	Q2	Q4	Q10	Q64	
Q56	0.0000	-0.7946	2.1327	-2.0334	-2.0186	Mgr acts on vision
Q2	-0.7946	0.0000	3.3597	3.1478	0.4981	Mgr builds cust rel
Q4	2.1327	3.3597	0.0000	-0.5440	-1.1503	Mgr builds hum res
Q10	-2.0334	3.1478	-0.5440	0.0000	-0.8591	Mgr builds suppl rel
Q64	-2.0186	0.4981	-1.1503	-0.8591	0.0000	Mgr collects cust data
Q24	-1.9300	0.9054	-1.3308	0.0670	-1.0294	Mgr comm diff decision
Q40	1.1541	-0.3048	-0.7965	-0.1720	0.7505	Mgr comm vision
Q36	-1.5297	0.0679	-2.0871	-0.8772	0.8585	Mgr details feedback
Q18	1.1019	-1.3759	0.6909	0.6358	1.9940	Mgr involved in proj
Q30	1.6924	2.0583	2.0396	0.9095	-0.4054	Mgr provide training
Q8	-3.3408	1.8733	1.0018	0.3241	-1.0383	Mgr provides info
Q44	-0.4982	-0.7571	-0.0786	-1.6626	1.7185	Mgr reports cust data
Q42	1.3888	-1.9783	1.5603	-1.7481	-1.1293	Mgr supports decision
Q60	-0.0296	-0.8969	-0.6695	1.9111	2.1569	Mgr timely feedback
Q28	2.4075	-1.9913	1.3252	-2.4002	-0.3257	Mgr understand respnsb

	Q24	Q40	Q36	Q18	Q30	
Q56	-1.9300	1.1541	-1.5297	1.1019	1.6924	Mgr acts on vision
Q2	0.9054	-0.3048	0.0679	-1.3759	2.0583	Mgr builds cust rel
Q4	-1.3308	-0.7965	-2.0871	0.6909	2.0396	Mgr builds hum res
Q10	0.0670	-0.1720	-0.8772	0.6358	0.9095	Mgr builds suppl rel
Q64	-1.0294	0.7505	0.8585	1.9940	-0.4054	Mgr collects cust data
Q24	0.0000	-1.4812	2.1330	-0.7030	-1.2830	Mgr comm diff decision
Q40	-1.4812	0.0000	1.2967	1.7117	0.5742	Mgr comm vision
Q36	2.1330	1.2967	0.0000	-0.1061	0.9275	Mgr details feedback
Q18	-0.7030	1.7117	-0.1061	0.0000	-2.6773	Mgr involved in proj
Q30	-1.2830	0.5742	0.9275	-2.6773	0.0000	Mgr provide training
Q8	0.4677	-2.4502	2.6561	-1.8713	-0.0648	Mgr provides info
Q44	0.9741	1.7368	3.8083	-1.4785	-0.3632	Mgr reports cust data
Q42	-1.0039	-1.2718	0.1211	2.5370	0.3385	Mgr supports decision
Q60	2.9712	-3.9078	-0.9803	-2.0214	-0.7533	Mgr timely feedback
Q28	-0.8166	-1.4477	-1.8354	2.0548	0.4949	Mgr understand respnsb

Asymptotically Standardized Residual Matrix

	Q8	Q44	Q42	Q60	Q28	
Q56	-3.3408	-0.4982	1.3888	-0.0296	2.4075	Mgr acts on vision
Q2	1.8733	-0.7571	-1.9783	-0.8969	-1.9913	Mgr builds cust rel
Q4	1.0018	-0.0786	1.5603	-0.6695	1.3252	Mgr builds hum res
Q10	0.3241	-1.6626	-1.7481	1.9111	-2.4002	Mgr builds suppl rel
Q64	-1.0383	1.7185	-1.1293	2.1569	-0.3257	Mgr collects cust data
Q24	0.4677	0.9741	-1.0039	2.9712	-0.8166	Mgr comm diff decision
Q40	-2.4502	1.7368	-1.2718	-3.9078	-1.4477	Mgr comm vision
Q36	2.6561	3.8083	0.1211	-0.9803	-1.8354	Mgr details feedback
Q18	-1.8713	-1.4785	2.5370	-2.0214	2.0548	Mgr involved in proj
Q30	-0.0648	-0.3632	0.3385	-0.7533	0.4949	Mgr provide training
Q8	0.0000	-0.7088	0.6092	2.9137	0.3701	Mgr provides info
Q44	-0.7088	0.0000	-1.2968	-1.5054	-1.9513	Mgr reports cust data
Q42	0.6092	-1.2968	0.0000	-0.6891	1.9644	Mgr supports decision
Q60	2.9137	-1.5054	-0.6891	0.0000	0.5418	Mgr timely feedback
Q28	0.3701	-1.9513	1.9644	0.5418	0.0000	Mgr understand respnsb

Average Standardized Residual = 1.178
Average Off-diagonal Standardized Residual = 1.347

Rank Order of 10 Largest Asymptotically Standardized Residuals

Q60,Q40	Q44,Q36	Q4,Q2	Q8,Q56	Q10,Q2	Q60,Q24	Q60,Q8
-3.9078	3.8083	3.3597	-3.3408	3.1478	2.9712	2.9137

Q30,Q18	Q8,Q36	Q42,Q18
-2.6773	2.6561	2.5370

Distribution of Asymptotically Standardized Residuals
(Each * represents 1 residuals)

```
-4.00000 -   -3.75000   1    0.83% | *
-3.75000 -   -3.50000   0    0.00% |
-3.50000 -   -3.25000   1    0.83% | *
-3.25000 -   -3.00000   0    0.00% |
-3.00000 -   -2.75000   0    0.00% |
-2.75000 -   -2.50000   1    0.83% | *
-2.50000 -   -2.25000   2    1.67% | **
-2.25000 -   -2.00000   4    3.33% | ****
-2.00000 -   -1.75000   6    5.00% | ******
-1.75000 -   -1.50000   4    3.33% | ****
-1.50000 -   -1.25000   8    6.67% | ********
-1.25000 -   -1.00000   5    4.17% | *****
-1.00000 -   -0.75000   9    7.50% | *********
-0.75000 -   -0.50000   5    4.17% | *****
-0.50000 -   -0.25000   5    4.17% | *****
-0.25000 -          0   5    4.17% | *****
       0 -    0.25000  18   15.00% | ******************
 0.25000 -    0.50000   6    5.00% | ******
 0.50000 -    0.75000   5    4.17% | *****
 0.75000 -    1.00000   6    5.00% | ******
 1.00000 -    1.25000   3    2.50% | ***
 1.25000 -    1.50000   3    2.50% | ***
 1.50000 -    1.75000   5    4.17% | *****
 1.75000 -    2.00000   4    3.33% | ****
 2.00000 -    2.25000   6    5.00% | ******
 2.25000 -    2.50000   1    0.83% | *
 2.50000 -    2.75000   2    1.67% | **
 2.75000 -    3.00000   2    1.67% | **
 3.00000 -    3.25000   1    0.83% | *
 3.25000 -    3.50000   1    0.83% | *
 3.50000 -    3.75000   0    0.00% |
 3.75000 -    4.00000   1    0.83% | *
```

Manifest Variable Equations

```
Q56       =     0.7560*F10       +  1.0000 E56
Std Err         0.0530 LAMB1056
t Value        14.2740

Q2        =     0.7040*F12       +  1.0000 E2
Std Err         0.0534 LAMB1202
t Value        13.1731

Q4        =     0.7198*F10       +  1.0000 E4
Std Err         0.0540 LAMB104
t Value        13.3331

Q10       =     0.7459*F12       +  1.0000 E10
Std Err         0.0523 LAMB1210
t Value        14.2670

Q64       =     0.7557*F11       +  1.0000 E64
Std Err         0.0525 LAMB1164
t Value        14.3992

Q24       =     0.7851*F11       +  1.0000 E24
Std Err         0.0516 LAMB1124
t Value        15.2117

Q40       =     0.7892*F10       +  1.0000 E40
Std Err         0.0520 LAMB1040
t Value        15.1807

Q36       =     0.8309*F10       +  1.0000 E36
Std Err         0.0507 LAMB1036
t Value        16.3790
```

```
Q18      =     0.8152*F12     +  1.0000 E18
Std Err        0.0502 LAMB1218
t Value       16.2524

Q30      =     0.5809*F12     +  1.0000 E30
Std Err        0.0564 LAMB1230
t Value       10.3067

Q8       =     0.8305*F11     +  1.0000 E8
Std Err        0.0502 LAMB1108
t Value       16.5381

Q44      =     0.7066*F11     +  1.0000 E44
Std Err        0.0539 LAMB1144
t Value       13.1210

Q42      =     0.7844*F12     +  1.0000 E42
Std Err        0.0511 LAMB1242
t Value       15.3390

Q60      =     0.7720*F12     +  1.0000 E60
Std Err        0.0515 LAMB1260
t Value       14.9885

Q28      =     0.7248*F12     +  1.0000 E28
Std Err        0.0529 LAMB1228
t Value       13.7086
```

Variances of Exogenous Variables

Variable	Parameter	Estimate	Standard Error	t Value
F10		1.000000	0	0.000
F12		1.000000	0	0.000
F11		1.000000	0	0.000
E56	THE56	0.428425	0.043510	9.847
E4	THE4	0.481892	0.047060	10.240
E40	THE40	0.377116	0.040288	9.361
E36	THE36	0.309683	0.036503	8.484
E18	THE18	0.335368	0.033960	9.875
E30	THE30	0.662558	0.058447	11.336
E64	THE64	0.428893	0.042160	10.173
E24	THE24	0.383595	0.039081	9.816
E8	THE8	0.310305	0.034488	8.998
E44	THE44	0.500680	0.047234	10.600
E60	THE60	0.403950	0.038910	10.382
E42	THE42	0.384786	0.037508	10.259
E28	THE28	0.474640	0.044161	10.748
E2	THE2	0.504434	0.046402	10.871
E10	THE10	0.443684	0.041848	10.602

Covariances among Exogenous Variables

Parameter			Estimate	Standard Error	t Value
F12	F10	GAM1012	0.816164	0.029070	28.076
F11	F10	GAM1011	0.815493	0.031029	26.282
F11	F12	GAM1112	0.910870	0.020309	44.849

Equations with Standardized Coefficients

```
Q56  =  0.7560*F10     + 0.6545 E56
            LAMB1056

Q2   =  0.7040*F12     + 0.7102 E2
            LAMB1202

Q4   =  0.7198*F10     + 0.6942 E4
            LAMB104

Q10  =  0.7459*F12     + 0.6661 E10
            LAMB1210

Q64  =  0.7557*F11     + 0.6549 E64
            LAMB1164

Q24  =  0.7851*F11     + 0.6194 E24
            LAMB1124

Q40  =  0.7892*F10     + 0.6141 E40
            LAMB1040

Q36  =  0.8309*F10     + 0.5565 E36
            LAMB1036

Q18  =  0.8152*F12     + 0.5791 E18
            LAMB1218

Q30  =  0.5809*F12     + 0.8140 E30
            LAMB1230

Q8   =  0.8305*F11     + 0.5571 E8
            LAMB1108

Q44  =  0.7066*F11     + 0.7076 E44
            LAMB1144

Q42  =  0.7844*F12     + 0.6203 E42
            LAMB1242

Q60  =  0.7720*F12     + 0.6356 E60
            LAMB1260

Q28  =  0.7248*F12     + 0.6889 E28
            LAMB1228
```

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-squared
1	Q56	0.428425	1.000000	0.571575
2	Q2	0.504434	1.000000	0.495566
3	Q4	0.481892	1.000000	0.518108
4	Q10	0.443684	1.000000	0.556316
5	Q64	0.428893	1.000000	0.571107
6	Q24	0.383595	1.000000	0.616405
7	Q40	0.377116	1.000000	0.622884
8	Q36	0.309683	1.000000	0.690317
9	Q18	0.335368	1.000000	0.664632
10	Q30	0.662558	1.000000	0.337442
11	Q8	0.310305	1.000000	0.689695
12	Q44	0.500680	1.000000	0.499320
13	Q42	0.384786	1.000000	0.615214
14	Q60	0.403950	1.000000	0.596050
15	Q28	0.474640	1.000000	0.525360

Correlations among Exogenous Variables

Parameter			Estimate
F12	F10	GAM1012	0.816164
F11	F10	GAM1011	0.815493
F11	F12	GAM1112	0.910870

The items and the corresponding dimensions appear in the following table:

Table 31. Items Tested under Hypothesis Three

Factor	Item
Active guidance	4. Given what's available, my manager has built a strong base of human resources in our work group.
Active guidance	36. My manager provides detailed feedback to me.
Active guidance	40. My manager communicates how our work group can support hospital administration's vision.
Active guidance	56. My manager allows our work group to support hospital administration's vision.
Independent action	8. My manager provides the information I need to do a good job.
Independent action	24. My manager communicates difficult decisions well.
Independent action	44. My manager reports data-based information on how well our work group serves its customers.
Independent action	64. My manager collects important data on how well our work group serves its customers.
Dependent action	2. My manager builds strong relationships with our work group's customers.
Dependent action	10. My manager builds strong relationships with our work group's suppliers.
Dependent action	18. My manager is appropriately involved in important work group projects.
Dependent action	28. My manager understands my responsibilities.
Dependent action	30. My manager provides job-related training when necessary.
Dependent action	42. My manager appropriately supports decisions I make.
Dependent action	60. My manager provides timely feedback to me.
dropped	12. I communicate openly with my manager.
dropped	14. When my manager gives me a responsibility, I also have the authority to carry it out.
dropped	52. My manager knows who the customers of our work group are.

The labeling of the managerial dimensions has been done first by considering the independent and dependent action dimensions. Independent action referred to items a manager completes alone or separate from the employee's perspective; the dependent actions, by contrast, are interactive in nature and indicate activities that could occur on an ongoing basis. The independent items may have only involved the employee sporadically, and mostly not on a regular interactive basis. The final dimension of active guidance is based on the wordings of items 36 and 40 which deal with managers giving specific direction to the employees. Granted, these three dimensions are intercorrelated, as the structural model assumes; however, there are some nuances of difference among these distinct latent variables. The dimensions of independent and dependent action are similar to what James (1976) identifies degree of task interdependence and task specialization.

The structural equation model is shown below (the variance of the latent variables is assumed to be one, and the measurement errors for the manifest variables are not displayed):

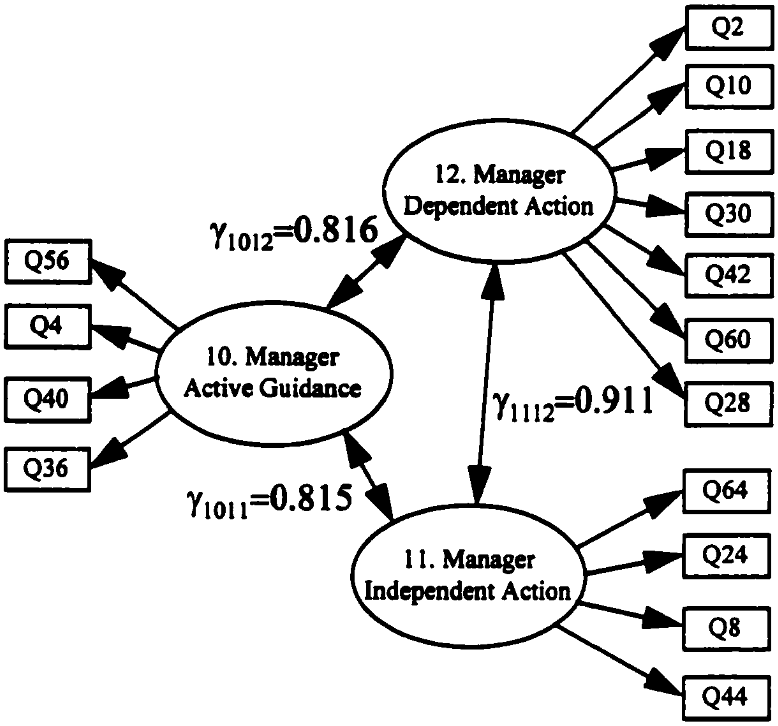

Figure 26. Structural Equation Model Tested under Hypothesis Three

In addition to testing the above model, the phase two data are compared to phase one data as a source of validation; as mentioned in the main text, phase one data are not used to construct structural models, and validation based on phase one are not necessary to establish the above model. Additionally, phase two data are shown to have more missing variables, and thus the phase one results should only be interpreted with caution.

The table below provides a comparison with phase one data, resulting in two structural equation models presented:

Table 32. Comparison of Fit Indices for Hypothesis Three

	Phase Two	Phase One
χ^2	221.5156	390.4912
df	87	87
Null χ^2	2630.2223	4891.4808
Null df	105	105
GFI	0.9038	0.8794
AGFI	0.8674	0.8337
RMR	0.0403	0.0386
PGFI	0.7489	0.7287
CFI	0.9467	0.9366
NFI	0.9158	0.9202
PNFI	0.7588	0.7624

The goodness of fit indices indicate strong fit with the data, thus supporting the hypothesis that the managerial dimensions are as proposed.

Hypothesis Four (Hospital Administration Dimensions)

```
Covariance Structure Analysis: Maximum Likelihood Estimation

Fit criterion . . . . . . . . . . . . . . . . . .    0.9258
Goodness of Fit Index (GFI) . . . . . . . . . . .    0.9034
GFI Adjusted for Degrees of Freedom (AGFI). . . .    0.8726
Root Mean Square Residual (RMR) . . . . . . . . .    0.0456
Parsimonious GFI (Mulaik, 1989) . . . . . . . . .    0.7706
Chi-square = 213.8625      df = 116     Prob>chi**2 = 0.0001
Null Model Chi-square:     df = 136               2097.5003
RMSEA Estimate  . . . . . . 0.0604  90%C.I.[0.0476, 0.0730]
Probability of Close Fit  . . . . . . . . . . . .    0.0882
ECVI Estimate . . . . . . . 1.2732  90%C.I.[1.1093, 1.4742]
Bentler's Comparative Fit Index . . . . . . . . .    0.9501
Normal Theory Reweighted LS Chi-square  . . . . .  209.8733
Akaike's Information Criterion. . . . . . . . . .  -18.1375
Bozdogan's (1987) CAIC. . . . . . . . . . . . . . -533.9590
Schwarz's Bayesian Criterion. . . . . . . . . . . -417.9590
McDonald's (1989) Centrality. . . . . . . . . . .    0.8098
Bentler & Bonett's (1980) Non-normed Index. . . .    0.9415
Bentler & Bonett's (1980) NFI . . . . . . . . . .    0.8980
James, Mulaik, & Brett (1982) Parsimonious NFI. .    0.7660
Z-Test of Wilson & Hilferty (1931). . . . . . . .    5.2117
Bollen (1986) Normed Index Rho1 . . . . . . . . .    0.8805
Bollen (1988) Non-normed Index Delta2 . . . . . .    0.9506
Hoelter's (1983) Critical N . . . . . . . . . . .       155
```

Residual Matrix

	Q55	Q1	Q3	Q9	Q63		
Q55	0.00000	0.03035	0.07689	-.02770	0.01614	HA	acts on vision
Q1	0.03035	0.00000	0.03957	0.02008	0.02558	HA	builds cust rel
Q3	0.07689	0.03957	0.00000	-.01972	0.07942	HA	builds hum res
Q9	-.02770	0.02008	-.01972	0.00000	-.01150	HA	builds suppl rel
Q63	0.01614	0.02558	0.07942	-.01150	0.00000	HA	collects cust data
Q23	0.00486	-.03501	-.05830	0.00950	-.08222	HA	comm diff decision
Q39	0.08934	-.09585	0.02644	0.04766	0.03424	HA	comm vision
Q35	-.02120	-.02226	-.04442	-.06247	-.11744	HA	details feedback
Q13	-.04899	0.03176	0.00531	0.01639	-.14848	HA	gives authority
Q17	0.08339	0.02593	0.04886	-.05703	0.01640	HA	involved in proj
Q51	0.07152	C.18273	0.10998	-.01078	0.00144	HA	knows customers
Q29	0.03566	0.01414	-.01983	-.00213	-.02582	HA	provide training
Q7	-.02017	-.06329	-.00800	0.03849	-.01353	HA	provides info
Q43	0.04964	-.00142	0.02775	-.09210	0.05635	HA	reports cust data
Q41	-.04613	0.01936	0.05597	0.03540	-.05416	HA	supports decision
Q59	-.05058	0.02087	-.02158	0.04326	0.04004	HA	timely feedback
Q27	-.02206	-.02089	0.00922	-.05673	-.01154	HA	understand respnsb

Residual Matrix

	Q23	Q39	Q35	Q13	Q17		
Q55	0.00486	0.08934	-.02120	-.04899	0.08339	HA	acts on vision
Q1	-.03501	-.09585	-.02226	0.03176	0.02593	HA	builds cust rel
Q3	-.05830	0.02644	-.04442	0.00531	0.04886	HA	builds hum res
Q9	0.00950	0.04766	-.06247	0.01639	-.05703	HA	builds suppl rel
Q63	-.08222	0.03424	-.11744	-.14848	0.01640	HA	collects cust data
Q23	0.00000	0.00644	0.03286	-.04258	-.03528	HA	comm diff decision
Q39	0.00644	0.00000	0.00739	-.08286	0.04577	HA	comm vision
Q35	0.03286	0.00739	0.00000	0.07002	-.00504	HA	details feedback
Q13	-.04258	-.08286	0.07002	0.00000	0.01121	HA	gives authority
Q17	-.03528	0.04577	-.00504	0.01121	-.00000	HA	involved in proj
Q51	-.04537	0.07554	-.06752	-.03227	-.02787	HA	knows customers
Q29	-.02152	0.01664	0.02352	-.00731	-.00942	HA	provide training
Q7	0.08214	-.01083	-.02524	0.00821	-.05678	HA	provides info
Q43	-.04178	-.00462	0.07015	0.04658	-.00730	HA	reports cust data
Q41	0.05157	-.05072	0.00616	0.07076	-.02318	HA	supports decision
Q59	0.02850	-.07657	-.00941	-.03504	-.04744	HA	timely feedback
Q27	-.01559	-.00737	0.00981	0.02231	0.04893	HA	understand respnsb

	Q51	Q29	Q7	Q43	Q41		
Q55	0.07152	0.03566	-.02017	0.04964	-.04613	HA	acts on vision
Q1	0.18273	0.01414	-.06329	-.00142	0.01936	HA	builds cust rel
Q3	0.10998	-.01983	-.00800	0.02775	0.05597	HA	builds hum res
Q9	-.01078	-.00213	0.03849	-.09210	0.03540	HA	builds suppl rel
Q63	0.00144	-.02582	-.01353	0.05635	-.05416	HA	collects cust data
Q23	-.04537	-.02152	0.08214	-.04178	0.05157	HA	comm diff decision
Q39	0.07554	0.01664	-.01083	-.00462	-.05072	HA	comm vision
Q35	-.06752	0.02352	-.02524	0.07015	0.00616	HA	details feedback
Q13	-.03227	-.00731	0.00821	0.04658	0.07076	HA	gives authority
Q17	-.02787	-.00942	-.05678	-.00730	-.02318	HA	involved in proj
Q51	-.00000	0.07597	-.04964	0.07690	0.00240	HA	knows customers
Q29	0.07597	0.00000	0.02341	-.00881	0.01426	HA	provide training
Q7	-.04964	0.02341	0.00000	-.03044	0.01742	HA	provides info
Q43	0.07690	-.00881	-.03044	0.00000	0.08556	HA	reports cust data
Q41	0.00240	0.01426	0.01742	0.08556	0.00000	HA	supports decision
Q59	0.01882	-.02277	-.01570	0.03264	-.02820	HA	timely feedback
Q27	0.01483	0.05691	-.01009	0.06053	0.00927	HA	understand respnsb

Residual Matrix

	Q59	Q27		
Q55	-.05058	-.02206	HA	acts on vision
Q1	0.02087	-.02089	HA	builds cust rel
Q3	-.02158	0.00922	HA	builds hum res
Q9	0.04326	-.05673	HA	builds suppl rel
Q63	0.04004	-.01154	HA	collects cust data
Q23	0.02850	-.01559	HA	comm diff decision
Q39	-.07657	-.00737	HA	comm vision
Q35	-.00941	0.00981	HA	details feedback
Q13	-.03504	0.02231	HA	gives authority
Q17	-.04744	0.04893	HA	involved in proj
Q51	0.01882	0.01483	HA	knows customers
Q29	-.02277	0.05691	HA	provide training
Q7	-.01570	-.01009	HA	provides info
Q43	0.03264	0.06053	HA	reports cust data
Q41	-.02820	0.00927	HA	supports decision
Q59	0.00000	-.03924	HA	timely feedback
Q27	-.03924	0.00000	HA	understand respnsb

Average Absolute Residual = 0.03366
Average Off-diagonal Absolute Residual = 0.03787

Rank Order of 10 Largest Residuals

Q51,Q1	Q13,Q63	Q35,Q63	Q51,Q3	Q39,Q1	Q43,Q9	Q39,Q55
0.1827	-0.1485	-0.1174	0.1100	-0.0958	-0.0921	0.0893

Q41,Q43	Q17,Q55	Q13,Q39
0.0856	0.0834	-0.0829

Asymptotically Standardized Residual Matrix

	Q55	Q1	Q3	Q9	Q63		
Q55	0.0000	0.8365	2.1768	-0.8129	0.4680	HA	acts on vision
Q1	0.8365	0.0000	1.2526	0.6676	0.6467	HA	builds cust rel
Q3	2.1768	1.2526	0.0000	-0.6803	2.0660	HA	builds hum res
Q9	-0.8129	0.6676	-0.6803	0.0000	-0.3109	HA	builds suppl rel
Q63	0.4680	0.6467	2.0660	-0.3109	0.0000	HA	collects cust data
Q23	0.1497	-1.2464	-2.1540	0.3692	-2.3418	HA	comm diff decision
Q39	3.5294	-2.4785	0.7014	1.3078	0.9144	HA	comm vision
Q35	-0.9291	-0.6086	-1.2475	-1.8184	-3.3700	HA	details feedback
Q13	-1.7218	0.7663	0.1313	0.4181	-3.6372	HA	gives authority
Q17	2.5487	0.6818	1.3247	-1.6111	1.3706	HA	involved in proj
Q51	1.7771	4.1075	2.5291	-0.2556	0.0617	HA	knows customers
Q29	0.9216	0.3974	-0.5774	-0.0651	-0.6097	HA	provide training
Q7	-0.6317	-2.3079	-0.3026	1.5333	-0.3923	HA	provides info
Q43	1.3802	-0.0438	0.8891	-3.0997	1.4380	HA	reports cust data
Q41	-1.8346	0.5026	1.4904	0.9753	-1.4531	HA	supports decision
Q59	-1.6942	0.8428	-0.9055	1.9136	1.2498	HA	timely feedback
Q27	-0.9464	-0.5650	0.2559	-1.6321	-0.3265	HA	understand respnsb

