IS-MBNQA: A NEW FRAMEWORK FOR THE RELATIONSHIP BETWEEN

INFORMATION SYSTEMS AND ORGANIZATIONAL QUALITY

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Despite numerous frameworks and models proposed in the literature, Information Systems (IS) assessment still remains elusive. In addition, little agreement exists on the contribution of the IS function within an organization and on how IS is related to the other organizational dimensions. Frameworks that show the relationship between IS and the organization are in the developmental stage and this work proposes a more comprehensive framework to assist in better understanding the relationship between IS and organizational quality.

This research examines two popular IS quality assessment frameworks - Malcolm Baldrige National Quality Award (MBNQA) and Information Systems Assessment (ISA) - and suggests a new framework, IS-MBNQA. This work integrates these two IS quality assessment frameworks into a single comprehensive model that provides a holistic view on how IS quality is interrelated to organizational quality. The existing two IS assessment frameworks attempted to measure IS quality at different levels within an organization. The MBNQA model is the most comprehensive quality framework because it takes an organization wide perspective. On the other hand, ISA employs an IS specific perspective and reflects the relationships of eight major IS success dimensions. ISA is a modified version of DeLone & McLean's model with the inclusion of a success factor for Service Quality. For this study, survey instruments are developed from the MBNQA and ISA frameworks and they are consolidated to allow testing of the single IS-MBNQA framework. Exploratory factor analysis is performed for instrument refinement and confirmatory factor analysis for validity of the models. The instruments developed in this work are utilized as a foundation for identifying the relationships among the dimensions within and between each model.

A major contribution of this work is the validation of the 2000 MBNQA model and the extension of existing models/frameworks to better explain the IS contribution to an organization. Copyright 2001

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CHAPTER 1

INTRODUCTION

Overview

The importance of a quality information system to the overall quality and productivity of an organization is evident from the inclusion of a dimension on Information and Analysis in the Malcolm Baldrige National Quality Award (NIST, 2000). While defining or measuring the effectiveness of the information systems (IS) function has proven complicated, further effort on refining IS assessment is essential for the effective management and continuous improvement of both the IS function and the organization (Drucker, 1989; Myers, Kappelman, and Prybutok, 1997). In addition, an effort to investigate the relationships among the established IS assessment tools to better reconcile their existing differences is warranted. This research examines two established IS quality assessment frameworks, the Malcolm Baldrige National Quality Award (MBNQA) and the Information Systems Assessment (ISA), and proposes a new information systems assessment framework by integrating existing frameworks to provide a more holistic view on how information system quality is related to organizational quality and productivity. The existing two IS assessment frameworks attempted to measure Information Systems quality at different levels within an organization. MBNQA is the most comprehensive quality framework and offers an organization-wide perspective. ISA employs an IS specific perspective and reflects the relationship of the seven major IS success dimensions. ISA is a modified framework of

DeLone & McLean's IS success model (1992) with the inclusion of two dimensions, Service Quality and Workgroup Impact. DeLone & McLean's model (1992) reflects the relationships among the six IS success dimensions and was regarded as the most comprehensive IS assessment model in the IS domain (Seddon, 1997; Myers, Kappelman, and Prybutok, 1997; Drury and Farhoomand, 1998). SERVQUAL is a popular instrument for measuring service quality and IS-SERVQUAL is a modified version of an information system service quality instrument. It measures the service quality of an IS provider. The new framework promises to provide us with the methodology to examine the interaction between the information system and the rest of the organization.

Survey instruments are developed for both MBNQA and ISA based on their original criteria. The developed instruments allow the creation of unidimensional measures for each dimension. Exploratory and confirmatory factor analysis will be performed for instrument refinement and validity tests of the existing and proposed models. Several other statistical analyses will be employed to identify interrelationships among organizational components including information systems.

The goal of the study is to maximize the benefits derived from information system investments by more completely understanding the interplay between the IT subsystem and the rest of the organization. Although applicable to any kind of organization, this work employs a government organization as a field laboratory. In order to accomplish this study the City of Denton serves as the field subject for data collection via a webbased survey.

Purpose of the Study

Effectively assessing information systems (IS) quality has long been a difficult challenge to developers and users. Despite the difficulty, the need to justify substantial investments in IS motivates academics and practitioners alike to attempt to continuously improve quality assessment procedures and methods. The purpose of this research is first to develop effective assessment measures of both information systems quality and organizational quality. Self-assessment surveys are developed based on the criteria of established IS and organizational frameworks. An IS quality assessment survey is developed on the basis of an Information Systems Assessment model (Myers, Kappelman, and Prybutok, 1997) and an organizational quality assessment tool is built on the MBNQA framework (NIST, 2000). Secondly these survey instruments are refined and tested for validity. This validation step will identify how each model is theoretically well founded by exploratory and confirmatory factor analysis. Thirdly a comprehensive IS quality assessment framework is proposed in an organizational context in order to examine various relationships between the IS subsystem and the other subsystems in an organization. Confirmatory factor analysis examines how well actual observation conforms to the new framework and compares the efficacy between the proposed framework and the previous ones. Finally, and most importantly, this study investigates the relationship among the different components in an organization, concentrating on the effect of information systems on the other system components in the utilization of the new proposed framework.

Statement of the Problem

A framework is important to the IS researcher in that it provides a structure for new findings and improvement. The framework helps define and organize components within the IS discipline. A framework assists researchers in more clearly defining constructs and improving the internal validity of their research. Without a framework research will result in chaotic and unintegrated findings.

A framework defines the variables within a research area and their linkages (Lucas, 1973). Frameworks should be complete (Nolan and Wetherbe, 1980). Barriff and Ginzberg (1982) stated that a framework should be concise, complete, consistent, mutually exclusive, and that it should impact behavior. They also emphasized that a framework should be a complete model for a discipline and contain individual sub-disciplines that can be individually researched. Gorla (1989) stated that a framework is a function within a discipline. He reiterated Barriff and Ginzberg's definition (1982) and added the concept that "framework must direct new research." Cushing (1990) added to the previous definitions the critical components of the integration of theory and new findings. Thus, a framework is a structure that holds theories and empirical findings together such that it is researched in a structured and methodical manner.

Primary IS frameworks were built in the 1970s. Gorry and Scott Morton (1971) built their IS framework on Anthony's model, which addressed the issue of resource allocation within an organizational context. They defined a matrix of operational control, management control, and strategic planning in the categories of structured, semistructured, and unstructured. Chervany, Dickson, and Kozar (1971) brought the psychology factor into MIS for the first time along with the introduction of experimental

gaming. Mock (1973) added the impact and influence of the external environment. Mitroff and Mason (1973) proposed one of the most well-accepted definitions: 'A person with a certain psychological type faces a problem in organizational context, in which he needs evidence to reach a decision, and the evidence is represented in a certain mode of presentation.'

Lucas (1980) was the first researcher to present both IS variables and their linkages. He was also the first to address systems and operations development activities. Nolan and Wetherbe (1980) presented a micro-framework and documented man and machine as an integrated part of MIS. Ives, Hamilton, and Davis (1980) published a synthesis and analysis of 331 MIS related dissertations and a review of the previously published MIS frameworks. Barriff and Ginzberg (1982) addressed the issue of behavior for the first time. Nauman and Jenkins (1982) provided a framework on prototyping. Guinan and Bostrom (1986) suggested the need for more accurate and improved communication among MIS researchers. Hirscheim and Newman (1990) suggested the use of symbolism and metaphor to better define MIS. Moad (1993) presented a framework for evaluating the IS function in relation to how top management seeks to measure the IS function for its contribution to the business. Moad's framework is a three by three matrix resulting in nine different categories of IS function performance. One axis consisted of the sources of the IS function's performance and the other axis contained the area of company impact. Saunders and Jones (1992) developed an IS function performance evaluation model. This model helped to describe how measures are selected from the multiple dimensions of the IS function relative to specific organizational factors based on the perspective of the evaluator.

Resting on the foundation of the work of Shannon and Weaver (1949) and Mason

(1978), DeLone and McLean (1992) attempted to systematically combine individual

measures from IS success categories to create a comprehensive model. DeLone and

McLean proposed that

"System Quality and Information Quality singularly and jointly affect both Use and User Satisfaction. Additionally, the amount of Use can affect the degree of User Satisfaction – positively or negatively – as well as the reverse being true. Use and User Satisfaction are direct antecedents of Individual Impact; and lastly, this Impact on individual performance should eventually have some Organizational Impact."

As shown in Figure 1, DeLone & McLean's model depicts the relationships of the

six IS success dimensions. This model is regarded as the most comprehensive IS assessment model within the body of IS research.



Figure 1. DeLone & McLean's IS Success framework

In recognition of the importance of an emerging dimension of 'information service quality' in information systems assessment, Pitt, Watson, and Kavan (1995) proposed a model of information system success similar to the DeLone & McLean's model, except service quality was included as one of the dimensions that affects both use and user satisfaction. Figure 2 shows the interrelationship among seven dimensions with an inclusion of the service quality in DeLone & McLean's work.



Figure 2. Pitt, Watson, and Kavan's Revised Information System Success Model (1995)

In 1997, Myers, Kappelman and Prybutok proposed an Information Systems Assessment (ISA) framework with the inclusion of an additional dimension 'Work group impact' within Pitt et. al.'s IS success model. The dimension is considered an important intermediate stage between the individual and the organization since the organizational environment of many firms places a greater emphasis on the role of teams in the work force (Alavi and Keen, 1989; Grohowski, McGoff, Vogel, Martz, and Nunamker, 1990).



Figure 3. Myers, Kappelman and Prybutok's ISA model (1997)

While numerous IS frameworks and models are proposed in the literature, IS assessment continues to be a pressing issue. In addition, little agreement exists on the role of the IS function within an organization and on how the IS dimension is related to the other organizational dimensions. The underlying assumption of the IS assessment efforts made to date is that finding IS success factors and assessment tools would allow for enhancement of IS quality and productivity and, ultimately, an organization's performance and profitability. However, the proposed models were developed from an information systems perspective and, as a result of such development, they reside in an information systems specific domain. These models may satisfy many of the requirements for a framework but lack completeness in examining the role of IS at an organizational level. The ISA proposed by Myers et. al. (1997) is the most comprehensive IS assessment framework but still fails to adequately relate IS to organizational structure. Though such approaches attempt to rationalize the relationship between IS quality and organizational quality, they lack appropriate variables and linkages in the framework. Thus examining the IS role in an organization-wide view as well as in a IS specific view is necessary to weave the IS function into an organizational context.

A new framework is imperative to further research on the relationship between IS quality and organizational quality. To satisfy this need ISA is integrated into an organizational quality framework and an updated framework is proposed and tested in this study.



Figure 4. Malcolm Baldrige Criteria for Performance Excellence Framework (NIST, 2000)

The Malcolm Baldrige National Quality Award (MBNQA) framework is considered the most appropriate organizational quality and productivity measurement (Carrubba, 1992; Dean & Bowen, 1994; Bemowski, 1995; Bemowski and Stratton, 1995). The MBNQA framework was created in 1987 under the auspices of the US Department of Commerce for the purpose of fostering the improvement of national competitiveness (NIST, 2000). The MBNQA provides a complete set of criteria to be used in developing a Total Quality Management system, including leadership, information & analysis, strategic planning, human resources, custome r focus and satisfaction, process management, and business results. The framework also outlines the relationships among these seven criteria. While this framework is not specific to the IS function, it provides the potential to develop an adequate assessment tool for all areas of the business including the IS function. The MBNQA provides an excellent view of an organization-wide quality system. However, it does not sufficiently measure IS quality. The Information & Analysis category in MBNQA carries heavy emphasis on performance quality measurement, such as measuring and analyzing performance data in an organization. Coupling ISA with MBNQA results in a thorough IS framework that provides a holistic view on how information system quality is related to organizational quality and productivity. This research proposes that the integration of the ISA model into the MBNQA framework allows development of a new organizational-level framework. This new framework will enhance the examination of how organizational dimensions interact with each other and how they singularly or jointly result in organizational outcomes within a larger organizational context. Three dimensions in ISA, impact on individual, workgroup, and organization, are assumed to be absorbed into six MBNQA dimensions in the new framework to ensure discriminant validity avoiding measurement redundancy. This study proposes a comprehensive IS-MBNQA framework as shown in Figure 5.



Figure 5. IS-MBNQA framework

Research Questions

Based on the survey questionnaires, these research questions are to be investigated in this study:

- 1. Is the MBNQA framework valid?
- 2. Is DeLone & McLean's IS success model valid?
- 3. Is the proposed IS-MBNQA framework valid?
- 4. What are the relationships among the seven dimensions in the IS-MBNQA framework?
- 5. Does Information System quality contribute to Organizational performance? Significance of the Study

There is a limitation on IS research regarding the relationship between IS quality and organizational quality due to the lack of a proper framework. A new framework proposed in this work is imperative to extend research in this field. The proposed IS-MBNQA framework is expected to satisfy this need.

In the early stage of this study, the IS-MBNQA assessment survey is developed for this work. The IS-MBNQA survey consists of two main components, MBNQA and ISA that are combined in an effort to integrate two frameworks. The MBNQA selfassessment survey is developed based on the original theoretical criteria of the 2000 MBNQA framework (NIST, 2000). This instrument is further modified to better fit the government organization. The ISA framework is an extension of DeLone & McLean's model. Questions were modified by the author after an extensive literature review on the previously published DeLone & McLean's instrument to create a unique and new ISA instrument. The survey instrument is used for testing the validity of several frameworks including IS-MBNQA, MBNQA, and DeLone & McLean's. Though the validity testing effort of the instruments is important on these three models, the MBNQA instrument validity test is unique to this work. The validity of a remains untested despite its popularized use as an organizational quality assessment tool. Most of the quality management literature has focused on measurement model construct and scale development but only one recent study (Wilson and Collier, 2000) evaluated the causal relationship of 1995 MBNQA framework (NIST, 1995) and the was subsequently modified in 2000. This study is the first one to empirically test the validity of the 2000 MBNQA framework (NIST, 2000).

The instruments developed for this work are utilized as a foundation for identifying the relationships among the dimensions within and between each framework. As a result of the proposed IS-MBNQA framework, emphasis is put on the investigation of the impact and the role of IS on organizational performance. As a result of this research investigation, the IS-MBNQA framework may potentially better explain the contribution of IS in an organization.

The MBNQA instrument is beneficial to the many organizations that use the MBNQA for performance and quality goals. The MBNQA self-assessment survey serves as a much more convenient alternative to full scale MBNQA evaluation by providing organizations with a quick and cost-effective quality assessment tool. The use of audit teams to complete a traditional evaluation takes considerable time and expends more resources than the proposed instrument. Individual organizations can use results of a

MBNQA self-assessment utilizing the developed instruments to determine their strengths and areas for improvement.

CHAPTER 2

LITERATURE REVIEW

This chapter provides a review of the pertinent literature and is divided into three sections. The first section is a literature review concerning information systems quality issues. The second is pertaining to organizational quality and performance with a concentration on the MBNQA framework. The third concerns the impact of IS on organizational performance.

Information Systems Measurement

Introduction

The classical purposes of an Information System are to support decision making in an organization (Davis and Olson, 1985) and to enhance organizational efficiency, quality, and productivity. Several models attempted to determine how information systems aid individual decision making by specifying the decision making process, whereas others focused on organizational decision making. Researchers have qualified the decision models by cognitive style (such as Hunt, Krzystofiak, Meindle, & Yousry, 1989), systematic decision theory, or intuitive decision theory (Isenberg, 1984). Making decisions is not a single activity that takes place all at once. The process consists of several different activities that take place at different times. Simon(1976) described four different stages in decision making: intelligence, design, choice, and implementation. Intelligence consists of identifying and understanding the problems. Possible solutions to the problems are designed. Choice consists of choosing among solution alternatives.

During solution implementation, the decision is put into effect. At any point in the decision-making process, one may have to loop back to a previous stage, so the process dose not necessarily follow a linear path. Gorry and Scott Morton (1971) defined the IS matrix by classifying organization levels: operational control, management control, and strategic planning in the categories of decision types (structured, semi-structured, and unstructured). Usually, operational control personnel face fairly well structured problems while a strategic planner usually encounters highly unstructured problems. In 1989, Hunt et al. proposed a simple flow for a decision environment, and decision outcome. Spence (1993) proposed the General Behavior Model for MIS offering comprehensive understanding for human-computer interaction with a focus on human components of the system.

In recognition of the importance of information systems as a critical decision and operational tool in an organization, several research efforts have focused on the development of an IS assessment framework (Beise, 1989; Dickson, Wells, & Wilkes, 1988; Wells, 1987). Articles discussing the need to assess the contribution of the IS function to the organization began appearing in the late 1970s (King and Rodriguez, 1978; Matlin, 1977; Rolefeson, 1978). Early research concentrated on economic considerations and introduced the idea that multiple assessment measures were essential to develop a clearer picture. (Ahituv, 1980; Bender, 1986; King and Schrems, 1978; Matlin, 1979). Borovits and Neumann (1979) described several indices of performance such as capacity, response time, throughput rate, overhead percentage, software time measures, raw speed, and availability. McLean (1973) called for a shift from a

measurement focus on efficiency to effectiveness emphasizing the alignment of the IS function with its organizational goals. An effective IS function is concerned about doing the right things, not about doing things right.

In a cooperation with the Ernst & Young Center for Information Systems and Strategy, Moad (1993) presented a framework for evaluating the IS function in relation to how top management wants to measure the IS function for its contribution to the business. The framework is a three-by-three matrix resulting in nine different categories of IS function performance. One axis consists of the sources of the IS function's performance and the other axis contains the area of company impact. Saunders and Jones (1992) developed an IS function performance evaluation model. This model helps describe how measures should be selected from the multiple dimensions of the IS function relative to specific organizational factors on the perspective of the evaluator. The identified dimensions in order of importance were 1) IS function impact on strategic direction, 2) integration of the IS function planning with corporate planning, 3) the quality of information outputs, and 4) the IS function's contribution to organizational financial performance. Even though its contribution to IS assessment theory is significant, the model has a limitation as a comprehensive IS assessment model because of the small sample size (three companies), oversight of the process nature of performance of the IS function (DeLone and McLean, 1992), and a limited and inadequate list of suggested measures for each dimension.

DeLone and McLean's IS success model (1992)

An important step in consolidating prior research was undertaken by DeLone and McLean (1992). They attempted to systematically combine individual measures from IS

success categories to create a comprehensive measurement instrument. Their model rests on the foundation of the work of Shannon and Weaver (1949) and Mason (1978). Shannon and Weaver (1949) used accuracy and efficiency of the system producing the information as the definition of the technical level, the level of success in relating the intended meaning as the definition of the semantic level, and the effect of the information on the receiver as the definition of the effectiveness level. Mason (1978) extended the Shannon and Weaver (1949) model by renaming effectiveness as influence and presented this level as a series of events that take place at the receiving end of an information system. DeLone and McLean (1992) suggested that Mason's extension of communication theory to the IS measurement implies the need for separate success measures for each level of information. They reviewed 180 articles concerning the IS success issues and collected empirical measures of each of the six dimensions of their model.

Table 1.