Asymptotically Standardized Residual Matrix

	Q23	Q39	Q35	Q13	Q17		
Q55	0.1497	3.5294	-0.9291	-1.7218	2.5487	HA	acts on vision
Q1	-1.2464	-2.4785	-0.6086	0.7663	0.6818	HA	builds cust rel
Q3	-2.1540	0.7014	-1.2475	0.1313	1.3247	HA	builds hum res
Q9	0.3692	1.3078	-1.8184	0.4181	-1.6111	HA	builds suppl rel
Q63	-2.3418	0.9144	-3.3700	-3.6372	1.3706	HA	collects cust data
Q23	0.0000	0.1848	1.0034	-1.1333	-1.0541	HA	comm diff decision
Q39	0.1848	0.0000	0.2878	-2.6092	1.2792	HA	comm vision
Q35	1.0034	0.2878	0.0000	2.4264	-0.1524	HA	details feedback
Q13	-1.1333	-2.6092	2.4264	0.0000	0.2856	HA	gives authority
Q17	-1.0541	1.2792	-0.1524	0.2856	0.0000	HA	involved in proj
Q51	-1.1190	1.7647	-1.6651	-0.7048	-1.4046	HA	knows customers
Q29	-0.7033	0.4048	0.6035	-0.1664	-0.2304	HA	provide training
Q7	3.5139	-0.3158	-0.7835	0.2218	-1.7298	HA	provides info
Q43	-1.5056	-0.1204	1.9351	1.1329	-0.1939	HA	reports cust data
Q41	1.4866	-1.7993	0.2412	2.2421	-0.6512	HA	supports decision
Q59	1.3567	-2.3762	-0.3121	-1.0023	-1.5663	HA	timely feedback
Q27	-0.4703	-0.2310	0.4144	0.7583	1.4557	HA	understand respnsb

	Q51	Q29	Q7	Q43	Q41		
Q55	1.7771	0.9216	-0.6317	1.3802	-1.8346	HA	acts on vision
Q1	4.1075	0.3974	-2.3079	-0.0438	0.5026	HA	builds cust rel
Q3	2.5291	-0.5774	-0.3026	0.8891	1.4904	HA	builds hum res
Q9	-0.2556	-0.0651	1.5333	-3.0997	0.9753	HA	builds suppl rel
Q63	0.0617	-0.6097	-0.3923	1.4380	-1.4531	HA	collects cust data
Q23	-1.1190	-0.7033	3.5139	-1.5056	1.4866	HA	comm diff decision
Q39	1.7647	0.4048	-0.3158	-0.1204	-1.7993	HA	comm vision
Q35	-1.6651	0.6035	-0.7835	1.9351	0.2412	HA	details feedback
Q13	-0.7048	-0.1664	0.2218	1.1329	2.2421	HA	gives authority
Q17	-1.4046	-0.2304	-1.7298	-0.1939	-0.6512	HA	involved in proj
Q51	0.0000	1.6163	-1.2409	1.7415	0.0562	HA	knows customers
Q29	1.6163	0.0000	0.7832	-0.2505	0.3481	HA	provide training
Q7	-1.2409	0.7832	0.0000	-1.1236	0.5100	HA	provides info
Q43	1.7415	-0.2505	-1.1236	0.0000	2.2395	HA	reports cust data
Q41	0.0562	0.3481	0.5100	2.2395	0.0000	HA	supports decision
Q59	0.4968	-0.8421	-0.7672	1.3347	-0.8791	HA	timely feedback
Q27	0.3619	1.4449	-0.3094	1.6514	0.3558	HA	understand respnsb

Asymptotically Standardized Residual Matrix

	Q59	Q27		
Q55	-1.6942	-0.9464	HA	acts on vision
Q1	0.8428	-0.5650	HA	builds cust rel
Q3	-0.9055	0.2559	HA	builds hum res
Q9	1.9136	-1.6321	HA	builds suppl rel
Q63	1.2498	-0.3265	HA	collects cust data
Q23	1.3567	-0.4703	HA	comm diff decision
Q39	-2.3762	-0.2810	HA	comm vision
Q35	-0.3121	0.4144	HA	details feedback
Q13	-1.0023	0.7583	HA	gives authority
Q17	-1.5663	1.4557	HA	involved in proj
Q51	0.4968	0.3619	HA	knows customers
Q29	-0.8421	1.4449	HA	provide training
Q7	-0.7672	-0.3094	HA	provides info
Q43	1.3347	1.6514	HA	reports cust data
Q41	-0.8791	0.3558	HA	supports decision
Q59	0.0000	-1.2848	HA	timely feedback
Q27	-1.2848	0.0000	HA	understand respnsb

Average Standardized Residual = 1.006

Average Off-diagonal Standardized Residual = 1.132

Rank Order of 10 Largest Asymptotically Standardized Residuals

Q51,Q1	Q13,Q63	Q39,Q55	Q7,Q23	Q35,Q63	Q43,Q9	Q13,Q39
4.1075	-3.6372	3.5294	3.5139	-3.3700	-3.0997	-2.6092

Q17,Q55	Q51,Q3	Q39,Q1
2.5487	2.5291	-2.4785

Distribution of Asymptotically Standardized Residuals
(Each * represents 1 residuals)

```
-3.75000 -   -3.50000   1   0.65% | *
-3.50000 -   -3.25000   1   0.65% | *
-3.25000 -   -3.00000   1   0.65% | *
-3.00000 -   -2.75000   0   0.00% |
-2.75000 -   -2.50000   1   0.65% | *
-2.50000 -   -2.25000   4   2.61% | ****
-2.25000 -   -2.00000   1   0.65% | *
-2.00000 -   -1.75000   3   1.96% | ***
-1.75000 -   -1.50000   8   5.23% | ********
-1.50000 -   -1.25000   3   1.96% | ***
-1.25000 -   -1.00000   8   5.23% | ********
-1.00000 -   -0.75000   8   5.23% | ********
-0.75000 -   -0.50000   9   5.88% | *********
-0.50000 -   -0.25000  11   7.19% | ***********
-0.25000 -          0   7   4.58% | *******
       0 -    0.25000  24  15.69% | ************************
 0.25000 -    0.50000  13   8.50% | *************
 0.50000 -    0.75000   7   4.58% | *******
 0.75000 -    1.00000   9   5.88% | *********
 1.00000 -    1.25000   3   1.96% | ***
 1.25000 -    1.50000  13   8.50% | *************
 1.50000 -    1.75000   4   2.61% | ****
 1.75000 -    2.00000   4   2.61% | ****
 2.00000 -    2.25000   4   2.61% | ****
 2.25000 -    2.50000   1   0.65% | *
 2.50000 -    2.75000   2   1.31% | **
 2.75000 -    3.00000   0   0.00% |
 3.00000 -    3.25000   0   0.00% |
 3.25000 -    3.50000   0   0.00% |
 3.50000 -    3.75000   2   1.31% | **
 3.75000 -    4.00000   0   0.00% |
 4.00000 -    4.25000   1   0.65% | *
```

Manifest Variable Equations

```
Q55       =    0.7570*F20      +  1.0000 E55
Std Err        0.0580 LAMB2055
t Value       13.0541

Q1        =    0.6750*F21      +  1.0000 E1
Std Err        0.0599 LAMB2101
t Value       11.2765

Q3        =    0.6973*F21      +  1.0000 E3
Std Err        0.0592 LAMB2103
t Value       11.7741

Q9        =    0.7244*F21      +  1.0000 E9
Std Err        0.0584 LAMB2109
t Value       12.4011

Q63       =    0.7483*F22      +  1.0000 E63
Std Err        0.0619 LAMB2263
t Value       12.0965

Q23       =    0.7565*F21      +  1.0000 E23
Std Err        0.0574 LAMB2123
t Value       13.1772

Q39       =    0.7068*F20      +  1.0000 E39
Std Err        0.0595 LAMB2039
t Value       11.8696
```

```
Q35      =     0.7513*F20      +  1.0000 E35
Std Err        0.0582 LAMB2035
t Value       12.9153

Q13      =     0.6392*F20      +  1.0000 E13
Std Err        0.0614 LAMB2013
t Value       10.4036

Q17      =     0.7836*F22      +  1.0000 E17
Std Err        0.0611 LAMB2217
t Value       12.8216

Q51      =     0.6303*F22      +  1.0000 E51
Std Err        0.0647 LAMB2251
t Value        9.7460

Q29      =     0.6129*F21      +  1.0000 E29
Std Err        0.0615 LAMB2129
t Value        9.9662

Q7       =     0.7664*F21      +  1.0000 E7
Std Err        0.0571 LAMB2107
t Value       13.4277

Q43      =     0.6826*F21      +  1.0000 E43
Std Err        0.0596 LAMB2143
t Value       11.4434

Q41      =     0.7100*F20      +  1.0000 E41
Std Err        0.0594 LAMB2041
t Value       11.9437

Q59      =     0.8030*F21      +  1.0000 E59
Std Err        0.0558 LAMB2159
t Value       14.3806

Q27      =     0.7431*F20      +  1.0000 E27
Std Err        0.0584 LAMB2027
t Value       12.7180
```

Variances of Exogenous Variables

Variable	Parameter	Estimate	Standard Error	t Value
F20		1.000000	0	0.000
F21		1.000000	0	0.000
F22		1.000000	0	0.000
E55	THE55	0.426980	0.046970	9.090
E3	THE3	0.513753	0.052293	9.824
E63	THE63	0.440047	0.057151	7.700
E23	THE23	0.427781	0.045318	9.440
E39	THE39	0.500475	0.052570	9.520
E35	THE35	0.435563	0.047612	9.148
E13	THE13	0.591434	0.059733	9.901
E17	THE17	0.385935	0.055643	6.936
E51	THE51	0.602728	0.065413	9.214
E7	THE7	0.412556	0.044102	9.355
E43	THE43	0.534086	0.053964	9.897
E41	THE41	0.495866	0.052213	9.497
E59	THE59	0.355190	0.039606	8.968
E27	THE27	0.447779	0.048531	9.227
E1	THE1	0.544345	0.054809	9.932
E9	THE9	0.475226	0.049147	9.669
E29	THE29	0.624353	0.061440	10.162

Covariances among Exogenous Variables

Parameter			Estimate	Standard Error	t Value
F21	F20	GAM2021	0.856567	0.027433	31.224
F22	F20	GAM2022	0.739076	0.046096	16.033
F22	F21	GAM2122	0.744244	0.044046	16.897

Equations with Standardized Coefficients

```
Q55    =    0.7570*F20      + 0.6534 E55
                  LAMB2055

Q1     =    0.6750*F21      + 0.7378 E1
                  LAMB2101

Q3     =    0.6973*F21      + 0.7168 E3
                  LAMB2103

Q9     =    0.7244*F21      + 0.6894 E9
                  LAMB2109

Q63    =    0.7483*F22      + 0.6634 E63
                  LAMB2263

Q23    =    0.7565*F21      + 0.6541 E23
                  LAMB2123

Q39    =    0.7068*F20      + 0.7074 E39
                  LAMB2039

Q35    =    0.7513*F20      + 0.6600 E35
                  LAMB2035

Q13    =    0.6392*F20      + 0.7690 E13
                  LAMB2013

Q17    =    0.7836*F22      + 0.6212 E17
                  LAMB2217

Q51    =    0.6303*F22      + 0.7764 E51
                  LAMB2251

Q29    =    0.6129*F21      + 0.7902 E29
                  LAMB2129

Q7     =    0.7664*F21      + 0.6423 E7
                  LAMB2107

Q43    =    0.6826*F21      + 0.7308 E43
                  LAMB2143

Q41    =    0.7100*F20      + 0.7042 E41
                  LAMB2041

Q59    =    0.8030*F21      + 0.5960 E59
                  LAMB2159

Q27    =    0.7431*F20      + 0.6692 E27
                  LAMB2027
```

Squared Multiple Correlations

Variable		Error Variance	Total Variance	R-squared
1	Q55	0.426980	1.000000	0.573020
2	Q1	0.544345	1.000000	0.455655
3	Q3	0.513753	1.000000	0.486247
4	Q9	0.475226	1.000000	0.524774
5	Q63	0.440047	1.000000	0.559953
6	Q23	0.427781	1.000000	0.572219
7	Q39	0.500475	1.000000	0.499525
8	Q35	0.435563	1.000000	0.564437
9	Q13	0.591434	1.000000	0.408566
10	Q17	0.385935	1.000000	0.614065
11	Q51	0.602728	1.000000	0.397273
12	Q29	0.624353	1.000000	0.375647
13	Q7	0.412556	1.000000	0.587444
14	Q43	0.534086	1.000000	0.465914
15	Q41	0.495866	1.000000	0.504134
16	Q59	0.355190	1.000000	0.644810
17	Q27	0.447779	1.000000	0.552221

Correlations among Exogenous Variables

Parameter			Estimate
F21	F20	GAM2021	0.856567
F22	F20	GAM2022	0.739076
F22	F21	GAM2122	0.744244

The items and the corresponding dimensions appear in the following table:

Table 33. Items Tested under Hypothesis Four

Factor	Item
Active guidance	55. Hospital administration supports its vision of the future with appropriate action.
Active guidance	13. When hospital administration gives our work group a responsibility, we also have the authority to carry it out.
Active guidance	27. Hospital administration understands our work group's responsibilities.
Active guidance	35. Hospital administration provides detailed feedback to our work group.
Active guidance	39. Hospital administration communicates its vision of the future to our hospital.
Active guidance	41. Hospital administration appropriately supports decisions made by our work group.
Customer project input	17. Hospital administration is appropriately involved in important hospital projects.
Customer project input	51. Hospital administration knows who the customers of our hospital are.
Customer project input	63. Hospital administration collects important data on how well our hospital serves its customers.
Customer project output	1. Hospital administration builds strong relationships with our hospital's customers.
Customer project output	3. Given what's available, hospital administration has built a strong base of human resources in our hospital.
Customer project output	7. Hospital administration provides the information our work group needs to do a good job.
Customer project output	9. Hospital administration builds strong relationships with our hospital's suppliers.
Customer project output	23. Hospital administration communicates difficult decisions well.
Customer project output	29. Hospital administration provides job-related training when necessary.
Customer project output	43. Hospital administration reports data-based information on how well our hospital serves its customers.
Customer project output	59. Hospital administration provides timely feedback to our work group.
dropped	11. Our work group communicates openly with hospital administration.

Labeling the hospital administration dimensions started with the observation that Q35 and Q39 also describe active guidance (since their pairs Q36 and Q40 defined the active guidance factor among the managerial dimensions). The labeling of the customer project input dimension is guided by items Q51 and Q63 which deal with collecting data and customer issues; by contrast, the customer project output dimension is highly influenced by Q59 which deals with feedback and Q43 which dealt with reporting data. Thus, the input dimension collects items which dealt with specific hospital-administration based projects, and the output dimension collected items associated with reporting back that information to employees.

The structural equation model is shown below (the variance of the latent variables is assumed to be one, and the measurement errors for the manifest variables are not displayed):

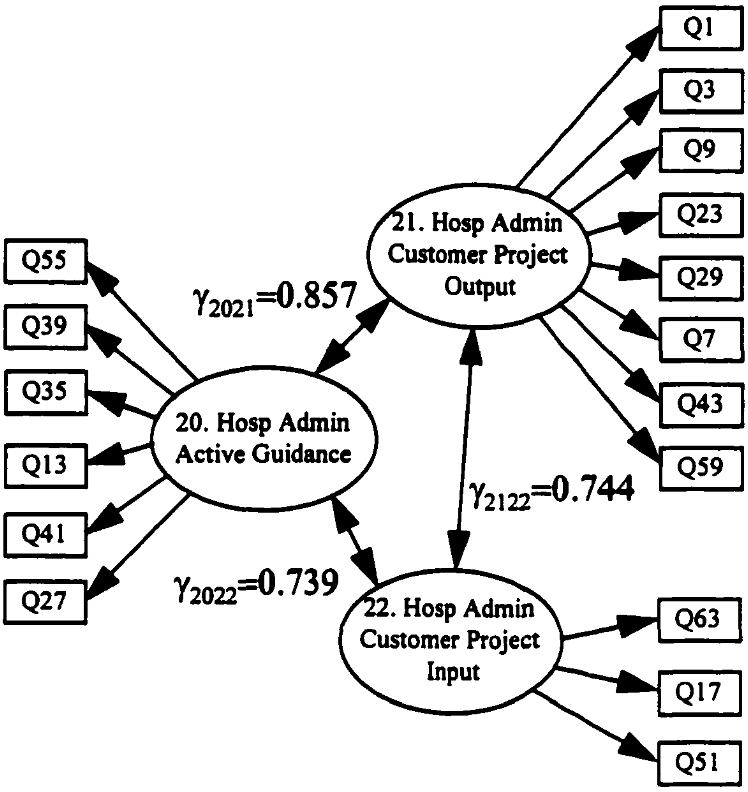

Figure 27. Structural Equation Model Tested under Hypothesis Four

In addition to testing the above model, the phase two data are compared to phase one data as a source of validation; as mentioned in the main text, phase one data are not used to construct structural models, and validation based on phase one are not necessary to establish the above model. Additionally, phase two data are shown to have more missing variables, and thus the phase one results should only be interpreted with caution.

The table below provides a comparison with phase one data, resulting in two structural equation models presented:

Table 34. Comparison of Fit Indices for Hypothesis Four

	Phase Two	Phase One
χ^2	213.8625	445.5101
df	116	116
Null χ^2	2097.5003	3986.3030
Null df	136	136
GFI	0.9034	0.8846
AGFI	0.8726	0.8479
RMR	0.0456	0.0461
PGFI	0.7706	0.7546
CFI	0.9501	0.9144
NFI	0.8980	0.8882
PNFI	0.7660	0.7576

The goodness of fit indices indicate strong fit with the data, thus supporting the hypothesis that the hospital administration dimensions are as proposed.

Hypothesis Five (Intra-Group and Intergroup Dimensions)

```
Covariance Structure Analysis: Maximum Likelihood Estimation

Fit criterion . . . . . . . . . . . . . . . . . .     1.0515
Goodness of Fit Index (GFI) . . . . . . . . . . .     0.9012
GFI Adjusted for Degrees of Freedom (AGFI). . . .     0.8604
Root Mean Square Residual (RMR) . . . . . . . . .     0.0500
Parsimonious GFI (Mulaik, 1989) . . . . . . . . .     0.7127
Chi-square = 346.9846      df = 121     Prob>chi**2 = 0.0001
Null Model Chi-square:     df = 153               3735.8834
RMSEA Estimate  . . . . . . 0.0752  90%C.I.[0.0660, 0.0846]
Probability of Close Fit  . . . . . . . . . . . .     0.0000
ECVI Estimate . . . . . . . 1.3730  90%C.I.[1.2125, 1.5582]
Bentler's Comparative Fit Index . . . . . . . . .     0.9369
Normal Theory Reweighted LS Chi-square  . . . . .   325.4795
Akaike's Information Criterion. . . . . . . . . .   104.9846
Bozdogan's (1987) CAIC. . . . . . . . . . . . . .  -476.0717
Schwarz's Bayesian Criterion. . . . . . . . . . .  -355.0717
McDonald's (1989) Centrality. . . . . . . . . . .     0.7108
Bentler & Bonett's (1980) Non-normed Index. . . .     0.9202
Bentler & Bonett's (1980) NFI . . . . . . . . . .     0.9071
James, Mulaik, & Brett (1982) Parsimonious NFI. .     0.7174
Z-Test of Wilson & Hilferty (1931). . . . . . . .     9.8601
Bollen (1986) Normed Index Rho1 . . . . . . . . .     0.8826
Bollen (1988) Non-normed Index Delta2 . . . . . .     0.9375
Hoelter's (1983) Critical N . . . . . . . . . . .        142
```

Residual Matrix

	Q50	Q34	Q26	Q54	Q62	
Q50	-.00968	0.02975	0.02716	-.07452	-.02787	Grp adapts
Q34	0.02975	-.00273	-.01307	-.05987	0.01569	Grp align with strat
Q26	0.02716	-.01307	0.00103	0.01749	-.10793	Grp improve goals
Q54	-.07452	-.05987	0.01749	0.00867	0.00202	Grp learns from in
Q62	-.02787	0.01569	-.10793	0.00202	-.01695	Grp learns from out
Q58	-.01148	0.11914	0.02678	-.02928	-.03569	Grp learns from past
Q32	-.00472	-.05097	0.02432	0.02340	-.08166	Grp makes changes
Q46	0.00301	0.04574	0.01224	0.01629	0.02835	Grp strong comm
Q22	0.00202	0.07337	-.03784	0.03183	-.03742	Grp study cust needs
Q49	-.02565	-.00456	-.02991	0.08033	0.01721	Hosp adapts
Q33	0.03758	0.01635	-.00973	-.00843	0.05778	Hosp align with strat
Q25	-.01410	0.02102	-.03306	0.04882	0.05475	Hosp improve goals
Q53	0.05365	0.05657	-.03162	0.05113	0.15780	Hosp learns from in
Q61	-.06757	-.05322	-.09356	0.11148	0.02977	Hosp learns from out
Q57	-.01673	0.01727	-.04984	0.04769	0.07737	Hosp learns from past
Q31	-.06198	0.00032	-.06532	0.00356	0.05419	Hosp makes changes
Q45	0.02788	-.04834	0.01411	0.08331	0.05307	Hosp strong comm
Q21	-.02724	0.12943	-.05618	0.03043	0.02793	Hosp study cust needs

Residual Matrix

	Q58	Q32	Q46	Q22	Q49	
Q50	-.01148	-.00472	0.00301	0.00202	-.02565	Grp adapts
Q34	0.11914	-.05097	0.04574	0.07337	-.00456	Grp align with strat
Q26	0.02678	0.02432	0.01224	-.03784	-.02991	Grp improve goals
Q54	-.02928	0.02340	0.01629	0.03183	0.08033	Grp learns from in
Q62	-.03569	-.08166	0.02835	-.03742	0.01721	Grp learns from out
Q58	-.00688	-.02317	-.03431	0.03485	0.04259	Grp learns from past
Q32	-.02317	-.01801	-.05384	-.00428	-.01058	Grp makes changes
Q46	-.03431	-.05384	0.00020	-.01460	-.10617	Grp strong comm
Q22	0.03485	-.00428	-.01460	0.01162	0.03556	Grp study cust needs
Q49	0.04259	-.01058	-.10617	0.03556	-.01373	Hosp adapts
Q33	0.01748	-.03402	-.09485	0.03972	-.02832	Hosp align with strat
Q25	0.06209	-.04111	-.03848	0.04002	-.02166	Hosp improve goals
Q53	0.02610	0.00592	0.02257	0.02186	0.01797	Hosp learns from in
Q61	0.03967	-.06816	-.09153	-.00217	0.00004	Hosp learns from out
Q57	0.03181	-.04475	-.12652	0.02399	0.02175	Hosp learns from past
Q31	-.00714	-.05114	-.10778	0.01635	-.05056	Hosp makes changes
Q45	0.10000	-.05547	0.08458	0.06873	0.00949	Hosp strong comm
Q21	0.05048	0.02986	-.11783	0.03346	0.03764	Hosp study cust needs

	Q33	Q25	Q53	Q61	Q57	
Q50	0.03758	-.01410	0.05365	-.06757	-.01673	Grp adapts
Q34	0.01635	0.02102	0.05657	-.05322	0.01727	Grp align with strat
Q26	-.00973	-.03306	-.03162	-.09356	-.04984	Grp improve goals
Q54	-.00843	0.04882	0.05113	0.11148	0.04769	Grp learns from in
Q62	0.05778	0.05475	0.15780	0.02977	0.07737	Grp learns from out
Q58	0.01748	0.06209	0.02610	0.03967	0.03181	Grp learns from past
Q32	-.03402	-.04111	0.00592	-.06816	-.04475	Grp makes changes
Q46	-.09485	-.03848	0.02257	-.09153	-.12652	Grp strong comm
Q22	0.03972	0.04002	0.02186	-.00217	0.02399	Grp study cust needs
Q49	-.02832	-.02166	0.01797	0.00004	0.02175	Hosp adapts
Q33	0.01855	-.01327	0.03810	0.04420	-.01074	Hosp align with strat
Q25	-.01327	-.02259	-.01961	0.02632	-.00155	Hosp improve goals
Q53	0.03810	-.01961	0.01627	0.14628	0.07194	Hosp learns from in
Q61	0.04420	0.02632	0.14628	0.04535	0.04732	Hosp learns from out
Q57	-.01074	-.00155	0.07194	0.04732	0.03082	Hosp learns from past
Q31	0.02370	-.00961	-.01619	0.07015	0.06178	Hosp makes changes
Q45	-.05627	-.00045	-.06929	0.01143	0.01470	Hosp strong comm
Q21	0.09622	0.01458	-.00816	0.01178	0.00593	Hosp study cust needs

Residual Matrix

	Q31	Q45	Q21	
Q50	-.06198	0.02788	-.02724	Grp adapts
Q34	0.00032	-.04834	0.12943	Grp align with strat
Q26	-.06532	0.01411	-.05618	Grp improve goals
Q54	0.00356	0.08331	0.03043	Grp learns from in
Q62	0.05419	0.05307	0.02793	Grp learns from out
Q58	-.00714	0.10000	0.05048	Grp learns from past
Q32	-.05114	-.05547	0.02986	Grp makes changes
Q46	-.10778	0.08458	-.11783	Grp strong comm
Q22	0.01635	0.06873	0.03346	Grp study cust needs
Q49	-.05056	0.00949	0.03764	Hosp adapts
Q33	0.02370	-.05627	0.09622	Hosp align with strat
Q25	-.00961	-.00045	0.01458	Hosp improve goals
Q53	-.01619	-.06929	-.00816	Hosp learns from in
Q61	0.07015	0.01143	0.01178	Hosp learns from out
Q57	0.06178	0.01470	0.00593	Hosp learns from past
Q31	-.01677	-.10332	0.02398	Hosp makes changes
Q45	-.10332	0.00020	-.01306	Hosp strong comm
Q21	0.02398	-.01306	0.02655	Hosp study cust needs

Average Absolute Residual = 0.03841
Average Off-diagonal Absolute Residual = 0.04119

Rank Order of 10 Largest Residuals

Q53,Q62	Q61,Q53	Q21,Q34	Q57,Q46	Q58,Q34	Q21,Q46	Q61,Q54
0.1578	0.1463	0.1294	-0.1265	0.1191	-0.1178	0.1115

Q62,Q26	Q31,Q46	Q49,Q46
-0.1079	-0.1078	-0.1062

Asymptotically Standardized Residual Matrix

	Q50	Q34	Q26	Q54	Q62	
Q50	-0.7989	0.9011	1.0652	-2.5659	-1.1944	Grp adapts
Q34	0.9011	-0.1785	-0.5829	-2.2497	0.4011	Grp align with strat
Q26	1.0652	-0.5829	0.1205	1.0103	-3.2682	Grp improve goals
Q54	-2.5659	-2.2497	1.0103	1.2380	0.0562	Grp learns from in
Q62	-1.1944	0.4011	-3.2682	0.0562	-0.9928	Grp learns from out
Q58	-0.7750	3.5889	1.0439	-1.0017	-1.5149	Grp learns from past
Q32	-0.1767	-2.1314	1.6063	1.2385	-2.3944	Grp makes changes
Q46	0.1787	1.3231	0.4500	0.5299	1.0831	Grp strong comm
Q22	0.0668	2.6370	-1.8780	1.3453	-1.0248	Grp study cust needs
Q49	-1.2238	-0.1143	-0.9121	2.2077	0.4953	Hosp adapts
Q33	1.0613	0.6283	-0.2863	-0.2283	1.4110	Hosp align with strat
Q25	-0.5177	0.6253	-1.6210	1.6295	1.5616	Hosp improve goals
Q53	1.8198	1.6010	-1.1119	2.2915	4.3260	Hosp learns from in
Q61	-2.1272	-1.2653	-2.5385	2.8281	1.1561	Hosp learns from out
Q57	-0.6717	0.4541	-1.6290	1.3860	2.3468	Hosp learns from past
Q31	-1.9788	0.0086	-2.1847	0.1064	1.4229	Hosp makes changes
Q45	0.8980	-1.1611	0.3966	2.1574	1.4067	Hosp strong comm
Q21	-0.7881	3.3447	-1.7120	0.8482	0.6951	Hosp study cust needs