The comparison of three studies: Shannon & Weaver (1949), Mason (1978), and DeLone & McLean (1992).

Shannon	Technical	Semantic	Effectiveness or Influence Level		
& Weaver	Level	Level			
(1949)					
Mason	Production	Product	Receipt	Influence on	Influence on
(1978)				Recipient	System
DeLone &	System	Information	Use	Individual	Organizational
McLean	Quality	Quality	&	Impact	Impact
(1992)	_	-	User Satisfaction	_	_

DeLone and McLean proposed that "SYSTEM QUALITY and INFORMATION QUALITY singularly and jointly affect both USE and USER SATISFACTION. Additionally, the amount of USE can affect the degree of USER SATISFACTION – positively or negatively – as well as the reverse being true. USE and USER SATISFACTION are direct antecedents of INDIVIDUAL IMPACT; and lastly, this IMPACT on individual performance should eventually have some ORGANIZATIONAL IMPACT."

As shown in Figure 6, DeLone & McLean's model depicts the relationships among the six IS success dimensions. This model is regarded as the most comprehensive IS assessment model within the body of IS research.



Figure 6. IS Success Model (DeLone & McLean, 1992)

The definitions of the constructs of the IS Success Model based on the study of DeLone and McLean (1992) are described as follows:

1. System Quality: System quality refers to measures of the information processing system itself. System quality is the desired characteristics of the IS itself which are focused on by some IS researchers. These desired characteristics of the IS itself include convenience of access, flexibility of system, integration of systems, response time, realization of user expectations, reliability, ease of use, ease of learning, usefulness of IS, etc.

2. Information Quality: Information quality refers to measures of information and data for desired characteristics, such as accuracy, precision, currency, reliability,

completeness, conciseness, relevance, understandability, meaningfulness, timeliness, comparability, and format.

3. Use: The use of IS refers to the consumption of the output by the recipient of an IS. The extent of the use of IS is one of the most frequently reported measures of the success of IS (Ein-Dor and Segev, 1978; Hamilton and Chervany, 1981). System use is chosen as the primary variable for the IS research framework due to its mutual interdependency with other IS success dimensions (Ein-Dor and Segev, 1978).

4. User Satisfaction: User satisfaction refers to the recipient response to the use of the output of IS. When the use of IS is required, the preceding measures become less useful, and successful interaction with IS can be measured in terms of user satisfaction. Studies have found that user satisfaction is associated with attitudes toward computer systems so that user satisfaction measures may be biased by user computer attitudes (Lucas, 1978). Therefore, studies that include user satisfaction as a success measure should ideally also include measures of user attitudes so that the potentially biasing effects of those attitudes can be controlled in the analysis.

5. Individual Impact: Individual impact refers to the effect of information on the behavior of the recipient. Individual impact indicates that the IS environment has given the user a better understanding of the decision context, has improved the user's decision-making productivity, has produced a change in the user's activity, or has changed the decision maker's perception of the importance or usefulness of the IS environment. Emery (1971) states that information has no intrinsic value; any value comes only through the impact it may have on physical events. Such impact is typically exerted through human decision makers.

6. Organizational impact: Organizational impact refers to the effect of IS on organizational performance. More comprehensive studies of the effect of computers on an organization include both revenue and cost issues within a cost and benefit analysis (Emery, 1971).

Subsequent studies have partially validated the model (Seddon and Kiew 1994; Goodhue and Thompson 1995; Etezadi-Amoli and Farhoomand 1996; Jurison 1996; Guimaraes and Igbaria 1997; Igbaria and Tan 1997; Teo and Wong 1998, Drury and Farhoomand, 1998). Seddon and Kiew (1994) were the first to publish an empirical test of the DeLone and McLean model using a slightly modified version of the first four dimensions of the model. The results provided support for the model. Hwang and Windsor (1996) employed meta-analysis for a validity test of the model and stated that although the model is a significant contribution, it needs further development and validation before it can serve as a basis for the selection of success measures. Torkzadeh (1994) pointed out that many systems are not voluntarily used and that perceived and actual uses may differ substantially. Bonner (1995) suggested that characteristics of information users, not systems quality, primarily affect user satisfaction. Use and satisfaction have been found to be causally related and possibly embedded in other dimensions (Ballentine, 1996). Ishman (1996) identified the model as a mixture of individual user and group attributes. At the group or organizational level, the modules representing use, user and individual impact drop out completely. Thus, depending on the context in which the model is employed, various parts need to be eliminated and others refined.

IS-SERVQUAL (Information Systems Service Quality)

The conventional role of an information system department was to provide and maintain the information system. However, as the end-user's role and involvement become more important, IS service quality also becomes a significant component of the IS function. Yet most IS assessment measures focus on the products of the IS function such as systems or information, rather than on the services. The IS effectiveness can not be fully measured without appropriate measurement of IS service quality. The IS department is not only a provider of products but also a service provider. Numerous information systems researchers contend that service quality is an important variable that affects IS success (Rands, 1992; Ferguson and Zawacki, 1993; Kettinger and Lee, 1994; Pitt, Watson, and Kavan, 1995). Service Quality has also been named a critical success factor for IS organizations (Furguson and Zawacki, 1993) that affects both use and user satisfaction (Pitt et al., 1995).

In response to the need for IS service quality measures, Pitt et. al. (1995) and Kettinger and Lee (1994) made important contributions to the field. Pitt et al. (1995) proposed the Information Systems Service Quality (IS-SERVQUAL) model by adapting the SERVQUAL questionnaire (Parasuraman, Zeithaml, and Berry, 1988) from the marketing literature. They proposed a set of determinants that can be used to assess service quality regardless of the type of service. Their initial research resulted in a model of service quality with distinct gaps occurring in organizations that influence service quality performance, as perceived by users. Their exploratory research reveals that the criteria used by users to evaluate service quality fit into the potentially overlapping dimensions. The 10 dimensions below become the foundation of the service quality

domain from which items were derived to develop the SERVQUAL scale. This model provides considerable help for the IS manager in knowing how to measure service quality.

- 1. <u>Reliability</u> involves consistency of performance and dependability.
- <u>Responsiveness</u> concerns the willingness or readiness of employees to provide service.
- <u>Competence</u> means possession of the required skills and knowledge to perform the service.
- 4. <u>Access</u> involves approachability and ease of contact.
- 5. <u>Courtesy</u> involves politeness, respect, consideration, and friendliness of contact personnel.
- 6. <u>Communication</u> means keeping users informed in language they could understand and listening to them.
- 7. <u>Credibility</u> involves having values most important to the customer such as trustworthiness, believability, and honesty.
- 8. <u>Security</u> is freedom from danger, risk, or doubt such as physical safety, financial security and confidentiality.
- <u>Understanding/Knowing the users</u> involves making the effort to understand the user's needs.
- 10. <u>Tangibles</u> include the physical evidence of the service.

Moreover, the work of Parasuraman et. al. (1988) conceptualized service quality

as a 5-dimensional construct consisting of tangibles, reliability, responsiveness,

assurance, and empathy. They identified 22 items to measure these 5 dimensions below

based on a series of studies through several iterations, universally across service industries. The SERVQUAL instrument is designed to be broadly applicable to service industries, and has been used by researchers (Augustyn and Ho, 1998; Ryan and Cliff, 1997; Ryan and Cliff, 1996; Cronin Jr. and Taylor, 1992; Babakus and Boller, 1992; Carman, 1990; Parasuraman, Zeithaml, and Berry, 1988) in replication studies in service industries, such as banking service, credit card processing service, repair and maintenance service, long distance telephone service, etc.

- 1. <u>Tangibles</u>: The appearance of physical facilities, equipment, personnel, and communication materials.
- 2. <u>Reliability</u>: The ability to perform the promised service dependably and accurately.
- 3. <u>Responsiveness</u>: The willingness to help users and to provide prompt service.
- 4. <u>Assurance</u>: The knowledge and courtesy of employees and their ability to convey trust and confidence.
- 5. <u>Empathy</u>: The provision of caring individualized attention to users. However, the most popular instrument for measuring service quality, IS-

SERVQUAL, has been criticized on both methodological and theoretical grounds (Babakus and Boller, 1992; Brown, Churchill, and Peter, 1992; Van Dyke, Kappelman, and Prybutok, 1997, 1999), and some researchers even suggest it should be abandoned altogether (Smith, 1995). As competition in the information service industry grows and managers have to justify the cost of information systems and information centers, it is critical that reliable instruments be developed to measure both service quality and success. Kettinger and Lee (1997) recommended a combination of Parasuraman et. al.'s (1985, 1988, 1991) Service Quality (SERVQUAL) questionnaire and Ives, Olson, and Baroudi's (1983) User Information Satisfaction (UIS) instrument to measure the satisfaction of users with information services providers. Galletta and Lederer (1989) discussed the difficulties associated with the use of this UIS questionnaire to measure user satisfaction. Citing poor reliability, they cautioned against the use of the UIS instrument to evaluate the information system (IS) function. Furthermore, while it may be true that the SERVQUAL instrument is a commonly-used measure for the assessment of perceived service quality in both marketing practice and research, Kettinger and Lee (1997) acknowledged that a number of studies have identified potential difficulties related to this instrument (e.g., Carman, 1990; Babakus and Boller 1992; Cronin and Taylor, 1992).

The difficulties associated with the SERVQUAL measure that are identified in the literature can be grouped in four main categories: 1) The use of difference or gap scores; 2) Poor predictive and convergent validity; 3) The ambiguous definition of the "expectations" construct; and 4) Unstable dimensionality. Given the problems cited above, a modified version of IS-SERVQUAL was proposed by Van Dyke, Kappelman, and Prybutok (1997). After conducting exploratory research with a series of executive and focus groups interviews, Van Dyke et al. found a set of ten dimensions that clients use in forming expectations and perceptions of information systems service quality. The instrument developed by Van Dyke et al. will be used in this work. The instrument results in one-half as many questions as traditional SERVQUAL while eliminating the many psychometric, methodological and statistical problems associated with the use of

difference scores. However, unlike the use of a perceived-performance only scoring method, the new instrument maintains the disconfirmation-of-expectations construct for perceived service quality. Figure 7 shows the theoretical framework that summarizes the nature and determinates of information system service quality.



Figure 7. Information Systems Service Quality Model
Table 2.

Determinants of IS Service Quality (Van Dyke et al., 1997)

Determinants	Descriptions
Reliability	The extent to which the management information science
	(MIS) staff performs promised service dependably.
Competence	The technical skills and expertise of the MIS staff.
Responsiveness	The willingness and speed with which the MIS staff makes an
	initial response to inquires from users.
Timeliness	The elapsed time between a user's request and the
	design, development and implementation of new
	applications or change requests by the MIS staff.
Communications	The exchange of pertinent information between the MIS staff
	and the users.
Training	The amount of instruction and support for learning that is
	afforded to the user to increase the user's proficiency in utilizing
	computer-based IS.
Empathy	The ability of the MIS staff to understand the specific needs of
	the user.
Attitude/Commitment	The commitment of the MIS staff to support user involvement
to user involvement	and participation in the design, development, or alteration of
	computer-based IS.
Relationships	The manner and methods of interaction, conduct, and personal
	association between users and the MIS staff.
Access	The availability or ease with which the appropriate hardware,
	software, and people can be utilized to support the users in the
	performance of their jobs.

Revised IS success model and Information Systems Assessment (ISA) model

Pitt et. al. (1995) proposed a model of information system success similar to the DeLone & McLean's model, except service quality was included as one of the dimensions that affects both use and user satisfaction. As Pitt et. al. stated, service quality is a critical element in information system success due to changes in how information technology is used in organizations and greater emphasis on end-user computing. The primary reason IS departments measure user satisfaction is to improve service quality, and the perceived quality of service provided by the IS departments is a key indicator of information system success (Pitt, Watson, and Kavan, 1995).



Figure 8. ISA framework

In recognition of importance of an emerging dimension of information service quality in information systems assessment, Myers, Kappelman and Prybutok (1997) also proposed Information Systems Assessment (ISA) framework by modifying DeLone & McLean's framework with an inclusion of service quality dimension. Additional new dimension added in ISA model is 'Work group impact'. The dimension is considered as an important intermediate stage between the individual and the organization since organizational environment of many firms places a greater emphasis on the role of teams in the work force (Alavi and Keen, 1989; Grohowski, McGoff, Vogel, Martz, and Nunamker, 1990). The importance of the dimension is supported by numerous research (Barua, Kriebel, and Mukhopadhyay, 1995; Moad, 1993, Bakos, 1987; Tyran, Dennis, Vogel, and Nunamaker, 1992; Satzinger and Olfman, 1995). Figure 8 shows interrelationship among eight dimensions with an inclusion of the two dimensions in DeLone & McLean's.

Organizational Quality Measurement

Introduction

Quality management has long been one of the top priorities in the most U.S. organizations. The historical evolution of quality management during past decades contained four stages (Asher, 1992). The first stage involved a costly and inefficient inspection based system. The second stage incorporated quality control systems into previous inspection based system. The third stage is characterized as prevention based quality assurance systems. The fourth stage uses a quality system that embraces the entire organization including all the stakeholders such as suppliers, employees, and customers. Such a process involving the quality improvement in all aspects of an organization is called Total Quality Management (TQM). TQM is regarded as one of the most effective ways to improve quality and enhance productivity (Oakland, 1993, Becker, William, & Daniel, 1994).

Much has been written about how TQM can be managed in an organization largely based upon studies of the leading gurus of the discipline such as Deming, Juran, Crosby, Feigenbaum, and Ishikawa. A wide range of issues, techniques, and approaches has been collected together under TQM philosophy on their studies. These issues include process management (Deming, 1982; Juran, 1980, 1988; Oakland, 1993; Shewart, 1931), leadership (Crosby, 1979; Deming, 1982; Oakland, 1993), supplier management (Crosby, 1979; Deming, 1982; Feigenbaum, 1961; Juran, 1988), quality systems (Crosby, 1986; Feigenbaum, 1961; Juran, 1988; Oakland, 1993), statistical process control (Deming,

1975; Ishkawa, 1985; Juran, 1988; Shewart, 1931), teamwork (Ishkawa, 1985; Joiner, 1986; Juran, 1988; Kanji, 1990; Oakland, 1993), quality policies (Crosby, 1979; Feigenbaum, 1961), zero defects (Crosby, 1979), training (Deming, 1975, 1982), planning (Groocock, 1986; Juran 1980), measuring quality costs (Benson, 1991; Crosby, 1979; Feigenbaum, 1961; Juran, 1962), customer feedback (Destanik, 1992; Zairi, 1992), and benchmarking (Camp, 1989; Zairi, 1992). Though no single TQM model has been unanimously established, there has been a trend in organizations to use TQM frameworks based upon the assessment criteria from key quality awards such as the Deming Prize in Japan, the Malcolm Baldridge National Quality Award (MBNQA) in the US and the European Quality Award (Black and Porter, 1996). MBNQA has become the most notable and best-established framework for TQM practices (Black and Porter, 1996; Sunday and Liberty, 1992; Heaphy, 1992; Saco, 1997; Przasnyski and Tai, 1999; Wilson and Collier, 2000).

Malcolm Baldrige National Quality Award

Malcolm Baldrige National Quality Award (MBNQA) was created by the United States Department of Commerce in 1987 to enhance competitiveness (Bell and Keys, 1998; Decarlo and Sterett, 1990). Specific goals of the award include promoting awareness of the relationship between quality and competitiveness, increasing understanding about the level of quality required to achieve world class recognition, and fostering the sharing of information about quality by world class organizations (N.I.S.T., 1995; Bemowski, 1995; Bemowski and Stratton, 1995). Seven criteria of MBNQA represent core values and concepts such as Leadership, Strategic Planning, Customer and

Market Focus, Information and Analysis, Human Resource Focus, Process Management, and Business Results.

Figure 9 below provides the theoretical framework connecting and integrating the categories. From top to bottom, the framework has three basic elements.



Figure 9. Malcolm Baldrige Criteria for Performance Excellence Framework

1. Strategy and Action Plans

Strategy and Action Plans yield the set of customer and market focused performance requirements, derived from short- and long-term strategic planning, that must be met and exceeded for an organization's strategy to succeed. Strategy and Action Plans guide overall resource decisions and drive the alignment of measures for all work units to ensure customer satisfaction and market success.

2. System

The system is comprised of the six Baldrige Categories in the center of the figure that define the organization, its operations, and its results.

Leadership (Category 1), Strategic Planning (Category 2), and Customer and Market Focus (Category 3) represent the leadership triad. These Categories are placed together to emphasize the importance of a leadership focus on strategy and customers. Senior leaders must set organizational direction and seek future opportunities for the organization. If leadership does not focus on customers the organization as a whole will lack that focus. Human Resource Focus (Category 5), Process Management (Category 6), and Business Results (Category 7) represent the results triad. An organization's employees and its key processes accomplish the work of the organization that yields business results. All actions point toward Business Results — a composite of customer, financial, and operational performance results, including human resource results and public responsibility.

The horizontal arrow in the center of the framework links the leadership triad to the results triad, a linkage critical to organizational success. Furthermore, the arrow indicates the central relationship between Leadership (Category 1) and Business Results (Category 7). Leaders must keep their eyes on business results and must learn from them to drive improvement.

3. Information and Analysis

Information and Analysis (Category 4) is critical to the effective management of an organization and to a fact-based system for improving performance and competitiveness. Information and analysis serves as a foundation for the performance management system and serves as a moderator in a systems perspective.

There are many significant benefits derived from using the Baldrige criteria as a framework for Total Quality Management (TQM) implementation and internal self-assessment (Carrubba, 1992). One of the greatest is that the award criteria constitute a comprehensive framework of the total quality conceptual framework, and repeated

updates of the criteria by a team of experts (Baldrige Examiners and Judges) ensure currency. Furthermore, using the MBNQA criteria for self-evaluation can help organizations focus improvement where further effort is needed through prioritization of findings. Finally, the award criteria are synthesized from a variety of different quality perspectives and, therefore, are not limited to a single viewpoint (Dean and Bowen, 1994).

Despite the wide acceptance of the MBNQA criteria as a quality assessment tool (Bobrowski and Bantham, 1994; Herrington, 1994; Saco, 1997; Przasnyski and Tai, 1999; Wilson and Collier, 2000), some difficulties with its use still remain. First, the MBNQA criteria as a theoretical assessment tool have not been fully validated. Some studies proved financial outperforming of Baldrige awardees over other organizations. A recent study (Kosko, 1999) revealed that whole Baldrige winner companies outperformed the S&P 500 by more than 2.6 to 1, achieving a 460% return on investment compared to S&P 500's 175% return. Helton (1995) found a similar result by comparing the stock price increase between the awardees and Dow Jones Industrials over the same period. Knotts, Parrish, and Evans (1993) found a high degree of support for the MBNQA from the Fortune 500 industrial companies. However some articles did not support the MBNQA framework (Bleakly, 1993; Fuchsberg, 1992; Naj, 1993), mentioning the weakness of direct relationship between TQM practice and results. For example, the 1990 MBNQA winner, Wallace Company, went bankrupt (Hill, 1993). Garvin's (1991) article triggered a controversy as to whether the MBNQA represents TQM. Crosby and Deming challenged Garvin's idea that the MBNQA codifies the principles of TQM. To date, most of the TQM studies have focused on measurement model construct and scale

development (Adam, 1994; Anderson, Rungtusanatham, and Schroeder, 1994; Samson and Terziovski, 1999; Saraph, Benson, and Schroeder, 1989). Some studies investigated the structural model among constructs (Anderson, Rungtusanatham, Schroeder, and Sakakibara, 1994; Handfiled, Ghosh, and Fawcett 1998; Powell, 1995) but did not evaluate the MBNQA causal model.

Second, the MBNQA evaluation process is complicated and long. The procedure involves prescreening of documentation and a four-stage review process including a site visit. It takes 10,000 to 50,000 man-hours on average for preparing and applying for the award (Herrington, 1994; Wu, Wiebe, and Politi, 1997). Even though applicants benefit from the potential MBNQA application feedback, small and medium sized companies with limited resources cannot afford the time and the expense to hire the external consultants that are generally needed to complete the application process (Asher, 1992).

Saraph, Benson, and Schroeder (1989) reviewed previous quality literature and suggested eight critical factors of quality management. These include role of top management and quality policy, role of the quality department, training, product/service design, supplier quality, process management and operating procedures, quality data reporting, and employee relations. In 1991, U.S. General Accounting Office (GAO, 1991) published an article on the improved performance by TQM practice in the 20 highest scoring MBNQA applicants. Black and Porter (1996) identified 10 critical factors of TQM matched them to the equivalent MBNQA items. The factors include corporate quality culture, strategic quality management, quality improvement measurement systems, people and customer management, operational quality management, external

interface management, supplier partnerships, teamwork structures, customer satisfaction orientation, and communication of improvement information.

Handfield and Ghosh (1995) tested MBNQA criteria with data on the manufacturing sector. The survey questions were developed to measure MBNQA content and criteria. Their model explained 15% of the observed variation in financial performance using structural equation modeling.

Wu, Wiebe, and Politi (1997) proposed a self-assessment instrument based on the seven categories of the MBNQA criteria to assess total quality management (TQM) in an organization. However, not linking business results to the instrument makes it difficult to test the validity of the instrument. They reduced their original 38 question-pool into a small set of final survey items using two methods, neural network models and regression analysis. However the two methods yielded similar results with the neural network approach proving superior to regression when a quadratic relationship was involved. As expected, most of the questions selected with both neural network and regression analysis were the same. Also, the number of final survey items was not enough to adequately measure each business practice as enumerated by the actual MBNQA criteria. The MBNQA has nineteen sub-categories under major seven categories and the sub-categories are subdivided into still smaller groupings.

Samson and Terziovski (1999) used MBNQA's first six constructs and their respective factor scores as independent variables and seventh operating performance and its factor score as the dependent variable. The results of regression analysis showed that leadership, human resource management, and customer focus were statistically

significant and positively related to operating performance. The other independent variables were not significant or inversely related to operating performance.

Prybutok and Spink (1999) also developed a survey for the health care industry based on the MBNQA criteria. Factor analysis and regression were used to develop the survey. The results highlighted the need for further research investigating the dimensions associated with the MBNQA criteria and their relationship with the Information and Analysis component. Prybutok and Spink's instrument was targeted for use in the healthcare industry, thus the development of a generic version is required for general business applications.

Wilson and Collier (2000) made a significant effort on the validity test of MBNQA framework investigating causal relationships in it. They developed a 101 item questionnaire directly tying to the specific criteria in the 1995 MBNQA framework, then tested the causal linkages of the framework with obtained data. The results of factor analysis supported the MBNQA causal model and showed strong evidence of MBNQA criteria as consistent predictors of organizational performance. The study also revealed that 'Leadership' has no direct effect on 'Financial results' but must influence overall performance through the system and that 'Information and Analysis' is statistically the second most important category. However, this study tested the 1995 MBNQA framework, not current version. The distinction of the two, 1995 and 2000 frameworks, is the role of 'Information and Analysis' construct. The construct was used as mediator between 'Leadership' and 'Results' in 1995 framework while it is a moderator in 2000 serving as a foundation for the quality management system.

The first step in this research effort is to develop a MBNQA-based survey questionnaire for data gathering in order to test the validity of 2000 MBNQA framework and to explore the relationships among the seven dimensions.

MBNQA in Government Organizations

National Institute of Standards and Technology (NIST, 2000), administrator of MBNQA, provides frameworks for three different sectors, Business, Education, and Health care industry. However this does not mean the three sectors employ different frameworks to measure organizational quality. The causal relationships and skeleton of the frameworks do not change though a minor modification was made to reflect different characteristics of each sector. The modifications are mostly on the name of the dimensions of the framework and on the sector-specific terminologies. Customer & Market in Business sector is replaced by Patients & Customer (in HealthCare) or Student & Stakeholder (in Education). Human Resource is altered by Faculty & Staff (Education) or Staff (HealthCare). The scoring weight is almost the same except for a difference in the Result category in the Education sector due to the addition of 'Student & Stakeholder focused result'. Thus it implies that MBNQA framework is theoretically and practically efficacious for the most types of organizations including the government sector. The terminologies in the survey of this research are tailored to suit the need of quality measurement guidelines for the Government sector.

Several states, Arizona, Minnesota, Missouri, and North Carolina, devised programs that are closely modeled after the MBNQA (Bobrowski and Paul, 1994; Herrington, 1994; Pannirselvam et al., 1998). The focus of these state quality programs is to enhance the competitiveness of their state's various types of industries. Texas also has

a similar program but includes educational organizations in the groups eligible to apply to its award program. Despite these state awards within reach of a broader spectrum of organizations, there remains a need for a quick and cost-effective self-evaluation instrument based on all the MBNQA criteria as an alternative to a full scale MBNQA inspection.

Impact of IS on the Organizational Performance

The impact of information system (IS) on organizations has been one of the main issues over the recent years. Chief executive officers and IS managers face the critical issue of assessing the impact of IS and justifying technology investment in organizations. Numerous research efforts have investigated the impact of IS investment on organizational strategic and economic performance.

Nolan, Norton, and Company (1985) claimed that above-average spending on information system (IS) can enhance a firm's profitability. Harris and Katz (1989) suggested that high-performance firms spend a significantly higher proportion of revenues for IS than low-performance firms do. Roach (1991) found that, in the banking industry, expenditures for IS increased by 20 percent per year during the 1980s and by 1989 such spending totaled 45 percent of the entire industry's capital stock. An interview with a mostly senior non-IS manger group by Katz (1993) showed that the companies' information system (IS) investments have improved operations, productivity, customer satisfaction, and cost control. A series of the interview also found that IS managers tend to focus solely on cost cutting and productivity within the IS function proper, not recognizing that the strategic impact of IS is dispersed throughout the modern business organization. Mahmood and Mann (1993) stated that although the individual IS

investment variables were found to be only weakly related to organizational strategic and economic performance, they were significantly related to performance when grouped together. Powell and Dent (1997) presented results from an empirical study in the retail industry. The results showed that IS alone has not produced sustainable performance advantages in the retail industry but that a number of firms have benefited from using IS to leverage intangible, complementary human and business resources, such as flexible culture, strategic planning, IS integration, and supplier relationships. The findings supported the resource-based approach. Bharadwaj (2000) used a matched-sample comparison group methodology and publicly available ratings to assess IS capability and firm performance. Results indicate that firms with high IS capability tend to outperform a control sample of firms on a variety of profits and cost-based performance measures. In an attempt to construct a framework demonstrating the relationship between firm performance and both IS and corporate investment, Sircar, Turnbow, and Bordoloi (2000) revealed that IS investment made a significant contribution to a firm's performance and that spending on information systems personnel and training is a worthwhile effort. The study used International Data Corp. (IDC) survey data from 624 companies over the years 1988-1993, totaling 2,009 observations, and also from Standard & Poor's and Moody's. Palaniswamy and Frank (2000) studied on the impact of enterprise resource planning (ERP) systems in organizations and presented five case studies that demonstrate how ERP systems improve performance and cross-functional integration in manufacturing organizations. They argued that the cost associated with ERP implementation is small compared with the advantages IS offers. Brynjolfsson and Hitt (2000) argued that a significant component of the value of IS is its ability to enable

complementary organizational investments, such as business processes and work practices, and that these investments lead to productivity increases by lowering costs and allowing firms to increase output quality in the form of new products or improvements in intangible aspects of existing products, such as convenience, timeliness, quality, and variety. They found considerable evidence in both the case literature on individual firms and multi-firm econometric analyses to support their view.

Although much evidence supports the positive impact of IS investment on organizational strategic and economic performance, there is little agreement on how the IS impact is measured. Cron and Sobol (1983) investigated the effect of computer utilization on the organizational performance of 138 medical wholesalers. Computer utilization was measured in terms of the reported number of computer applications and organizational performance was measured using four profitability measures: pretax profits, return on assets, return on net worth, and five-year sales growth. Bender (1986) measured organizational performance in terms of the ratio of total operating expense to total premium income. The IS impact was represented by the ratio of informationprocessing expense to total operating expense. Bender concluded that an appropriate level of investment in IS could have a positive impact on total expenses and that the optimal investment in IS for the companies studied was achieved at a level between 20 and 25 percent of total operating expenses. In a four-year investigation of forty insurance companies, Harris and Katz (1989) used the ratio of IS expense to premium income and the ratio of information system expense to total operating expense as IS investment while organizational performance was measured by the ratio of total operating expense to premium income. Alpar and Kim (1990) used a microeconomic theory-based approach to

investigate the impact of IS on the performance of a large number of banks. Time deposits, labor, capital, and IS expenses were used as inputs to the model. Demand deposits, installment loans, real estate mortgage loans, and commercial and other loans were used as outputs from the model. Overall, IS effort was found to be cost reducing. Mahmood and Mann (1993) used five ratios as IS investment: IS budget as a percentage of revenue, value of an organization's IS as a percentage of revenue, percentage of IS budget spent on staff, percentage of IS budget spent on the training of IS staff, number of PCs and terminals as a percentage of total employees. Organizational performance was measured by six direct ratios: return on investment, return on sales, growth in revenue, sales by total assets, sales by employee, and market to book value.

Rai, Patnayakuni and Patnayakuni (1997) argued that the measures of IS investment have differential effects on the various measures of corporate business performance and that the way in which the impact of IS is measured is an important consideration. Given the complexity of an organization, no single set of measures will be sufficient to capture all factors contributing to both IS investments and organizational performance. Moreover, most research efforts in this field have been made on the impact of IS investment, not on IS quality as a whole. In addition, most of the previous studies investigated the direct relationship between IS and organizational performance without considering the interrelatedness of the other social and technological subsystems in an organization. While it is tempting to conclude higher IS investment will increase overall IS quality and organizational performance, it is unlikely that IS expenditures alone will ensure a firm's superior performance (Harris and Katz, 1989). Recent study by Wilson and Collier (2000) empirically tested the causal relationships of the MBNQA framework

and revealed that IS is the second most important indicator to business results in an organization wide perspective. In this study, overall IS quality will be measured by the composite index of the first five components in ISA model. These include system quality, information quality, IS service quality, use, and user satisfaction. Then the impact of IS on business results will be investigated with regard to the other five organizational subsystems within the MBNQA framework.

CHAPTER 3

MATERIALS AND METHODS

Introduction

This chapter presents the instrument development and research methodology used in this study. The procedure for constructing a survey instrument of Malcolm Baldrige Quality National Award (MBNQA) and Information Systems Assessment (ISA) will be discussed. Survey methodology and procedure will follow along with a description of several statistical analysis tools for this study. Validity and reliability issues will be also emphasized since a part of survey questionnaire developed in this study has not been validated yet.

One of the main objectives in this research is to develop effective and efficient assessment measures of organizational quality and information quality. It is essential to test whether these developed instruments really measure what it intends to with accuracy. The developed instruments will be used for refining instruments, comparing models, and investigating relationships among the constructs. In order to accomplish these objectives, survey data was gathered via a Web-based survey with the subject of City of Denton employees.

The Web-based survey of the City of Denton (COD) project was conducted by a research team from the University of North Texas (UNT) about how IT relates to organizational performance. There are three main parts (A, B, and C) in the web-survey, however this study utilizes only Parts A and B that are pertinent to this research.

Table 3.

Content	Part	Questions	# of Questions
Cover Letter			
Terms and Definition			
Demographics	A-1	1-12	12
MBNOA	A-2	1-36	60*
MIDNQA	A-3	37-71	09.
IS SERVOUAT	B-1	1-28	54
IS-SER VQUAL	B-2	29-54	54
IS-SUCCESS	B-3	1-16	19**

Content of the Web-Survey Questionnaire along with the Related Questions.

* Two redundant questions are excluded from the total. They are to check response consistency.

**One reversed question for checking response consistency is excluded. Three additional questions are included in a Demographic part.

Information Systems Assessment Instrument

Information Systems Assessment (ISA) is an attempt to integrate service quality component into DeLone & McLean's IS success model. IS-SERVQUAL instrument established by Van Dyke, Kappelman, and Prybutok (1997) is used for measuring information system service quality. Along with the use of IS-SERVQUAL, development effort will be mostly on the first four dimensions in ISA framework such as system quality, information quality, use, and user satisfaction.

IS-SERVQUAL

Van Dyke, Kappelman, and Prybutok's (1997) IS-SERVQUAL instrument serves to measure Information System service quality in this study. Since the debut of SERVQUAL a number of problems with the instrument have been reported and discussed in the literature (Babakus and Boller, 1992; Carman, 1990; Cronin and Taylor, 1992; Kettinger and Lee, 1997; Van Dyke, Kappelman, and Prybutok, 1997, 2000). Those problems have been discussed in the chapter 2. Van Dyke et. al.'s IS-SERVQAUL instrument is current and validated measurement through a series of executive and focus groups interviews. Also many psychometric, methodological and statistical problems associated with the use of difference scores were eliminated. The items pertaining to IS-SERVQUAL are mapped to 10 service quality dimensions as shown in Table 4, where the item numbers correspond to items in Part B-1 and B-2 of the Web-based survey. Table 5 represents the instrument of IS-SERVQUAL adapted from the study of Van Dyke et al. Van Dyke et al's original questionnaire is used except for a modification on the terminology to enhance respondents' understanding with use of familiar terms. 'Technology Service Department staff' replaces 'MIS staff' and 'the City' substitutes 'firm'. Respondents are asked to rate the extent to which the performance of the technology service department's staff meets their expectations by circling a number raging from 1 (far short of expectations) to 7 (greatly exceeds expectations).

Table 4

Dimension	Label	Part	Item Number
Reliability	RELI	B-1	Items 1-5
Competence	COMP	B-1	Items 6-11
Responsiveness	RESP	B-1	Items 12-17
Timeliness	TIME	B-1	Items 18-22
Communications	COMM	B-1	Items 23-28
Training	TRAIN	B-2	Items 29-33
Empathy	EMPA	B-2	Items 34-39
Attitude/Commitment to user involvement	ATTI	B-2	Items 40-44
Relationships	RELA	B-2	Items 45-49
Access	ACCE	B-2	Items 50-54

IS-SERVQUAL Item to Dimension Map: Total 54 items

Table 5.

Instrument of IS-SERVQUAL Adapted From the Study of Van Dye, Kappelman, Prybutok

(1997)

	Questions
1.	The MIS staff does what it promises to do.
2.	The MIS staff is reliable.
3.	The MIS staff performs services right the first time.
4.	The MIS staff is dependable.
5.	Reliability means the extent to which the MIS staff performs promised service dependably. Please rate the overall reliability of the MIS staff.
6.	The members of the MIS staff have the technical skills needed to do their jobs well.
7.	The members of the MIS staff are appropriately qualified for their jobs.
8.	The MIS staff has the expertise required to create or evaluate for purchase the information technologies needed by our firm.
9.	The MIS staff has the expertise required to maintain the computer-based information systems needed by our firm.
10.	The members of the MIS staff have an amount of experience appropriate for their positions.
11.	Competence means the technical skills and expertise of the MIS staff. Please rate the overall competence
	of the MIS staff.
12.	When I have a problem, the MIS staff does its best to respond as soon as possible.
13.	The people on the MIS staff return my calls promptly.
14.	Members of the MIS staff respond quickly to e-mails requesting information or assistance.
15.	Members of the MIS staff are always willing to help.
16.	The MIS department responds quickly to my requests for help with software applications.
17.	Responsiveness means the willingness and speed with which the MIS staff makes an initial response to
	inquires from users. Please rate the overall responsiveness of the MIS staff.
18.	When problems occur, the MIS staff solves them in a timely manner.
19.	The MIS staff finishes projects on time.
20.	The members of the MIS staff meet their deadlines during system development and implementation.
21.	Change requests are completed in a timely manner.
22.	Timeliness means the elapsed time between a user's request and the design, development and
	implementation of new applications or change requests by the MIS staff. Please rate the timeliness of the
	MIS staff.
23.	The members of the MIS staff are able to explain new systems/software in a manner that I can understand.
24.	The MIS staff keeps me informed in advance of scheduled system downtime.
25.	The MIS staff keeps me informed of the status of ongoing projects that will affect my job.
26.	It is easy for me to communicate with the MIS department.
27.	The MIS staff demonstrates good interpersonal communication skills in their interactions with other
	people.
28.	Communications means the exchange of pertinent information between the MIS staff and the users.
	Please rate the overall communication ability of the MIS staff.
29.	The MIS staff ensures that users are properly trained on new systems.
30.	The MIS staff provides adequate training support for my needs.
31.	The training provided by the MIS staff is helpful.
32.	I ne MIS start understands that a new project is not over until the user training is complete.
55.	Fraining means the amount of instruction and support for learning that is afforded to the user to increase
	the user's proficiency in utilizing information Technologies. Please rate the training provided by the MIS
2.1	
34.	The MIS staff understands the specific needs of the users.

- 35. My IT-related problems are important to the MIS staff.
- 36. The members of the MIS staff understand my frustrations with computer-based information systems.
- 37. The members of the MIS staff have my best interest at heart.
- 38. The members of the MIS staff show a sincere interest in helping me with my problems.
- 39. **Empathy** means the ability of the MIS staff to understand the specific needs of the user. Please rate the overall empathy of the MIS staff.
- 40. People on the MIS staff are open to suggestions from users regarding how Information Technology systems can be improved.
- 41. The members of the MIS staff are committed to user involvement in the design, development or alteration of computer-based information systems.
- 42. The members of the MIS staff seek input from users before making changes to existing systems.
- 43. The MIS staff considers users to be part of the development team.
- 44. **Attitude/Commitment to user involvement** means the commitment of the MIS staff to support user involvement and participation in the design, development, or alteration of computer-based information systems. Please rate the Attitude/Commitment to user involvement of the MIS staff.
- 45. The members of the MIS staff have a good working relationship with people in other departments.
- 46. I have a good working relationship with the members of the MIS staff.
- 47. The members of the MIS staff are courteous.
- 48. I get along well with members of the MIS staff.
- 49. **Relationships** mean the manner and methods of interaction, conduct, and personal association between users and the MIS staff. Please rate the relationships between you and the MIS staff.
- 50. The computer/network is available when I need to use it.
- 51. I can gain access to system resources when needed for work.
- 52. Help Desk and system support have operating hours convenient to the users.
- 53. The software that I need to do my job is available during working hours.
- 54. Access means the availability or ease with which the appropriate hardware, software, and people can be utilized to support the performance of your work. Please rate the access provided by the MIS staff. Please rate the access provided by the MIS staff.