	Q58	Q32	Q46	Q22	Q49		
Q50	-0.7750	-0.1767	0.1787	0.0668	-1.2238	Grp	adapts
Q34	3.5889	-2.1314	1.3231	2.6370	-0.1143	Grp	align with strat
Q26	1.0439	1.6063	0.4500	-1.8780	-0.9121	Grp	improve goals
Q54	-1.0017	1.2385	0.5299	1.3453	2.2077	Grp	learns from in
Q62	-1.5149	-2.3944	1.0831	-1.0248	0.4953	Grp	learns from out
Q58	-0.6771	-0.8620	-2.0359	1.1500	1.5599	Grp	learns from past
Q32	-0.8620	-1.7771	-1.8941	-0.1989	-0.3111	Grp	makes changes
Q46	-2.0359	-1.8941	0.0000	-0.4611	-3.4863	Grp	strong comm
Q22	1.1500	-0.1989	-0.4611	0.6554	0.9693	Grp	study cust needs
Q49	1.5599	-0.3111	-3.4863	0.9693	-1.1368	Hosp	adapts
Q33	0.4904	-0.9684	-2.5678	1.0734	-0.8669	Hosp	align with strat
Q25	2.2521	-1.5093	-1.3107	1.3257	-0.8868	Hosp	improve goals
Q53	0.8765	0.1990	0.7189	0.6778	0.6764	Hosp	learns from in
Q61	1.2361	-1.8009	-2.6579	-0.0548	0.0015	Hosp	learns from out
Q57	1.6157	-1.4055	-4.4225	0.6906	1.4595	Hosp	learns from past
Q31	-0.2258	-2.2131	-3.2488	0.4864	-1.7818	Hosp	makes changes
Q45	3.1847	-1.5124	2.4982	1.7698	0.4823	Hosp	strong comm
Q21	1.4507	0.8790	-3.2647	1.2782	1.1767	Hosp	study cust needs

Asymptotically Standardized Residual Matrix

	Q33	Q25	Q53	Q61	Q57		
Q50	1.0613	-0.5177	1.8198	-2.1272	-0.6717	Grp	adapts
Q34	0.6283	0.6253	1.6010	-1.2653	0.4541	Grp	align with strat
Q26	-0.2863	-1.6210	-1.1119	-2.5385	-1.6290	Grp	improve goals
Q54	-0.2283	1.6295	2.2915	2.8281	1.3860	Grp	learns from in
Q62	1.4110	1.5616	4.3260	1.1561	2.3468	Grp	learns from out
Q58	0.4904	2.2521	0.8765	1.2361	1.6157	Grp	learns from past
Q32	-0.9684	-1.5093	0.1990	-1.8009	-1.4055	Grp	makes changes
Q46	-2.5678	-1.3107	0.7189	-2.6579	-4.4225	Grp	strong comm
Q22	1.0734	1.3257	0.6778	-0.0548	0.6906	Grp	study cust needs
Q49	-0.8669	-0.8868	0.6764	0.0015	1.4595	Hosp	adapts
Q33	1.2513	-0.5893	1.5050	1.2284	-0.3493	Hosp	align with strat
Q25	-0.5893	-2.5157	-1.2732	0.9005	-0.0693	Hosp	improve goals
Q53	1.5050	-1.2732	2.2774	4.7310	2.9324	Hosp	learns from in
Q61	1.2284	0.9005	4.7310	2.7623	2.2582	Hosp	learns from out
Q57	-0.3493	-0.0693	2.9324	2.2582	3.0963	Hosp	learns from past
Q31	0.8754	-0.5622	-0.8080	2.1547	2.3447	Hosp	makes changes
Q45	-1.6229	-0.0169	-2.4137	0.4409	0.8577	Hosp	strong comm
Q21	3.1211	0.6585	-0.3294	0.3339	0.1968	Hosp	study cust needs

	Q31	Q45	Q21		
Q50	-1.9788	0.8980	-0.7881	Grp	adapts
Q34	0.0086	-1.1611	3.3447	Grp	align with strat
Q26	-2.1847	0.3966	-1.7120	Grp	improve goals
Q54	0.1064	2.1574	0.8482	Grp	learns from in
Q62	1.4229	1.4067	0.6951	Grp	learns from out
Q58	-0.2258	3.1847	1.4507	Grp	learns from past
Q32	-2.2131	-1.5124	0.8790	Grp	makes changes
Q46	-3.2488	2.4982	-3.2647	Grp	strong comm
Q22	0.4864	1.7698	1.2782	Grp	study cust needs
Q49	-1.7818	0.4823	1.1767	Hosp	adapts
Q33	0.8754	-1.6229	3.1211	Hosp	align with strat
Q25	-0.5622	-0.0169	0.6585	Hosp	improve goals
Q53	-0.8080	-2.4137	-0.3294	Hosp	learns from in
Q61	2.1547	0.4409	0.3339	Hosp	learns from out
Q57	2.3447	0.8577	0.1968	Hosp	learns from past
Q31	-1.6713	-3.3846	0.9102	Hosp	makes changes
Q45	-3.3846	0.0000	-0.3853	Hosp	strong comm
Q21	0.9102	-0.3853	1.5769	Hosp	study cust needs

Average Standardized Residual = 1.348
Average Off-diagonal Standardized Residual = 1.358

Rank Order of 10 Largest Asymptotically Standardized Residuals

Q61,Q53	Q57,Q46	Q53,Q62	Q58,Q34	Q49,Q46	Q45,Q31	Q21,Q34
4.7310	-4.4225	4.3260	3.5889	-3.4863	-3.3846	3.3447
		Q62,Q26	Q21,Q46	Q31,Q46		
		-3.2682	-3.2647	-3.2488		

Distribution of Asymptotically Standardized Residuals
(Each * represents 1 residuals)

```
-4.50000 -   -4.25000   1   0.58% | *
-4.25000 -   -4.00000   0   0.00% |
-4.00000 -   -3.75000   0   0.00% |
-3.75000 -   -3.50000   0   0.00% |
-3.50000 -   -3.25000   4   2.34% | ****
-3.25000 -   -3.00000   1   0.58% | *
-3.00000 -   -2.75000   0   0.00% |
-2.75000 -   -2.50000   5   2.92% | *****
-2.50000 -   -2.25000   2   1.17% | **
-2.25000 -   -2.00000   6   3.51% | ******
-2.00000 -   -1.75000   6   3.51% | ******
-1.75000 -   -1.50000   8   4.68% | ********
-1.50000 -   -1.25000   4   2.34% | ****
-1.25000 -   -1.00000   7   4.09% | *******
-1.00000 -   -0.75000  10   5.85% | **********
-0.75000 -   -0.50000   6   3.51% | ******
-0.50000 -   -0.25000   6   3.51% | ******
-0.25000 -          0   9   5.26% | *********
       0 -    0.25000  11   6.43% | ***********
 0.25000 -    0.50000  10   5.85% | **********
 0.50000 -    0.75000  10   5.85% | **********
 0.75000 -    1.00000  10   5.85% | **********
 1.00000 -    1.25000  13   7.60% | *************
 1.25000 -    1.50000  11   6.43% | ***********
 1.50000 -    1.75000   8   4.68% | ********
 1.75000 -    2.00000   2   1.17% | **
 2.00000 -    2.25000   3   1.75% | ***
 2.25000 -    2.50000   7   4.09% | *******
 2.50000 -    2.75000   1   0.58% | *
 2.75000 -    3.00000   3   1.75% | ***
 3.00000 -    3.25000   3   1.75% | ***
 3.25000 -    3.50000   1   0.58% | *
 3.50000 -    3.75000   1   0.58% | *
 3.75000 -    4.00000   0   0.00% |
 4.00000 -    4.25000   0   0.00% |
 4.25000 -    4.50000   1   0.58% | *
 4.50000 -    4.75000   1   0.58% | *
```

Manifest Variable Equations

```
Q50      =     0.7994*F1      +  1.0000 E50
Std Err        0.0476 LAMB150
t Value       16.7915

Q34      =     0.6458*F2      +  1.0000 E34
Std Err        0.0499 LAMB234
t Value       12.9324

Q26      =     0.8016*F2      +  1.0000 E26
Std Err        0.0473 LAMB226
t Value       16.9582

Q54      =     0.7190*F2      +  1.0000 E54
Std Err        0.0494 LAMB254
t Value       14.5686
```

```
Q62      =    0.6451*F1      +  1.0000 E62
Std Err       0.0502 LAMB162
t Value      12.8451

Q58      =    0.7902*F1      +  1.0000 E58
Std Err       0.0480 LAMB158
t Value      16.4567

Q32      =    0.7917*F2      +  1.0000 E32
Std Err       0.0480 LAMB232
t Value      16.4799

Q46      =    0.7424*F1      +  1.0000 E46
Std Err       0.0497 LAMB146
t Value      14.9355

Q22      =    0.7159*F2      +  1.0000 E22
Std Err       0.0475 LAMB222
t Value      15.0727

Q49      =    0.7788*F3      +  1.0000 E49
Std Err       0.0483 LAMB349
t Value      16.1080

Q33      =    0.6194*F4      +  1.0000 E33
Std Err       0.0497 LAMB433
t Value      12.4520

Q25      =    0.8225*F4      +  1.0000 E25
Std Err       0.0475 LAMB415
t Value      17.3339

Q53      =    0.7516*F4      +  1.0000 E53
Std Err       0.0482 LAMB453
t Value      15.5934

Q61      =    0.6498*F3      +  1.0000 E61
Std Err       0.0482 LAMB361
t Value      13.4801

Q57      =    0.7880*F3      +  1.0000 E57
Std Err       0.0468 LAMB357
t Value      16.8272

Q31      =    0.7385*F4      +  1.0000 E31
Std Err       0.0493 LAMB431
t Value      14.9654

Q45      =    0.7049*F3      +  1.0000 E45
Std Err       0.0507 LAMB345
t Value      13.8961

Q21      =    0.6425*F4      +  1.0000 E21
Std Err       0.0485 LAMB412
t Value      13.2415
```

Variances of Exogenous Variables

Variable	Parameter	Estimate	Standard Error	t Value
F2		1.000000	0	0.000
F1		1.000000	0	0.000
F4		1.000000	0	0.000
F3		1.000000	0	0.000
E34	THE34	0.585626	0.050356	11.630
E26	THE26	0.356328	0.036744	9.698
E32	THE32	0.391279	0.038881	10.063
E22	THE22	0.475914	0.043312	10.988
E54	THE54	0.474409	0.043361	10.941
E58	THE58	0.382543	0.039351	9.721
E50	THE50	0.370698	0.038823	9.548
E62	THE62	0.600746	0.052005	11.552
E46	THE46	0.448614	0.042768	10.490
E25	THE25	0.346020	0.036536	9.471
E31	THE31	0.471392	0.043416	10.858
E21	THE21	0.560672	0.048298	11.609
E53	THE53	0.418889	0.039827	10.518
E33	THE33	0.597805	0.050812	11.765
E57	THE57	0.348226	0.037193	9.363
E49	THE49	0.407245	0.040945	9.946
E61	THE61	0.532428	0.047011	11.326
E45	THE4546	0.502972	0.046058	10.920

Covariances among Exogenous Variables

Parameter			Estimate	Standard Error	t Value
F1	F2	GAM12	0.781836	0.031864	24.536
F4	F2	GAM24	0.726789	0.032956	22.054
F4	F1	GAM14	0.710198	0.037904	18.737
F3	F2	GAM23	0.548947	0.048413	11.339
F3	F1	GAM13	0.718144	0.034971	20.535
F3	F4	GAM34	0.826627	0.028955	28.549
E25	E26	THE2526	0.118409	0.026855	4.409
E31	E32	THE3132	0.148564	0.030321	4.900
E21	E22	THE2122	0.284997	0.036284	7.855
E53	E54	THE5354	0.109218	0.029988	3.642
E33	E34	THE3334	0.280063	0.039199	7.145
E57	E58	THE5758	0.146483	0.028333	5.170
E49	E50	THE4950	0.178258	0.030039	5.934
E61	E62	THE6162	0.303672	0.039038	7.779

Equations with Standardized Coefficients

```
Q50   =   0.7955*F1      + 0.6059 E50
              LAMB150

Q34   =   0.6450*F2      + 0.7642 E34
              LAMB234

Q26   =   0.8021*F2      + 0.5972 E26
              LAMB226

Q54   =   0.7221*F2      + 0.6918 E54
              LAMB254

Q62   =   0.6397*F1      + 0.7686 E62
              LAMB162

Q58   =   0.7874*F1      + 0.6164 E58
              LAMB158
```

```
Q32    =   0.7846*F2      + 0.6200 E32
                LAMB232

Q46    =   0.7425*F1      + 0.6699 E46
                LAMB146

Q22    =   0.7201*F2      + 0.6939 E22
                LAMB222

Q49    =   0.7735*F3      + 0.6338 E49
                LAMB349

Q33    =   0.6252*F4      + 0.7805 E33
                LAMB433

Q25    =   0.8134*F4      + 0.5817 E25
                LAMB415

Q53    =   0.7577*F4      + 0.6525 E53
                LAMB453

Q61    =   0.6650*F3      + 0.7468 E61
                LAMB361

Q57    =   0.8004*F3      + 0.5994 E57
                LAMB357

Q31    =   0.7324*F4      + 0.6809 E31
                LAMB431

Q45    =   0.7049*F3      + 0.7093 E45
                LAMB345

Q21    =   0.6512*F4      + 0.7589 E21
                LAMB412
```

Squared Multiple Correlations

Variable		Error Variance	Total Variance	R-squared
1	Q50	0.370698	1.009682	0.632857
2	Q34	0.585626	1.002731	0.415969
3	Q26	0.356328	0.998966	0.643303
4	Q54	0.474409	0.991331	0.521442
5	Q62	0.600746	1.016951	0.409267
6	Q58	0.382543	1.006883	0.620072
7	Q32	0.391279	1.018012	0.615644
8	Q46	0.448614	0.999805	0.551299
9	Q22	0.475914	0.988384	0.518493
10	Q49	0.407245	1.013732	0.598271
11	Q33	0.597805	0.981452	0.390897
12	Q25	0.346020	1.022595	0.661625
13	Q53	0.418889	0.983726	0.574181
14	Q61	0.532428	0.954646	0.442277
15	Q57	0.348226	0.969176	0.640699
16	Q31	0.471392	1.016766	0.536381
17	Q45	0.502972	0.999800	0.496928
18	Q21	0.560672	0.973449	0.424035

Correlations among Exogenous Variables

Parameter			Estimate
F1	F2	GAM12	0.781836
F4	F2	GAM24	0.726789
F4	F1	GAM14	0.710198
F3	F2	GAM23	0.548947
F3	F1	GAM13	0.718144
F3	F4	GAM34	0.826627
E25	E26	THE2526	0.337217
E31	E32	THE3132	0.345923
E21	E22	THE2122	0.551723
E53	E54	THE5354	0.245001
E33	E34	THE3334	0.473331
E57	E58	THE5758	0.401344
E49	E50	THE4950	0.458786
E61	E62	THE6162	0.536943

The items and the corresponding dimensions appear in the following table (dropped items are not listed):

Table 35. Items Tested under Hypothesis Five

Factor	Item
Intergroup Action	21. Hospital work groups study customer needs.
Intergroup Action	25. Hospital work groups effectively improve our hospital's goals.
Intergroup Action	31. Our hospital makes major changes when necessary.
Intergroup Action	53. Our hospital learns from the successes in our work group.
Intergroup Action	33. Hospital work groups align their work with the overall hospital strategy (or mission).
Intergroup Interaction	45. There is strong communication among hospital work groups.
Intergroup Interaction	49. Our hospital adapts well to new demands.
Intergroup Interaction	57. Our hospital learns from past mistakes.
Intergroup Interaction	61. Our hospital learns from success stories at other hospitals.
Intra-group Action	22. Our work group studies customer needs.
Intra-group Action	26. Our work group effectively improves our group's goals.
Intra-group Action	32. Our work group makes major changes when necessary.
Intra-group Action	34. People within our work group align their work with the overall work group strategy (or mission).
Intra-group Action	54. Our work group learns from my personal successes.
Intra-group Interaction	46. There is strong communication within our work group.
Intra-group Interaction	50. Our work group adapts well to new demands.
Intra-group Interaction	58. Our work group learns from past mistakes.
Intra-group Interaction	62. Our work group learns from the success stories within our hospital.

In addition to including these items, it is assumed that there is a correlated error term between items of a specific pair. Thus, items Q49 and Q50 are assumed correlated, under the assumption that both variables may be influenced by another causal source related to adaptation. The structural equation model is shown below (the variance of the latent variables is assumed to be one, and the independent measurement errors for the manifest variables are not displayed):

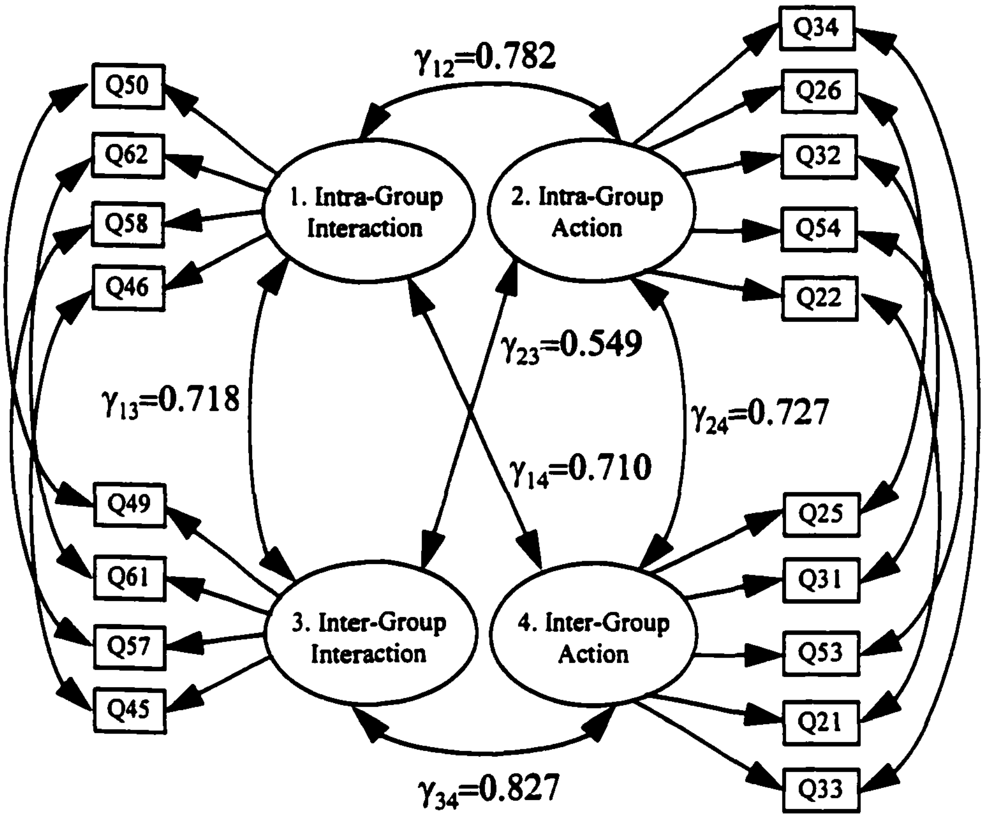

Figure 28. Structural Equation Model Tested under Hypothesis Five

A competing model is developed under the two assumptions that $\lambda_{12} = \lambda_{34}$ and $\lambda_{13} = \lambda_{24}$; this competing model assumes that the relationships between the latent action and interaction variables are equivalent, and that the relationship among the action variables is also equal to the relationship among the interaction variables. The competing model, therefore, adds two degrees of freedom to the model. This comparison is performed based on the observation that the loadings between action and interaction are relatively stable when different models are tested for hypotheses one and two.

In addition to testing the above model, the phase two data are compared to phase one data as a source of validation; as mentioned in the main text, phase one data are not used to construct structural models, and validation based on phase one are not necessary to establish the above model. Additionally, phase two data are shown to have more missing variables, and thus the phase one results should only be interpreted with caution.

The table below provides a comparison with phase one data. The extra comparison mentioned earlier accounts for the two additional structural equation models presented:

Table 36. Comparison of Fit Indices under Hypothesis Five

	Phase Two	Phase One	Phase Two	Phase One
χ^2	346.9846	418.1849	348.6357	423.6950
df	121	121	123	123
Null χ^2	3735.8834	6399.3960	3735.8834	6399.3960
Null df	153	153	153	153
GFI	0.9012	0.9105	0.9006	0.9091
AGFI	0.8604	0.8735	0.8618	0.8737
RMR	0.0500	0.0486	0.0510	0.0477
PGFI	0.7127	0.7200	0.7240	0.7309
CFI	0.9369	0.9524	0.9370	0.9519
NFI	0.9071	0.9347	0.9067	0.9338
PNFI	0.7174	0.7392	0.7289	0.7507

The goodness of fit indices indicate strong fit with the data, thus supporting the hypothesis that the work group dimensions are as proposed.

Hypothesis Six (Managerial and Hospital Administration Dimensions)

Covariance Structure Analysis: Maximum Likelihood Estimation

```
Fit criterion . . . . . . . . . . . . . . . . . .      3.0744
Goodness of Fit Index (GFI) . . . . . . . . . . .      0.8378
GFI Adjusted for Degrees of Freedom (AGFI). . . .      0.8026
Root Mean Square Residual (RMR) . . . . . . . . .      0.0537
Parsimonious GFI (Mulaik, 1989) . . . . . . . . .      0.7330
Chi-square = 710.1840     df = 434     Prob>chi**2 = 0.0001
Null Model Chi-square:    df = 496              5287.8893
RMSEA Estimate . . . . . . 0.0525  90%C.I.[0.0454, 0.0594]
Probability of Close Fit . . . . . . . . . . . .      0.2731
ECVI Estimate . . . . . . . 4.0239  90%C.I.[3.7152, 4.3732]
Bentler's Comparative Fit Index . . . . . . . . .      0.9424
Normal Theory Reweighted LS Chi-square . . . . .    715.7955
Akaike's Information Criterion. . . . . . . . . .   -157.8160
Bozdogan's (1987) CAIC. . . . . . . . . . . . . .  -2087.7000
Schwarz's Bayesian Criterion. . . . . . . . . . .  -1653.7000
McDonald's (1989) Centrality. . . . . . . . . . .      0.5514
Bentler & Bonett's (1980) Non-normed Index. . . .      0.9341
Bentler & Bonett's (1980) NFI . . . . . . . . . .      0.8657
James, Mulaik, & Brett (1982) Parsimonious NFI. .      0.7575
Z-Test of Wilson & Hilferty (1931). . . . . . . .      7.9067
Bollen (1986) Normed Index Rho1 . . . . . . . . .      0.8465
Bollen (1988) Non-normed Index Delta2 . . . . . .      0.9431
Hoelter's (1983) Critical N . . . . . . . . . . .         159
```

Residual Matrix

	Q55	Q1	Q3	Q9	Q63		
Q55	-.00253	0.03836	0.08988	-.01905	0.05003	HA	acts on vision
Q1	0.03836	0.00546	0.05942	0.03572	0.03509	HA	builds cust rel
Q3	0.08988	0.05942	0.03236	0.00164	0.09326	HA	builds hum res
Q9	-.01905	0.03572	0.00164	0.00988	-.00125	HA	builds suppl rel
Q63	0.05003	0.03509	0.09326	-.00125	0.04801	HA	collects cust data
Q23	0.00549	-.02729	-.04480	0.01785	-.07868	HA	comm diff decision
Q39	0.12453	-.07792	0.04926	0.06696	0.07524	HA	comm vision
Q35	-.03553	-.04365	-.06151	-.08537	-.11008	HA	details feedback
Q13	-.04671	0.02487	0.00234	0.00905	-.13209	HA	gives authority
Q17	0.11970	0.03666	0.06415	-.04546	0.07451	HA	involved in proj
Q51	0.07718	0.16894	0.09937	-.02553	0.01725	HA	knows customers
Q29	0.05643	0.04120	0.01236	0.02696	-.00568	HA	provide training
Q7	-.02503	-.06111	-.00008	0.04090	-.01463	HA	provides info
Q43	0.06851	0.02433	0.05913	-.06440	0.07515	HA	reports cust data
Q41	-.04350	0.01179	0.05274	0.02733	-.03588	HA	supports decision
Q59	-.05251	0.02639	-.00998	0.04926	0.04157	HA	timely feedback
Q27	-.01170	-.02286	0.01192	-.05879	0.01292	HA	understand respnsb
Q56	0.04371	0.04658	0.06514	-.06159	0.02749	Mgr	acts on vision
Q2	0.03338	0.01789	0.07784	0.02992	0.01003	Mgr	builds cust rel
Q4	0.08285	0.07972	0.05772	0.01801	0.07831	Mgr	builds hum res
Q10	0.04784	0.04887	0.01613	-.00376	-.04240	Mgr	builds suppl rel
Q64	0.09427	0.03803	0.01209	-.02104	0.00442	Mgr	collects cust data
Q24	-.00787	0.05420	-.02934	-.04336	-.08895	Mgr	comm diff decision
Q40	0.10808	-.02979	0.03162	0.06886	0.03766	Mgr	comm vision
Q36	0.04238	-.01934	-.02709	-.09006	-.14483	Mgr	details feedback
Q18	0.14693	-.03284	0.04817	-.00627	0.05292	Mgr	involved in proj
Q30	0.06902	0.06027	0.06971	0.05569	0.08190	Mgr	provide training
Q8	-.03149	0.04785	0.01393	-.03086	-.11642	Mgr	provides info
Q44	0.05753	0.05833	0.08872	-.05631	0.00770	Mgr	reports cust data
Q42	0.09612	-.07983	0.07497	-.06963	-.01521	Mgr	supports decision
Q60	0.00951	0.02335	-.00728	-.01959	-.00051	Mgr	timely feedback
Q28	0.10994	0.05336	0.09175	-.03329	0.03767	Mgr	understand respnsb

Residual Matrix

	Q23	Q39	Q35	Q13	Q17		
Q55	0.00549	0.12453	-.03553	-.04671	0.11970	HA	acts on vision
Q1	-.02729	-.07792	-.04365	0.02487	0.03666	HA	builds cust rel
Q3	-.04480	0.04926	-.06151	0.00234	0.06415	HA	builds hum res
Q9	0.01785	0.06696	-.08537	0.00905	-.04546	HA	builds suppl rel
Q63	-.07868	0.07524	-.11008	-.13209	0.07451	HA	collects cust data
Q23	-.01009	0.01895	0.00005	-.05760	-.03068	HA	comm diff decision
Q39	0.01895	0.02609	0.00820	-.06901	0.08945	HA	comm vision
Q35	0.00005	0.00820	-.02345	0.03940	0.00354	HA	details feedback
Q13	-.05760	-.06901	0.03940	-.00016	0.02910	HA	gives authority
Q17	-.03068	0.08945	0.00354	0.02910	0.01176	HA	involved in proj
Q51	-.06723	0.08927	-.08559	-.03851	-.01034	HA	knows customers
Q29	0.00129	0.04520	0.01843	-.00173	0.01236	HA	provide training
Q7	0.07460	-.00315	-.06432	-.01182	-.05702	HA	provides info
Q43	-.02136	0.02331	0.05995	0.04906	0.01315	HA	reports cust data
Q41	0.03497	-.03525	-.02775	0.05599	-.00324	HA	supports decision
Q59	0.02428	-.06566	-.04700	-.05326	-.04488	HA	timely feedback
Q27	-.02618	0.01575	-.01760	0.01353	0.07537	HA	understand respnsb
Q56	0.00785	0.09879	-.04891	-.09326	0.12253	Mgr	acts on vision
Q2	-.06488	-.03123	-.04988	0.06868	-.06519	Mgr	builds cust rel
Q4	-.00495	0.05266	-.07979	-.05903	0.04476	Mgr	builds hum res
Q10	-.02044	-.02050	-.07090	0.04709	-.06003	Mgr	builds suppl rel
Q64	-.04813	-.00987	0.01894	-.02009	0.12628	Mgr	collects cust data
Q24	-.05053	-.03232	-.02078	0.06294	-.01835	Mgr	comm diff decision
Q40	0.03911	0.04311	0.01504	0.01181	0.07564	Mgr	comm vision
Q36	-.05340	-.00150	-.06430	-.01278	-.05642	Mgr	details feedback
Q18	-.01664	0.06981	-.03876	0.01607	0.01322	Mgr	involved in proj
Q30	0.04450	0.08447	-.02906	0.00851	0.03325	Mgr	provide training
Q8	-.04439	-.11373	-.08967	0.01828	-.03957	Mgr	provides info
Q44	-.01422	0.02731	0.14342	0.15416	0.07405	Mgr	reports cust data
Q42	-.07380	-.03331	-.09925	0.01067	0.01457	Mgr	supports decision
Q60	-.06307	-.04499	-.13007	-.00926	-.07149	Mgr	timely feedback
Q28	-.06545	-.02413	-.17996	0.00604	0.09781	Mgr	understand respnsb