Instrument of DeLone and McLean's IS Success Model

Delone and McLean's model (1992) provided an important consolidation of past

research. Their analysis led them to propose constructs that comprise an interrelated set

of six success constructs, which dominate the previous research. The six major

dimensions are system quality, information quality, use, user satisfaction, impact, and

organizational impact. The review of the literature reveals that these dimensions have

evolved over time. Following its appearance in the literature, a number of studies tested

explicitly the associations among the measures identified in the model (Etezadi-Amoli

and Farhoomand, 1996; Goodhue and Thompson, 1995; Guimaraes and Igbaria, 1997;

Igbaria and Tan, 1997; Jurison, 1996; Seddon and Kiew, 1994; Teo and Wong, 1998).

The other group of researchers implicitly tested the model by investigating multiple success dimensions and their interrelationships (Gelderman, 1998; Igbaria and Tan, 1997; Teng and Calhoun, 1996).

The operational definitions have been described by several researchers however without a convergent agreement. Quality has been an important dimension of systems success since the earliest studies. Mason (1978) included this dimension in his Stages of Communication. Examples of system quality include reliability, response time, data accuracy, completeness, system flexibility, ease of use, ease of learning, and usefulness of specific features. Information quality includes information accuracy, output timeliness, reliability, relevance, currency, and decision relevance. Some system output measures have been suggested for particular application areas, for example planning system success (Venkatraman and Ramanujam, 1987). Use is one of the most frequently reported measures of success of an information system. Examples include connect time, number of computer queries, number of functions utilized, number of records processed, use vs. non-use, frequency of use, regularity of use, expenditures/charging for use, and degree of IS institutionalization. User Satisfaction represents the recipient response to the use of the output of an information system and it has been frequently used as a measure of the successful interaction of users with the IS. Common measures used in empirical IS research include Swanson's 16-item measure (Swanson, 1974), Bailey and Pearson's 39item instrument (Bailey and Pearson, 1983), Raymond's 13-item subset (Raymond, 1985), and Sanders and Courtney's instrument for measuring satisfaction with DSS (Sanders and Courtney, 1985). Impact or the effect of information on the behavior of the recipient is the most difficult to define. As a result there are many different measures,

each of which may be applicable to different situations. They include user confidence, time to reach a decision, quality of decision analysis, problem identification, efficiency of decisions, number of alternatives generated, and change in decision behavior.

Organizational impact represents the effect of information on organizational performance and it is one of the main issues for IS managers (Niederman, Brancheau, and Wetherbe, 1991; Pervan, 1993). Examples include decision performance, participant performance, cost reductions, revenue and profit improvements, critical applications, and productivity gains.

This study selects measured items and develops a new instrument by referencing DeLone and McLean's study (1992) as part of ISA instrument. Validation of this measurement is necessary in this study and further research.

These selected items pertaining to the DeLone and McLean's IS Success Model are mapped to six dimensions as shown in Table 6, where the item numbers correspond to items in Part B-3 of the Web-based survey, except the Use dimension that are in Part A-1. Table 6.

Dimension	Label	Part	Item Number
System quality	SYQU	B-3	Items 1-6
Information quality	INQU	B-3	Items 7-13
Use	USE	A-1	Items 2, 3, &
			5
User satisfaction	USSA	B-3	Items 14
Individual impact	INIM	B-3	Items 15
Organizational impact	ORIM	B-3	Items 16

DeLone and McLean's Items vs. Dimension Map: Total 20 items

Table 7 represents the instrument of the IS Success Model adapted from DeLone

and McLean's Study (1992). Respondents are asked to check their view on each item in

7-Likert-Scale from 1 (far short of expectations) to 7 (greatly exceeds expectations).

Table 7.

Instrument of IS Success Model Adapted from DeLone and McLean's Study (1992)

System Quality
Regarding Information Technologies you use as a CoD employee, please rate the following (1-6):
1. Reliability.
2. Ease of use.
3. Accessibility.
4. Usefulness.
5. Flexibility.
6. Please rate the overall quality of Information Technologies in the CoD.
Information Quality
Regarding the data and information provided by the CoD's Information Technologies, please rate the
following (7-13).
7. Content.
8. Availability.
9. Accuracy.
10. Timeliness.
11. Conciseness.
12. Convenience.
13. Please rate the overall quality of data and information provided by the CoD's Information Technologies.
Use
2. Number of applications you use at work (Part A-1)
3. Number of computer related training you completed (Part A-1)
5. How many hours per week do you use IT to perform your CoD work? (Part A-1)
User Satisfaction
14. Overall, I am satisfied with the CoD's Information Technologies.
Individual Impact
15. Overall, there has been a positive impact as to how much <u>my</u> performance was improved by the aid of
CoD's Information Technologies.
Organizational Impact
16. Overall, there has been a positive impact as to how much the CoD's performance was improved by the
aid of Information Technologies.

MBNQA Instrument

Developing a quality based measurement instrument is an important step in

assessing the perceived quality of an organization (Bemowski and Stratton, 1995; Black

and Porter, 1996; Prybutok and Stafford 1999). Instrument validation and exploration of

the relationships in the MBNQA as measured by such an instrument is the primary objective.

Prybutok and Spink (1999) developed a survey for the health care industry based on the Malcolm Baldrige National Quality Award criteria. Factor analysis and regression were used to develop the survey. This study will use their MBNQA criteria-based survey as a foundation. The instrument was first developed with the cooperation and support of the Baylor Health Care System. The survey questions were derived directly from the Baldrige criteria. However, Baylor used this survey with its senior management and the number of responses was insufficient for instrument validation and model testing. Subsequent work on this instrument resulted in a more generic version that was pilot tested at a dinner meeting of the American Society for Quality, Dallas section. In this study, MBNQA-based survey is conducted of City of Denton employees. Considerable discussion and effort was made by the research team to modify the questionnaire to make sure the survey accurately measures the seven Baldrige criteria with the use in the City. The research team consisted of five faculty and five Ph. D. students from MIS, Management Science, and Psychology. One of the faculty is an ASQ Senior member, ASQ Certified Quality Engineer, ASQ Certified Quality Auditor, and ASQ Certified Quality Manager. This team continuously corresponded with City managers to exchange ideas and information to better modify the survey. Table 8 and 9 show the items and their corresponding dimensions on the developed MBNQA instrument.

Table 8.

Items of MBNQA Framework to Dimension Map: Total 69 items

Dimension	Label	Part	Item Number
Leadership	LEAD	A-2	Items 1-9
Strategic Planning	STRT	A-2	Items 10-17
Customer and Market Focus	CUST	A-2	Items 18-27
Information and analysis	INFO	A-2	Items 28-35
Human Resources	HR	A-3	Items 36-46
Process Management	PROC	A-3	Items 47-55
Business Results	RESL	A-3	Items 56-69

Table 9

Instrument of MBNQA

	1. Leadership		
1.	CoD has strong values for achieving high quality performance that applies consistently throughout		
	all facets of the organization.		
2.	CoD has good communication channels through which top management's direction (values and		
	expectations) clearly delivered to employees.		
3.	Management of the CoD clearly sets strategy, goals, and objectives for future directions for the		
	organization.		
4.	Management of the CoD establishes and reinforces environment for empowerment and innovation.		
5.	Management of the CoD encourages and supports organizational and employee learning.		
6.	CoD evaluates performance and capabilities of all functions of the organization on a regular basis.		
7.	CoD uses recent performance review findings as feedback for improvement and innovation		
	opportunities.		
8.	Management in CoD is concerned with the impact on society of our products, services, or		
	operations (reverse B3-27)		
9.	CoD actively supports and strengthens our relationships with key segment of the community (such		
	as education, community service organizations, religious organizations, or professional		
	associations)		
	2. Strategic Planning		
10.	CoD has a well-defined short-term (1-2 years) plan to help achieve its goals and objectives.		
11.	CoD has a well-defined long-term (2-5 years) plan to help achieve its goals and objectives.		
12.	CoD has a well-defined strategy/plan to increase Customer/citizen/citizen satisfaction.		
13.	CoD has well-defined human resource requirements and plans which consider employees'		
	capabilities and needs.		
14.	CoD has a well-defined strategy/plan to enhance supplier/partner relationships.		
15.	CoD has well-defined strategy/plan to address key goals and objectives.		
16.	CoD employs performance measures or indicators for tracking progress relative to its action plans.		
17.	CoD allocates resources well to ensure accomplishment of overall action plans.		
3. Customer and Market Focus			
18.	CoD has a formal method for determining current product/service requirements and expectations		
	of its Customer/citizens/citizens.		
19.	CoD has a formal method for determining future product/service requirements and expectations of		
	its Customer/citizens/citizens.		
20.	CoD has a formal method for identifying Customer/citizen/citizen groups and market segments.		
21.	COD has effective Customer/citizen relationship practices that enable Customer/citizens/citizens		

to seek assistance, comments, or complaints.

- 22. CoD continuously improves its Customer/citizen/citizen relationship management practices.
- 23. CoD determines key Customer/citizen/citizen contact requirements and delivers them to all employees involved in the response chain.
- 24. CoD resolves Customer/citizen/citizen complaints promptly and effectively.
- 25. CoD formally examines Customer/citizen/citizen complaints in order to make necessary improvements to its processes.
- 26. CoD measures and analyzes current levels of Customer/citizen/citizen satisfaction and dissatisfation.
- 27. COD compares its Customer/citizen satisfaction results with similar organizations.

4. Information and analysis

CoD provides effective performance measurement systems and techniques for ensuring each of the following (28-32):

- 28. Data and information reliability
- 29. Data and information consistency
- 30. Data and information accessibility
- 31. Data and information review.
- 32. Timely update of data and information
- 33. CoD regularly performs comparisons of its performance to similar world-class organization benchmarks in order to support its performance, evaluation, and improvement.
- 34. Performance data and information gathered <u>internally</u> is systematically analyzed to help support overall quality objectives.
- 35. Performance data and information gathered <u>externally</u> is systematically analyzed to help support overall quality objectives.

5. Human Resources

36. CoD has human resource plans derived from the strategic plan that are aimed at achieving the full potential of its work force.

<u>CoD exerts efforts toward building a work environment and an employee support climate conductive</u> to the followings (37-40)

- 37. performance excellence
- 38. full involvement in their work
- 39. personal growth
- 40. organizational growth
- 41. CoD promotes cooperation, individual initiatives, innovation, and flexibility to achieve its goals and objectives.
- 42. CoD's compensation, recognition, and related reward practices reinforce high performance.
- 43. CoD has a formal program for education and training that keeps up with business and individual needs.
- 44. All employees in CoD receive training (e.g., diversity training, management development, new employee orientation, and safety, and information technology, etc.) required for them to meet the objectives associated with their responsibilities.
- 45. CoD maintains a work environment conducive to the well-being and growth of all its employees.
- 46. CoD regularly monitors employee satisfaction and uses the results to support its quality improvement and innovation efforts.

6. Process Management

<u>CoD has a systematic method for introducing new products and services which include the following</u> (47-49):

- 47. Designing in Customer/citizen requirements.
- 48. Addressing quality issues early in the design cycle.
- 49. Analyzing relevant process capabilities.
- 50. CoD monitors the processes used to provide products and services in order to identify when it is necessary to make corrections.
- 51. CoD continuously improves the processes used to provide its products and services.

CoD formally assesses the quality of its (52-54):

- 52. products and services.
- 53. production and delivery systems.
- 54. goods and services supplied by external suppliers and partners.
- 55. CoD's quality requirements are communicated to all external suppliers of goods and services.

7. Business Results

The CoD's current level of each of the following is superior to similar cities (56-69)

- 56. Customer/citizen satisfaction.
- 57. Customer/citizen loyalty and positive referral.
- 58. Customer/citizen-perceived value
- 59. Financial performance (e.g. return on investment, budget variance, profitability)
- 60. Employee well-being and development
- 61. Employee satisfaction
- 62. Supplier and partner performance (e.g. performance/cost improvement, quality)
- 63. Regulatory/legal compliance
- 64. Quality
- 65. Productivity
- 66. Environmental citizenship
- 67. Fostering economic development
- 68. Crime control
- **69.** Education

Survey Method and Subjects

Subjects

The City of Denton served as the field subject for data collection via a web-based

survey. Denton, Texas, is situated approximately 30 miles north of the Dallas-Fort Worth

metroplex and is home to two major universities, the University of North Texas and

Texas Woman's University with more than 80,000 residents. The City has approximately

1100 employees.

On-line survey

The joint research team was initiated at University of North Texas (UNT) to enhance multi-and-interdisciplinary research. Three centers, the Center for Quality and Productivity, the Information Systems Research Center, and the Center for the Study of Work Teams joined for collaborative research in 2000. The research team consisted of five faculty and the faculty Center directors and five Ph.D. students from the MIS, Management Science, and Psychology Departments. The team developed a survey instrument based on the research frameworks discussed in the conceptual foundation section along with feedback from interviews with City focus groups containing managers, executives, and employees. Both qualitative and quantitative data were collected and analyzed. Quantitative data collection was done by means of a Web-based questionnaire over the Internet at <u>http://dentonsurvey.isrc.unt.edu</u>. The focus group study was included in this work to provide qualitative input for survey design through interviews. The result of the series of interviews helped modify the questionnaire to meet the specific needs of the City of Denton.

The first page of on-line survey is a log-in page so that anyone without a password cannot participate the survey. After a successful log-in, the next page is an introduction of the survey and a summary section for terms and definitions. This section can be accessed throughout all the subsequent pages by placing the link to it. Page 1 in Part A starts with demographic survey followed by the MBNQA questionnaire on Pages 2-3. In part B, IS-SERVQUAL is presented on Pages 1-2 and ISA instrument is on Page 3. The Institutional Review Board of University of North Texas (UNT), Denton, Texas on March 27, 2001, approved sets of instruments to be used in this study. A cover letter

signed by the directors of three Centers (Information System Research Center (ISRC), Center for Quality and Productivity, and Center for the Study of Work Teams (CSWT)) was attached to the Web-based survey. A copy of the survey's cover letter and the complete instrument are shown in Appendix.

The on-line survey was developed with MS FrontPage. Also Active Server Page codes were added to HTML codes to provide authentication and security features. The survey was presented on multiple pages so that a respondent could stop the survey at any page and resume later. However, the respondent needs to complete the multiple pages of survey in an arranged sequence. At the time the respondent returns to the survey site, the system detects the last page that he/she completed and brings him/her to the next page. Additional checks have been implemented with the use of Java script as follows: 1) If a user does not log in and knows the URL of a certain page, the user still won't be able to go to any of the pages; 2) If a user knows a URL of a certain page and tries to go there after logging in or before submitting the current pages, he would automatically be redirected to a page that he has not yet completed to maintain the appropriate sequence; 3) After logging in, if the user types the URL of a certain page that he has already completed, he will be redirected to a page with a notification that he has already completed that page and that he should start again; 4) If a user has already successfully submitted all the pages but tries to log in again, he will automatically be redirected to a page that tells him that he has already successfully completed the survey; 5) A pop-up error message appears when an answer to a question is missing. However, the 'Not applicable' option is always available along with Likert scales.

The use of divided multiple pages, rather than a single continuous document, along with each submits minimized the risk of loss of data during transmission. It also allowed flexibility on time management to the respondents. A unique and easy-toremember access code, which was a combination of city name and an animal name, was assigned to each employee for authentication and tracking purposes. The use of password precluded the possibility of having unintended person answering the question. The Web server kept track of the employee's progress and guided the employee through the survey. The tracking capability also helps to identify the non-respondents for follow-up mailing. Two weeks after the initial e-mail message with the announcement of the survey and user access code, three follow-up reminding messages were sent at one-week intervals to encourage participation of those who had not completed the survey. To ensure a high response rate with truthful response, the City Council, City Manager, and senior management of the City actively requested the cooperation of all participating employees. The City Manager sent out two letters to all employees encouraging their participation. In these letters, purpose, benefits, and the voluntary nature of the study were emphasized.

Respondents were notified that the university research team runs the survey and that the team will analyze data and provide recommendation to the City of Denton regarding how to improve operational performance with a proper management of information technologies. Respondents were also notified that only the research team will keep the survey responses and their identities and individual responses will be kept confidential and anonymous. It was emphasized that survey participation is voluntary and refusal to participate would not adversely affect them in any way. In addition, respondents could withdraw from the survey at any time. The demographic portion of

the survey contains questions regarding personal information questions such as gender, age, and education level, however a response was not required.

Procedure for Analysis

The set of instruments in the study is evaluated for reliability and validity. In addition, the results were analyzed using regression analysis, exploratory factor analysis, and structural equation modeling.

Reliability refers to the property of a measurement instrument that causes it to give similar results for similar inputs. Because of the single administration used in this study, the instruments used are subjected to internal consistency reliability. This internal consistency measures consistency across the parts of a measuring instrument, with parts being individual questions or subsets of questions. Cronbach's alpha is used for this test. A listwise deletion technique is used in this study to deal with missing values and inconsistent responses to assure reliability in expense of losing sample size. Several reversed and redundant questions are included to check the response consistency. When the responses show considerable gap between the same two questions, the individual's responses are eliminated. The same rule applies when any of the responses is missing or checked as 'Not Applicable'.

Construct validity determines how well the instrument measures the construct it is intended to measure. Construct validity is evaluated by performing correlation and factor analysis. High correlation within a construct and a weak relationship with other constructs is desirable. Factor analysis is employed for this purpose.

A regression analysis is performed with variables in the MBNQA model to determine significant predictors of business performance. Regression provides a

technique for building a statistical predictor (X) of a response (Y) and enables prediction of Y based on the model. In the MBNQA framework, business results is dependent variable and the other six variables are independent.

Exploratory and confirmatory factor analysis will be used for identifying constructs and testing the hypothesized model. Factor analysis is a multivariate statistical method that identifies the extent to which the responses to the items in the survey have common variances (Hair, Anderson, Tatham, and Black 1995). It is used to determine the interdependence between variables and allows definition or confirmation of conceptualized dimensions (Churchill, 1979).

Exploratory factor analysis (EFA)

EFA is used to explore the empirical data, to discover and detect characteristic features and relationships without imposing any definite model assumption on the data. An exploratory analysis may be structure generating, model generating, or hypothesis generating. In general, EFA is guided by intuitive and ad hoc rules (Kelloway, 1998). The goal of EFA is to describe and summarize data by grouping variables together that are correlated. A principal axis factor (PAF) analysis with a varimax rotation as available in SPSS 10.0 was used to analyze the survey items. PAF implicitly assumes that a variable is composed of a common part and a unique part, and the common part is due to the presence of the common factors. The objectives of PAF are to first estimate the communalities and then identify the common factors responsible for the communalities and the correlation among the variables. The PAF techniques assume an implicit underlying factor model and for this reason many researchers choose to use PAF.