	Q51	Q29	Q7	Q43	Q41		
Q55	0.07718	0.05643	-.02503	0.06851	-.04350	HA	acts on vision
Q1	0.16894	0.04120	-.06111	0.02433	0.01179	HA	builds cust rel
Q3	0.09937	0.01236	-.00008	0.05913	0.05274	HA	builds hum res
Q9	-.02553	0.02696	0.04090	-.06440	0.02733	HA	builds suppl rel
Q63	0.01725	-.00568	-.01463	0.07515	-.03588	HA	collects cust data
Q23	-.06723	0.00129	0.07460	-.02136	0.03497	HA	comm diff decision
Q39	0.08927	0.04520	-.00315	0.02331	-.03525	HA	comm vision
Q35	-.08559	0.01843	-.06432	0.05995	-.02775	HA	details feedback
Q13	-.03851	-.00173	-.01182	0.04906	0.05599	HA	gives authority
Q17	-.01034	0.01236	-.05702	0.01315	-.00324	HA	involved in proj
Q51	0.00003	0.07384	-.07602	0.07124	-.00447	HA	knows customers
Q29	0.07384	0.03375	0.04158	0.02824	0.02052	HA	provide training
Q7	-.07602	0.04158	-.02095	-.01531	-.00474	HA	provides info
Q43	0.07124	0.02824	-.01531	0.03389	0.08838	HA	reports cust data
Q41	-.00447	0.02052	-.00474	0.08838	-.01611	HA	supports decision
Q59	-.00639	-.00089	-.02684	0.05167	-.04836	HA	timely feedback
Q27	0.01245	0.06869	-.02634	0.06936	-.00039	HA	understand respnsb
Q56	0.10729	0.06708	-.04927	0.08568	-.01182	Mgr	acts on vision
Q2	0.02256	0.06470	-.01917	0.06256	-.01946	Mgr	builds cust rel
Q4	0.10450	0.08704	0.03047	0.10936	0.00761	Mgr	builds hum res
Q10	-.01278	0.09893	0.02625	-.01450	-.00043	Mgr	builds suppl rel
Q64	0.05229	0.09261	0.00965	0.11977	-.05962	Mgr	collects cust data
Q24	-.00519	0.05537	-.07039	0.06989	0.02013	Mgr	comm diff decision
Q40	0.02386	0.02479	-.01829	0.05742	-.03261	Mgr	comm vision
Q36	-.05977	0.02853	-.08777	0.05896	-.01241	Mgr	details feedback
Q18	-.01665	0.04713	-.07027	0.01357	0.02360	Mgr	involved in proj
Q30	0.10142	0.08144	0.10953	0.05165	0.01516	Mgr	provide training
Q8	0.01253	0.06338	-.06926	-.00631	-.03879	Mgr	provides info
Q44	0.06254	0.12247	-.04598	0.07697	0.07052	Mgr	reports cust data
Q42	-.05741	0.03168	-.03141	0.02725	-.01300	Mgr	supports decision
Q60	-.04437	0.05018	-.01496	-.02885	0.02747	Mgr	timely feedback
Q28	0.08547	0.09705	-.02437	0.02706	0.01240	Mgr	understand respnsb

Residual Matrix

	Q59	Q27	Q56	Q2	Q4		
Q55	-.05251	-.01170	0.04371	0.03338	0.08285	HA	acts on vision
Q1	0.02639	-.02286	0.04658	0.01789	0.07972	HA	builds cust rel
Q3	-.00998	0.01192	0.06514	0.07784	0.05772	HA	builds hum res
Q9	0.04926	-.05879	-.06159	0.02992	0.01801	HA	builds suppl rel
Q63	0.04157	0.01292	0.02749	0.01003	0.07831	HA	collects cust data
Q23	0.02428	-.02618	0.00785	-.06488	-.00495	HA	comm diff decision
Q39	-.06566	0.01575	0.09879	-.03123	0.05266	HA	comm vision
Q35	-.04700	-.01760	-.04891	-.04988	-.07979	HA	details feedback
Q13	-.05326	0.01353	-.09326	0.06868	-.05903	HA	gives authority
Q17	-.04488	0.07537	0.12253	-.06519	0.04476	HA	involved in proj
Q51	-.00639	0.01245	0.10729	0.02256	0.10450	HA	knows customers
Q29	-.00089	0.06869	0.06708	0.06470	0.08704	HA	provide training
Q7	-.02684	-.02634	-.04927	-.01917	0.03047	HA	provides info
Q43	0.05167	0.06936	0.08568	0.06256	0.10936	HA	reports cust data
Q41	-.04836	-.00039	-.01182	-.01946	0.00761	HA	supports decision
Q59	-.01458	-.05309	-.04780	0.03854	0.01180	HA	timely feedback
Q27	-.05309	-.00828	0.00651	0.01488	-.01294	HA	understand respnsb
Q56	-.04780	0.00651	0.03985	-.00432	0.09458	Mgr	acts on vision
Q2	0.03854	0.01488	-.00432	0.00920	0.12805	Mgr	builds cust rel
Q4	0.01180	-.01294	0.09458	0.12805	0.02357	Mgr	builds hum res
Q10	0.06275	-.00060	-.05025	0.07548	-.01640	Mgr	builds suppl rel
Q64	0.06869	0.01660	-.05070	0.01429	-.03864	Mgr	collects cust data
Q24	-.04915	-.01491	-.04054	0.02930	-.03852	Mgr	comm diff decision
Q40	-.00727	0.04434	0.06411	-.00577	0.01135	Mgr	comm vision
Q36	-.06547	-.02258	-.00819	-.01963	-.03688	Mgr	details feedback
Q18	-.01920	0.04797	0.05365	-.02451	0.02942	Mgr	involved in proj
Q30	0.03003	0.07608	0.09664	0.08878	0.10266	Mgr	provide training
Q8	-.03718	-.08859	-.07258	0.05126	0.03029	Mgr	provides info
Q44	0.06560	0.10691	0.01527	-.00152	0.01670	Mgr	reports cust data
Q42	-.06918	-.01225	0.06380	-.04063	0.05809	Mgr	supports decision
Q60	-.03137	-.07306	0.02120	-.01650	-.01239	Mgr	timely feedback
Q28	-.02689	-.01145	0.09652	-.05120	0.05104	Mgr	understand respnsb

	Q10	Q64	Q24	Q40	Q36		
Q55	0.04784	0.09427	-.00787	0.10808	0.04238	HA	acts on vision
Q1	0.04887	0.03803	0.05420	-.02979	-.01934	HA	builds cust rel
Q3	0.01613	0.01209	-.02934	0.03162	-.02709	HA	builds hum res
Q9	-.00376	-.02104	-.04336	0.06886	-.09006	HA	builds suppl rel
Q63	-.04240	0.00442	-.08895	0.03766	-.14483	HA	collects cust data
Q23	-.02044	-.04813	-.05053	0.03911	-.05340	HA	comm diff decision
Q39	-.02050	-.00987	-.03232	0.04311	-.00150	HA	comm vision
Q35	-.07090	0.01894	-.02078	0.01504	-.06430	HA	details feedback
Q13	0.04709	-.02009	0.06294	0.01181	-.01278	HA	gives authority
Q17	-.06003	0.12628	-.01835	0.07564	-.05642	HA	involved in proj
Q51	-.01278	0.05229	-.00519	0.02386	-.05977	HA	knows customers
Q29	0.09893	0.09261	0.05537	0.02479	0.02853	HA	provide training
Q7	0.02625	0.00965	-.07039	-.01829	-.08777	HA	provides info
Q43	-.01450	0.11977	0.06989	0.05742	0.05896	HA	reports cust data
Q41	-.00043	-.05962	0.02013	-.03261	-.01241	HA	supports decision
Q59	0.06275	0.06869	-.04915	-.00727	-.06547	HA	timely feedback
Q27	-.00060	0.01660	-.01491	0.04434	-.02258	HA	understand respnsb
Q56	-.05025	-.05070	-.04054	0.06411	-.00819	Mgr	acts on vision
Q2	0.07548	0.01429	0.02930	-.00577	-.01963	Mgr	builds cust rel
Q4	-.01640	-.03864	-.03852	0.01135	-.03688	Mgr	builds hum res
Q10	-.01198	-.03518	-.00548	-.01130	-.05899	Mgr	builds suppl rel
Q64	-.03518	-.04206	-.05166	0.01181	-.01608	Mgr	collects cust data
Q24	-.00548	-.05166	-.01623	-.04625	0.01790	Mgr	comm diff decision
Q40	-.01130	0.01181	-.04625	0.01216	0.00266	Mgr	comm vision
Q36	-.05899	-.01608	0.01790	0.00266	-.04104	Mgr	details feedback
Q18	0.00362	0.04338	-.01495	0.04651	-.03148	Mgr	involved in proj
Q30	0.04201	0.00263	-.02092	0.03960	0.03113	Mgr	provide training
Q8	-.00059	-.05097	-.02310	-.06718	0.02097	Mgr	provides info
Q44	-.03552	0.03514	0.02053	0.06823	0.09982	Mgr	reports cust data
Q42	-.04440	-.03215	-.02272	-.03408	-.02392	Mgr	supports decision
Q60	0.03442	0.05340	0.07523	-.11090	-.05278	Mgr	timely feedback
Q28	-.06866	-.01552	-.02398	-.04634	-.08155	Mgr	understand respnsb

Residual Matrix

	Q18	Q30	Q8	Q44	Q42		
Q55	0.14693	0.06902	-.03149	0.05753	0.09612	HA	acts on vision
Q1	-.03284	0.06027	0.04785	0.05833	-.07983	HA	builds cust rel
Q3	0.04817	0.06971	0.01393	0.08872	0.07497	HA	builds hum res
Q9	-.00627	0.05569	-.03086	-.05631	-.06963	HA	builds suppl rel
Q63	0.05292	0.08190	-.11642	0.00770	-.01521	HA	collects cust data
Q23	-.01664	0.04450	-.04439	-.01422	-.07380	HA	comm diff decision
Q39	0.06981	0.08447	-.11373	0.02731	-.03331	HA	comm vision
Q35	-.03876	-.02906	-.08967	0.14342	-.09925	HA	details feedback
Q13	0.01607	0.00851	0.01828	0.15416	0.01067	HA	gives authority
Q17	0.01322	0.03325	-.03957	0.07405	0.01457	HA	involved in proj
Q51	-.01665	0.10142	0.01253	0.06254	-.05741	HA	knows customers
Q29	0.04713	0.08144	0.06338	0.12247	0.03168	HA	provide training
Q7	-.07027	0.10953	-.06926	-.04598	-.03141	HA	provides info
Q43	0.01357	0.05165	-.00631	0.07697	0.02725	HA	reports cust data
Q41	0.02360	0.01516	-.03879	0.07052	-.01300	HA	supports decision
Q59	-.01920	0.03003	-.03718	0.06560	-.06918	HA	timely feedback
Q27	0.04797	0.07608	-.08859	0.10691	-.01225	HA	understand respnsb
Q56	0.05365	0.09664	-.07258	0.01527	0.06380	Mgr	acts on vision
Q2	-.02451	0.08878	0.05126	-.00152	-.04063	Mgr	builds cust rel
Q4	0.02942	0.10266	0.03029	0.01670	0.05809	Mgr	builds hum res
Q10	0.00362	0.04201	-.00059	-.03552	-.04440	Mgr	builds suppl rel
Q64	0.04338	0.00263	-.05097	0.03514	-.03215	Mgr	collects cust data
Q24	-.01495	-.02092	-.02310	0.02053	-.02272	Mgr	comm diff decision
Q40	0.04651	0.03960	-.06718	0.06823	-.03408	Mgr	comm vision
Q36	-.03148	0.03113	0.02097	0.09982	-.02392	Mgr	details feedback
Q18	0.00008	-.04349	-.03732	-.01564	0.04541	Mgr	involved in proj
Q30	-.04349	0.03857	0.01928	0.02014	0.03197	Mgr	provide training
Q8	-.03732	0.01928	-.02051	-.01400	0.01425	Mgr	provides info
Q44	-.01564	0.02014	-.01400	0.03786	-.01347	Mgr	reports cust data
Q42	0.04541	0.03197	0.01425	-.01347	0.00316	Mgr	supports decision
Q60	-.03490	0.00129	0.06621	-.02057	-.01150	Mgr	timely feedback
Q28	0.03877	0.03383	0.00649	-.04202	0.04174	Mgr	understand respnsb

	Q60	Q28		
Q55	0.00951	0.10994	HA	acts on vision
Q1	0.02335	0.05336	HA	builds cust rel
Q3	-.00728	0.09175	HA	builds hum res
Q9	-.01959	-.03329	HA	builds suppl rel
Q63	-.00051	0.03767	HA	collects cust data
Q23	-.06307	-.06545	HA	comm diff decision
Q39	-.04499	-.02413	HA	comm vision
Q35	-.13007	-.17996	HA	details feedback
Q13	-.00926	0.00604	HA	gives authority
Q17	-.07149	0.09781	HA	involved in proj
Q51	-.04437	0.08547	HA	knows customers
Q29	0.05018	0.09705	HA	provide training
Q7	-.01496	-.02437	HA	provides info
Q43	-.02885	0.02706	HA	reports cust data
Q41	0.02747	0.01240	HA	supports decision
Q59	-.03137	-.02689	HA	timely feedback
Q27	-.07306	-.01145	HA	understand respnsb
Q56	0.02120	0.09652	Mgr	acts on vision
Q2	-.01650	-.05120	Mgr	builds cust rel
Q4	-.01239	0.05104	Mgr	builds hum res
Q10	0.03442	-.06866	Mgr	builds suppl rel
Q64	0.05340	-.01552	Mgr	collects cust data
Q24	0.07523	-.02398	Mgr	comm diff decision
Q40	-.11090	-.04634	Mgr	comm vision
Q36	-.05278	-.08155	Mgr	details feedback
Q18	-.03490	0.03877	Mgr	involved in proj
Q30	0.00129	0.03383	Mgr	provide training
Q8	0.06621	0.00649	Mgr	provides info
Q44	-.02057	-.04202	Mgr	reports cust data
Q42	-.01150	0.04174	Mgr	supports decision
Q60	-.00473	0.01078	Mgr	timely feedback
Q28	0.01078	-.00100	Mgr	understand respnsb

Average Absolute Residual = 0.04307
Average Off-diagonal Absolute Residual = 0.04464

Rank Order of 10 Largest Residuals

Q28,Q35	Q51,Q1	Q44,Q13	Q18,Q55	Q36,Q63	Q44,Q35	Q13,Q63
-0.1800	0.1689	0.1542	0.1469	-0.1448	0.1434	-0.1321

Q60,Q35	Q4,Q2	Q64,Q17
-0.1301	0.1281	0.1263

Asymptotically Standardized Residual Matrix

	Q55	Q1	Q3	Q9	Q63		
Q55	-0.1362	0.9825	2.3925	-0.5198	1.2941	HA	acts on vision
Q1	0.9825	0.3037	1.6685	1.0701	0.8577	HA	builds cust rel
Q3	2.3925	1.6685	1.4608	0.0496	2.3448	HA	builds hum res
Q9	-0.5198	1.0701	0.0496	0.6247	-0.0326	HA	builds suppl rel
Q63	1.2941	0.8577	2.3448	-0.0326	2.0693	HA	collects cust data
Q23	0.1574	-0.8631	-1.4352	0.6197	-2.1709	HA	comm diff decision
Q39	4.1060	-1.9103	1.2583	1.7417	1.8483	HA	comm vision
Q35	-1.3645	-1.1572	-1.7122	-2.4192	-2.9656	HA	details feedback
Q13	-1.5030	0.5961	0.0577	0.2311	-3.1489	HA	gives authority
Q17	3.1683	0.9169	1.6429	-1.2205	2.8658	HA	involved in proj
Q51	1.8322	3.8270	2.3215	-0.6144	0.6095	HA	knows customers
Q29	1.3664	1.0584	0.3253	0.7450	-0.1313	HA	provide training
Q7	-0.7265	-1.9698	-0.0026	1.4485	-0.4115	HA	provides info
Q43	1.7604	0.6677	1.6593	-1.9006	1.8760	HA	reports cust data
Q41	-1.4383	0.2955	1.3495	0.7304	-0.8985	HA	supports decision
Q59	-1.6081	0.9237	-0.3452	1.9068	1.2152	HA	timely feedback
Q27	-0.4030	-0.5910	0.3143	-1.6228	0.3351	HA	understand respnsb
Q56	1.3044	0.9636	1.4096	-1.3301	0.6357	Mgr	acts on vision
Q2	0.7263	0.5194	1.7121	0.6770	0.2243	Mgr	builds cust rel
Q4	1.8659	1.6239	1.5791	0.3827	1.7524	Mgr	builds hum res
Q10	1.0811	1.0926	0.3666	-0.1130	-0.9926	Mgr	builds suppl rel
Q64	2.1742	0.7934	0.2599	-0.4606	0.1358	Mgr	collects cust data
Q24	-0.1926	1.1913	-0.6656	-1.0077	-2.1719	Mgr	comm diff decision
Q40	2.6929	-0.6347	0.7096	1.5436	0.9198	Mgr	comm vision
Q36	1.1437	-0.4259	-0.6353	-2.1129	-3.8125	Mgr	details feedback
Q18	3.5910	-0.7808	1.1612	-0.1583	1.4097	Mgr	involved in proj
Q30	1.3795	1.2032	1.4201	1.1515	1.6606	Mgr	provide training
Q8	-0.8185	1.0982	0.3306	-0.7552	-3.0638	Mgr	provides info
Q44	1.2999	1.2215	1.9110	-1.2311	0.1714	Mgr	reports cust data
Q42	2.3016	-1.8371	1.7498	-1.6916	-0.3735	Mgr	supports decision
Q60	0.2200	0.5334	-0.1691	-0.4728	-0.0123	Mgr	timely feedback
Q28	2.4775	1.1629	2.0318	-0.7605	0.8620	Mgr	understand respnsb

Asymptotically Standardized Residual Matrix

	Q23	Q39	Q35	Q13	Q17		
Q55	0.1574	4.1060	-1.3645	-1.5030	3.1683	HA	acts on vision
Q1	-0.8631	-1.9103	-1.1572	0.5961	0.9169	HA	builds cust rel
Q3	-1.4352	1.2583	-1.7122	0.0577	1.6429	HA	builds hum res
Q9	0.6197	1.7417	-2.4192	0.2311	-1.2205	HA	builds suppl rel
Q63	-2.1709	1.8483	-2.9656	-3.1489	2.8658	HA	collects cust data
Q23	-0.9213	0.5147	0.0015	-1.5416	-0.8639	HA	comm diff decision
Q39	0.5147	1.5230	0.2953	-2.0345	2.2307	HA	comm vision
Q35	0.0015	0.2953	-1.2112	1.3653	0.0982	HA	details feedback
Q13	-1.5416	-2.0345	1.3653	0.0000	0.7031	HA	gives authority
Q17	-0.8639	2.2307	0.0982	0.7031	0.7455	HA	involved in proj
Q51	-1.6899	2.0208	-2.1089	-0.8432	-0.4109	HA	knows customers
Q29	0.0376	1.0516	0.4602	-0.0391	0.2895	HA	provide training
Q7	2.9700	-0.0867	-1.9491	-0.3210	-1.6344	HA	provides info
Q43	-0.6813	0.5749	1.5907	1.1840	0.3290	HA	reports cust data
Q41	0.9730	-1.0859	-0.9723	1.7173	-0.0833	HA	supports decision
Q59	1.0207	-1.9015	-1.5055	-1.5325	-1.3825	HA	timely feedback
Q27	-0.7547	0.5065	-0.6416	0.4375	2.0148	HA	understand respnsb
Q56	0.1739	2.2549	-1.2191	-2.0236	2.8492	Mgr	acts on vision
Q2	-1.4924	-0.6587	-1.1107	1.4093	-1.4827	Mgr	builds cust rel
Q4	-0.1079	1.1497	-1.8697	-1.2311	1.0051	Mgr	builds hum res
Q10	-0.4910	-0.4460	-1.6492	0.9956	-1.4415	Mgr	builds suppl rel
Q64	-1.1029	-0.2180	0.4515	-0.4309	2.9737	Mgr	collects cust data
Q24	-1.5622	-0.7517	-0.5294	1.4194	-0.4405	Mgr	comm diff decision
Q40	0.9056	1.2845	0.3987	0.2649	1.8703	Mgr	comm vision
Q36	-1.3100	-0.0378	-2.0980	-0.3010	-1.5211	Mgr	details feedback
Q18	-0.4293	1.6241	-0.9842	0.3627	0.4654	Mgr	involved in proj
Q30	0.9310	1.6574	-0.5888	0.1628	0.6754	Mgr	provide training
Q8	-1.1629	-2.7790	-2.4482	0.4325	-1.0240	Mgr	provides info
Q44	-0.3225	0.5963	3.3248	3.2722	1.6202	Mgr	reports cust data
Q42	-1.8295	-0.7608	-2.4644	0.2362	0.3696	Mgr	supports decision
Q60	-1.5552	-0.9986	-3.1037	-0.1996	-1.7678	Mgr	timely feedback
Q28	-1.5207	-0.5234	-4.1749	0.1271	2.2843	Mgr	understand respnsb

	Q51	Q29	Q7	Q43	Q41		
Q55	1.8322	1.3664	-0.7265	1.7604	-1.4383	HA	acts on vision
Q1	3.8270	1.0584	-1.9698	0.6677	0.2955	HA	builds cust rel
Q3	2.3215	0.3253	-0.0026	1.6593	1.3495	HA	builds hum res
Q9	-0.6144	0.7450	1.4485	-1.9006	0.7304	HA	builds suppl rel
Q63	0.6095	-0.1313	-0.4115	1.8760	-0.8985	HA	collects cust data
Q23	-1.6899	0.0376	2.9700	-0.6813	0.9730	HA	comm diff decision
Q39	2.0208	1.0516	-0.0867	0.5749	-1.0859	HA	comm vision
Q35	-2.1089	0.4602	-1.9491	1.5907	-0.9723	HA	details feedback
Q13	-0.8432	-0.0391	-0.3210	1.1840	1.7173	HA	gives authority
Q17	-0.4109	0.2895	-1.6344	0.3290	-0.0833	HA	involved in proj
Q51	0.0000	1.5851	-1.9390	1.6297	-0.1028	HA	knows customers
Q29	1.5851	1.8281	1.2312	0.7255	0.4851	HA	provide training
Q7	-1.9390	1.2312	-1.8053	-0.5002	-0.1338	HA	provides info
Q43	1.6297	0.7255	-0.5002	1.6390	2.2108	HA	reports cust data
Q41	-0.1028	0.4851	-0.1338	2.2108	-0.9433	HA	supports decision
Q59	-0.1722	-0.0285	-1.1517	1.7553	-1.4514	HA	timely feedback
Q27	0.2961	1.6718	-0.7700	1.7879	-0.0133	HA	understand respnsb
Q56	2.2436	1.3392	-1.1003	1.7939	-0.2675	Mgr	acts on vision
Q2	0.4611	1.3419	-0.4447	1.3526	-0.4180	Mgr	builds cust rel
Q4	2.1276	1.7123	0.6691	2.2548	0.1641	Mgr	builds hum res
Q10	-0.2700	2.1082	0.6371	-0.3233	-0.0097	Mgr	builds suppl rel
Q64	1.0730	1.8551	0.2244	2.5737	-1.3363	Mgr	collects cust data
Q24	-0.1085	1.1584	-1.7620	1.5843	0.4776	Mgr	comm diff decision
Q40	0.5177	0.5053	-0.4282	1.2372	-0.7675	Mgr	comm vision
Q36	-1.3576	0.5939	-2.1877	1.3125	-0.3109	Mgr	details feedback
Q18	-0.3871	1.0595	-1.8354	0.3202	0.5700	Mgr	involved in proj
Q30	1.9191	2.4650	2.3028	1.0384	0.2989	Mgr	provide training
Q8	0.2739	1.3725	-2.2394	-0.1499	-0.9735	Mgr	provides info
Q44	1.2429	2.4751	-1.0565	2.1530	1.5532	Mgr	reports cust data
Q42	-1.2609	0.6935	-0.7871	0.6243	-0.3878	Mgr	supports decision
Q60	-0.9570	1.0892	-0.3732	-0.6566	0.6273	Mgr	timely feedback
Q28	1.7759	2.0281	-0.5711	0.5897	0.2757	Mgr	understand respnsb

Asymptotically Standardized Residual Matrix

	Q59	Q27	Q56	Q2	Q4		
Q55	-1.6081	-0.4030	1.3044	0.7263	1.8659	HA	acts on vision
Q1	0.9237	-0.5910	0.9636	0.5194	1.6239	HA	builds cust rel
Q3	-0.3452	0.3143	1.4096	1.7121	1.5791	HA	builds hum res
Q9	1.9068	-1.6228	-1.3301	0.6770	0.3827	HA	builds suppl rel
Q63	1.2152	0.3351	0.6357	0.2243	1.7524	HA	collects cust data
Q23	1.0207	-0.7547	0.1739	-1.4924	-0.1079	HA	comm diff decision
Q39	-1.9015	0.5065	2.2549	-0.6587	1.1497	HA	comm vision
Q35	-1.5055	-0.6416	-1.2191	-1.1107	-1.8697	HA	details feedback
Q13	-1.5325	0.4375	-2.0236	1.4093	-1.2311	HA	gives authority
Q17	-1.3825	2.0148	2.8492	-1.4827	1.0051	HA	involved in proj
Q51	-0.1722	0.2961	2.2436	0.4611	2.1276	HA	knows customers
Q29	-0.0285	1.6718	1.3392	1.3419	1.7123	HA	provide training
Q7	-1.1517	-0.7700	-1.1003	-0.4447	0.6691	HA	provides info
Q43	1.7553	1.7879	1.7939	1.3526	2.2548	HA	reports cust data
Q41	-1.4514	-0.0133	-0.2675	-0.4180	0.1641	HA	supports decision
Q59	-1.1628	-1.6523	-1.1103	0.9403	0.2694	HA	timely feedback
Q27	-1.6523	-0.4678	0.1516	0.3274	-0.2864	HA	understand respnsb
Q56	-1.1103	0.1516	2.2436	-0.1107	3.0324	Mgr	acts on vision
Q2	0.9403	0.3274	-0.1107	0.5046	3.1673	Mgr	builds cust rel
Q4	0.2694	-0.2864	3.0324	3.1673	1.0347	Mgr	builds hum res
Q10	1.6156	-0.0137	-1.3548	2.4710	-0.4253	Mgr	builds suppl rel
Q64	1.6355	0.3838	-1.3517	0.3874	-0.9851	Mgr	collects cust data
Q24	-1.2657	-0.3664	-1.1734	0.8702	-1.0643	Mgr	comm diff decision
Q40	-0.1785	1.0790	2.4937	-0.1553	0.3927	Mgr	comm vision
Q36	-1.7359	-0.5902	-0.3693	-0.5607	-1.4024	Mgr	details feedback
Q18	-0.5380	1.1972	1.5963	-0.9124	0.8306	Mgr	involved in proj
Q30	0.6543	1.5281	2.2268	2.3281	2.2991	Mgr	provide training
Q8	-1.0309	-2.3155	-2.2536	1.6382	0.8929	Mgr	provides info
Q44	1.5418	2.4192	0.3953	-0.0403	0.4182	Mgr	reports cust data
Q42	-1.8436	-0.2990	1.8275	-1.4014	1.5714	Mgr	supports decision
Q60	-1.0216	-1.7171	0.5903	-0.5672	-0.3312	Mgr	timely feedback
Q28	-0.6634	-0.3377	2.5656	-1.5955	1.2889	Mgr	understand respnsb