Then confirmatory factor analysis using LISREL, a structural equation-modeling program, is conducted on each instrument to establish the validity of the model. A structural equation model (SEM) is a model of relationships among variables that encompass and extend regression and factor analysis procedures (Hayduk, 1987; Bollen, 1989). Mertler and Vannatta (2001) define SEM as sophisticated version of path analysis incorporating unobservable, un-measurable (latent) variables into the path model.

Confirmatory factor analysis (CFA)

The major objective of the CFA is to empirically validate the hypothesized model and to confirm or disconfirm a priori theory. The CFA estimates the parameters of the hypothesized model with a sample covariance matrix and determines the fit of the hypothesized model. This process is used to determine how close the estimated covariance matrix is to the sample covariance matrix. The closer the two, the better the fit identified between the sample and hypothesized model. A good fit indicates the sample data support the hypothesized model. The results of the analysis are examined to determine the degree of fit of the model and several indicators are examined to evaluate the model's goodness of fit. In this study, Lisrel 8.30 is used for confirmatory factor analysis. Lisrel, an acronym for linear structural relations, is a general-purpose program for estimating a variety of covariance structure models.

Bollen and Long (1993) described the five stages characteristic of most applications of SEM: 1) Model specification, 2) identification, 3) estimation, 4) testing fit, and 5) respecification.

Model specification

SEM is inherently a confirmatory technique, the methods of SEM are ill suited for the exploratory identification of relationships (Kelloway, 1998). Rather, the foremost requirement for any form of SEM is the a priori specification of a model. The purpose of the model is to explain why variables are correlated in particular fashion. Bollen (1989) presents the fundamental hypothesis for SEM as ? = ?(?), where ? is the observed population covariance matrix, ? is a vector of model parameters, and ?(?) is the covariance matrix implied by the model. When the equality expressed in the equation holds, the model is said to "fit" the data (Kelloway, 1998). The goal of SEM is to explain the patterns of covariance observed among the study variables.

Most frequently, the structural relations that form the model are depicted in a path diagram in which variables are linked by unidirectional arrows (representing causal relations) or bi-directional curved arrows (representing noncausal, correlational, or relationships). In general, the best path diagram should be the most parsimonious diagram that fully explains why variables are correlated and can be justified on theoretical grounds (Kelloway, 1998). Path diagram is most useful in depicting the hypothesized relations because there is a set of rules. Initially developed by Wright (1934), that allows one to translate the diagram into a series of structural equations by writing a set of equations that completely define the observed correlations matrix. The set of arrows constituting the path diagram include both simple and compound paths. A simple path represents the direct relationship between two variables (i.e., the regression of Yon X). A compound path consists of two or more simple paths. The value of a compound path is the product of all the simple paths constituting the compound path. The correlation

between any two variables is the sum of the simple and compound paths linking the two variables.

Identification

Application of SEM techniques involves the estimation of unknown parameters (e.g., factor loadings or path coefficients) based on observed covariances/correlations (Kelloway, 1998). One of the identification issues deals with whether a unique solution or its component parameters for the model can be obtained (Bollen, 1989). Models or parameters may be underidentified (i.e., the number of unknowns exceeds the number of equations), just-identified (i.e., the number of unknowns exactly equals the number of equations), or overidentified (i.e., the number of equations exceeds the number of unknowns). If the model is underidentified, no solution is possible. If the model is just-identified, then there is one set of values that completely fit the observed correlation matrix. That matrix, however, also contains many sources of error (e.g., sampling error or measurement error). In an overidentified, there are a number of possible solutions, and the task is to select the one that comes closest to explaining the observed data within some margin of error. Therefore, the ideal situation for social studies is to have an overidentified model.

Overidentification of SEM is achieved by placing two types of restrictions on the model parameters to be estimated: 1) Assign a direction to parameters, and 2) set some parameters to be fixed (e.g., zero indicates that path is not in the model) to a predetermined value. For CFA, issues of model identification typically are dealt with by default. That is, the latent variables or constructs are hypothesized to "cause" the observed variables. The model is recursive in that the causal flow is expected to be from
the latent variables to the observed variables (Kelloway, 1998). Bollen (1989) indicates that CFA models are identified if there are at least two indicators for each latent variable and the latent variables are allowed to correlate, but error terms are uncorrelated.

<u>Estimation</u>

LISREL solves for model parameters by a process of iterative estimation. When repeated iterations fail to minimize the fitting criterion, LISREL stops the iteration and reports the last solution it estimated. Three common fitting criteria are ordinary least squares (OLS), generalized least squares (GLS), and maximum likelihood (ML). Each criterion attempts to minimize the differences between the predicted and observed covariance matrices. When the observed and predicted covariance matrices are exactly the same, all the above criteria will equal 0. Thus, the goal of the iterative estimation procedure is to minimize the fitting function specified by the user.

Maximum likelihood (ML) estimation is the most widely used method and researchers usually equate using LISREL with doing ML estimation (Kelloway, 1998). ML estimators are known to be consistent and asymptotically efficient in large samples (Bollen, 1989). ML is likely attributable to the fact that the minimum fitting criterion multiplied by N-1 (where N is the number of observations) is distributed as chi-square.

Moreover, although the matrices of correlation and covariance are very similar, the standardization of variables in constructing a correlation matrix removes important information about the scale of measurement of individual variables from the data (Kelloway, 1998). This study employs a covariance matrix in the analysis.

The output from LISREL is divided into a number of sections: 1) the covariance matrix, 2) the maximum likelihood estimates, 3) the fit indices for the model, and 4) the

 R^2 values for each variable are indications of how well the latent variables explain the variance in the observed variables. The model with a low ?² or high P-value indicates a better fit. For each endogenous variable, LISREL calculates the R^2 value, which is interpreted exactly the same as R^2 values in regression.

Testing fit

The assessment of model fit is not a straightforward task. SEM has no single statistical test that best describes the strength of the model's predictions.

Instead, researchers have developed a number of goodness-of-fit measures that when used in combination assesses the results from three perspectives: Overall fit, comparative fit to a base model, and model parsimony. In evaluating the set of measures, some general criteria are applicable and indicate models with acceptable fit: (1) Non-significant $?^2$ (at least P > 0.05, perhaps 0.10 or 0.20); (2) incremental fit indices, such as Normed Fit Index (NFI), Tucker-Lewis Index (TLI), greater than 0.90; (3) Low Root Mean Square Residual (RMSR), Root Mean Square Error of Approximation (RMSEA) based on the use of correlations or covariances. Values ranging from 0.05 to 0.08 are deemed acceptable. (4) Parsimony indices that portray the proposed model as more parsimonious than alternative models.

Tanaka (1993) also points out that at least two traditions in the assessment of model fit are apparent. First, the assessment of absolute fit is concerned with the ability of the model to reproduce the actual covariance matrix. Second, the assessment of comparative fit, which is further subdivided into the assessment of comparative fit and parsimonious fit, is concerned with comparing two or more competing models to assess which provides the better fit to the data (Kelloway, 1998). The assessment of

parsimonious fit is based on the recognition that one can always obtain a better fitting model by estimating more parameters. Thus, the assessment of parsimonious fit is based on the idea of a trade-off of cost (i.e., loss of a degree of freedom) and benefit (i.e., increased fit). Although measures of comparative and absolute fit will always favor more complex models, measures of parsimonious fit provide a fairer basis for comparison by adjusting for the known effects of estimating more parameters.

1. Absolute Fit

Tests of absolute fit are concerned with the ability to reproduce the correlation/covariance matrix. The development of the chi-square test statistic for SEM proceeds directly from early accounts of path analysis in which there were attempts to specify a model that reproduced the original covariance matrix (Blalock, 1964; Kelloway, 1998). A nonsignificant chi-square implies that there is no significant discrepancy between the covariance matrix implied by the model and the population covariance matrix. Thus, a nonsignificant chi-square indicates that the model "fits" the data in that the model can reproduce the population covariance matrix. The test is distributed with degrees of freedom equal to (1/2)(q)(q+1)-(k) where q is the number of variables in the model and k is the number of estimated parameters. However, although the chi-square test is a generally accepted statistical measure for SEM analysis, it is sensitive to sample sizes that exceed 200. As sample size increases, this measure has a greater tendency to indicate significant differences for equivalent models. Thus, the chi-square test alone does not serve as an appropriate indicator. For this reason, LISREL output also includes some other indicators of model fit. The indicators are used in the calculation of some fit

indices such as the noncentrality parameter (NCP), estimated as chi-square-df, and the 90% confidence interval for the NCP.

Although many indicators are presented mainly for the additional information, all the values presented typically have no straightforward interpretation (Kelloway, 1998). Steiger (1990) pointed out that none of the fit indices commonly reported in the literature satisfy all these criteria, with the exception of the root mean squared error of approximation (RMSEA), which he developed. The current version of LISREL (LISREL 8.30) reports a number of indices of model fit, about four of which address of the question of absolute fit.

RMR: The simplest fit index provided by LISREL is root mean squared residual (RMR). RMR is the square root of the mean of the squared discrepancies between the implied and observed covariance matrices. The lower bound of the index is 0, and low values are taken to indicate good fit. The index, however, is sensitive to the scale of measurement of the model variables. As a result, it is difficult to determine what a low value actually is. LISREL therefore provides the standardized RMR, which has a lower bound of 0 and an upper bound of 1. Values less than 0.05 are interpreted as indicating a good fit to the data (Kelloway, 1998).

RMSEA: Similar to the RMR, the RMSEA is based on the analysis of residuals, with smaller values indicating a better fit to the data. Steiger (1990) suggests that values below 0.10 indicate a good fit to the data, and values below 0.05 a very good fit to the data. Values below 0.01 indicate an outstanding fit to the data, although Steiger (1990) notes that these values are rarely obtained. In addition, the RMSEA has the important advantage of going beyond point estimates to the provision of 90% confidence intervals

for the point estimate. LISREL also provides a test of the significance of the RMSEA by testing whether the value obtained is significantly different from 0.05.

GFI: The goodness-of-fit index (GFI) is based on a ratio of the sum of the squared discrepancies to the observed variance. The GFI ranges from 0 to 1, with values exceeding 0.9 indicating a good fit to the data.

AFGI: The adjusted goodness-of-fit index (AFGI) adjusts the GFI for degrees of freedom in the model. The AFGI also ranges from 0 to 1, with values above 0.9 indicating a good fit to the data. A discrepancy between the GFI and AGFI typically indicates the inclusion of trivial and often nonsignificant parameters.

2. Comparative Fit

The question of comparative fit deals with whether the model under consideration is better than another competing model. In some sense, the tests of model fit of this study are based on a comparison of models. That is, indices of comparative fit typically choose as the baseline of a model that is known a priori to provide a poor fit to the data. The most common baseline model is the null (or independence) model, which specifies no relationships between the variables composing the model. Several examples of indices of comparative fit are described as follows.

NFI: Bentler and Bonett (1980) have suggested a Normed fit index (NFI), defined as (chi-square indep- chi-square model)/ chi-square indep. The NFI ranges from 0 to 1, with values exceeding 0.9 indicating a good fit. The NFI indicates the percentage improvement in fit over the baseline independence model. For example, an NFI of 0.9 means that the model is 90% better fitting than the null model. Although the NFI is widely used, it may underestimate the fit of the model in small samples.

NNFI: The non-normed fit index (NNFI) adjusts the NFI for the number of degrees of freedom in the model. The NNFI reduces the problem of underestimating fit, but it may result in numbers outside of the 0 to 1 range. Higher values of the NNFI indicate a better fitting model, and it is common to apply the 0.90 as a cut-off indicating a good fit to the data.

IFI: Bollen's (1989) incremental fit index (IFI) is given by (chi-square indep - chi-square model)/ (chi-square indep - df model). IFI values range between 0 and 1., with higher values indicating a better fit to the data.

CFI: Bentler (1990) proposed a comparative fit index (CFI) based on the non central chi-square distribution. The CFI also ranges between 0 and 1, with values exceeding 0.90 indicating a good fit to the data.

RFI: Marsh, Balla, & MacDonald (1988) proposed a relative fit index (RFI), which ranges between 0 and 1, with values exceeding 0.90 indicating a good fit to the data.

ECVI: Browne and Cudeck (1989) suggested the use of the expected crossvalidation index (ECVI) by using a single sample. However, cross-validation requires two samples: a calibration sample and a validation sample. The procedure relies on fitting a model to the calibration sample, and then evaluating the discrepancy between the covariance matrix implied by the model to the covariance matrix of the validation sample. The ECVI estimates the expected discrepancy over all possible calibration samples. The ECVI has a lower bound of zero but no upper bound. Smaller values indicate better-fitting models.

3. Parsimonious Fit.

Parsimonious fit indices are concerned primarily with the cost-benefit trade-off of fit and degrees of freedom. Several of the indices can be calculated by adjusting other indices of fit for model complexity.

PNFI: James, Mulaik, and Brett (1982) have proposed the parsimonious normed fit index (PNFI), which adjusts the NFI for model parsimony. The PNFI ranges from 0 to 1, with higher values indicating a more parsimonious fit. There is no standard for how high index should be to indicate parsimonious fit.

PGFI: The parsimonious goodness-of- fit index (PGFI) adjusts the GFI for the degrees of freedom in the model. The PGFI ranges from 0 to 1, with higher values indicating a more parsimonious fit. There is no standard for how high index should be to indicate parsimonious fit.

AIC and CAIC: The Akaike Information Criterion (AIC) and Consistent Akaike Information Criterion (CAIC) (Akaike, 1987; Bozdogan, 1987) consider the fit of the model and the number of estimated parameters as the measures of parsimonious fit. Neither index is scaled to range between 0 and 1. Smaller values of the AIC and CAIC indicate a more parsimonious model, but there are no conventions or guidelines to indicate what "small" means. Interpretation of the AIC and CAIC is based on comparing competing models and choosing the model that shows the most parsimony.

Model modification.

The goal of model respecification is to improve either the parsimony or the fit of the model (MacCallum, 1986). Thus, respecification typically consists of one of two forms of model modification: (1) Delete nonsignificant paths from the model, or (2) add

paths to the model based on the empirical data. According to Kelloway (1998), there are several approaches to solve the problem when the model does not fit the data. One solution to an ill-fitting model is to simply stop testing and declare the theory that guided model development to be wrong. Another solution to an ill-fitting model is to use the available information to try to generate a more appropriate model. This is the art of model modification- changing the original model to fit the data (Kelloway, 1998).

The principal danger in post hoc model modification is that this procedure is exploratory. Thus, model modifications need to have some resemblance of theoretical consistency. For instance, if many studies suggest that job satisfaction and job performance are unrelated, hypothesizing a path between satisfaction and performance just to make the model fit is not desirable. Inspection of the LISREL-produced modification indices suggests several likely additional parameters such as the correlations between observed variables, i.e., modification indices greater than 5.0(Kelloway, 1998). Although the modification index suggests that a substantial improvement in fit could be obtained from making this modification, it may contain the dangers associated with post hoc model modifications (Kelloway, 1998).

CHAPTER 4

RESULTS

The survey data that was obtained in this study is reported in this chapter. A complete analysis and discussion of the results is presented in Chapter 5.

Survey Response Results

1100 email addresses of the City of Denton employees were used in order to invite them to fill out the on-line survey for this project in Spring 2001. A total of 339 responses were received over a period of five weeks, resulting in a response rate of 30.82%. However, 80% (269) of the total respondents (339) completed all the parts. Most of the responses, 203 (74.6%) were received within the first two weeks. Table 10 shows how many respondents completed each page. A follow-up email was deemed necessary and the deadline was extended for another three weeks. Reminder letters were sent both to non-respondents and respondents that only partially completed the survey at one-week intervals emphasizing the benefits of this study on their workplace. Also an advanced report that included some demographic analysis was offered to the City to encourage their response. This prompt analysis turnaround was possible because of the advantage of automatic data recording that avoided the usual lead-time involved with collection by mail. The follow-up effort attracted additional responses from 136 City employees. Table 11 shows the response frequency change over the five-week period. The dates shown on the table are Mondays, on which reminding letters were sent. The result indicates rapid response increases following these days, however the increase was

no longer apparent after four weeks. Responses are anonymously and automatically coded via the Web server and converted to Microsoft Access 2000.

Table 10

Responses by page





Responses by date



Respondent Characteristics

Table 12

Gender

Gender	Number of employees	Percent
Male	167	50.6%
Female	163	49.4%
Total	330	100.0%
Not answered	9	

Table 13

Age

	Number of	
Years of Age	respondents	Percent
Less than 20	2	0.6%
20 – less than 30	42	13.0%
30 – less than 40	113	34.9%
40 – less than 50	105	32.4%
50 – less than 60	57	17.6%
60 or more	5	1.5%
Total	324	100.0%
Not answered	15	

Table 14

Education

	Number of	
Highest education	respondents	Percent
High school	40	12.7%
Some college	80	25.5%
2-year college	39	12.4%
4-year college	92	29.3%
Graduate school	63	20.1%
Total	314	100.0%
Not answered	15	

Table 12, 13, and 14 show the distribution of respondents by gender, age, and education, respectively. An almost equal number of males and females participated the

survey. The gender ratio of the respondents was 50.6% (male) to 49.4% (female). About 67% of the respondents were between the age of 30 and 50. There were few workers (less than 5.5%) below 20 or over 60 years of age. The average age of the participants is 40.2. About half of the participants have a degree from a four-year college or graduate school, whereas 13% are high school graduates.

Table 15

Years with the City	# of respondents	Percent
Less than one year	47	13.9%
1 – less than 2 years	29	8.6%
2 – less than 5 years	72	21.2%
5 – less than 10 years	68	20.1%
10 – less than 15 years	48	14.2%
15 – less than 20 years	44	13.0%
20 years or over	31	9.1%
Total	339	100.0%

Years of Employment at the City

Table 15 shows the distribution of years range of respondents the worked for the CoD. About 30% of respondents have worked for the City between 1 and 5 years. Another 34% ranged between 5 and 15 years of employment and 22% over 15 years. The average employment year of the participants is 8.4 years.

The number of current job years is tabulated in Table 16. The participants have been in their current positions for about 4.4 years on the average. 23.6% of the respondents have been less than 1 year in the current job, 16.8% between 1 and 2 years, and 23.3% between 2 and 4 years. In other words, about 64% of the respondents have been in their job no more than 4 years.

Table 16Years of Current Job

Number of years at current	# of	
job	respondents	Percent
Less than one year	80	23.6%
1 - less than 2 years	57	16.8%
2 - less than 3 years	37	10.9%
3 - less than 4 years	42	12.4%
4 - less than 5 years	28	8.3%
5 - less than 7 years	29	8.6%
7 - less than 10 years	17	5.0%
10 - less than 15 years	32	9.4%
15 - less than 20 years	13	3.8%
20 years or over	4	1.2%
Total	339	100.0%

Table 17

Years range	Frequency	Percent
Less than 1 year	5	1.5%
1 - less than years	9	2.7%
2 - less than 4 years	29	8.6%
4 - less than 6 years	41	12.2%
6 - less than 10 years	51	15%
10 - less than 15 years	82	24.3%
15 - less than 20 years	76	22.6%
20 years or over	34	10.1%
Valid data	327	100%
Total	339	
Not answered	12	

Table 17 shows the distribution of IT experience years. 24.3% of the respondents have between 10 and 15 years of IT experience, 22.6% between 15 and 20 years, and 15% between 6 and 10 years of experience. In other words, about 61.9 of the respondents have at least 6 to 20 years of experience using IT. About 57% of the respondents have at least 10 years of IT experience.