	Q10	Q64	Q24	Q40	Q36		
Q55	1.0811	2.1742	-0.1926	2.6929	1.1437	HA	acts on vision
Q1	1.0926	0.7934	1.1913	-0.6347	-0.4259	HA	builds cust rel
Q3	0.3666	0.2599	-0.6656	0.7096	-0.6353	HA	builds hum res
Q9	-0.1130	-0.4606	-1.0077	1.5436	-2.1129	HA	builds suppl rel
Q63	-0.9926	0.1358	-2.1719	0.9198	-3.8125	HA	collects cust data
Q23	-0.4910	-1.1029	-1.5622	0.9056	-1.3100	HA	comm diff decision
Q39	-0.4460	-0.2180	-0.7517	1.2845	-0.0378	HA	comm vision
Q35	-1.6492	0.4515	-0.5294	0.3987	-2.0980	HA	details feedback
Q13	0.9956	-0.4309	1.4194	0.2649	-0.3010	HA	gives authority
Q17	-1.4415	2.9737	-0.4405	1.8703	-1.5211	HA	involved in proj
Q51	-0.2700	1.0730	-0.1085	0.5177	-1.3576	HA	knows customers
Q29	2.1082	1.8551	1.1584	0.5053	0.5939	HA	provide training
Q7	0.6371	0.2244	-1.7620	-0.4282	-2.1877	HA	provides info
Q43	-0.3233	2.5737	1.5843	1.2372	1.3125	HA	reports cust data
Q41	-0.0097	-1.3363	0.4776	-0.7675	-0.3109	HA	supports decision
Q59	1.6156	1.6355	-1.2657	-0.1785	-1.7359	HA	timely feedback
Q27	-0.0137	0.3838	-0.3664	1.0790	-0.5902	HA	understand respnsb
Q56	-1.3548	-1.3517	-1.1734	2.4937	-0.3693	Mgr	acts on vision
Q2	2.4710	0.3874	0.8702	-0.1553	-0.5607	Mgr	builds cust rel
Q4	-0.4253	-0.9851	-1.0643	0.3927	-1.4024	Mgr	builds hum res
Q10	-0.7358	-1.0116	-0.1750	-0.3225	-1.8047	Mgr	builds suppl rel
Q64	-1.0116	-1.7662	-1.9817	0.3334	-0.4870	Mgr	collects cust data
Q24	-0.1750	-1.9817	-1.4199	-1.4377	0.6099	Mgr	comm diff decision
Q40	-0.3225	0.3334	-1.4377	0.6694	0.1294	Mgr	comm vision
Q36	-1.8047	-0.4870	0.6099	0.1294	-2.0154	Mgr	details feedback
Q18	0.1483	1.4604	-0.5405	1.4808	-1.0916	Mgr	involved in proj
Q30	1.1796	0.0635	-0.5421	0.9491	0.7817	Mgr	provide training
Q8	-0.0204	-2.1420	-1.2939	-2.2625	0.7856	Mgr	provides info
Q44	-0.9915	1.1169	0.7508	1.8564	2.8830	Mgr	reports cust data
Q42	-1.6688	-0.9738	-0.7666	-1.0382	-0.7927	Mgr	supports decision
Q60	1.3005	1.5949	2.5194	-3.2832	-1.6869	Mgr	timely feedback
Q28	-2.3178	-0.4337	-0.7348	-1.2996	-2.4620	Mgr	understand respnsb

Asymptotically Standardized Residual Matrix

	Q18	Q30	Q8	Q44	Q42		
Q55	3.5910	1.3795	-0.8185	1.2999	2.3016	HA	acts on vision
Q1	-0.7808	1.2032	1.0982	1.2215	-1.8371	HA	builds cust rel
Q3	1.1612	1.4201	0.3306	1.9110	1.7498	HA	builds hum res
Q9	-0.1583	1.1515	-0.7552	-1.2311	-1.6916	HA	builds suppl rel
Q63	1.4097	1.6606	-3.0638	0.1714	-0.3735	HA	collects cust data
Q23	-0.4293	0.9310	-1.1629	-0.3225	-1.8295	HA	comm diff decision
Q39	1.6241	1.6574	-2.7790	0.5963	-0.7608	HA	comm vision
Q35	-0.9842	-0.5888	-2.4482	3.3248	-2.4644	HA	details feedback
Q13	0.3627	0.1628	0.4325	3.2722	0.2362	HA	gives authority
Q17	0.4654	0.6754	-1.0240	1.6202	0.3696	HA	involved in proj
Q51	-0.3871	1.9191	0.2739	1.2429	-1.2609	HA	knows customers
Q29	1.0595	2.4650	1.3725	2.4751	0.6935	HA	provide training
Q7	-1.8354	2.3028	-2.2394	-1.0565	-0.7871	HA	provides info
Q43	0.3202	1.0384	-0.1499	2.1530	0.6243	HA	reports cust data
Q41	0.5700	0.2989	-0.9735	1.5532	-0.3878	HA	supports decision
Q59	-0.5380	0.6543	-1.0309	1.5418	-1.8436	HA	timely feedback
Q27	1.1972	1.5281	-2.3155	2.4192	-0.2990	HA	understand respnsb
Q56	1.5963	2.2268	-2.2536	0.3953	1.8275	Mgr	acts on vision
Q2	-0.9124	2.3281	1.6382	-0.0403	-1.4014	Mgr	builds cust rel
Q4	0.8306	2.2991	0.8929	0.4182	1.5714	Mgr	builds hum res
Q10	0.1483	1.1796	-0.0204	-0.9915	-1.6688	Mgr	builds suppl rel
Q64	1.4604	0.0635	-2.1420	1.1169	-0.9738	Mgr	collects cust data
Q24	-0.5405	-0.5421	-1.2939	0.7508	-0.7666	Mgr	comm diff decision
Q40	1.4808	0.9491	-2.2625	1.8564	-1.0382	Mgr	comm vision
Q36	-1.0916	0.7817	0.7856	2.8830	-0.7927	Mgr	details feedback
Q18	0.0056	-1.3803	-1.4756	-0.4785	1.9841	Mgr	involved in proj
Q30	-1.3803	2.1567	0.5326	0.4776	0.9493	Mgr	provide training
Q8	-1.4756	0.5326	-1.6817	-0.5669	0.5217	Mgr	provides info
Q44	-0.4785	0.4776	-0.5669	1.7743	-0.3923	Mgr	reports cust data
Q42	1.9841	0.9493	0.5217	-0.3923	0.1898	Mgr	supports decision
Q60	-1.5297	0.0376	2.4209	-0.5942	-0.4585	Mgr	timely feedback
Q28	1.5136	0.9120	0.2146	-1.1351	1.5381	Mgr	understand respnsb

	Q60	Q28		
Q55	0.2200	2.4775	HA	acts on vision
Q1	0.5334	1.1629	HA	builds cust rel
Q3	-0.1691	2.0318	HA	builds hum res
Q9	-0.4728	-0.7605	HA	builds suppl rel
Q63	-0.0123	0.8620	HA	collects cust data
Q23	-1.5552	-1.5207	HA	comm diff decision
Q39	-0.9986	-0.5234	HA	comm vision
Q35	-3.1037	-4.1749	HA	details feedback
Q13	-0.1996	0.1271	HA	gives authority
Q17	-1.7678	2.2843	HA	involved in proj
Q51	-0.9570	1.7759	HA	knows customers
Q29	1.0892	2.0281	HA	provide training
Q7	-0.3732	-0.5711	HA	provides info
Q43	-0.6566	0.5897	HA	reports cust data
Q41	0.6273	0.2757	HA	supports decision
Q59	-1.0216	-0.6634	HA	timely feedback
Q27	-1.7171	-0.3377	HA	understand respnsb
Q56	0.5903	2.5656	Mgr	acts on vision
Q2	-0.5672	-1.5955	Mgr	builds cust rel
Q4	-0.3312	1.2889	Mgr	builds hum res
Q10	1.3005	-2.3178	Mgr	builds suppl rel
Q64	1.5949	-0.4337	Mgr	collects cust data
Q24	2.5194	-0.7348	Mgr	comm diff decision
Q40	-3.2832	-1.2996	Mgr	comm vision
Q36	-1.6869	-2.4620	Mgr	details feedback
Q18	-1.5297	1.5136	Mgr	involved in proj
Q30	0.0376	0.9120	Mgr	provide training
Q8	2.4209	0.2146	Mgr	provides info
Q44	-0.5942	-1.1351	Mgr	reports cust data
Q42	-0.4585	1.5381	Mgr	supports decision
Q60	-0.3805	0.3830	Mgr	timely feedback
Q28	0.3830	-0.0582	Mgr	understand respnsb

```
              Average Standardized Residual = 1.142
       Average Off-diagonal Standardized Residual = 1.149

  Rank Order of 10 Largest Asymptotically Standardized Residuals

 Q28,Q35   Q39,Q55     Q51,Q1    Q36,Q63   Q18,Q55   Q44,Q35   Q60,Q40
 -4.1749    4.1060     3.8270    -3.8125    3.5910    3.3248   -3.2832

                      Q44,Q13    Q17,Q55     Q4,Q2
                       3.2722     3.1683    3.1673

        Distribution of Asymptotically Standardized Residuals
                 (Each * represents 2 residuals)

-4.25000 -   -4.00000   1    0.19% |
-4.00000 -   -3.75000   1    0.19% |
-3.75000 -   -3.50000   0    0.00% |
-3.50000 -   -3.25000   1    0.19% |
-3.25000 -   -3.00000   3    0.57% | *
-3.00000 -   -2.75000   2    0.38% | *
-2.75000 -   -2.50000   0    0.00% |
-2.50000 -   -2.25000   8    1.52% | ****
-2.25000 -   -2.00000  11    2.08% | *****
-2.00000 -   -1.75000  17    3.22% | ********
-1.75000 -   -1.50000  23    4.36% | ***********
-1.50000 -   -1.25000  24    4.55% | ************
-1.25000 -   -1.00000  25    4.73% | ************
-1.00000 -   -0.75000  28    5.30% | **************
-0.75000 -   -0.50000  27    5.11% | *************
-0.50000 -   -0.25000  41    7.77% | ********************
-0.25000 -          0  32    6.06% | ****************
       0 -    0.25000  27    5.11% | *************
 0.25000 -    0.50000  39    7.39% | *******************
 0.50000 -    0.75000  38    7.20% | *******************
 0.75000 -    1.00000  22    4.17% | ***********
 1.00000 -    1.25000  31    5.87% | ***************
 1.25000 -    1.50000  25    4.73% | ************
 1.50000 -    1.75000  33    6.25% | ****************
 1.75000 -    2.00000  20    3.79% | **********
 2.00000 -    2.25000  15    2.84% | *******
 2.25000 -    2.50000  17    3.22% | ********
 2.50000 -    2.75000   4    0.76% | **
 2.75000 -    3.00000   5    0.95% | **
 3.00000 -    3.25000   3    0.57% | *
 3.25000 -    3.50000   2    0.38% | *
 3.50000 -    3.75000   1    0.19% |
 3.75000 -    4.00000   1    0.19% |
 4.00000 -    4.25000   1    0.19% |

                  Manifest Variable Equations

         Q55     =      0.7414*F20      +  1.0000 E55
         Std Err        0.0566 LAMB2055
         t Value       13.1084

         Q1      =      0.6642*F21      +  1.0000 E1
         Std Err        0.0579 LAMB2101
         t Value       11.4713

         Q3      =      0.6788*F21      +  1.0000 E3
         Std Err        0.0555 LAMB2103
         t Value       12.2241

         Q9      =      0.7127*F21      +  1.0000 E9
         Std Err        0.0569 LAMB2109
         t Value       12.5239
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Q63      =     0.7110*F22     +  1.0000 E63
Std Err        0.0573 LAMB2263
t Value       12.4181

Q23      =     0.7572*F21     +  1.0000 E23
Std Err        0.0571 LAMB2123
t Value       13.2668

Q39      =     0.6742*F20     +  1.0000 E39
Std Err        0.0574 LAMB2039
t Value       11.7434

Q35      =     0.7864*F20     +  1.0000 E35
Std Err        0.0560 LAMB2035
t Value       14.0542

Q13      =     0.6496*F20     +  1.0000 E13
Std Err        0.0609 LAMB2013
t Value       10.6672

Q17      =     0.7430*F22     +  1.0000 E17
Std Err        0.0595 LAMB2217
t Value       12.4939

Q51      =     0.6411*F22     +  1.0000 E51
Std Err        0.0639 LAMB2251
t Value       10.0305

Q29      =     0.5822*F21     +  1.0000 E29
Std Err        0.0583 LAMB2129
t Value        9.9942

Q7       =     0.7757*F21     +  1.0000 E7
Std Err        0.0569 LAMB2107
t Value       13.6399

Q43      =     0.6550*F21     +  1.0000 E43
Std Err        0.0563 LAMB2143
t Value       11.6274

Q41      =     0.7214*F20     +  1.0000 E41
Std Err        0.0580 LAMB2041
t Value       12.4360

Q59      =     0.8078*F21     +  1.0000 E59
Std Err        0.0554 LAMB2159
t Value       14.5708

Q27      =     0.7448*F20     +  1.0000 E27
Std Err        0.0569 LAMB2027
t Value       13.0806

Q56      =     0.7120*F10     +  1.0000 E56
Std Err        0.0559 LAMB1056
t Value       12.7361

Q2       =     0.6990*F12     +  1.0000 E2
Std Err        0.0567 LAMB1202
t Value       12.3223

Q4       =     0.6967*F10     +  1.0000 E4
Std Err        0.0559 LAMB104
t Value       12.4568

Q10      =     0.7567*F12     +  1.0000 E10
Std Err        0.0564 LAMB1210
t Value       13.4285
```

```
Q64      =     0.7792*F11      +  1.0000 E64
Std Err        0.0561 LAMB1164
t Value       13.8970

Q24      =     0.8024*F11      +  1.0000 E24
Std Err        0.0561 LAMB1124
t Value       14.3127

Q40      =     0.7767*F10      +  1.0000 E40
Std Err        0.0552 LAMB1040
t Value       14.0761

Q36      =     0.8623*F10      +  1.0000 E36
Std Err        0.0544 LAMB1036
t Value       15.8629

Q18      =     0.8149*F12      +  1.0000 E18
Std Err        0.0543 LAMB1218
t Value       15.0049

Q30      =     0.5528*F12      +  1.0000 E30
Std Err        0.0585 LAMB1230
t Value        9.4474

Q8       =     0.8497*F11      +  1.0000 E8
Std Err        0.0546 LAMB1108
t Value       15.5731

Q44      =     0.6920*F11      +  1.0000 E44
Std Err        0.0554 LAMB1144
t Value       12.4950

Q42      =     0.7830*F12      +  1.0000 E42
Std Err        0.0549 LAMB1242
t Value       14.2630

Q60      =     0.7706*F12      +  1.0000 E60
Std Err        0.0561 LAMB1260
t Value       13.7311

Q28      =     0.7282*F12      +  1.0000 E28
Std Err        0.0566 LAMB1228
t Value       12.8671
```

Variances of Exogenous Variables

Variable	Parameter	Estimate	Standard Error	t Value
F10		1.000000	0	0.000
F12		1.000000	0	0.000
F11		1.000000	0	0.000
F20		1.000000	0	0.000
F21		1.000000	0	0.000
F22		1.000000	0	0.000
E56	THE56	0.453167	0.048142	9.413
E4	THE4	0.490987	0.051443	9.544
E40	THE40	0.384642	0.043462	8.850
E36	THE36	0.297521	0.038899	7.648
E18	THE18	0.335863	0.036942	9.092
E30	THE30	0.655795	0.063275	10.364
E64	THE64	0.434938	0.046933	9.267
E24	THE24	0.372327	0.041462	8.980
E8	THE8	0.298534	0.036266	8.232
E44	THE44	0.483289	0.049582	9.747
E60	THE60	0.410852	0.043047	9.544
E42	THE42	0.383773	0.040821	9.401
E28	THE28	0.470735	0.048001	9.807
E2	THE2	0.502145	0.050501	9.943
E10	THE10	0.439363	0.045451	9.667
E55	THE55	0.452872	0.048175	9.401
E3	THE3	0.506851	0.051073	9.924
E63	THE63	0.446498	0.055419	8.057
E23	THE23	0.436765	0.045664	9.565
E39	THE39	0.519409	0.053110	9.780
E35	THE35	0.404992	0.044755	9.049
E13	THE13	0.578229	0.058198	9.936
E17	THE17	0.436143	0.055256	7.893
E51	THE51	0.588902	0.063764	9.236
E7	THE7	0.419275	0.044350	9.454

Variances of Exogenous Variables

Variable	Parameter	Estimate	Standard Error	t Value
E43	THE43	0.537143	0.053544	10.032
E41	THE41	0.495667	0.051798	9.569
E59	THE59	0.362037	0.039692	9.121
E27	THE27	0.453605	0.048428	9.367
E1	THE1	0.553407	0.055149	10.035
E9	THE9	0.482210	0.049190	9.803
E29	THE29	0.627320	0.061111	10.265

Covariances among Exogenous Variables

Parameter			Estimate	Standard Error	t Value
F12	F10	GAM1012	0.827900	0.029241	28.313
F11	F10	GAM1011	0.820045	0.031839	25.756
F11	F12	GAM1112	0.890330	0.022525	39.527
F20	F10	GAM1020	0.633470	0.047456	13.349
F20	F12	GAM1220	0.622973	0.048092	12.954
F20	F11	GAM1120	0.641120	0.048617	13.187
F21	F10	GAM1021	0.550978	0.054256	10.155
F21	F12	GAM1221	0.688463	0.041068	16.764
F21	F11	GAM1121	0.606908	0.049306	12.309
F21	F20	GAM2021	0.872613	0.024656	35.392
F22	F10	GAM1022	0.512545	0.063390	8.086
F22	F12	GAM1222	0.563002	0.057993	9.708
F22	F11	GAM1122	0.438354	0.067218	6.521
F22	F20	GAM2022	0.729945	0.046022	15.861
F22	F21	GAM2122	0.775980	0.040113	19.345
E55	E56	THE5556	0.194350	0.036562	5.316
E3	E4	THE0304	0.241688	0.039361	6.140
E63	E64	THE6364	0.243033	0.038328	6.341
E23	E24	THE2324	0.106192	0.031365	3.386
E39	E40	THE3940	0.190335	0.036324	5.240
E35	E36	THE3536	0.183022	0.032018	5.716
E17	E18	THE1718	0.151248	0.032733	4.621
E7	E8	THE0708	0.106371	0.028919	3.678
E43	E44	THE4344	0.239143	0.039686	6.026
E41	E42	THE4142	0.172911	0.034242	5.050
E59	E60	THE5960	0.121583	0.030442	3.994
E27	E28	THE2728	0.186170	0.036018	5.169
E1	E2	THE0102	0.221941	0.040260	5.513
E9	E10	THE0910	0.175504	0.035555	4.936
E29	E30	THE2930	0.285042	0.047946	5.945

Equations with Standardized Coefficients

```
Q55    =    0.7405*F20      + 0.6721 E55
                   LAMB2055

Q1     =    0.6660*F21      + 0.7460 E1
                   LAMB2101

Q3     =    0.6901*F21      + 0.7237 E3
                   LAMB2103

Q9     =    0.7162*F21      + 0.6979 E9
                   LAMB2109

Q63    =    0.7287*F22      + 0.6848 E63
                   LAMB2263

Q23    =    0.7534*F21      + 0.6576 E23
                   LAMB2123

Q39    =    0.6831*F20      + 0.7303 E39
                   LAMB2039

Q35    =    0.7774*F20      + 0.6291 E35
                   LAMB2035

Q13    =    0.6495*F20      + 0.7604 E13
                   LAMB2013

Q17    =    0.7474*F22      + 0.6643 E17
                   LAMB2217
```

```
Q51    =    0.6412*F22      + 0.7674 E51
                LAMB2251

Q29    =    0.5923*F21      + 0.8057 E29
                LAMB2129

Q7     =    0.7677*F21      + 0.6408 E7
                LAMB2107

Q43    =    0.6663*F21      + 0.7456 E43
                LAMB2143

Q41    =    0.7157*F20      + 0.6984 E41
                LAMB2041

Q59    =    0.8020*F21      + 0.5974 E59
                LAMB2159

Q27    =    0.7417*F20      + 0.6707 E27
                LAMB2027

Q56    =    0.7267*F10      + 0.6870 E56
                LAMB1056

Q2     =    0.7023*F12      + 0.7119 E2
                LAMB1202

Q4     =    0.7051*F10      + 0.7091 E4
                LAMB104

Q10    =    0.7522*F12      + 0.6589 E10
                LAMB1210

Q64    =    0.7633*F11      + 0.6461 E64
                LAMB1164

Q24    =    0.7960*F11      + 0.6053 E24
                LAMB1124

Q40    =    0.7814*F10      + 0.6240 E40
                LAMB1040

Q36    =    0.8451*F10      + 0.5346 E36
                LAMB1036

Q18    =    0.8149*F12      + 0.5796 E18
                LAMB1218

Q30    =    0.5638*F12      + 0.8259 E30
                LAMB1230

Q8     =    0.8411*F11      + 0.5409 E8
                LAMB1108

Q44    =    0.7055*F11      + 0.7087 E44
                LAMB1144

Q42    =    0.7842*F12      + 0.6205 E42
                LAMB1242

Q60    =    0.7688*F12      + 0.6395 E60
                LAMB1260

Q28    =    0.7278*F12      + 0.6858 E28
                LAMB1228
```

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-squared
1	Q55	0.452872	1.002530	0.548271
2	Q1	0.553407	0.994537	0.443553
3	Q3	0.506851	0.967637	0.476197
4	Q9	0.482210	0.990123	0.512979
5	Q63	0.446498	0.951992	0.530986
6	Q23	0.436765	1.010085	0.567596
7	Q39	0.519409	0.973912	0.466678
8	Q35	0.404992	1.023455	0.604289
9	Q13	0.578229	1.000165	0.421866
10	Q17	0.436143	0.988237	0.558666
11	Q51	0.588902	0.999968	0.411079
12	Q29	0.627320	0.966253	0.350770
13	Q7	0.419275	1.020954	0.589330
14	Q43	0.537143	0.966110	0.444014
15	Q41	0.495667	1.016109	0.512191
16	Q59	0.362037	1.014579	0.643165
17	Q27	0.453605	1.008282	0.550121
18	Q56	0.453167	0.960148	0.528024
19	Q2	0.502145	0.990796	0.493190
20	Q4	0.490987	0.976434	0.497163
21	Q10	0.439363	1.011977	0.565837
22	Q64	0.434938	1.042062	0.582618
23	Q24	0.372327	1.016229	0.633620
24	Q40	0.384642	0.987836	0.610622
25	Q36	0.297521	1.041041	0.714208
26	Q18	0.335863	0.999922	0.664111
27	Q30	0.655795	0.961430	0.317897
28	Q8	0.298534	1.020506	0.707465
29	Q44	0.483289	0.962141	0.497695
30	Q42	0.383773	0.996837	0.615009
31	Q60	0.410852	1.004733	0.591084
32	Q28	0.470735	1.001002	0.529736

Correlations among Exogenous Variables

Parameter			Estimate
F12	F10	GAM1012	0.827900
F11	F10	GAM1011	0.820045
F11	F12	GAM1112	0.890330
F20	F10	GAM1020	0.633470
F20	F12	GAM1220	0.622973
F20	F11	GAM1120	0.641120
F21	F10	GAM1021	0.550978
F21	F12	GAM1221	0.688463
F21	F11	GAM1121	0.606908
F21	F20	GAM2021	0.872613
F22	F10	GAM1022	0.512545
F22	F12	GAM1222	0.563002
F22	F11	GAM1122	0.438354

Correlations among Exogenous Variables

Parameter			Estimate
F22	F20	GAM2022	0.729945
F22	F21	GAM2122	0.775980
E55	E56	THE5556	0.429010
E3	E4	THE0304	0.484484
E63	E64	THE6364	0.551494
E23	E24	THE2324	0.263333
E39	E40	THE3940	0.425829
E35	E36	THE3536	0.527256
E17	E18	THE1718	0.395179
E7	E8	THE0708	0.300660
E43	E44	THE4344	0.469363
E41	E42	THE4142	0.396452
E59	E60	THE5960	0.315250
E27	E28	THE2728	0.402886
E1	E2	THE0102	0.421018
E9	E10	THE0910	0.381292
E29	E30	THE2930	0.444407

Unlike hypothesis five, no attempt is made to rearrange the items or test competing models different from those accepted under hypotheses three and four, mostly because the items did not break into three comparable dimensions. The items and the corresponding dimensions appear in the following two tables:

Table 37. Managerial Items Tested under Hypothesis Six

Factor	Item
Mgr guidance	4. Given what's available, my manager has built a strong base of human resources in our work group.
Mgr guidance	36. My manager provides detailed feedback to me.
Mgr guidance	40. My manager communicates how our work group can support hospital administration's vision.
Mgr guidance	56. My manager allows our work group to support hospital administration's vision.
Independent action	8. My manager provides the information I need to do a good job.
Independent action	24. My manager communicates difficult decisions well.
Independent action	44. My manager reports data-based information on how well our work group serves its customers.
Independent action	64. My manager collects important data on how well our work group serves its customers.
Dependent action	2. My manager builds strong relationships with our work group's customers.
Dependent action	10. My manager builds strong relationships with our work group's suppliers.
Dependent action	18. My manager is appropriately involved in important work group projects.
Dependent action	28. My manager understands my responsibilities.
Dependent action	30. My manager provides job-related training when necessary.
Dependent action	42. My manager appropriately supports decisions I make.
Dependent action	60. My manager provides timely feedback to me.

Table 38. Hospital Administration (HA) Items Tested under Hypothesis Six

Factor	Item
HA Active guidance	55. Hospital administration supports its vision of the future with appropriate action.
HA Active guidance	13. When hospital administration gives our work group a responsibility, we also have the authority to carry it out.
HA Active guidance	27. Hospital administration understands our work group's responsibilities.
HA Active guidance	35. Hospital administration provides detailed feedback to our work group.
HA Active guidance	39. Hospital administration communicates its vision of the future to our hospital.
HA Active guidance	41. Hospital administration appropriately supports decisions made by our work group.
Customer project input	17. Hospital administration is appropriately involved in important hospital projects.
Customer project input	51. Hospital administration knows who the customers of our hospital are.
Customer project input	63. Hospital administration collects important data on how well our hospital serves its customers.
Customer project output	1. Hospital administration builds strong relationships with our hospital's customers.
Customer project output	3. Given what's available, hospital administration has built a strong base of human resources in our hospital.
Customer project output	7. Hospital administration provides the information our work group needs to do a good job.
Customer project output	9. Hospital administration builds strong relationships with our hospital's suppliers.
Customer project output	23. Hospital administration communicates difficult decisions well.
Customer project output	29. Hospital administration provides job-related training when necessary.
Customer project output	43. Hospital administration reports data-based information on how well our hospital serves its customers.
Customer project output	59. Hospital administration provides timely feedback to our work group.