Table 18

Distribution of Departments

	Number of	
Department	responses	Percent
Budget & Fiscal Operations	26	7.7%
Building, Planning & Zoning	14	4.1%
Community Development	11	3.2%
Customer Service	10	2.9%
Electricity	15	4.4%
Engineering	22	6.5%
Facility Management	9	2.7%
General Government	7	2.1%
Human Resources	12	3.5%
Legal	8	2.4%
Library	21	6.2%
Motor Pool and Maintenance	2	0.6%
Municipal Court	5	1.5%
Parks	21	6.2%
Public Safety	65	19.2%
Safety, Training, and Risk		
Management	1	0.3%
Solid Waste, Landfill &		
Recycling	8	2.4%
Technology Services	22	6.5%
Transportation	13	3.8%
Utilities Administration	7	2.1%
Water, Wastewater & Drainage	30	8.8%
Other	10	2.9%
Total	339	100.0%

Table 18 shows the distribution of the respondents by their working departments. The survey participants represent 21 different department categories in the City of Denton. The biggest portion, 19.2%, of the response came from the Department of Public Safety including Police, Fire, Animal Control, and Code Enforcement. 8.8% from the Department Of Water, Wastewater, and Drainage, And 7.7% from The Department Of Budget and Fiscal Operations including Accounting, Warehouse, Purchasing, Tax and Treasury. A considerable percentage difference exists between the highest and the second highest. It is partly because Dept. of Public Safety is the biggest body at the City,

accounting 30% of total employees.

Table 19

Distribution of Software Usage and Training Demand

			Number o	f
	Number of respondents		respondents who	
Application	using application		need training	
GroupWise	312	92.0%	69	20.4%
Word	284	83.8%	69	20.4%
Excel	278	82.0%	115	33.9%
PowerPoint	198	58.4%	125	36.9%
Microsoft Publisher	96	28.3%	68	20.1%
WordPerfect	76	22.4%	27	8.0%
Civicall	62	18.3%	59	17.4%
Adobe Illustrator	58	17.1%	80	23.6%
ArcExplorer (ESRI)	48	14.2%	75	22.1%
Harris Billing System	45	13.3%	46	13.6%
JDEdwards Human Resources	40	11.8%	51	15.0%
Brio	38	11.2%	68	20.1%
Geographic Information System	37	10.9%	72	21.2%
Microsoft Project	36	10.6%	60	17.7%
Microsoft Access	31	9.1%	10	2.9%
CRW Trak-it	25	7.4%	39	11.5%
Dynix Library System	24	7.1%	23	6.8%
Microsoft Request	22	6.5%	35	10.3%
ArcInfo	20	5.9%	60	17.7%
ICS/VisionAir	14	4.1%	41	12.1%
Aldus Page Maker	13	3.8%	51	15.0%
Class	13	3.8%	27	8.0%
Court Specialists Inc System	11	3.2%	29	8.6%
CityWorks	9	2.7%	37	10.9%
LaserFiche	8	2.4%	35	10.3%
Teleworks	6	1.8%	28	8.3%
Trashflow	6	1.8%	25	7.4%
C/S Fleet Maintenance System	5	1.5%	39	11.5%
Tax Accounting System	4	1.2%	28	8.3%
Amazon Billing	3	0.9%	28	8.3%
SpindleMedia	3	0.9%	23	6.8%
Veritas Backup Express	2	0.6%	23	6.8%
Web Casting	1	0.3%	30	8.8%
MetaCube Data Warehousing	0	0.0%	26	7.7%
Other	68	20.1%	26	7.7%

Table 19 shows the distribution of the respondents by software used and more training. The five most widely used applications at the City of Denton were GroupWise, Word, Excel, PowerPoint, and Microsoft Publisher. In the City, 92% of the respondents use Group Wise, 83.8% with Microsoft Word, and 82% with Microsoft Excel. Table 19 also shows the percentage of respondents who expressed a need for training for each application. The top five applications that they looked for training on were PowerPoint, Excel, Adobe Illustrator, ArcExplorer, and GIS. It is interesting to find that the most popular software groups still call for the biggest portion of training demand despite of their widespread use for a long time. More than 20% of the respondents want more training on PowerPoint, Excel, and Word.

Table 20

Software	Training	Compl	leted
	0	1	

	Frequency	Percent
1. A+ Certification	2	0.6%
2. A+ Complete	0	0.0%
3. Access - Part 1	75	22.1%
4. Access - Part 2	30	8.8%
5. Excel - Expert User	26	7.7%
6. Excel - Proficient User	79	23.3%
7. GroupWise	131	38.6%
8. PowerPoint	84	24.8%
9. PowerPoint 2000 Cheat Sheet	4	1.2%
10. PowerPoint 2000 Exam Prep	1	0.3%
11. TimeQuest	2	0.6%
12. How Computers Work	20	5.9%
13. Windows 98	85	25.1%
14. Windows 98 Upgrade Training	19	5.6%
15. Word - Expert User	26	7.7%
16. Word - Proficient User	82	24.2%

Table 20 shows the distribution of the respondents who completed all the software training. The most popular software trainings in the City in order were GroupWise,

PowerPoint, Windows 98, Word, Excel, and Access. About 38.6% of respondents had completed training on GroupWise, 24.8% on PowerPoint, and 25.1% on Windows 98. Although 24.8% of respondents had training on PowerPoint, still 36.9% of the respondents asked for more training on it. It indicates the heavy demand and usage rate of PowerPoint at the City.

Table 21

Working Hours Per Week

Hours Range	Frequency	Percent
Less than 30 hours	10	3.0%
30 - less than 40 hours	4	1.2%
40 - less than 45 hours	236	69.6%
45 - less than 55 hours	57	16.9%
55 or over	32	9.4%
Total	339	100.0%

Table 21 shows the distribution of the respondents working hours per week.

About 69.6% of the respondents worked for the City over 40 and below 45 hours per

week, 16.9% worked over 45 and below 55 hours, and 9.4% worked over 55. There were

few who worked for City below 40 hours, 4.2%.

Table 22

Number of Hours Using IT at work

Hours range	Frequency	Percent
0 – less than 10 hours	60	17.8%
10 – less than 20 hours	46	13.6%
20 – less than 30 hours	74	21.9%
30 – less than 40 hours	88	26.0%
40 – less than hours	64	18.9%
50 or over	7	2.1%
Total	339	100.0%

About 66.8% of respondents used IT to perform their work between 20 and 50 hours per week. Very few respondents, approximately 2% of them, used IT to perform the work for more than 50 hours. Average IT usage for the work is 24.1 hours per week. Table 23

Job Type

	Frequency	Percent
1. Field Service	12	3.5%
2. Mid-level managers	60	17.7%
3. Office/Clerical	58	17.1%
4. Professionals	83	24.5%
5. Supervisors	23	6.8%
6. Technical paraprofessionals	74	21.8%
7. Others	29	8.6%
Total	339	100.0%

Table 23 shows the distribution of Respondents by job types. The survey respondents represent a broad range of job types. About 24.5% of the responses were from professionals, 21.8% from technical paraprofessionals, and 17.7% from mid-level managers. The three highest percentages of responses from these professionals indicate that they are the predominant IT users at the CoD location. About 54% of the respondents hold a position of operational nature (i.e., filed service, office and clerical, technical and supervisory) whereas the remaining participants hold a managerial or professional position.

MBNQA Ratings

MBNQA survey averages ranged from 3.66 to 5.52. All of them except one (question #46) exceeded 4, which is neutral in 7-Likert scale. In the overall sense, the

City's quality practice is slightly above the expected level. Table 24 shows brief

summary of the results.

Table 24

MBNQA results by category

Category	Average
1. Leadership (125 points)	
1.1 Org. leadership (85)	4.80 (3)*
1.2 Public responsibilities and citizenship (40)	5.36 (1)
2. Strategic Planning (85 pts)	
2.1 Strategy development (40)	4.68 (6)
2.2 Strategy deployment (45)	4.57 (8)
3. Customer and Market Focus (85 pts)	
3.1 Customer and market knowledge (40)	4.48 (10)
3.2 Customer satisfaction and relationships	4.78 (4)
(45)	
4. Information and analysis (85 pts)	
4.1 Measurement of org. performance(40)	4.54 (9)
4.2 Analysis of org. performance (45)	4.23 (11)
5. Human Resources (85 pts)	4.77 (5)
6. Process Management (85 pts.)	4.59 (7)
7. Business Results (450 pts.)	4.89 (2)

* Numbers in the parenthesis represent ordered rank from the highest to the lowest

Two categories, Leadership and Business Results, are the most highly ranked

among seven categories in MBNQA survey. The two carry 57.5% of total weightings

(125+450 / 1000pts.) in MBNQA scoring system. This is a good indication for the City in

improving quality management in that the City is doing the best in the two most

important areas. However, the highest category averages of 5.36 and 4.89 imply that

there is still room for the improvement even in the best two areas.

The two lowest ranked categories are Information & Analysis and Customer &

Market Focus. It is recommended that the City develop more effective performance

measurement systems to support overall quality objectives. Also the City needs to refine

a method for determining service/product requirement and expectations of its customer, though the City maintains good customer relationship management.

Strong areas include: 1) Strong values for high quality (leadership, Q1), 2) Supporting organizational and employee learning (leadership, Q5), 3) Supporting relationship with key community segments (leadership, Q8), 4) Concerned with the impact of services, products, and operations on the society (leadership, Q9), 5) Resolving customer complaints promptly and effectively (Customer & Market Focus, Q24), 6) Building work environment and employee support (Human Resources, Q38, 39, 40, and 44), and 7) Current level of followings compared to similar cities (Business Results, Q63, 64, 65, 66, 68, 69)

Weak areas include: 1) Comparison of customer satisfaction results with similar organizations (Customer & Market Focus, Q27), 2) Comparison of its performance to benchmark (Information & Analysis, Q33), 3) Gathering internal and external data and information to support quality objectives (Information & Analysis, Q34 and Q35), and 4) Monitoring employee satisfaction for quality improvement and innovation efforts (human Resources, Q46).

Information & Analysis category was found to be the major area for the improvement. By looking at survey result of IS-SERVQAUAL and IS-SUCCES ratings, the problem can be explored in a more detailed level.

Average and standard deviation on each question are presented in Table 25. As stated in Ch. 3, several reversed and redundant questions were placed in the questionnaire to check the response consistency. The frequency in the following table represents

sample size after eliminating all the responses that have significant gap between the same

two questions.

Table 25

Q#	1	2	3	4	5	6	7	8	9	10
Mean	5.00	4.46	4.85	4.81	5.38	4.56	4.53	5.52	5.19	4.67
Std.	1.49	1.60	1.43	1.52	1.54	1.56	1.57	1.26	1.21	1.39
freq.	258	260	258	256	261	250	242	258	247	232
Q#	11	12	13	14	15	16	17	18	19	20
Mean	4.62	4.92	4.66	4.49	4.71	4.59	4.41	4.49	4.47	4.48
Std.	1.40	1.30	1.49	1.21	1.31	1.44	1.42	1.36	1.35	1.32
freq.	230	239	249	197	235	225	235	216	214	199
Q#	21	22	23	24	25	26	27	28	29	30
Mean	5.17	4.96	4.45	5.06	4.86	4.51	4.29	4.54	4.57	4.54
Std.	1.37	1.35	1.37	1.41	1.44	1.41	1.41	1.50	1.46	1.52
freq.	252	240	238	242	223	210	175	216	215	217
Q#	31	32	33	34	35	36	37	38	39	40
Mean	4.53	4.52	4.13	4.30	4.26	4.37	4.98	5.03	5.01	5.04
Std.	1.42	1.50	1.51	1.50	1.46	1.51	1.54	1.52	1.58	1.50
freq.	215	220	181	202	193	214	248	248	247	244
Q#	41	42	43	44	45	46	47	48	49	50
Mean	4.96	4.47	4.76	5.20	4.83	3.66	4.55	4.30	4.42	4.49
Std.	1.54	1.69	1.64	1.57	1.47	1.62	1.30	1.45	1.42	1.37
freq.	241	244	236	246	247	235	186	193	187	205
Q#	51	52	53	54	55	56	57	58	59	60
Mean	4.67	4.71	4.73	4.72	4.70	4.90	4.77	4.73	4.68	4.66
Std.	1.39	1.38	1.35	1.28	1.34	1.26	1.26	1.22	1.36	1.53
freq.	215	216	212	200	180	199	198	195	184	211
Q#	61	62	63	64	65	66	67	68	69	
Mean	4.59	4.65	5.23	5.18	5.12	5.12	4.05	5.56	5.10	
Std.	1.50	1.14	1.36	1.26	1.25	1.38	1.70	1.16	1.44	
frea.	214	178	190	211	210	202	206	209	203	

MBNQA	Statistics	on Each	Question
~			\sim

IS-SERVOUAL Ratings

Service quality of Technology Service Department's (TSD) staff is relatively good. Averages range from 3.98 to 5.07. Table 26and 27 show summary results. More detailed descriptive statistics are presented in Table 28

Table 26

Result of IS Service Quality by Category

Category	Average	Questions
1. Reliability	4.34 (7)	1-5
2. Competence	4.78 (4)	6-11
3. Responsiveness	4.70 (5)	12-17
4. Timeliness	4.31 (8)	18-22
5. Communications	4.79 (3)	23-28
6. Training	3.98 (10)	29-33
7. Empathy	4.39 (6)	34-39
8. Attitude/Commitment to user	4.04 (9)	40-44
involvement		
9. Relationships	5.07 (1)	45-49
10. Access	4.95 (2)	50-54





According to the results, TSD staff maintains a good working relationship with IS users and they are very accessible to the users. Users have confidence on the availability of hardware, software, and people that can be utilized to support their performance.

However, they want more training support to increase their proficiency in utilizing IS, especially on new systems. Also users want to be more involved in the design, development, or alteration of IS systems, particularly when making changes to existing systems.

The City employees more greatly expect that they get along well with members of the TSD staff. They also more greatly expect that the TSD staff keeps them informed in advance of scheduled system downtime, and the members of the TSD staff are courteous. They also expect that the TSD staff provide adequate training support for their needs.

Average and standard deviation on each question are presented in Table 28. The frequency in the following table represents sample size after checking and eliminating all the inconsistent responses.

Table 28

Q#	1	2	3	4	5	6	7	8	9	10
Mean	4.30	4.47	4.07	4.43	4.46	4.83	4.85	4.81	4.70	4.69
Std.	1.51	1.49	1.56	1.53	1.45	1.46	1.38	1.45	1.49	1.44
freq.	206	210	206	210	207	193	186	177	186	160
Q#	11	12	13	14	15	16	17	18	19	20
Mean	4.79	4.80	4.63	4.64	5.00	4.45	4.64	4.41	4.16	4.18
Std.	1.47	1.67	1.58	1.56	1.56	1.58	1.517	1.582	1.56	1.634
freq.	200	207	205	179	207	187	204	208	174	154
Q#	21	22	23	24	25	26	27	28	29	30
Mean	4.38	4.39	4.59	5.31	4.67	4.70	4.78	4.65	3.66	3.87
Std.	1.44	1.508	1.608	1.439	1.59	1.517	1.608	1.528	1.513	1.561
freq.	160	177	182	207	184	205	204	208	184	188
Q#	31	32	33	34	35	36	37	38	39	40
Mean	4.39	4.07	3.93	4.03	4.40	4.32	4.38	4.67	4.50	4.27
Std.	1.478	1.615	1.587	1.561	1.585	1.608	1.662	1.617	1.575	1.616
freq.	178	151	169	173	179	171	180	189	183	146
Q#	41	42	43	44	45	46	47	48	49	50
Mean	4.12	3.67	3.89	4.25	4.57	5.09	5.22	5.29	5.12	4.86
Std.	1.674	1.677	1.693	1.58	1.628	1.566	1.435	1.424	1.409	1.529
freq.	147	154	149	165	174	190	197	190	189	204
Q#	51	52	53	54						
Mean	4.84	4.99	5.25	4.80						
Std.	1.462	1.482	1.394	1.453						
freg.	202	195	205	198						

IS-SERVQUAL Statistics on Each Question

IS-SUCCESS Ratings

Table 29

Descriptive Statistics of IS-SUCCESS

	Question	N	Mean	Std.	Domain	Categ. Mean
	Regarding IT you use as a CoD employee, please rate the following (1-7):			uev		liteun
SUCCES1	reliability	258	4.59	1.49	IS Quality	
SUCCES2	ease of use	258	4.90	1.31	IS Quality	
SUCCES3	accessibility	259	4.82	1.43	IS Quality	
SUCCES4	usefulness	259	5.14	1.38	IS Quality	
SUCCES5	flexibility	255	4.75	1.46	IS Quality	
SUCCES6	Please rate the OVERALL quality of IT in the CoD	260	4.89	1.38	IS Quality	4.85
	Regarding the data and information provided by the CoD's IT, please rate the following (7-13)					
SUCCES7	content	236	4.84	1.28	D & I Quality	
SUCCES8	availability	240	4.78	1.38	D & I Quality	
SUCCES9	accuracy	233	4.89	1.32	D & I Quality	
SUCCES10	timeliness	238	4.63	1.36	D & I Quality	
SUCCES11	conciseness	234	4.76	1.33	D & I Quality	
SUCCES12	convenience	237	4.72	1.43	D & I Quality	
SUCCES13	Please rate the overall quality of data and information provided by the CoD's IT.	239	4.79	1.31	D & I Quality	4.77
SUCCES14	Overall, I am satisfied with the CoD's IT.	257	4.70	1.52	User satisfaction	4.70
SUCCES15	Overall , there has been a positive impact as to how much my performance was improved by the aid of CoD's IT.	249	4.88	1.51	Individual impact	4.88
SUCCES16	Overall , there has been a positive impact as to how much the CoD's performance was improved by the aid of IT.	238	5.03	1.48	Organizationa l impact	5.03
DEMO2_US	Number of applications you use at work	325	5.52	2.52	Use	
DEMO3_US	Number of computer related training you completed	325	2.04	2.56	Use	
DEMO5_US	How many hours per week do you use IT to perform your CoD work?	330	25.11	14.91	Use	
DEMO8_US	How many years of experience do you have using IT?	327	10.92	6.30	Use	

The IS-SUCCESS is reported in Table 29 according to the dimension they represent. These dimensions correspond to information system quality, data quality, use, user satisfaction, individual impact, and organizational impact. The number of valid responses as well as the mean and standard deviation is shown for each dimension. The dimensions rated higher in expectation are organizational impact and individual impact with a mean of 5.03 and 4.88. The dimensions rated lower in expectation are user satisfaction, and data and information quality with a mean of 4.70 and 4.77. Note that the dimension of Use is not ordinal (i.e., not scale) measurement so it is not compared with other dimensions of the IS-SUCCESS. The descriptive statistics of IS-SUCCESS are shown in Table 29

CHAPTER 5

DATA ANALYSIS

Introduction

The objective of this study is to develop and test an empirical model. First exploratory factor analysis is used to determine the validity of the instruments. The results of this factor analysis are used to select the best sets of items for each instrument used in this study, MBNQA, IS-SERVQUAL, and IS-Success assessments. Second, regression analysis is used to identify significant predictors of business result in the proposed IS-MBNQA frame work. Lastly, confirmatory factor analysis tests the causal relationship in the MBNQA framework and compares proposed IS-MBNQA with the conventional MBNQA model.