In addition to including these items, it is assumed that there is a correlated error term between items of a specific pair (independent of the primary dimensional relationship). For example, items Q59 and Q60 are assumed to have a correlated error which might represent an external source mediating timely feedback. The structural equation model is shown below (the variance of the latent variables is assumed to be one, and neither the correlated and independent measurement errors for the manifest variables are not displayed):

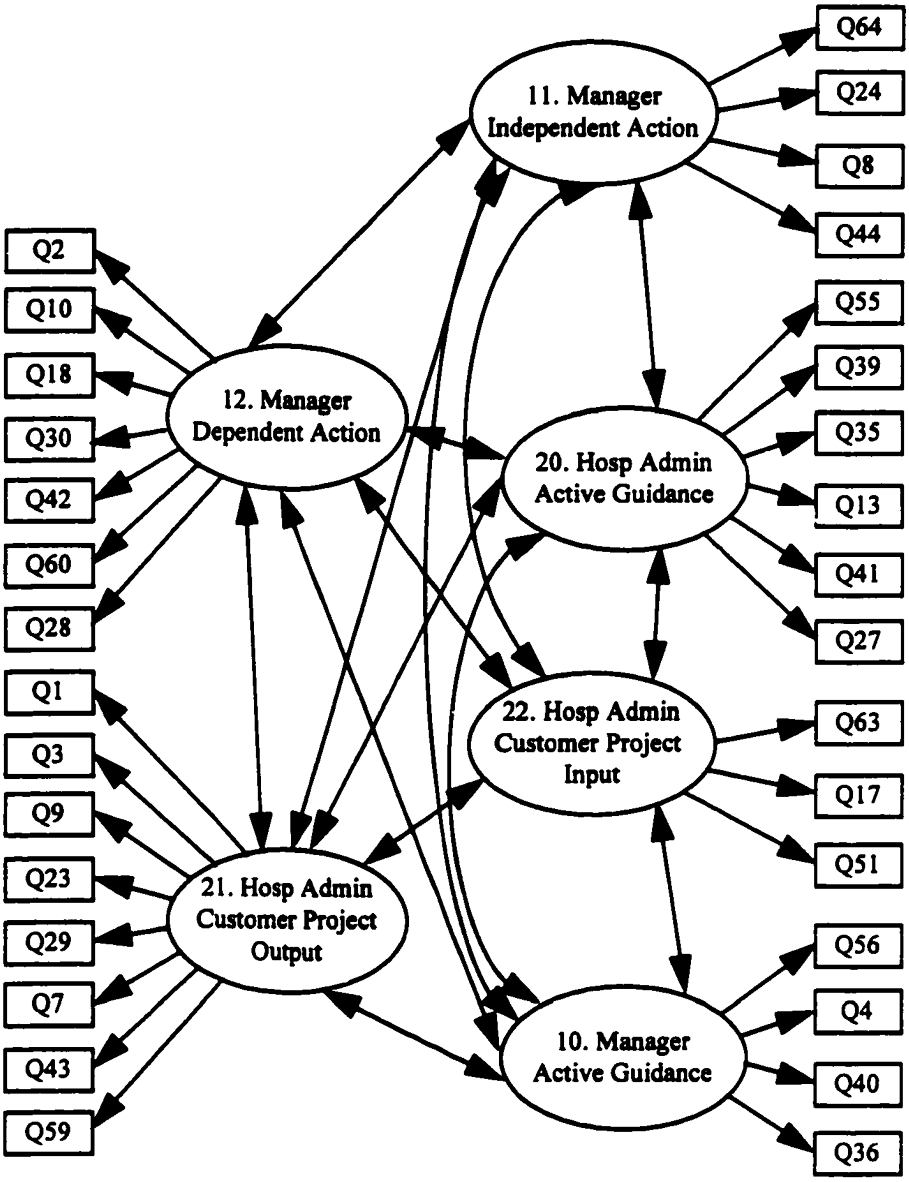

Figure 29. Structural Equation Model Tested under Hypothesis Six

In addition to testing the above model, the phase two data are compared to phase one data as a source of validation; as mentioned in the main text, phase one data are not used to construct structural models, and validation based on phase one are not necessary to establish the above model. Additionally, phase two data are shown to have more missing variables, and thus the phase one results should only be interpreted with caution. The table below provides a comparison with phase one data, resulting in two structural equation models presented:

Table 39. Comparison of Fit Indices under Hypothesis Six

	Phase Two	Phase One
χ^2	710.1840	1465.0118
df	434	434
Null χ^2	5287.8893	10695.7934
Null df	496	496
GFI	0.8378	0.8122
AGFI	0.8026	0.7716
RMR	0.0537	0.0707
PGFI	0.7330	0.7107
CFI	0.9424	0.8989
NFI	0.8657	0.8630
PNFI	0.7575	0.7552

The goodness of fit indices indicate strong fit with the data, thus supporting the hypothesis that the multiple managerial and hospital administration dimensions are as proposed.

APPENDIX F

REGRESSION WEIGHTS FOR FACTOR SCORES

This appendix contains the SAS computer code printout of regression weights for each of four combinations of factor scores. The reader is referred to the *SAS/STAT User's Guide: Version 6* (SAS, 1990) for details on the FACTOR procedure, which was used to perform common factor analysis.

Intra-Group Dimensions

For the following output, factor 1 refers to intra-group interaction and factor 2 refers to intra-group action.

```
Squared Multiple Correlations of the Variables with each Factor

                       FACTOR1   FACTOR2
                      0.882121  0.855207

              Standardized Scoring Coefficients

               FACTOR1    FACTOR2

     Q50       0.18210    0.06051    Grp  adapts
     Q48       0.12405    0.00596    Grp  cooperates
     Q62       0.12168   -0.01585    Grp  learns from out
     Q58       0.13588    0.06976    Grp  learns from past
     Q46       0.23507   -0.00444    Grp  strong comm
     Q38       0.21541    0.02618    Grp  teamwork
     Q20       0.14146    0.09694    Grp  trust each other
     Q26       0.01205    0.30171    Grp  improve goals
     Q32      -0.02961    0.38580    Grp  makes changes
     Q6        0.06428    0.06097    Grp  studies problems
     Q22       0.02248    0.16447    Grp  study cust needs
```

Intergroup Dimensions

For the following output, factor 1 refers to intergroup interaction and factor 2 refers to intergroup action.

Squared Multiple Correlations of the Variables with each Factor

FACTOR1	FACTOR2
0.854338	0.838582

Standardized Scoring Coefficients

	FACTOR1	FACTOR2	
Q49	0.03925	0.26640	Hosp adapts
Q61	0.07919	0.12472	Hosp learns from out
Q57	0.09578	0.26698	Hosp learns from past
Q45	-0.03487	0.30476	Hosp strong comm
Q25	0.25621	0.05180	Hosp improve goals
Q53	0.21624	0.04661	Hosp learns from in
Q31	0.27983	-0.02466	Hosp makes changes
Q21	0.15017	0.01823	Hosp study cust needs
Q37	0.10044	0.10035	Hosp teamwork

Managerial Dimensions

For the following computer output, factor 1 is dependent action, factor 2 is independent action, and factor 3 is active guidance.

Squared Multiple Correlations of the Variables with each Factor

FACTOR1	FACTOR2	FACTOR3
0.867931	0.855284	0.848671

Standardized Scoring Coefficients

	FACTOR1	FACTOR2	FACTOR3	
Q56	0.08669	-0.11594	0.31178	Mgr acts on vision
Q4	0.05146	-0.02270	0.15632	Mgr builds hum res
Q40	-0.05275	0.04734	0.30266	Mgr comm vision
Q36	-0.12954	0.23257	0.29902	Mgr details feedback
Q64	0.03870	0.15181	-0.00963	Mgr collects cust data
Q24	0.03247	0.22695	-0.03868	Mgr comm diff decision
Q8	0.07708	0.25956	-0.05276	Mgr provides info
Q44	-0.05572	0.18954	0.04656	Mgr reports cust data
Q2	0.08518	0.05808	0.00358	Mgr builds cust rel
Q10	0.12707	0.05733	-0.02255	Mgr builds suppl rel
Q18	0.20631	-0.00417	0.06085	Mgr involved in proj
Q30	0.06515	-0.00254	0.03889	Mgr provide training
Q42	0.20483	-0.01852	0.03939	Mgr supports decision
Q60	0.19139	0.09999	-0.08066	Mgr timely feedback
Q28	0.21962	-0.06237	0.02629	Mgr understand respnsb

Hospital Administration Dimensions

For the following printout, factor 1 is customer project output, factor 2 is active guidance and factor 3 is customer project input.

Squared Multiple Correlations of the Variables with each Factor

FACTOR1	FACTOR2	FACTOR3
0.883015	0.864661	0.831667

Standardized Scoring Coefficients

	FACTOR1	FACTOR2	FACTOR3		
Q55	-0.00851	0.16219	0.11262	HA	acts on vision
Q39	-0.01021	0.13235	0.08057	HA	comm vision
Q35	0.01128	0.27221	-0.04659	HA	details feedback
Q13	0.01330	0.16068	-0.03967	HA	gives authority
Q41	0.04336	0.14326	-0.00985	HA	supports decision
Q27	-0.00658	0.18340	0.05158	HA	understand respnsb
Q1	0.09469	0.00258	0.07001	HA	builds cust rel
Q3	0.07616	0.02391	0.10154	HA	builds hum res
Q9	0.18109	-0.00626	0.00451	HA	builds suppl rel
Q23	0.20194	0.05047	-0.04945	HA	comm diff decision
Q29	0.06513	0.03841	0.01824	HA	provide training
Q7	0.20338	0.02592	-0.01745	HA	provides info
Q43	0.06384	0.06380	0.05006	HA	reports cust data
Q59	0.27610	-0.03511	0.04911	HA	timely feedback
Q63	0.02564	-0.07300	0.37901	HA	collects cust data
Q17	-0.03842	0.06709	0.25136	HA	involved in proj
Q51	0.00617	0.00050	0.16585	HA	knows customers

APPENDIX G

ANALYSIS OF VARIANCE COMPARISONS OF HOSPITALS BASED ON FACTOR SCALES

This section summarizes the computer printout for comparing the hospitals (and groups nested within hospitals) with the 10 derived dimensions. Since two factor scoring methods are compared (regression and unit weights), there are a total of twenty analysis of variance tests reported in this appendix.

Intra-group Dimensions

For the following output, regression factor 1 refers to intra-group interaction and regression factor 2 refers to intra-group action. Unit weight dimension wg1 refers to intra-group interaction and unit weight dimension wg2 refers to intra-group action.

General Linear Models Procedure

Dependent Variable: FACTOR1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	28.477889	1.498836	2.09	0.0054
Error	284	203.473629	0.716456		
Corrected Total	303	231.951518			

R-Square	C.V.	Root MSE	FACTOR1 Mean
0.122775	2445.048	0.8464	0.0346

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	11.341335	3.780445	5.28	0.0015
GROUP(HOSPXFM)	16	17.136554	1.071035	1.49	0.1004

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	7.208142	2.402714	3.35	0.0194
GROUP(HOSPXFM)	16	17.136554	1.071035	1.49	0.1004

General Linear Models Procedure

Dependent Variable: FACTOR2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	26.011493	1.369026	1.88	0.0156
Error	284	207.001339	0.728878		
Corrected Total	303	233.012831			

R-Square	C.V.	Root MSE	FACTOR2 Mean
0.111631	3232.640	0.8537	0.0264

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	10.340376	3.446792	4.73	0.0031
GROUP(HOSPXFM)	16	15.671117	0.979445	1.34	0.1698

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	5.440817	1.813606	2.49	0.0607
GROUP(HOSPXFM)	16	15.671117	0.979445	1.34	0.1698

General Linear Models Procedure

Dependent Variable: WG1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	28.489731	1.499460	2.56	0.0004
Error	321	188.304398	0.586618		
Corrected Total	340	216.794129			

R-Square	C.V.	Root MSE	WG1 Mean
0.131414	19.86064	0.7659	3.8564

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	9.965490	3.321830	5.66	0.0009
GROUP(HOSPXFM)	16	18.524240	1.157765	1.97	0.0144

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	5.944474	1.981491	3.38	0.0186
GROUP(HOSPXFM)	16	18.524240	1.157765	1.97	0.0144

General Linear Models Procedure

Dependent Variable: WG2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	24.436771	1.286146	1.56	0.0635
Error	343	282.412746	0.823361		
Corrected Total	362	306.849518			

R-Square	C.V.	Root MSE	WG2 Mean
0.079638	24.93440	0.9074	3.6391

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	8.752786	2.917595	3.54	0.0149
GROUP(HOSPXFM)	16	15.683985	0.980249	1.19	0.2732

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	4.439147	1.479716	1.80	0.1474
GROUP(HOSPXFM)	16	15.683985	0.980249	1.19	0.2732

Intergroup Dimensions

For the following output, regression factor 1 refers to intergroup interaction and regression factor 2 refers to intergroup action. Unit weight dimension hg1 refers to intergroup interaction and unit weight dimension hg2 refers to intergroup action.

General Linear Models Procedure

Dependent Variable: FACTOR1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	33.651241	1.771118	2.65	0.0004
Error	213	142.528793	0.669149		
Corrected Total	232	176.180034			

	R-Square	C.V.	Root MSE	FACTOR1 Mean
	0.191005	-9999.99	0.8180	-0.0040

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	17.325385	5.775128	8.63	0.0001
GROUP(HOSPXFM)	16	16.325857	1.020366	1.52	0.0929

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	8.992338	2.997446	4.48	0.0045
GROUP(HOSPXFM)	16	16.325857	1.020366	1.52	0.0929

Dependent Variable: FACTOR2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	48.917550	2.574608	3.96	0.0001
Error	213	138.346156	0.649512		
Corrected Total	232	187.263705			

	R-Square	C.V.	Root MSE	FACTOR2 Mean
	0.261223	-4230.402	0.8059	-0.0191

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	32.832433	10.944144	16.85	0.0001
GROUP(HOSPXFM)	16	16.085117	1.005320	1.55	0.0855

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	18.917612	6.305871	9.71	0.0001
GROUP(HOSPXFM)	16	16.085117	1.005320	1.55	0.0855

General Linear Models Procedure

Dependent Variable: HG1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	58.226583	3.064557	4.06	0.0001
Error	268	202.390604	0.755189		
Corrected Total	287	260.617188			

R-Square	C.V.	Root MSE	HG1 Mean
0.223418	24.00735	0.8690	3.6198

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	37.060771	12.353590	16.36	0.0001
GROUP(HOSPXFM)	16	21.165813	1.322863	1.75	0.0378

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	17.352694	5.784231	7.66	0.0001
GROUP(HOSPXFM)	16	21.165813	1.322863	1.75	0.0378

Dependent Variable: HG2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	29.810051	1.568950	2.22	0.0030
Error	259	183.369237	0.707989		
Corrected Total	278	213.179288			

R-Square	C.V.	Root MSE	HG2 Mean
0.139836	24.90149	0.8414	3.3790

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	13.598523	4.532841	6.40	0.0003
GROUP(HOSPXFM)	16	16.211528	1.013221	1.43	0.1270

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	7.070892	2.356964	3.33	0.0202
GROUP(HOSPXFM)	16	16.211528	1.013221	1.43	0.1270

Managerial Dimensions

For the following computer output, regression factor 1 is dependent action, regression factor 2 is independent action, and regression factor 3 is active guidance. Unit weight dimension mgr1 refers to active guidance, unit weight dimension mgr2 refers to independent action and unit weight dimension mgr3 refers to dependent action.

General Linear Models Procedure

Dependent Variable: FACTOR1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	27.084892	1.425521	1.90	0.0155
Error	221	166.161309	0.751861		
Corrected Total	240	193.246201			

R-Square	C.V.	Root MSE	FACTOR1 Mean
0.140157	2410.212	0.8671	0.0360

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	5.659701	1.886567	2.51	0.0597
GROUP(HOSPXFM)	16	21.425191	1.339074	1.78	0.0349

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	2.124874	0.708291	0.94	0.4211
GROUP(HOSPXFM)	16	21.425191	1.339074	1.78	0.0349

Dependent Variable: FACTOR2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	36.182890	1.904363	2.52	0.0007
Error	221	167.155488	0.756360		
Corrected Total	240	203.338378			

R-Square	C.V.	Root MSE	FACTOR2 Mean
0.177944	3716.627	0.8697	0.0234

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	20.379731	6.793244	8.98	0.0001
GROUP(HOSPXFM)	16	15.803159	0.987697	1.31	0.1949

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	11.768866	3.922955	5.19	0.0018
GROUP(HOSPXFM)	16	15.803159	0.987697	1.31	0.1949

Dependent Variable: FACTOR3

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	26.114920	1.374469	1.61	0.0543
Error	221	188.174557	0.851469		
Corrected Total	240	214.289477			

R-Square	C.V.	Root MSE	FACTOR3 Mean
0.121867	9999.99	0.9228	0.0037

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	12.372625	4.124208	4.84	0.0028
GROUP(HOSPXFM)	16	13.742296	0.858893	1.01	0.4485

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	6.606222	2.202074	2.59	0.0540
GROUP(HOSPXFM)	16	13.742296	0.858893	1.01	0.4485

Dependent Variable: MGR1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	24.828399	1.306758	1.49	0.0867
Error	342	300.306270	0.878089		
Corrected Total	361	325.134669			

R-Square	C.V.	Root MSE	MGR1 Mean
0.076363	25.20186	0.9371	3.7182

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	10.735382	3.578461	4.08	0.0073
GROUP(HOSPXFM)	16	14.093016	0.880814	1.00	0.4528

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	4.765028	1.588343	1.81	0.1453
GROUP(HOSPXFM)	16	14.093016	0.880814	1.00	0.4528

Dependent Variable: MGR2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	62.715986	3.300841	3.54	0.0001
Error	346	322.435653	0.931895		
Corrected Total	365	385.151639			

R-Square	C.V.	Root MSE	MGR2 Mean
0.162835	25.63054	0.9653	3.7664

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	30.378244	10.126081	10.87	0.0001
GROUP(HOSPXFM)	16	32.337742	2.021109	2.17	0.0059

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	18.881628	6.293876	6.75	0.0002
GROUP(HOSPXFM)	16	32.337742	2.021109	2.17	0.0059

Dependent Variable: MGR3

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	31.558466	1.660972	2.14	0.0044
Error	256	198.342236	0.774774		
Corrected Total	275	229.900702			

R-Square	C.V.	Root MSE	MGR3 Mean
0.137270	23.43837	0.8802	3.7554

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	7.118048	2.372683	3.06	0.0287
GROUP(HOSPXFM)	16	24.440418	1.527526	1.97	0.0154

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	2.356348	0.785449	1.01	0.3871
GROUP(HOSPXFM)	16	24.440418	1.527526	1.97	0.0154

Hospital Administration Dimensions

For the following table, regression factor 1 is customer project output, regression factor 2 is active guidance and regression factor 3 is customer project input. Unit weight dimension hadm1 refers to active guidance, unit weight dimension hadm2 refers to customer project output and unit weight dimension hadm3 refers to customer project input.

General Linear Models Procedure

Dependent Variable: FACTOR1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	36.599226	1.926275	2.66	0.0006
Error	133	96.273349	0.723860		
Corrected Total	152	132.872575			

R-Square	C.V.	Root MSE	FACTOR1 Mean
0.275446	1926.971	0.8508	0.0442

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	15.296600	5.098867	7.04	0.0002
GROUP(HOSPXFM)	16	21.302626	1.331414	1.84	0.0321

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	10.644366	3.548122	4.90	0.0029
GROUP(HOSPXFM)	16	21.302626	1.331414	1.84	0.0321

Dependent Variable: FACTOR2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	44.896237	2.362960	3.33	0.0001
Error	133	94.350506	0.709402		
Corrected Total	152	139.246743			

R-Square	C.V.	Root MSE	FACTOR2 Mean
0.322422	-2075.833	0.8423	-0.0406

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	25.872085	8.624028	12.16	0.0001
GROUP(HOSPXFM)	16	19.024152	1.189009	1.68	0.0587

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	15.322539	5.107513	7.20	0.0002
GROUP(HOSPXFM)	16	19.024152	1.189009	1.68	0.0587

General Linear Models Procedure

Dependent Variable: FACTOR3

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	28.114180	1.479694	1.84	0.0241
Error	133	106.839143	0.803302		
Corrected Total	152	134.953324			

R-Square	C.V.	Root MSE	FACTOR3 Mean
0.208325	-1779.067	0.8963	-0.0504

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	18.911931	6.303977	7.85	0.0001
GROUP(HOSPXFM)	16	9.202249	0.575141	0.72	0.7739

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	14.152938	4.717646	5.87	0.0009
GROUP(HOSPXFM)	16	9.202249	0.575141	0.72	0.7739

General Linear Models Procedure

Dependent Variable: HADM1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	39.827553	2.096187	2.67	0.0003
Error	268	210.744313	0.786359		
Corrected Total	287	250.571867			

R-Square	C.V.	Root MSE	HADM1 Mean
0.158947	24.69257	0.8868	3.5912

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	17.399134	5.799711	7.38	0.0001
GROUP(HOSPXFM)	16	22.428420	1.401776	1.78	0.0334

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	6.867392	2.289131	2.91	0.0350
GROUP(HOSPXFM)	16	22.428420	1.401776	1.78	0.0334

General Linear Models Procedure

Dependent Variable: HADM2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	33.576143	1.767165	2.53	0.0009
Error	163	113.973037	0.699221		
Corrected Total	182	147.549180			

R-Square	C.V.	Root MSE	HADM2 Mean
0.227559	25.18907	0.8362	3.3197

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	13.300676	4.433559	6.34	0.0004
GROUP(HOSPXFM)	16	20.275467	1.267217	1.81	0.0333

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	9.637359	3.212453	4.59	0.0041
GROUP(HOSPXFM)	16	20.275467	1.267217	1.81	0.0333

Dependent Variable: HADM3

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	32.452951	1.708050	2.37	0.0013
Error	260	187.175241	0.719905		
Corrected Total	279	219.628193			

R-Square	C.V.	Root MSE	HADM3 Mean
0.147763	21.57245	0.8485	3.9331

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HOSPXFM	3	19.462561	6.487520	9.01	0.0001
GROUP(HOSPXFM)	16	12.990391	0.811899	1.13	0.3292

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPXFM	3	13.222391	4.407464	6.12	0.0005
GROUP(HOSPXFM)	16	12.990391	0.811899	1.13	0.3292

APPENDIX H

INVESTIGATIONS OF DIMENSIONS BY HOSPITAL AND GROUP

The following table reports overall statistics on the ten dimensions (using the unit weight method), overall and by demographic group.

WG1 = Intra-Group Interaction; WG2 = Intra-Group Action

Variable	N	Mean	Std Dev	Minimum	Maximum
All Groups					
WG1	342	3.8585119	0.7982820	1.2856445	5.0000000
WG2	365	3.6424658	0.9194432	1.0000000	5.0000000
Group = Physicians					
WG1	37	3.7062988	0.9384602	1.2856445	5.0000000
WG2	46	3.6250000	0.9657323	1.2500000	5.0000000
Group = Business Departments					
WG1	69	3.9830941	0.8448759	1.8569336	5.0000000
WG2	71	3.6936620	0.9830684	1.0000000	5.0000000
Group = Nursing					
WG1	104	4.0147846	0.7407640	1.8569336	5.0000000
WG2	106	3.7500000	0.8843884	1.0000000	5.0000000
Group = Ancillary					
WG1	96	3.6768239	0.7053696	1.5712891	5.0000000
WG2	98	3.5663265	0.8430668	1.5000000	5.0000000
Group = Support					
WG1	35	3.7874442	0.8566476	1.8569336	5.0000000
WG2	42	3.4523810	1.0199804	1.5000000	5.0000000

HG1 = Inter-Group Interaction; HG2 = Inter-Group Action

Variable	N	Mean	Std Dev	Minimum	Maximum
All Groups					
HG1	288	3.6197917	0.9529291	1.2500000	5.0000000
HG2	279	3.3789981	0.8756894	1.1999512	5.0000000
Group = Physicians					
HG1	31	3.4677419	0.9868762	1.2500000	4.7500000
HG2	36	3.5720283	0.8365313	1.1999512	5.0000000
Group = Business Departments					
HG1	56	3.8705357	0.9558327	1.2500000	5.0000000
HG2	59	3.4946993	0.9323976	1.1999512	5.0000000
Group = Nursing					
HG1	89	3.8005618	0.8562768	1.5000000	5.0000000
HG2	87	3.2687315	0.8272932	1.1999512	5.0000000
Group = Ancillary					
HG1	80	3.2812500	0.9607610	1.5000000	5.0000000
HG2	69	3.2896428	0.8584703	1.3999023	5.0000000
Group = Support					
HG1	32	3.6718750	0.9385075	1.7500000	5.0000000
HG2	28	3.4498291	0.9701008	1.5998535	5.0000000

MGR1 = Manager Active Guidance
MGR2 = Manager Dependent Action
MGR3 = Manager Independent Action

Variable	N	Mean	Std Dev	Minimum	Maximum
All Groups					
MGR1	364	3.7204670	0.9469322	1.0000000	5.0000000
MGR2	367	3.7697548	1.0278489	1.0000000	5.0000000
MGR3	276	3.7554339	0.9143318	1.2856445	5.0000000
Group = Physicians					
MGR1	44	3.5568182	1.0199516	1.0000000	5.0000000
MGR2	37	3.6418919	0.9382692	1.7500000	5.0000000
MGR3	28	3.6884940	0.8890787	2.0000000	5.0000000
Group = Business Departments					
MGR1	72	3.7708333	0.9918240	1.2500000	5.0000000
MGR2	74	3.8175676	1.1750090	1.0000000	5.0000000
MGR3	56	3.8568813	0.9522177	1.2856445	5.0000000
Group = Nursing					
MGR1	112	3.8191964	0.8131865	1.2500000	5.0000000
MGR2	116	3.8965517	1.0331826	1.0000000	5.0000000
MGR3	79	3.8315986	0.9188874	1.2856445	5.0000000
Group = Ancillary					
MGR1	96	3.6562500	0.9488567	1.0000000	5.0000000
MGR2	96	3.6093750	0.9232469	1.5000000	5.0000000
MGR3	81	3.6240626	0.8628394	1.2856445	5.0000000
Group = Support					
MGR1	38	3.6644737	1.1467880	1.2500000	5.0000000
MGR2	43	3.7848837	1.0214681	1.5000000	5.0000000
MGR3	32	3.7809753	0.9950019	1.5712891	5.0000000

HADM1 = Hospital Administration Active Guidance
HADM2 = Hospital Administration Customer Project Output
HADM3 = Hospital Administration Customer Project Input

Variable	N	Mean	Std Dev	Minimum	Maximum
All Groups					
HADM1	288	3.5912391	0.9343836	1.0000000	5.0000000
HADM2	183	3.3196721	0.9003942	1.1250000	5.0000000
HADM3	280	3.9331273	0.8872417	1.0000000	5.0000000
Group = Physicians					
HADM1	32	3.5935822	0.8869083	2.0000000	5.0000000
HADM2	16	3.5234375	0.8805996	2.0000000	5.0000000
HADM3	32	3.7810974	1.0146053	1.0000000	5.0000000
Group = Business Departments					
HADM1	63	3.7299378	0.8718857	1.5000000	5.0000000
HADM2	38	3.4407895	0.9017330	1.1250000	4.8750000
HADM3	61	4.1800797	0.7342610	2.0000000	5.0000000
Group = Nursing					
HADM1	86	3.6839003	0.9110433	1.0000000	5.0000000
HADM2	55	3.3409091	0.9770084	1.1250000	5.0000000
HADM3	85	3.8625689	0.7923081	1.6665039	5.0000000
Group = Ancillary					
HADM1	77	3.3114981	0.9805101	1.0000000	5.0000000
HADM2	50	3.0950000	0.8031983	1.1250000	4.5000000
HADM3	74	3.8826640	0.9122941	1.3332520	5.0000000
Group = Support					
HADM1	30	3.7498454	0.9596762	1.8332520	5.0000000
HADM2	24	3.4114583	0.9017489	2.0000000	5.0000000
HADM3	28	3.9164342	1.1674742	1.0000000	5.0000000

The following data reports output from Fisher's LSD test for comparing groups nested within hospitals on each of the ten dimensions. These printouts are classified by hospital (coded one through four to preserve anonymity) and group (coded 1 = physicians, 2 = business departments, 3 = nursing, 4 = ancillary, and 5 = support).

```
                    General Linear Models Procedure

                    T tests (LSD) for variable: WG1 (Intra-Group Interaction)

      NOTE: This test controls the type I comparisonwise error rate not
            the experimentwise error rate.

         Alpha= 0.05  Confidence= 0.95  df= 321  MSE= 0.586618
                      Critical Value of T= 1.96738

   Comparisons significant at the 0.05 level are indicated by '***'.
```

HOSPXFM Comparison	Lower Confidence Limit	Difference Between Means	Upper Confidence Limit	
H2 - H1	-0.1663	0.0733	0.3129	
H2 - H4	0.0931	0.3116	0.5301	***
H2 - H3	0.1946	0.4342	0.6738	***
H1 - H2	-0.3129	-0.0733	0.1663	
H1 - H4	0.0109	0.2383	0.4657	***
H1 - H3	0.1132	0.3609	0.6086	***
H4 - H2	-0.5301	-0.3116	-0.0931	***
H4 - H1	-0.4657	-0.2383	-0.0109	***
H4 - H3	-0.1047	0.1226	0.3500	
H3 - H2	-0.6738	-0.4342	-0.1946	***
H3 - H1	-0.6086	-0.3609	-0.1132	***
H3 - H4	-0.3500	-0.1226	0.1047	

Level of GROUP	Level of HOSPXFM	N	WG1 Mean	WG1 SD
1	H1	7	3.93847656	1.22288376
2	H1	18	4.33295356	0.62165383
3	H1	22	3.90227717	0.76776536
4	H1	19	3.73655942	0.79716231
5	H1	8	4.12451172	0.77275639
1	H2	8	4.28527832	0.56095928
2	H2	18	4.09488932	0.83721869
3	H2	29	4.29530913	0.74030036
4	H2	22	3.94773171	0.61951511
5	H2	8	3.26763916	0.76904252
1	H3	12	3.60697428	0.73373638
2	H3	8	3.89251709	1.02925169
3	H3	13	3.69193209	0.83464850
4	H3	30	3.48072917	0.80150215
5	H3	11	3.80495384	0.94173442
1	H4	10	3.19978027	0.99246829
2	H4	25	3.67968750	0.86224283
3	H4	40	3.97821045	0.64978354
4	H4	25	3.62833984	0.51007211
5	H4	8	3.94610596	0.80060599

General Linear Models Procedure

T tests (LSD) for variable: WG2 (Intra-Group Action)

NOTE: This test controls the type I comparisonwise error rate not the experimentwise error rate.