Initially, the data set is cleaned by checking the reversed and redundant questions that were placed in the questionnaire. When a respondent shows considerable gap between two identical questions, that individual's responses were eliminated because it is anticipated that a conscientious response would provide the same answers for the same two questions. However possibly a difference of ± 2 could be due to transient issues such as location of the questions. Thus it was decided to define unreliable respondents as those with a difference of more than 2 in their response to the 7-Likert ordinal scale items. As a result of this screening, seventy seven records were deleted and total sample size was reduced to 261.

Exploratory Factor Analysis

For the exploratory factor analysis principal axis factoring (PAF) with a varimax rotation was used done SPSS 10.0.

Appropriateness of factor analysis

The first decision with factor analysis is to determine whether or not the data are appropriate for factor analysis. A number of measures are used for this purpose. First, correlation matrix can be examined. High correlations among the variables indicate that the variables can be grouped into homogeneous sets of variables such that each set of variables measures the same underlying construct or dimension. Second, partial correlations controlling for all other variables can be examined. These correlations, called negative anti-image correlations, should be small for the correlation matrix to be appropriate for factoring. Third, Kaiser's measure of overall sampling adequacy can be examined as a measure of the sampling adequacy for each indicator. This measure, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser 1970), is a popular diagnostic measure. KMO provides a means to assess the extent to which the indicators of a construct belong together. Although there are no statistical tests for the KMO measure, guidelines are suggested by Kaiser and Rice (1974). It is suggested that a higher value is desired and that the overall KMO should be greater than 0.80, however above 0.60 is tolerable. In addition, SPSS provides the Bartlett's test which assesses whether or not the correlation matrix is appropriate for factoring. The test examines the extent to which the correlation matrix departs from orthogonality. High significance of this test indicates that the correlation matrix is not orthogonal and is, therefore, appropriate for factoring. However, it should be noted that the test is sensitive to sample size. For large

sample size, the test is liable to conclude that the correlations among the variables are small. In the subsequent analysis, the KMO measure is used to determine the appropriateness of the data along with Bartlett's test.

Number of factors extracted

The next step is to determine the number of factors needed to explain correlations among variables. The most popular heuristics are the eigenvalue-greater-than-one and the scree plot. Variable loadings and researcher's knowledge about the variables are important for interpreting the results (Sharma, 1996).

Once the number of factors is determined the next question is which items belong to each factor. As discussed earlier, high loadings of a variable on a factor indicate that there is much in common between the factor and the respective variable. Although there are no definite cut-off points to define high loadings, factor loadings greater than 0.30 are considered to meet a minimal loading level; loadings of .40 are considered more important; and loadings of 0.50 or greater are considered practically significant (Hair et. al. 1995). Many researchers have used cut-off values as low as 0.40 (Sharma, 1996). Because of the developmental stage of the models and their associated instrument measures, the selection rule in this study is to choose variables that have a factor loading greater than 0.50 on one factor and less than 0.40 on all the others.

Factor extraction methods

A number of factor extraction methods are proposed for exploratory factor analysis. Among those, principal components factoring (PCF) and principal axis factoring (PAF) methods are the two most popular ones. PCF assumes that the prior estimates of communalities are one. The correlation matrix is then subjected to a principal components analysis. This assumption implies that a given variable is not composed of common and unique parts. However it is hoped that a few principal components would account for a major proportion of a variable's variance. The remaining components are lumped together into a single component labeled as the unique factor, and the variance in common with it is called the variable's unique or error variance. Therefore, strictly speaking, PCF is simply principal components analysis and not factor analysis (Sharma, 1996).

On the other hand, PAF implicitly assumes that a variable is composed of a common part and a unique part, and the common part is due to the presence of the common factors. The objectives of PAF are to first estimate the communalities and then identify the common factors responsible for the communalities and the correlation among the variables. The PAF techniques assume an implicit underlying factor model and for this reason many researchers choose to use PAF.

Factor rotations

Rotations of the factor solution are the common type of constraints placed on the factor model for obtaining a unique solution. There are two types of factor rotation techniques, orthogonal and oblique.

In oblique rotation the axes are not constrained to be orthogonal to each other. In other words, it is assumed that the factors are correlated. The pattern loadings and structure loadings will not be the same, resulting in two loading matrices that need to be interpreted. The projection of vectors or points onto the axes can be determined in two ways. Therefore, interpretation of an oblique factor model is not always clear cut and the technique is not popular in behavioral and social sciences (Sharma, 1996).

On the other hand, orthogonal rotation result in orthogonal factor models and transformation matrix is estimated such that the new loadings result in an interpretable factor structure. Quartimax and varimax are the most commonly used orthogonal techniques. The objective of quartimax rotation is to identify a factor structure such that all the indicators should load on one other factor and have near zero loadings on the remaining factors. The objective of varimax rotation is to determine the transformation matrix such that any given factor will have some variables that will load very high on it and some that will load very low on it. This is achieved by maximizing the variance of the squared loading across variables, subject to the constraint that the communality of each variable is unchanged. Given the need to trim down a large set of questionnaire into a small and parsimonious instrument, principal axis factoring (PAF) with a varimax rotation is selected for this study.

MBNQA

An overall value of 0.886 for the KMO measure suggests that the correlation matrix of MBNQA questionnaire is appropriate for factoring. Also Bartlett's test statistic is highly significant (p=0.000) and implies that the correlation matrix is not orthogonal. Therefore, the data set is appropriate for factoring.

Kaiser-Meyer-Olkin		
Measure of Sampling		.886
Adequacy.		
Bartlett's Test of	Approx.	9207.378
Sphericity	Chi-	
	Square	
	df	2346
	Sig.	.000

Table	30				
KMO	and	Bartlett's	Test:	MBNQ)A

Principal axis factoring with varimax rotation was run on the MBNQA's 69 item questionnaire and ten factors were extracted with eigen-value-greater-than-one. However, as shown in rotated factor matrix (Table 31), only six factors were found to have significant factor loadings between variables and factors. Items in Leadership and Strategic Planning were extracted into one factor. Except for this joint loading, the factor grouping was exactly the same as MBNQA's theoretical seven dimensions and all the items were extracted to their intended dimensions. Given the large number of items (69) and considerable correlations among the items, the grouping result is excellent.

Table 31

MBNQA	Items	Factor									
		1	2	3	4	5	6	7	8	9	10
		Human	Inform	Leaders -	Cust &	Busi.	Process				
		Resource	Analysis	hip	Mkt	Results	Mgmt				
	Q1	.457	.122	.404	.219	.250	.218	-2.2E-02	.111	-5.5E-03	8.5E-02
	Q2	.363	.151	.416	8.8E-02	.278	.142	4.9E-02	.205	.536	1.0E-02
٩	Q3	.381	.236	.674	.171	3.5E-02	.152	.138	.122	.119	-4.8E-02
shi	Q4	.345	.179	.584	.165	.182	.180	3.0E-02	1.8E-02	.327	-5.6E-02
ers	Q5	.307	.273	.630	.168	.161	5.6E-03	-4.2E-02	.290	-8.4E-02	6.3E-02
ad	Q6	.437	.190	.249	.218	.158	7.8E-02	.118	.514	.185	3.1E-02
Le	Q7	.596	.191	.277	.161	7.4E-02	9.2E-02	6.5E-02	.501	8.9E-02	-6.7E-02
	Q8	.263	.135	.606	.228	.312	7.5E-02	-6.8E-03	2.6E-02	.145	187
	Q9	.183	2.1E-02	.537	.363	.160	.214	5.7E-02	-2.3E-03	103	146
	Q10	.252	.317	.578	.232	.165	2.9E-02	.227	3.8E-02	2.5E-02	.215
	Q11	.124	.331	.643	.302	.120	3.4E-02	.252	-1.9E-02	-1.3E-02	7.0E-02
	Q12	.249	.205	.545	.346	.321	.130	.118	.151	-7.6E-02	1.0E-03
<u> </u>	Q13	.581	.176	.240	.277	9.5E-02	.148	6.1E-02	.262	.116	7.8E-02
giq	Q14	.237	.471	.302	.403	3.7E-02	.172	.124	.133	1.0E-02	.207
ate	Q15	.251	.358	.608	.345	8.2E-02	.159	.209	.169	6.2E-02	9.9E-02
itre lau	Q16	.220	.303	.419	.324	6.1E-02	.158	.419	.267	-5.2E-03	-7.3E-02
ωд	Q17	.347	.276	.445	.309	4.2E-02	.172	.319	8.5E-02	-5.8E-02	7.0E-02
	Q18	.235	.318	.314	.444	.130	.190	9.3E-02	.453	7.3-02	.251
sna	Q19	.263	.338	.343	.562	.108	.228	9.1E-02	.268	6.1E-02	.163
ö	Q20	.249	.362	.274	.606	1.4E-02	.196	.169	.140	-2.7E-02	.154
т. Т	Q21	.196	.177	.221	.530	.486	.146	6.2E-02	2.1E-02	-3.5E-02	316
ĂK M	Q22	.280	.251	.232	.565	.500	.131	.133	7.8E-02	-6.2E-02	129
∞ ∞	Q23	.364	.209	.285	.588	.175	.119	.215	7.6E-02	-4.9E-02	9.7E-02
er	Q24	.348	9.3E-02	.284	.613	.293	.144	-4.7E-02	-3.6E-02	5.4E-02	-8.1E-02
E O	Q25	.243	.180	.274	.707	.270	.189	.108	3.3E-02	5.1E-02	229
ste	Q26	.275	.266	.258	.664	.202	.235	.174	5.5E-02	-7.3E-04	.105
ũ	Q27	.102	.324	.256	.568	5.0E-02	.171	.182	7.0E-02	7.0E-02	8.6E-02

	Q28	.110	.825	.213	.196	.221	.168	.162	8.5E-02	-1.1E-02	-8.0E-02
alysis	Q29	.150	.787	.235	.242	.169	.223	6.3E-02	3.5E-02	3.1E-02	-2.6E-04
	Q30	.159	.850	.209	6.2E-02	.199	.114	8.5E-02	7.8E-02	5.4E-03	7.4E-02
	Q31	.159	.866	.249	.197	.112	.208	2.7E-02	6.6E-03	8.3E-02	1.5E-02
Ar	Q32	.177	.866	.147	.159	.147	.148	7.3E-02	.110	-2.0E-02	2.2E-03
80	Q33	.120	.536	.110	.433	.114	.283	.331	.217	4.9E-02	-9.7E-02
j.	Q34	.205	.482	.233	.282	.148	.147	.565	6.3E-02	5.0E-02	8.9E-02
2	Q35	.134	.560	9.6E-02	.360	.145	.254	.420	.171	5.0E-02	132
urces	Q36	.308	.449	9.5E-02	.318	.147	.239	.495	.132	5.0E-02	-8.3E-02
	Q37	.838	.165	.188	.212	.209	6.2E-02	3.1E-02	-1.6E-02	-6.5E-02	5.0E-02
	Q38	.773	.175	.339	.205	.179	9.8E-02	.110	-1.0E-02	-2.6E-02	2.5E-02
	Q39	.827	9.0E-02	.234	.225	.162	9.2E-02	.219	5.8E-02	-5.1E-02	7.4E-02
so	Q40	.736	.148	.206	.200	.237	.150	3.2E-02	5.0E-02	2.1E-02	2.8E-02
e K	Q41	.530	.182	.382	.275	.244	.120	.218	4.6E-02	-7.2E-02	215
S	Q42	.687	.251	.159	.126	.206	.112	.156	9.9E-02	-1.7E-02	121
ma	Q43	.443	.251	.102	6.5E-02	.278	.230	.185	.340	116	-3.2E-02
Ŧ	Q44	.354	.307	.196	-2.6E-02	.282	.233	.222	.387	189	-9.9E-02
_	Q45	.805	9.3E-03	.207	.113	.166	.292	2.7E-02	7.1E-02	8.9E-02	5.0E-02
	Q46	.658	.218	.114	.157	8.0E-02	.359	.222	1.5E-02	.102	-1.1E-02
	Q47	.197	.156	.243	.289	.396	.414	.455	.111	5.3E-02	5.2E-02
	Q48	.401	.226	.229	.333	.125	.530	.378	-5.7E-02	6.7E-02	9.1E-02
ent c	Q49	.422	.274	.261	.268	.159	.412	.471	6.2E-03	-1.8E-02	.121
SS6	Q50	.269	.371	9.0E-02	.185	.279	.572	.328	5.6E-02	-8.1E-02	-7.4E-02
ige	Q51	.314	.427	.179	.246	.231	.580	.243	.135	-7.4E-04	-5.9E-02
Pro	Q52	.317	.413	.200	.299	.220	.597	.122	.106	3.8E-02	-7.9E-02
ů E	Q53	.496	.315	3.5E-02	.216	.194	.546	4.9E-02	9.2-02	.120	-5.3E-02
	Q54	.265	.321	.140	.204	.232	.604	7.8E-02	4.6E-02	-9.0E-03	6.9E-03
	Q55	.272	.333	.175	.250	.230	.619	2.4E-02	.143	5.4E-02	.107
	Q56	.269	.273	.119	.243	.713	.231	.142	-1.3E-02	.171	.139
	Q57	.444	.257	-4.9E-02	.139	.705	9.6E-02	.105	7.4E-02	.215	.198
	Q58	.497	.203	1.3-02	8.2E-02	.653	8.9E-02	.118	6.3E-02	.228	.161
s	Q59	.347	.396	.231	.174	.446	.245	.244	7.4E-03	164	-1.1E-02
s Result	Q60	.810	.135	.199	.132	.286	.149	8.5E-02	.193	1.6E-02	-2.2E-02
	Q61	.778	8.4E-02	.174	.156	.263	.235	.122	.126	9.7E-02	1.8E-03
	Q62	.367	.517	.149	.177	.344	.410	6.5E-02	.135	-8.4E-02	.134
es	Q63	.327	.203	.458	9.3E-02	.323	.242	-7.7E-02	.215	309	.129
sin	Q64	.422	.306	.344	.166	.540	.291	-6.9E-02	.105	107	188
3ů	Q65	.506	.260	.199	.169	.483	.226	103	.128	-1.9E-02	129
	Q66	.246	.137	.301	.191	.649	.278	5.2E-02	.170	-5.07-02	2.6E-02
	Q67	.330	.272	.188	.171	.359	.184	.278	8.2E-02	146	.303
	Q68	.161	5.5E-02	.244	8.2E-02	.568	8.0E-02	7.0E-02	3.0E-02	-4.6E-02	128
1	Q69	.424	.190	.283	.278	.359	.178	.117	.270	242	-4.4E-02

Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 16 iterations.

The extraction of two dimensions, Leadership and Strategic Planning, into one

factor is believed to result from the inherent correlation between the two. Strategic

Planning measures mostly management's strategy and plan to achieve goals, which stem

from Leadership. Thus Strategic Planning evidently has a significant overlap with Leadership dimension. However, a closer look at the factor matrix shows slight different loadings between the two on the other factors. For example, Leadership group has higher loadings on factor 1 than Strategic Planning group and has lower factor loadings on factor 2 than Strategic Planning. This difference can be more clearly identified by plotting the variables in the factor space. Considering theoretical background and significance of each dimension, it was decided not to combine these two dimensions in further analysis in this study.

Next step was to determine the best set of variables for each factor. As discussed earlier, high loadings on a factor indicate that there is much in common between the factor and the respective variable. With the selection rule with factor loadings greater than 0.50 on one factor and less than 0.40 on all the others, the 69-variables set was reduced into 42 variables. However a caution was exercised on these variables that exhibit only a slight deviation from the 0.5 and 0.4 selection requirement. Most of them were deleted but some that are regarded theoretically important were retained. Those variables include Q48, Q52, Q57, Q58, and Q64. Question 48 was retained due to the importance of quality in the design stage. Question 52 was retained because quality assessment of product and service is indispensable to quality improvement. Questions 57, 58, and 64 were retained because of the importance of quality benchmarking efforts in achieving customer loyalty, customer perceived value, and service quality. Also, Q34 (internal performance data analysis) and Q35 (external performance data analysis) were combined into one (performance data analysis) to avoid redundancy. In table 31, the bold and italicized factor loading indicate that the identified variable was selected in the

dimension. An Italicized but not bolded loading shows that the variable is significant but

not selected due to the substantial overlap of that variable loadings on the other factors.

Table 32 shows the final set of items for the MBNQA questionnaire developed through

exploratory factor analysis and the described considerations.

Table 32

Revised MBNQA questionnaire

	1. Leadership
1.	Management of the CoD clearly sets strategy, goals, and objectives for future directions
	for the organization.
2.	Management of the CoD establishes and reinforces environment for empowerment and
2	innovation.
3.	Management of the CoD encourages and supports organizational and employee learning.
4.	management in CoD is concerned with the impact on society of our products, services, or
5.	CoD actively supports and strengthens our relationships with key segment of the
	community (such as education, community service organizations, religious organizations,
	or professional associations)
	2. Strategic Planning
6.	CoD has a well-defined short-term (1-2 years) plan to help achieve its goals and
	objectives.
7.	CoD has a well-defined long-term (2-5 years) plan to help achieve its goals and
	objectives.
8.	CoD has a well-defined strategy/plan to increase Customer/citizen/citizen satisfaction.
9.	CoD has well-defined strategy/plan to address key goals and objectives.
	3. Customer and Market Focus
10.	CoD has a formal method for determining future product/service requirements and
	expectations of its Customer/citizens/citizens.
11.	CoD has a formal method for identifying Customer/citizen/citizen groups and market
10	segments.
12.	CoD determines key Customer/citizen/citizen contact requirements and delivers them to
12	all employees involved in the response chain.
13.	CoD resolves Customer/citizen/citizen complaints promptly and effectively.
14.	improvements to its processes
15	CoD measures and analyzes current levels of Customer/sitizen/sitizen satisfaction and
15.	dissatisfaction
16	COD compares its Customer/citizen satisfaction results with similar organizations
10.	con compares its customer/entzen substaction results with similar organizations.
	4. Information and analysis
CoI	D provides effective performance measurement systems and techniques for ensuring each
<u>of t</u>	he following (17-20):

17	Data and information valiability								
17.	Data and information reliability								
18.	Data and information consistency								
19.	17. Data and information review								
20.	Data and information review.								
21.	limely update of data and information								
22.	Performance data and information gathered is systematically analyzed to help support								
	overall quality objectives.								
	5. Human Resources								
CoD	CoD exerts efforts toward building a work environment and an employee support climate								
conc	luctive to the followings (23-26)								
22	C 11								
23.	performance excellence								
24.	full involvement in their work								
25.	personal growth								
26.	organizational growth								
27.	CoD promotes cooperation, individual initiatives, innovation, and flexibility to achieve its goals and objectives.								
28.	CoD's compensation, recognition, and related reward practices reinforce high								
20	performance.								
29.	coD maintains a work environment conductive to the wen-being and growth of an its								
30	CoD regularly monitors ampleyee satisfaction and uses the results to support its quality								
50.	improvement and inprovation offerts								
	improvement and innovation errorts.								
	6 Propos Management								
CoD	0.110ccss Management								
follo	wing (21, 22):								
10110	wing (51-52).								
21	Addressing quality issues early in the design evalu								
51.	Addressing quanty issues early in the design cycle.								
52.	CoD monitors the processes used to provide products and services in order to identify								
	when it is necessary to make corrections.								
CoD	formally assesses the quality of its (33-35):								
22									
33.	products and services.								
34.	goods and services supplied by external suppliers and partners.								
35.	CoD's quality requirements are communicated to all external suppliers of goods and								
	services.								
	7. Business Results								
The	CoD's current level of each of the following is superior to similar cities (36-41)								
36.	Customer/citizen satisfaction.								
37.	Customer/citizen loyalty and positive referral.								
38.	Financial performance (e.g. return on investment, budget variance, profitability)								
39.	Customer/citizen-perceived value								
40.	Quality								
41.	Environmental citizenship								
42	Crime control								
74.									
IS-SERVQUAL

An overall value of 0.927 for the KMO measure indicates that the correlation matrix of IS-SERVQUAL questionnaire is appropriate for factoring. Also Bartlett's test statistic is significant (p=0.000) and implies that the correlation matrix is not orthogonal. Therefore, it is appropriate for factoring.