Alpha= 0.05 Confidence= 0.95 df= 343 MSE= 0.823361
Critical Value of T= 1.96690

Comparisons significant at the 0.05 level are indicated by '***'.

HOSPXFM Comparison	Lower Confidence Limit	Difference Between Means	Upper Confidence Limit	
H2 - H1	-0.1903	0.0907	0.3716	
H2 - H4	-0.0801	0.1708	0.4217	
H2 - H3	0.1634	0.4425	0.7215	***
H1 - H2	-0.3716	-0.0907	0.1903	
H1 - H4	-0.1803	0.0802	0.3406	
H1 - H3	0.0641	0.3518	0.6395	***
H4 - H2	-0.4217	-0.1708	0.0801	
H4 - H1	-0.3406	-0.0802	0.1803	
H4 - H3	0.0133	0.2717	0.5300	***
H3 - H2	-0.7215	-0.4425	-0.1634	***
H3 - H1	-0.6395	-0.3518	-0.0641	***
H3 - H4	-0.5300	-0.2717	-0.0133	***

Level of GROUP	Level of HOSPXFM	N	WG2 Mean	WG2 SD
1	H1	9	3.61111111	1.26929552
2	H1	17	3.77941176	1.17221196
3	H1	22	3.79545455	1.05682691
4	H1	19	3.77631579	0.73074703
5	H1	9	3.41666667	1.12500000
1	H2	9	4.13888889	0.76148612
2	H2	20	3.81250000	0.81060001
3	H2	26	3.85576923	0.81293627
4	H2	21	4.00000000	0.87321246
5	H2	10	3.00000000	0.87400737
1	H3	15	3.41666667	0.99851080
2	H3	8	3.68750000	1.13192314
3	H3	15	3.23333333	1.07099197
4	H3	30	3.31666667	0.80924969
5	H3	10	3.40000000	1.16189500
1	H4	13	3.51923077	0.78036809
2	H4	26	3.54807692	0.96441493
3	H4	43	3.84302326	0.71344081
4	H4	28	3.36607143	0.80070034
5	H4	13	3.86538462	0.87568654

General Linear Models Procedure

T tests (LSD) for variable: HG1 (Inter-Group Interaction)

NOTE: This test controls the type I comparisonwise error rate not the experimentwise error rate.

Alpha= 0.05 Confidence= 0.95 df= 268 MSE= 0.755189
Critical Value of T= 1.96886

Comparisons significant at the 0.05 level are indicated by '***'.

HOSPXFM Comparison	Lower Confidence Limit	Difference Between Means	Upper Confidence Limit	
H1 - H2	-0.2295	0.0679	0.3653	
H1 - H4	0.2368	0.5192	0.8016	***
H1 - H3	0.6236	0.9273	1.2310	***
H2 - H1	-0.3653	-0.0679	0.2295	
H2 - H4	0.1797	0.4513	0.7228	***
H2 - H3	0.5657	0.8594	1.1531	***
H4 - H1	-0.8016	-0.5192	-0.2368	***
H4 - H2	-0.7228	-0.4513	-0.1797	***
H4 - H3	0.1296	0.4081	0.6866	***
H3 - H1	-1.2310	-0.9273	-0.6236	***
H3 - H2	-1.1531	-0.8594	-0.5657	***
H3 - H4	-0.6866	-0.4081	-0.1296	***

Level of GROUP	Level of HOSPXFM	N	-------------HG1------------- Mean	SD
1	H1	7	3.39285714	1.36058461
2	H1	15	4.43333333	0.52155902
3	H1	20	3.87500000	0.90502980
4	H1	12	4.06250000	0.75472000
5	H1	8	4.00000000	0.74402381
1	H2	8	3.71875000	0.61871843
2	H2	13	4.11538462	0.72611541
3	H2	26	4.09615385	0.67110701
4	H2	16	3.82812500	0.72869032
5	H2	8	3.59375000	0.78986323
1	H3	7	3.07142857	0.79992559
2	H3	7	3.71428571	1.00445437
3	H3	11	3.22727273	0.92503071
4	H3	30	2.82500000	0.87874813
5	H3	10	3.25000000	1.05409255
1	H4	9	3.61111111	1.10475613
2	H4	21	3.36904762	1.07418297
3	H4	32	3.71093750	0.85926960
4	H4	22	3.07954545	0.90101254
5	H4	6	4.04166667	1.05376310

General Linear Models Procedure

T tests (LSD) for variable: HG2 (Inter-Group Action)

NOTE: This test controls the type I comparisonwise error rate not the experimentwise error rate.

Alpha= 0.05 Confidence= 0.95 df= 259 MSE= 0.707989
Critical Value of T= 1.96917

Comparisons significant at the 0.05 level are indicated by '***'.

HOSPXFM Comparison	Lower Confidence Limit	Difference Between Means	Upper Confidence Limit	
H1 - H2	-0.1408	0.1588	0.4584	
H1 - H4	0.1669	0.4450	0.7232	***
H1 - H3	0.2877	0.5918	0.8958	***
H2 - H1	-0.4584	-0.1588	0.1408	
H2 - H4	0.0201	0.2862	0.5523	***
H2 - H3	0.1399	0.4329	0.7260	***
H4 - H1	-0.7232	-0.4450	-0.1669	***
H4 - H2	-0.5523	-0.2862	-0.0201	***
H4 - H3	-0.1243	0.1468	0.4178	
H3 - H1	-0.8958	-0.5918	-0.2877	***
H3 - H2	-0.7260	-0.4329	-0.1399	***
H3 - H4	-0.4178	-0.1468	0.1243	

Level of GROUP	Level of HOSPXFM	N	HG2 Mean	HG2 SD
1	H1	8	3.94976807	0.96662284
2	H1	15	3.83976237	0.92327516
3	H1	17	3.50562960	0.81274675
4	H1	11	3.81791548	0.53249359
5	H1	6	3.33312988	1.19779312
1	H2	8	3.87481689	0.64972363
2	H2	14	3.55688477	0.89843080
3	H2	22	3.36338113	0.82716431
4	H2	16	3.72479248	0.54101868
5	H2	6	3.19986979	0.93799988
1	H3	11	3.27257191	0.96030983
2	H3	6	3.66650391	0.81656037
3	H3	12	3.01639811	0.78368128
4	H3	25	2.97577148	0.90969520
5	H3	8	2.99984741	0.68450853
1	H4	9	3.33311632	0.54771516
2	H4	24	3.19980876	0.94541408
3	H4	36	3.18313260	0.84494748
4	H4	17	2.99984203	0.90266468
5	H4	8	4.17480469	0.78155355

General Linear Models Procedure

T tests (LSD) for variable: MGR1 (Manager Active Guidance)

NOTE: This test controls the type I comparisonwise error rate not the experimentwise error rate.

Alpha= 0.05 Confidence= 0.95 df= 342 MSE= 0.878089
Critical Value of T= 1.96692

Comparisons significant at the 0.05 level are indicated by '***'.

HOSPXFM Comparison	Lower Confidence Limit	Difference Between Means	Upper Confidence Limit	
H2 - H1	-0.0680	0.2266	0.5213	
H2 - H4	0.0049	0.2663	0.5276	***
H2 - H3	0.2221	0.5100	0.7979	***
H1 - H2	-0.5213	-0.2266	0.0680	
H1 - H4	-0.2311	0.0396	0.3104	
H1 - H3	-0.0130	0.2834	0.5798	
H4 - H2	-0.5276	-0.2663	-0.0049	***
H4 - H1	-0.3104	-0.0396	0.2311	
H4 - H3	-0.0196	0.2438	0.5071	
H3 - H2	-0.7979	-0.5100	-0.2221	***
H3 - H1	-0.5798	-0.2834	0.0130	
H3 - H4	-0.5071	-0.2438	0.0196	

Level of GROUP	Level of HOSPXFM	N	MGR1 Mean	MGR1 SD
1	H1	8	3.25000000	1.47599845
2	H1	17	3.67647059	1.10313724
3	H1	22	3.95454545	0.80043278
4	H1	18	3.83333333	1.09812675
5	H1	9	3.61111111	1.05409255
1	H2	7	4.10714286	0.69006556
2	H2	19	3.94736842	0.88811187
3	H2	28	4.14285714	0.59093684
4	H2	21	3.98809524	0.72230616
5	H2	8	3.25000000	1.23923940
1	H3	15	3.38333333	0.99940458
2	H3	8	3.71875000	1.25667859
3	H3	18	3.19444444	1.10332237
4	H3	31	3.51612903	0.90123869
5	H3	9	3.69444444	1.37941211
1	H4	14	3.64285714	0.84189739
2	H4	28	3.72321429	0.94853514
3	H4	44	3.80113636	0.67250734
4	H4	26	3.43269231	1.00885503
5	H4	12	3.95833333	1.01597095

General Linear Models Procedure

T tests (LSD) for variable: MGR2 (Manager Dependent Action)

NOTE: This test controls the type I comparisonwise error rate not the experimentwise error rate.

Alpha= 0.05 Confidence= 0.95 df= 346 MSE= 0.931895
Critical Value of T= 1.96684

Comparisons significant at the 0.05 level are indicated by '***'.

HOSPXFM Comparison	Lower Confidence Limit	Difference Between Means	Upper Confidence Limit	
H2 - H1	0.0004	0.2951	0.5899	***
H2 - H4	0.2599	0.5242	0.7885	***
H2 - H3	0.5191	0.8128	1.1065	***
H1 - H2	-0.5899	-0.2951	-0.0004	***
H1 - H4	-0.0477	0.2290	0.5058	
H1 - H3	0.2127	0.5177	0.8227	***
H4 - H2	-0.7885	-0.5242	-0.2599	***
H4 - H1	-0.5058	-0.2290	0.0477	
H4 - H3	0.0129	0.2886	0.5643	***
H3 - H2	-1.1065	-0.8128	-0.5191	***
H3 - H1	-0.8227	-0.5177	-0.2127	***
H3 - H4	-0.5643	-0.2886	-0.0129	***

Level of GROUP	Level of HOSPXFM	N	MGR2 Mean	MGR2 SD
1	H1	8	3.40625000	0.99046796
2	H1	21	4.17857143	0.83719344
3	H1	23	3.70652174	1.05972813
4	H1	17	3.95588235	1.04296488
5	H1	8	3.90625000	0.82307676
1	H2	6	4.00000000	0.90829511
2	H2	20	4.32500000	0.96347780
3	H2	31	4.32258065	0.81187424
4	H2	21	4.07142857	0.69436507
5	H2	12	3.81250000	0.81967982
1	H3	14	3.58928571	0.80028326
2	H3	7	3.25000000	1.47196014
3	H3	17	2.83823529	1.07143732
4	H3	30	3.43333333	0.94214844
5	H3	10	3.80000000	0.99163165
1	H4	9	3.69444444	1.17777450
2	H4	26	3.28846154	1.24437195
3	H4	45	4.10000000	0.86010042
4	H4	28	3.24107143	0.79197989
5	H4	13	3.67307692	1.37076855

General Linear Models Procedure

T tests (LSD) for variable: MGR3 (Manager Independent Action)

NOTE: This test controls the type I comparisonwise error rate not the experimentwise error rate.

Alpha= 0.05 Confidence= 0.95 df= 256 MSE= 0.774774
Critical Value of T= 1.96927

Comparisons significant at the 0.05 level are indicated by '***'.

HOSPXFM Comparison	Lower Confidence Limit	Difference Between Means	Upper Confidence Limit	
H2 - H1	-0.1401	0.1786	0.4972	
H2 - H4	-0.0068	0.2729	0.5526	
H2 - H3	0.1519	0.4525	0.7532	***
H1 - H2	-0.4972	-0.1786	0.1401	
H1 - H4	-0.2058	0.0943	0.3944	
H1 - H3	-0.0458	0.2740	0.5937	
H4 - H2	-0.5526	-0.2729	0.0068	
H4 - H1	-0.3944	-0.0943	0.2058	
H4 - H3	-0.1013	0.1796	0.4606	
H3 - H2	-0.7532	-0.4525	-0.1519	***
H3 - H1	-0.5937	-0.2740	0.0458	
H3 - H4	-0.4606	-0.1796	0.1013	

Level of GROUP	Level of HOSPXFM	N	MGR3 Mean	MGR3 SD
1	H1	4	3.64257813	0.92197681
2	H1	11	3.86976207	0.75966775
3	H1	16	3.67831421	1.07465986
4	H1	15	3.94264323	0.91602284
5	H1	7	3.81598772	0.86390208
1	H2	5	4.34238281	0.16290690
2	H2	15	3.89492188	0.98880073
3	H2	21	4.40115792	0.60198725
4	H2	19	3.90195826	0.41247413
5	H2	7	2.91817801	1.01640485
1	H3	12	3.59497070	0.88854922
2	H3	7	3.93861607	0.95783395
3	H3	10	3.04267578	1.04548007
4	H3	27	3.41772461	0.92817295
5	H3	10	3.98544922	1.02007148
1	H4	7	3.40799386	1.09540284
2	H4	23	3.80103601	1.06095358
3	H4	32	3.78100586	0.76108968
4	H4	20	3.39968262	0.95157083
5	H4	8	4.24969482	0.68184101

General Linear Models Procedure

T tests (LSD) for variable: HADM1 (HADM Active Guidance)

NOTE: This test controls the type I comparisonwise error rate not the experimentwise error rate.

Alpha= 0.05 Confidence= 0.95 df= 268 MSE= 0.786359
Critical Value of T= 1.96886

Comparisons significant at the 0.05 level are indicated by '***'.

HOSPXFM Comparison	Lower Confidence Limit	Difference Between Means	Upper Confidence Limit	
H1 - H2	-0.3016	0.0063	0.3142	
H1 - H4	0.0758	0.3606	0.6453	***
H1 - H3	0.3041	0.6202	0.9363	***
H2 - H1	-0.3142	-0.0063	0.3016	
H2 - H4	0.0787	0.3543	0.6298	***
H2 - H3	0.3060	0.6139	0.9218	***
H4 - H1	-0.6453	-0.3606	-0.0758	***
H4 - H2	-0.6298	-0.3543	-0.0787	***
H4 - H3	-0.0251	0.2596	0.5443	
H3 - H1	-0.9363	-0.6202	-0.3041	***
H3 - H2	-0.9218	-0.6139	-0.3060	***
H3 - H4	-0.5443	-0.2596	0.0251	

Level of GROUP	Level of HOSPXFM	N	HADM1 Mean	HADM1 SD
1	H1	6	3.41650391	1.18669109
2	H1	17	4.17624081	0.76258143
3	H1	17	3.62721163	0.96737212
4	H1	13	3.92296424	0.69919170
5	H1	8	3.81225586	1.11420258
1	H2	7	3.90471540	0.81571863
2	H2	15	3.72202148	1.01112087
3	H2	24	4.06225586	0.60549176
4	H2	16	3.79133606	0.85946421
5	H2	6	3.30546061	0.77757179
1	H3	10	3.36645508	0.86702302
2	H3	7	3.57135882	0.83810483
3	H3	9	3.14794922	0.65323532
4	H3	27	3.03685619	0.93635972
5	H3	8	3.47900391	0.99381146
1	H4	9	3.72200521	0.79495363
2	H4	24	3.46500651	0.78162786
3	H4	36	3.59242079	1.03308537
4	H4	21	2.92049154	0.98823388
5	H4	8	4.29156494	0.74937842

General Linear Models Procedure

T tests (LSD) for variable: HADM2 (HADM Customer Project Output)

NOTE: This test controls the type I comparisonwise error rate not
the experimentwise error rate.

Alpha= 0.05 Confidence= 0.95 df= 163 MSE= 0.699221
Critical Value of T= 1.97462

Comparisons significant at the 0.05 level are indicated by '***'.

HOSPXFM Comparison	Lower Confidence Limit	Difference Between Means	Upper Confidence Limit	
H1 - H2	-0.2709	0.1081	0.4870	
H1 - H4	0.0680	0.4282	0.7884	***
H1 - H3	0.3354	0.7010	1.0666	***
H2 - H1	-0.4870	-0.1081	0.2709	
H2 - H4	-0.0160	0.3201	0.6563	
H2 - H3	0.2511	0.5929	0.9348	***
H4 - H1	-0.7884	-0.4282	-0.0680	***
H4 - H2	-0.6563	-0.3201	0.0160	
H4 - H3	-0.0482	0.2728	0.5938	
H3 - H1	-1.0666	-0.7010	-0.3354	***
H3 - H2	-0.9348	-0.5929	-0.2511	***
H3 - H4	-0.5938	-0.2728	0.0482	

Level of GROUP	Level of HOSPXFM	N	HADM2 Mean	HADM2 SD
1	H1	3	4.41666667	0.50518149
2	H1	9	3.97222222	0.66078131
3	H1	11	3.36363636	1.14762601
4	H1	6	3.81250000	0.42389562
5	H1	5	3.17500000	0.90398424
1	H2	3	3.62500000	0.97628121
2	H2	9	3.50000000	1.03077641
3	H2	16	3.88281250	0.70336801
4	H2	10	3.50000000	0.50000000
5	H2	5	2.72500000	0.64590053
1	H3	6	2.97916667	0.85665289
2	H3	6	3.00000000	1.00623059
3	H3	9	2.75000000	0.92491554
4	H3	21	2.82738095	0.79792327
5	H3	9	3.48611111	0.81116343
1	H4	4	3.59375000	0.66438411
2	H4	14	3.25000000	0.82187637
3	H4	19	3.15131579	0.93037006
4	H4	13	2.88461538	0.86220034
5	H4	5	4.20000000	0.82253419

General Linear Models Procedure

T tests (LSD) for variable: HADM3 (HADM Customer Project Input)

NOTE: This test controls the type I comparisonwise error rate not the experimentwise error rate.

Alpha= 0.05 Confidence= 0.95 df= 260 MSE= 0.719905
Critical Value of T= 1.96913

Comparisons significant at the 0.05 level are indicated by '***'.

HOSPXFM Comparison	Lower Confidence Limit	Difference Between Means	Upper Confidence Limit	
H1 - H2	-0.1338	0.1628	0.4594	
H1 - H4	0.0800	0.3678	0.6556	***
H1 - H3	0.4443	0.7526	1.0610	***
H2 - H1	-0.4594	-0.1628	0.1338	
H2 - H4	-0.0582	0.2051	0.4683	
H2 - H3	0.3043	0.5899	0.8754	***
H4 - H1	-0.6556	-0.3678	-0.0800	***
H4 - H2	-0.4683	-0.2051	0.0582	
H4 - H3	0.1084	0.3848	0.6612	***
H3 - H1	-1.0610	-0.7526	-0.4443	***
H3 - H2	-0.8754	-0.5899	-0.3043	***
H3 - H4	-0.6612	-0.3848	-0.1084	***

Level of GROUP	Level of HOSPXFM	N	HADM3 Mean	HADM3 SD
1	H1	6	4.05541992	1.14336068
2	H1	16	4.31219482	0.63789438
3	H1	17	4.13712086	0.72707679
4	H1	11	4.48455256	0.47991138
5	H1	5	4.26611328	0.89420882
1	H2	8	4.16644287	0.75591360
2	H2	17	4.17624081	0.79166518
3	H2	25	4.09316406	0.64918920
4	H2	17	4.15668084	0.65741098
5	H2	8	3.74993896	1.13740645
1	H3	9	3.40728082	0.89411662
2	H3	6	4.11092122	0.77949341
3	H3	11	3.30286754	0.83604320
4	H3	28	3.55927386	0.87974971
5	H3	9	3.29600694	1.36856552
1	H4	9	3.62950304	1.21842414
2	H4	22	4.10582386	0.77917538
3	H4	32	3.72895813	0.81400145
4	H4	18	3.75910102	1.14215694
5	H4	6	4.77766927	0.40372264

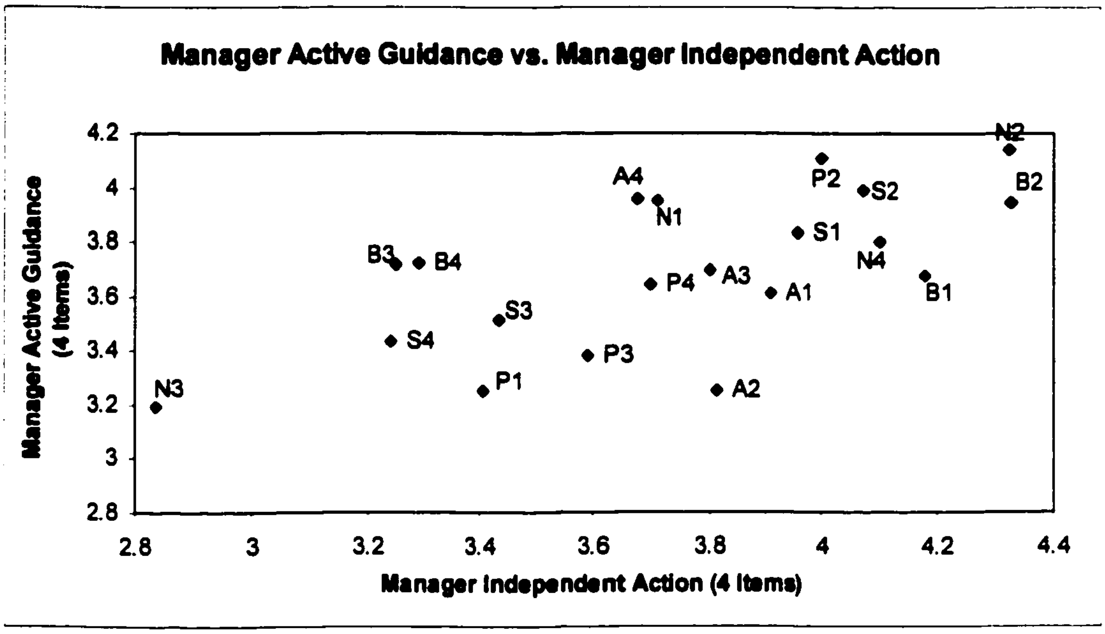

Figure 30. Manager Active Guidance vs. Manager Independent Action

Statistical comparisons have been performed using Fisher's LSD, the results of which appear earlier in this Appendix; the reader is warned against making statistical inferences from the above graph alone.

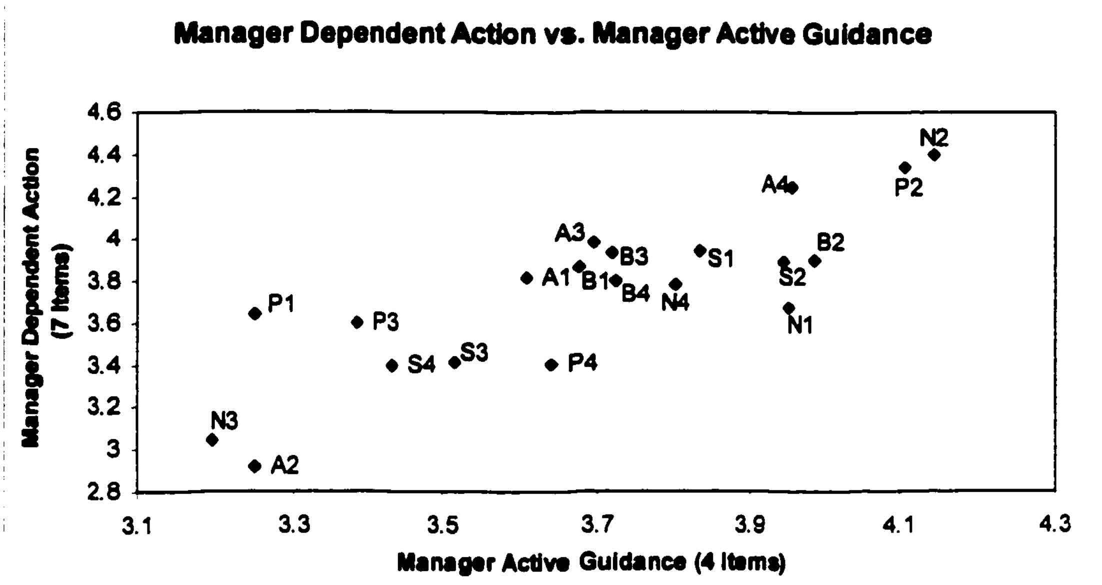

Figure 31. Manager Dependent Action vs. Manager Active Guidance

Statistical comparisons have been performed using Fisher's LSD, the results of which appear earlier in this Appendix; the reader is warned against making statistical inferences from the above graph alone.

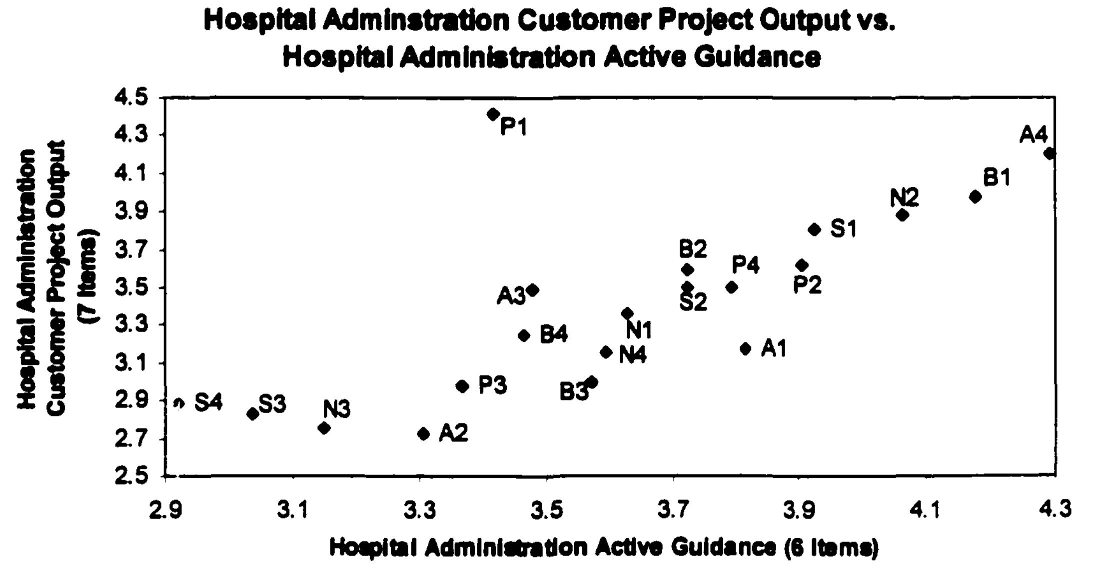

Figure 32. Hospital Administration Customer Project Output vs. Hospital Administration Active Guidance

Statistical comparisons have been performed using Fisher's LSD, the results of which appear earlier in this Appendix; the reader is warned against making statistical inferences from the above graph alone.

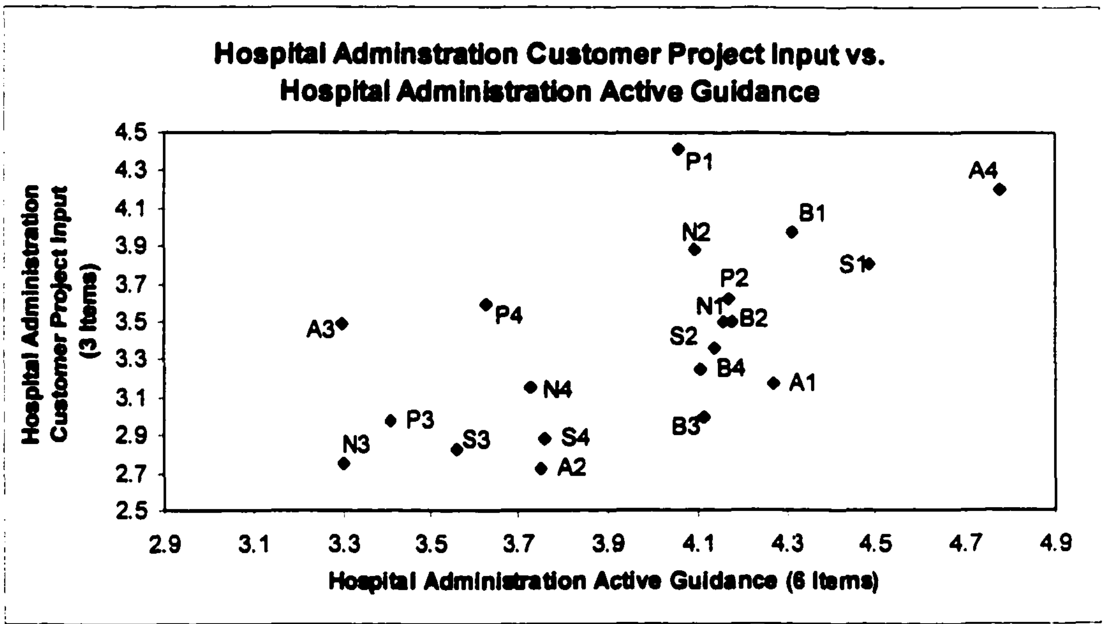

Figure 33. Hospital Administration Customer Project Input versus Hospital Administration Active Guidance

Statistical comparisons have been performed using Fisher's LSD, the results of which appear earlier in this Appendix; the reader is warned against making statistical inferences from the above graph alone. Each of the four above graphs demonstrated a positive correlation among the plotted dimensions, consistent with the positive path coefficients from the structural equation modeling which are statistically different from zero.

APPENDIX I

STUDY OF MISSING VARIABLES FOR DIMENSIONS AND PERFORMANCE VARIABLES

This appendix contains the computer output for the investigation of systematic missing data for the dimensions and the hosptial performance variables. In both cases, dummy variables are created and coded "1" for missing and "0" for non-missing (for the dimension variables, missing is chosen if even one item is missing). These coded variables are then correlated with the demographic variables, and the results are included below.

Climate Dimensions

Simple Statistics

Variable	N	Mean	Std Dev	Sum
DX1	446	0.233184	0.423333	104.000000
DX2	446	0.181614	0.385959	81.000000
DX3	446	0.354260	0.478826	158.000000
DX4	446	0.336323	0.472981	150.000000
DX5	446	0.177130	0.382207	79.000000
DX6	446	0.381166	0.486219	170.000000
DX7	446	0.183857	0.387802	82.000000
DX8	446	0.589686	0.492443	263.000000
DX9	446	0.354260	0.478826	158.000000
DX10	446	0.372197	0.483933	166.000000
HOSP1	446	0.116592	0.321294	52.000000
HOSP2	446	0.358744	0.480171	160.000000
HOSP3	446	0.089686	0.286052	40.000000
HOSP4	446	0.215247	0.411455	96.000000
HOSP5	446	0.219731	0.414529	98.000000
GROUP1	442	0.124434	0.330450	55.000000
GROUP2	442	0.192308	0.394560	85.000000
GROUP3	442	0.309955	0.462999	137.000000
GROUP4	442	0.255656	0.436724	113.000000
GROUP5	442	0.117647	0.322555	52.000000
GENDER	431	1.264501	0.441580	545.000000
AGE	435	5.590805	1.894184	2432.000000
YHOSP	435	8.519651	7.384903	3706.048000
YHEALTH	439	14.180162	9.355260	6225.091000
YPOS	381	8.428165	7.873240	3211.131000
MANHA	431	1.522042	0.500094	656.000000
MAN	425	1.595294	0.491414	678.000000
WITHG1	438	0.563927	0.496464	247.000000
WITHG2	438	0.294521	0.456348	129.000000
WITHG3	438	0.420091	0.494138	184.000000
WITHG4	438	0.440639	0.497032	193.000000
WITHG5	438	0.410959	0.492570	180.000000
YMAN	386	3.821946	4.067885	1475.271000
YWG	387	4.764101	4.212129	1843.707000

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0
/ Number of Observations

	HOSP1	HOSP2	HOSP3	HOSP4
DX1 Intra-Group Interaction	-0.01860 0.6953 446	0.16241 0.0006 446	-0.04319 0.3628 446	-0.14689 0.0019 446
DX2 Intra-Group Action	-0.04429 0.3507 446	0.09630 0.0421 446	0.03532 0.4568 446	-0.10521 0.0263 446
DX3 Inter-Group Interaction	-0.06459 0.1733 446	0.13017 0.0059 446	0.03002 0.5272 446	-0.10276 0.0300 446
DX4 Inter-Group Action	0.00756 0.8735 446	0.06123 0.1968 446	0.00909 0.8482 446	-0.03796 0.4239 446
DX5 Manager Independent Action	-0.05876 0.2156 446	0.13052 0.0058 446	0.03936 0.4070 446	-0.15725 0.0009 446
DX6 Manager Dependent Action	0.04573 0.3352 446	0.08676 0.0672 446	0.01217 0.7977 446	-0.08528 0.0720 446
DX7 Manager Active Guidance	0.00793 0.8674 446	0.07944 0.0938 446	0.01308 0.7829 446	-0.06549 0.1674 446
DX8 Hosp Admin Cust Proj Output	0.00478 0.9199 446	0.10122 0.0326 446	0.05444 0.2512 446	-0.04004 0.3990 446
DX9 Hosp Admin Active Guidance	-0.04998 0.2923 446	0.05198 0.2733 446	0.03002 0.5272 446	-0.06854 0.1484 446
DX10 Hosp Admin Cust Proj Input	-0.01957 0.6802 446	0.13006 0.0059 446	0.06675 0.1593 446	-0.16625 0.0004 446

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0
/ Number of Observations

	HOSP5	GROUP1	GROUP2	GROUP3
DX1 Intra-Group Interaction	0.00190 0.9682 446	0.08868 0.0625 442	-0.04680 0.3263 442	0.01974 0.6789 442
DX2 Intra-Group Action	0.00283 0.9524 446	-0.01485 0.7555 442	-0.01786 0.7080 442	0.08317 0.0807 442
DX3 Inter-Group Interaction	-0.01944 0.6821 446	0.06958 0.1441 442	-0.00741 0.8765 442	0.00274 0.9542 442
DX4 Inter-Group Action	-0.04538 0.3390 446	-0.01879 0.6935 442	-0.03983 0.4035 442	0.02530 0.5958 442
DX5 Manager Independent Action	0.02328 0.6239 446	0.15518 0.0011 442	-0.05500 0.2485 442	-0.03315 0.4870 442
DX6 Manager Dependent Action	-0.05970 0.2083 446	0.08979 0.0593 442	-0.03465 0.4674 442	0.06614 0.1651 442
DX7 Manager Active Guidance	-0.04219 0.3741 446	0.01861 0.6964 442	-0.03555 0.4559 442	0.00259 0.9567 442
DX8 Hosp Admin Cust Proj Output	-0.11877 0.0121 446	0.09423 0.0477 442	-0.03272 0.4926 442	0.01710 0.7200 442
DX9 Hosp Admin Active Guidance	0.02584 0.5862 446	0.05520 0.2468 442	-0.09175 0.0539 442	0.03354 0.4818 442
DX10 Hosp Admin Cust Proj Input	-0.01653 0.7278 446	0.04042 0.3966 442	-0.08523 0.0735 442	0.01815 0.7036 442

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0
/ Number of Observations

	GROUP4	GROUP5	GENDER	AGE
DX1	-0.10896	0.08559	-0.01483	0.03336
Intra-Group Interaction	0.0220	0.0722	0.7589	0.4877
	442	442	431	435
DX2	-0.07035	0.01294	0.03616	-0.00660
Intra-Group Action	0.1398	0.7862	0.4540	0.8909
	442	442	431	435
DX3	-0.06935	0.02774	-0.06012	-0.01224
Inter-Group Interaction	0.1455	0.5608	0.2129	0.7991
	442	442	431	435
DX4	-0.00640	0.04033	-0.00978	0.05595
Inter-Group Action	0.8933	0.3976	0.8395	0.2443
	442	442	431	435
DX5	-0.03340	0.00109	0.03616	0.01117
Manager Independent Action	0.4837	0.9817	0.4540	0.8163
	442	442	431	435
DX6	-0.11180	0.00682	-0.01265	0.04734
Manager Dependent Action	0.0187	0.8862	0.7934	0.3246
	442	442	431	435
DX7	-0.04651	0.08368	-0.02923	-0.00397
Manager Active Guidance	0.3293	0.0788	0.5451	0.9343
	442	442	431	435
DX8	-0.03385	-0.03522	-0.02119	0.11655
Hosp Admin Cust Proj Output	0.4778	0.4601	0.6608	0.0150
	442	442	431	435
DX9	-0.03669	0.05722	-0.03813	0.00004
Hosp Admin Active Guidance	0.4416	0.2299	0.4297	0.9993
	442	442	431	435
DX10	-0.02601	0.07201	0.00452	-0.02189
Hosp Admin Cust Proj Input	0.5855	0.1306	0.9255	0.6489
	442	442	431	435

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0
/ Number of Observations

	YHOSP	YHEALTH	YPOS	MANHA
DX1 Intra-Group Interaction	-0.03824 0.4262 435	-0.04013 0.4016 439	0.07213 0.1600 381	-0.02362 0.6248 431
DX2 Intra-Group Action	-0.04186 0.3838 435	-0.02682 0.5752 439	0.07954 0.1212 381	-0.00823 0.8647 431
DX3 Inter-Group Interaction	-0.06562 0.1719 435	-0.09025 0.0588 439	0.03948 0.4423 381	0.09452 0.0499 431
DX4 Inter-Group Action	-0.00486 0.9195 435	-0.01348 0.7782 439	0.06818 0.1842 381	0.15585 0.0012 431
DX5 Manager Independent Action	0.03439 0.4743 435	0.01560 0.7444 439	0.08612 0.0932 381	0.03580 0.4585 431
DX6 Manager Dependent Action	0.00033 0.9945 435	-0.07108 0.1371 439	0.04550 0.3758 381	-0.04878 0.3123 431
DX7 Manager Active Guidance	-0.05295 0.2705 435	-0.07982 0.0948 439	-0.02849 0.5794 381	0.14514 0.0025 431
DX8 Hosp Admin Cust Proj Output	0.02451 0.6102 435	0.03936 0.4107 439	0.13410 0.0088 381	0.02305 0.6332 431
DX9 Hosp Admin Active Guidance	-0.02749 0.5674 435	-0.04458 0.3514 439	0.02921 0.5698 381	0.11930 0.0132 431
DX10 Hosp Admin Cust Proj Input	-0.00242 0.9599 435	-0.04372 0.3608 439	0.07570 0.1403 381	0.15482 0.0013 431

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0
/ Number of Observations

	MAN	WITHG1	WITHG2	WITHG3
DX1	0.18131	-0.16300	-0.11542	-0.07518
Intra-Group Interaction	0.0002	0.0006	0.0157	0.1161
	425	438	438	438
DX2	0.13840	-0.04139	-0.07471	-0.16219
Intra-Group Action	0.0043	0.3875	0.1184	0.0007
	425	438	438	438
DX3	0.23039	-0.12741	-0.16305	-0.06262
Inter-Group Interaction	0.0001	0.0076	0.0006	0.1909
	425	438	438	438
DX4	0.17753	-0.08579	-0.12459	-0.09744
Inter-Group Action	0.0002	0.0729	0.0091	0.0415
	425	438	438	438
DX5	0.08317	-0.11956	-0.03735	-0.01342
Manager Independent Action	0.0868	0.0123	0.4355	0.7795
	425	438	438	438
DX6	0.13991	-0.12306	-0.12441	-0.11938
Manager Dependent Action	0.0039	0.0099	0.0091	0.0124
	425	438	438	438
DX7	0.12576	-0.07204	-0.05201	-0.06973
Manager Active Guidance	0.0095	0.1322	0.2774	0.1451
	425	438	438	438
DX8	0.17296	-0.09150	-0.12291	-0.06681
Hosp Admin Cust Proj Output	0.0003	0.0557	0.0100	0.1628
	425	438	438	438
DX9	0.21026	-0.08866	-0.17359	-0.09181
Hosp Admin Active Guidance	0.0001	0.0637	0.0003	0.0548
	425	438	438	438
DX10	0.18653	-0.12125	-0.14404	-0.10384
Hosp Admin Cust Proj Input	0.0001	0.0111	0.0025	0.0298
	425	438	438	438

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0
/ Number of Observations

	WITHG4	WITHG5	YMAN	YWG
DX1 Intra-Group Interaction	-0.01929 0.6872 438	-0.07670 0.1090 438	-0.06429 0.2076 386	0.00817 0.8727 387
DX2 Intra-Group Action	0.00086 0.9858 438	-0.03223 0.5011 438	0.03846 0.4511 386	0.02463 0.6291 387
DX3 Inter-Group Interaction	-0.03422 0.4750 438	-0.13722 0.0040 438	-0.05324 0.2968 386	-0.02219 0.6634 387
DX4 Inter-Group Action	-0.10645 0.0259 438	-0.09456 0.0480 438	0.00625 0.9026 386	0.00606 0.9055 387
DX5 Manager Independent Action	-0.03200 0.5042 438	-0.07939 0.0970 438	-0.02203 0.6661 386	0.04110 0.4200 387
DX6 Manager Dependent Action	0.01119 0.8154 438	-0.08627 0.0713 438	-0.02436 0.6333 386	0.06621 0.1937 387
DX7 Manager Active Guidance	0.01959 0.6826 438	0.01146 0.8109 438	-0.10082 0.0478 386	-0.05901 0.2468 387
DX8 Hosp Admin Cust Proj Output	-0.03136 0.5128 438	0.00193 0.9678 438	0.04539 0.3738 386	0.07456 0.1432 387
DX9 Hosp Admin Active Guidance	-0.05357 0.2633 438	-0.07864 0.1002 438	0.00082 0.9873 386	0.04372 0.3910 387
DX10 Hosp Admin Cust Proj Input	-0.05797 0.2260 438	-0.09015 0.0594 438	0.01447 0.7768 386	0.05649 0.2676 387

Hospital Performance Criteria

In the below printout, the SX variables correspond to the hospital performance variables.

sx1 = reducing patient costs
sx2 = reducing overall hospital costs
sx3 = reducing work errors
sx4 = reducing hospital administration complaints
sx5 = reducing physician complaints
sx6 = reducing nursing complaints
sx7 = reducing patient complaints
sx8 = increasing hosp. admin. satisfaction
sx9 = increasing physician satisf.
sx10 = increasing nursing satisfaction
sx11 = increasing patient satisf.

Simple Statistics

Variable	N	Mean	Std Dev	Sum
SX1	446	0.434978	0.496311	194.000000
SX2	446	0.403587	0.491168	180.000000
SX3	446	0.195067	0.396697	87.000000
SX4	446	0.457399	0.498741	204.000000
SX5	446	0.343049	0.475261	153.000000
SX6	446	0.334081	0.472198	149.000000
SX7	446	0.352018	0.478136	157.000000
SX8	446	0.459641	0.498928	205.000000
SX9	446	0.343049	0.475261	153.000000
SX10	446	0.325112	0.468943	145.000000
HOSP1	446	0.116592	0.321294	52.000000
HOSP2	446	0.358744	0.480171	160.000000
HOSP3	446	0.089686	0.286052	40.000000
HOSP4	446	0.215247	0.411455	96.000000
HOSP5	446	0.219731	0.414529	98.000000
GROUP1	442	0.124434	0.330450	55.000000
GROUP2	442	0.192308	0.394560	85.000000
GROUP3	442	0.309955	0.462999	137.000000
GROUP4	442	0.255656	0.436724	113.000000
GROUP5	442	0.117647	0.322555	52.000000
GENDER	431	1.264501	0.441580	545.000000
AGE	435	5.590805	1.894184	2432.000000
YHOSP	435	8.519651	7.384903	3706.048000
YHEALTH	439	14.180162	9.355260	6225.091000
YPOS	381	8.428165	7.873240	3211.131000
MANHA	431	1.522042	0.500094	656.000000
MAN	425	1.595294	0.491414	678.000000
WITHG1	438	0.563927	0.496464	247.000000
WITHG2	438	0.294521	0.456348	129.000000
WITHG3	438	0.420091	0.494138	184.000000
WITHG4	438	0.440639	0.497032	193.000000
WITHG5	438	0.410959	0.492570	180.000000
YMAN	386	3.821946	4.067885	1475.271000
YWG	387	4.764101	4.212129	1843.707000

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / Number of Observations

	HOSP1	HOSP2	HOSP3	HOSP4	HOSP5	GROUP1
SX1	-0.06509 0.1700 446	0.07924 0.0946 446	0.00951 0.8412 446	-0.05236 0.2699 446	0.00407 0.9318 446	-0.10581 0.0261 442
SX2	-0.11373 0.0163 446	0.09934 0.0360 446	-0.00230 0.9614 446	-0.04164 0.3804 446	0.01599 0.7364 446	-0.04061 0.3944 442
SX3	-0.02016 0.6711 446	0.09189 0.0525 446	-0.01590 0.7378 446	-0.06507 0.1701 446	-0.01526 0.7479 446	-0.00791 0.8684 442
SX4	0.01704 0.7197 446	0.00766 0.8719 446	0.05834 0.2188 446	-0.10853 0.0219 446	0.04538 0.3390 446	0.04287 0.3686 442
SX5	-0.01234 0.7949 446	-0.00874 0.8539 446	0.02113 0.6564 446	-0.04519 0.3410 446	0.04997 0.2923 446	-0.05134 0.2815 442
SX6	0.02411 0.6116 446	-0.02431 0.6086 446	0.01059 0.8235 446	-0.03553 0.4542 446	0.03743 0.4304 446	-0.01523 0.7496 442
SX7	0.02480 0.6015 446	0.00663 0.8890 446	0.01510 0.7504 446	-0.13472 0.0044 446	0.09640 0.0419 446	-0.02937 0.5380 442
SX8	-0.02665 0.5745 446	0.05119 0.2807 446	0.00967 0.8386 446	-0.12179 0.0100 446	0.07557 0.1110 446	0.02737 0.5660 442
SX9	-0.05649 0.2338 446	0.00110 0.9815 446	0.00460 0.9229 446	0.00077 0.9870 446	0.03857 0.4165 446	-0.09484 0.0463 442
SX10	-0.01351 0.7760 446	-0.05008 0.2913 446	-0.00008 0.9987 446	-0.00245 0.9588 446	0.07097 0.1345 446	0.03610 0.4490 442

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0
/ Number of Observations

	GROUP2	GROUP3	GROUP4	GROUP5	GENDER	AGE
SX1	0.16769	-0.09774	-0.05840	0.12265	-0.06351	-0.01676
	0.0004	0.0400	0.2204	0.0098	0.1882	0.7275
	442	442	442	442	431	435
SX2	0.06044	-0.00552	-0.04233	0.03291	-0.09949	0.01837
	0.2047	0.9079	0.3746	0.4901	0.0390	0.7024
	442	442	442	442	431	435
SX3	-0.01688	0.08683	-0.11203	0.05580	-0.07304	-0.02656
	0.7234	0.0682	0.0185	0.2417	0.1300	0.5807
	442	442	442	442	431	435
SX4	0.00621	-0.05888	0.02989	-0.00747	0.00664	0.04007
	0.8964	0.2166	0.5308	0.8756	0.8907	0.4045
	442	442	442	442	431	435
SX5	0.10135	-0.02259	-0.09976	0.09612	-0.00454	-0.02312
	0.0331	0.6357	0.0360	0.0434	0.9251	0.6306
	442	442	442	442	431	435
SX6	0.19704	-0.14528	-0.05601	0.05895	0.00426	0.01323
	0.0001	0.0022	0.2400	0.2162	0.9298	0.7831
	442	442	442	442	431	435
SX7	0.16383	-0.15859	-0.03396	0.10332	0.02783	-0.01520
	0.0005	0.0008	0.4763	0.0299	0.5645	0.7518
	442	442	442	442	431	435
SX8	0.03858	-0.05208	0.03763	-0.05143	-0.03836	-0.00671
	0.4185	0.2746	0.4300	0.2806	0.4269	0.8891
	442	442	442	442	431	435
SX9	0.12564	-0.05364	-0.05587	0.09612	-0.04593	-0.05782
	0.0082	0.2604	0.2411	0.0434	0.3414	0.2288
	442	442	442	442	431	435
SX10	0.22028	-0.18582	-0.06729	0.05140	0.02213	-0.01268
	0.0001	0.0001	0.1578	0.2809	0.6469	0.7920
	442	442	442	442	431	435

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0
/ Number of Observations

	YHOSP	YHEALTH	YPOS	MANHA	MAN	WITHG1
SX1	-0.05034	-0.09705	-0.08545	0.06521	0.16725	-0.13141
	0.2949	0.0421	0.0958	0.1766	0.0005	0.0059
	435	439	381	431	425	438
SX2	-0.01007	-0.04528	-0.00784	0.07340	0.15679	-0.11505
	0.8340	0.3438	0.8788	0.1281	0.0012	0.0160
	435	439	381	431	425	438
SX3	-0.00810	-0.04563	-0.03706	-0.03906	0.09944	-0.09788
	0.8662	0.3402	0.4707	0.4186	0.0405	0.0406
	435	439	381	431	425	438
SX4	0.04496	0.00667	0.05173	0.11932	0.19360	-0.14894
	0.3495	0.8892	0.3139	0.0132	0.0001	0.0018
	435	439	381	431	425	438
SX5	-0.01545	-0.12568	-0.04455	0.08093	0.17249	-0.16475
	0.7479	0.0084	0.3858	0.0933	0.0004	0.0005
	435	439	381	431	425	438
SX6	-0.00852	-0.12474	-0.04503	0.08766	0.12911	-0.12942
	0.8594	0.0089	0.3807	0.0691	0.0077	0.0067
	435	439	381	431	425	438
SX7	-0.00948	-0.09490	-0.05045	0.05035	0.12358	-0.19585
	0.8437	0.0469	0.3260	0.2970	0.0108	0.0001
	435	439	381	431	425	438
SX8	-0.01984	-0.05608	0.01501	0.16053	0.19943	-0.07602
	0.6798	0.2410	0.7702	0.0008	0.0001	0.1121
	435	439	381	431	425	438
SX9	-0.02600	-0.14396	-0.08186	0.12992	0.18258	-0.16996
	0.5887	0.0025	0.1106	0.0069	0.0002	0.0004
	435	439	381	431	425	438
SX10	-0.00169	-0.13205	-0.01526	0.10910	0.19566	-0.19229
	0.9719	0.0056	0.7666	0.0235	0.0001	0.0001
	435	439	381	431	425	438

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0
/ Number of Observations

	WITHG2	WITHG3	WITHG4	WITHG5	YMAN	YWG
SX1	-0.12086	-0.04496	-0.04381	-0.04759	0.00124	0.00615
	0.0114	0.3478	0.3603	0.3204	0.9806	0.9040
	438	438	438	438	386	387
SX2	-0.14135	-0.07488	-0.07084	-0.05044	0.07431	0.05718
	0.0030	0.1176	0.1388	0.2922	0.1451	0.2618
	438	438	438	438	386	387
SX3	-0.16208	-0.16787	-0.05856	-0.04150	0.08648	-0.00520
	0.0007	0.0004	0.2213	0.3863	0.0897	0.9187
	438	438	438	438	386	387
SX4	-0.13110	-0.00705	-0.11838	-0.02760	0.08575	0.02350
	0.0060	0.8831	0.0132	0.5646	0.0925	0.6449
	438	438	438	438	386	387
SX5	-0.08798	-0.04656	-0.04649	-0.06300	0.03225	-0.06211
	0.0658	0.3309	0.3317	0.1882	0.5276	0.2228
	438	438	438	438	386	387
SX6	-0.11100	-0.00486	-0.06316	-0.08078	0.01401	0.00143
	0.0201	0.9193	0.1870	0.0913	0.7838	0.9777
	438	438	438	438	386	387
SX7	-0.07419	0.03615	-0.06191	-0.12533	0.10775	0.00750
	0.1211	0.4504	0.1960	0.0086	0.0343	0.8831
	438	438	438	438	386	387
SX8	-0.14696	-0.00556	-0.08947	0.03000	0.11824	0.04017
	0.0020	0.9077	0.0614	0.5312	0.0201	0.4307
	438	438	438	438	386	387
SX9	-0.11213	-0.03104	-0.06042	-0.01787	0.05187	-0.06145
	0.0189	0.5171	0.2069	0.7091	0.3094	0.2278
	438	438	438	438	386	387
SX10	-0.13430	0.02740	-0.07018	-0.08884	0.08440	0.01543
	0.0049	0.5674	0.1425	0.0632	0.0978	0.7622
	438	438	438	438	386	387

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