Table 33

KMO and Bartlett's Test: IS-SERVQUAL

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.927
Bartlett's Test of Sphericity	Approx.	8148.411
	Chi-Square	
	df	1431
	Sig.	.000

Principal axis factoring with varimax rotation extracted six factors with eigenvalue-greater-than-one. However, as shown in rotated factor matrix (Table 34), only three of them are deemed to have significant factor loadings between variables and factors.

The variables in the same dimension showed a similar pattern of factor loadings. This means that the variables in each dimension measure the same latent variable. However, the separation among the dimensions was not apparent, indicating that some variables in different dimensions measure very similar or same construct. It is potentially due to a substantial redundancy or overlap among the variables across the dimensions. The results indicate that ten dimensions with 54-item-set is too many to measure IS service quality, which is a relatively narrow and specifically defined construct.

Reliability, Responsiveness, and Timeliness were grouped into one (factor 2 in Table 34), though each of them showed slightly different loading patterns on the other

factors. Empathy, and Attitude/Commitment were grouped into factor 1. Relationship singularly belonged to factor 3. Competence was significantly loaded onto factor 4 but, simultaneously, they were slightly highly loaded onto factor 2. Training was also significantly loaded onto two factors at the same time, indicating significant overlap with other dimensions. Communication did not show significant loadings to any factors.

Thus, only three factors are determined as significant dimensions. Reliability, Responsiveness, and Timeliness are grouped into one new dimension called Reliability (factor 2). Training, Empathy, and Attitude/Commitment are grouped as Support (factor 1). The relationship dimension remains same (factor 3).

In the Table 34, the bold and italicized factor loading indicate the variable was selected in the dimension. An italicized but not bolded loading indicate that the variable is significant but not selected due to the substantial overlap on the other factor.

Table 34

Rotated Factor Matrix: IS-SERVQUAL

Dimension	Var	Factor					
		1	2	3	4	5	6
		Support	Reliability	Relationship			
	Q1	.353	.757	.116	.341	.205	-2.041E-02
	Q2	.361	.787	.237	.302	.114	-5.355E-02
Reliability	Q3	.373	.747	.115	.316	.200	-8.952E-02
	Q4	.348	.772	.185	.353	.172	-5.540E-02
	Q5	.367	.719	.225	.362	.125	105
	Q6	.250	.447	.175	.701	.232	6.177E -02
	Q7	.213	.531	.196	.708	.227	4.445E -02
Competence	Q8	.483	.397	.238	.584	.222	-8.323E-02
	Q9	.374	.428	.293	.602	.257	-4.315E-02
	Q10	.355	.459	.289	.644	.239	2.440E -02
	Q11	.359	.459	.233	.682	.205	.115
	Q12	.168	.697	.379	.277	.191	.238

Responsiveness	Q13	.264	.682	.372	.148	.202	.287
	Q14	.336	.712	.331	.167	.217	.221
	Q15	.306	.588	.566	.224	.151	.258
	Q16	.449	.685	.335	.219	.192	.182
	Q17	.381	.710	.332	.237	.167	.235
	Q18	.363	.731	.257	.284	.123	3.327E -02
Timeliness	Q19	.347	.736	.273	.215	.264	163
	Q20	.361	.709	.285	.214	.226	228
	Q21	.403	.676	.340	.234	.227	-6.739E-02
	Q22	.383	.679	.357	.253	.243	-6.381E-02
	Q23	.555	.442	.375	.147	.221	7.042E -02
	Q24	.208	.400	.276	.212	.384	1.708E -02
Communications	Q25	.431	.415	.330	-9.89E -02	.311	134
	Q26	.466	.455	.475	9.711E-02	.334	.201
	Q27	.462	.426	.567	.112	.134	.117
	Q28	.541	.516	.400	.171	.246	-5.757E-02
	Q29	.712	.393	.164	.243	.118	153
Training	Q30	.762	.336	.233	.288	.151	-5.084E-02
	Q31	.589	.352	.355	.411	.135	-8.277E-02
	Q32	.709	.363	.327	.215	.231	225
	Q33	.766	.321	.229	.228	.221	113
	Q34	.770	.337	.221	.201	.211	118
Empathy	Q35	.611	.330	.368	.123	.265	7.268E -02
	Q36	.650	.123	.347	.156	.361	.281
	Q37	.655	.314	.450	.213	.195	5.436E -02
	Q38	.669	.291	.405	.291	.218	.154
	Q39	.700	.331	.320	.225	.240	.136
	Q40	.682	.288	.365	.220	.299	.160
Attitude/	Q41	.728	.329	.264	.222	.173	.101
Commitment	Q42	.751	.382	.188	.128	.237	6.262E -02
	Q43	.749	.386	.174	.193	.215	.114
	Q44	.665	.306	.332	.269	.253	7.827E -02
	Q45	.518	.368	.618	.276	6.5E-02	-1.749E-02
	Q46	.483	.218	.708	.245	.175	2.511E -02
Relationships	Q47	.305	.337	.793	.130	.164	3.409E -02
	Q48	.302	.282	.794	.256	.239	-3.429E-02
	Q49	.386	.313	. 752	.178	.207	114
Access	Q50	.390	.224	.188	.218	.730	2.646E -02
	Q51	.404	.242	.176	.199	.728	5.777E -02
	Q52	.323	.418	.137	.220	.452	8.155E -02
	Q53	.162	.182	.399	.237	.475	-3.416E-02
	Q54	.484	.355	.211	.355	.526	198

Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.

a Rotation converged in 11 iterations.

Table 35 shows the final set of items for IS-SEVQUAL questionnaire developed

through exploratory factor analysis.

Table 35

Refined Set of IS-SEVQUAL Questionnaire

	Reliability			
1.	The MIS staff does what it promises to do.			
2.	The MIS staff is reliable.			
3.	The MIS staff performs services right the first time.			
4.	The MIS staff is dependable.			
5.	Reliability means the extent to which the MIS staff performs promised service dependably.			
	Please rate the overall reliability of the MIS staff.			
6.	When I have a problem, the MIS staff does its best to respond as soon as possible.			
7.	The people on the MIS staff return my calls promptly.			
8.	Members of the MIS staff respond quickly to e-mails requesting information or assistance.			
9.	Responsiveness means the willingness and speed with which the MIS staff makes an initial			
	response to inquires from users. Please rate the overall responsiveness of the MIS staff.			
10.	When problems occur, the MIS staff solves them in a timely manner.			
11.	The MIS staff finishes projects on time.			
12.	The members of the MIS staff meet their deadlines during system development and			
	implementation.			
13.	Timeliness means the elapsed time between a user's request and the design, development			
	and implementation of new applications or change requests by the MIS staff. Please rate the			
	timeliness of the MIS staff.			
	Attitude			
14.	The MIS staff ensures that users are properly trained on new systems.			
15.	The MIS staff provides adequate training support for my needs.			
16.	The MIS staff understands that a new project is not over until the user training is complete.			
17.	Training means the amount of instruction and support for learning that is afforded to the			
	user to increase the user's proficiency in utilizing Information Technologies. Please rate the			
	training provided by the MIS staff.			
18.	The MIS staff understands the specific needs of the users.			
19.	My IT-related problems are important to the MIS staff.			
20.	The members of the MIS staff understand my frustrations with computer-based information			
	systems.			
21.	Empathy means the ability of the MIS staff to understand the specific needs of the user.			
	Please rate the overall empathy of the MIS staff.			
22.	People on the MIS staff are open to suggestions from users regarding how Information			
	Technology systems can be improved.			
23.	The members of the MIS staff are committed to user involvement in the design,			
	development or alteration of computer-based information systems.			
24.	The members of the MIS staff seek input from users before making changes to existing			
	systems.			
25.	The MIS staff considers users to be part of the development team.			
26.	Attitude/Commitment to user involvement means the commitment of the MIS staff to			
	support user involvement and participation in the design, development, or alteration of			
	computer-based information systems. Please rate the Attitude/Commitment to user			
	involvement of the MIS staff.			
	Relationship			
27	The members of the MIS staff are courteous.			
27.	I get along well with members of the MIS staff.			
20.	Relationships mean the manner and methods of interaction, conduct, and personal			
	association between users and the MIS staff. Please rate the relationships between you and			
	the MIS staff			

IS-SUCCESS

An overall value of 0.945 for the KMO measure indicates that the correlation matrix of IS-SUCESS questionnaire is appropriate for factoring. Also Bartlett's test statistic is significant (p=0.000) and implies that the correlation matrix is not orthogonal. Therefore, it is appropriate for factoring.

Table 36

KMO and Bartlett's Test: IS-SUCCESS

Kaiser-Meyer-Olkin Measure		.945
of Sampling Adequacy.		
Bartlett's Test of Sphericity	Approx.	4101.230
	Chi-Square	
	df	171
	Sig.	.000

Table 37

Rotated Factor Matrix: IS-SUCCESS

		Factor	
		1	2
System Quality	Q1	.855	-5.367E-02
	Q2	.804	.119
	Q3	.857	-5.247E-02
	Q4	.824	.177
	Q5	.853	6.984E -02
	Q6	.928	6.045E -02
Information	Q7	.862	9.352E -02
Quality	Q8	.890	103
	Q9	.884	3.086E -03
	Q10	.869	-9.415E-03
	Q11	.911	8.412E -02
	Q12	.905	2.644E -02
	Q13	.939	5.836E -02
Satisfaction	Q14	.798	.320
Indiv. Impact	Q15	.652	.605
Org. Impact	Q16	.690	.562
Use	Q2-Part A	-3.119E-02	.397
	Q3-Part A	4.733E -02	.291
	Q5-Part A	-8.953E-02	.435

Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.

a Rotation converged in 3 iterations.

Principal axis factoring with varimax rotation extracted two factors with eigenvalue-greater-than-one. All the variables except Use had high loadings on factor 1, as shown in Table 37. Thus careful observation on the lodgings on factor 2 is needed to distinguish characteristics of the dimensions. About three different loading groups are identified. The first group is System Quality and Information Quality. They showed very similar loading patterns and are grouped into one factor. This indicates that these two closely interact with each other and that the quality improvement in one area accompanies with the other in the City of Denton. The second group is Satisfaction and Impact dimensions. They also have significant relationships with factor 1 but much higher loadings on factor 2. Satisfaction has higher loading on factor 1 and lower on factor 2 than Impact dimensions. The third group is a Use dimension. The variables in Use do not significantly relate to any of the two factors but they show a similar pattern, low on factor 1 but slightly high on factor 2.

Factor score

Based on the results of the exploratory factor analysis, factor scores were calculated for all dimensions involved in this study. Each score is a composite index of several variables and it represents a respondent's composite score on each dimension. Multiple regression is one of the techniques that estimate the factor score coefficients. The estimated factor score is a function of the original standardized variables and the loading matrix. The scores produced have mean of 0 and a variance equal to squared multiple correlation between the estimated factor score and the true factor values.

Table 38 shows the factor score coefficient matrix and the factor score covariance for each factor in the MBNQA survey instrument.

Table 38.

Factor Score matrix: MBNQA

Factor	Question#	Factor Matrix	Factor Score	Factor Score
			Coefficient	Covariance
			Matrix	
Leadership	Q1	.820	.319	.872
·	Q2	.762	.226	
	Q3	.761	.236	
	Q4	.736	.205	
	Q5	.674	.160	
Strategic	Q6	.877	.273	.925
Planning	Q7	.892	.323	
-	Q8	.809	.176	
	Q9	.874	.293	
Customer &	Q10	.821	.173	.936
Market Focus	Q11	.809	.133	
	Q12	.842	.210	
	Q13	.673	.061	
	Q14	.797	.167	
	Q15	.897	.323	
	Q16	.729	.063	
Info & Analysis	Q17	.951	.326	.972
	Q18	.939	.171	
	Q19	.901	.104	
	Q20	.947	.280	
	Q21	.880	.134	
	Q22	.697	.036	
Human	Q23	.884	.199	.953
Resources	Q24	.869	.124	
	Q25	.910	.259	
	Q26	.840	.121	
	Q27	.811	.128	
	Q28	.738	.083	
	Q29	.825	.124	
	Q30	.743	.087	
Process	Q31	.843	.192	.935
Management	Q32	.837	.177	
	Q33	.889	.276	
	Q34	.877	.246	
	Q35	.850	.193	
Business Results	Q36	.899	.293	.934
	Q37	.867	.181	
	Q38	.847	.189	
	Q39	.703	.089	
	Q40	.813	.205	
	Q41	.750	.115	
	Q42	.577	.064	

Only the variables that were selected through the previous exploratory factor analysis are used to estimate the factor score. Variables in the table represent the question numbers in the revised survey. It should be noted that Leadership and Strategic Planning are not combined together at this stage even though they loaded into the same factor because the main objective is to test interrelationships among the factors in the original MBNQA framework and IS-MBNQA framework. The factor score coefficients and covariances were produced using Principal Axis Factoring with Varimax rotation. The results are used as an input to calculate a weighted linear sum for each factor for each respondent.

Table 39 shows the factor score coefficient matrix and the factor score covariance for each factor in IS-SERVQUAL.

Table 39.

Factor	Question #	Factor Matrix	Factor Score	Factor Score
			Coefficient	Covariance
			Matrix	
Reliability	Q1	.069	.911	.984
,	Q2	.157	.948	
	Q3	.036	.858	
	Q4	.140	.937	
	Q5	.058	.913	
	Q6	.063	.871	
	Q7	.040	.841	
	Q8	.075	.845	
	Q9	.107	.909	
	Q10	.099	.910	
	Q11	.115	.921	
	Q12	.059	.887	
	Q13	.066	.902	
Support	Q14	.853	.022	.982
	Q15	.922	.136	
	Q16	.900	.070	
	Q17	.925	.135	
	Q18	.918	.106	
	Q19	.838	.052	

	Q20	.824	.047	
	Q21	.874	.085	
	Q22	.877	.097	
	Q23	.904	.103	
	Q24	.906	.064	
	Q25	.909	.116	
	Q26	.882	.059	
Relationship	Q27	.919	.107	.982
- 1	Q28	.988	.766	
	Q29	.936	.136	

Table 40 shows the factor score coefficient matrix and the factor score covariance for System Quality, Information Quality, and Use in IS-SUCCESS. Variables in the table represent the question numbers in the original survey. The factor score coefficients and covariances were produced using Principal Axis Factoring with Varimax rotation.

Table 40.

Factor Score matrix: IS-SUCCESS

Factor	Question #	Factor Matrix	Factor Score	Factor Score
			Coefficient	Covariance
			Matrix	
System	Q1	.877	.064	.976
Quality	Q2	.836	.087	
Quality	Q3	.868	.059	
	Q4	.873	.114	
	Q5	.919	.139	
	Q6	.978	.582	
Information	Q7	.900	.097	.979
Quality	Q8	.875	.092	
Quality	Q9	.911	.133	
	Q10	.913	.120	
	Q11	.950	.201	
	Q12	.912	.077	
	Q13	.967	.329	
Use	Q2-Part A	.737	.595	.631
	Q3-Part A	.318	.130	
	Q5-Part A	.540	.281	

Regression Analysis

The factor scores are used as an input for regression analysis to find out the significant predictor of business results in MBNQA framework. In MBNQA framework, business result is dependent variable and the other six (Leadership, Strategic Planning, Customer & Market Focus, Information & analysis, Human Resources, and process management) are independent. Stepwise regression was performed with an entry level of 0.05 (probability of F) and a removal level of 0.10. Stepwise regression puts variables into the equation, one at a time, beginning with the variable having the highest correlation with dependent variable. At each stage the procedure can remove any variable whose partial F-value indicates that this variable does not contribute, given the present set of independent variables in the model.

The stepwise regression procedure stopped after the addition of three variables, Process Management, Human Resources, and Information & Analysis. The result in Table 41 shows three significant variables put into the model. Process Management was the most significant variable in explaining Business Result and was first selected. Then Human Resources and Information & Analysis entered as next significant predictors. The regression model is significant at 0.01 level (p=0.000) and the three variables in this model explained 57.5% (R^2) of total variation. All variance inflation factor (VIF) are less than10, indicating that no significant multicollinearity was detected among the independent variables. T-test on each variable showed that Process Management and Human Resources are significant at 0.01 (p=0.000) and Information & Analysis was significant at 0.025 (p<0.019). Table 41.

Stepwise Regression Analysis

Variables Entered/Removed

Model	Variables	Variables	Method
	Entered	Removed	
1	PROC_MGM		Stepwise (Criteria: Probability-of-
			F-to-enter <= .050, Probability-of-
			F-to-remove >= .100).
2	HR		Stepwise (Criteria: Probability-of-
			F-to-enter <= .050, Probability-of-
			F-to-remove >= .100).
3	INFO_ANL		Stepwise (Criteria: Probability-of-
			F-to-enter <= .050, Probability-of-
			F-to-remove >= .100).

a. Dependent Variable: RESULT

ANOVA

Mode		Sum of	df	Mean	F	Sig.
		Squares		Square		-
1	Regression	49.373	1	49.373	109.385	.000
	Residual	51.457	114	.451		
	Total	100.830	115			
2	Regression	55.317	2	27.659	68.671	.000
	Residual	45.513	113	.403		
	Total	100.830	115			
3	Regression	57.523	3	19.174	49.589	.000
	Residual	43.307	112	.387		
	Total	100.830	115			

a. Predictors: (Constant), PROC_MGM

b. Predictors: (Constant), PROC_MGM, HR

c. Predictors: (Constant), PROC_MGM, HR, INFO_ANL

d. Dependent Variable: RESULTS

Coefficients

	Coefficients	Std. Error	t	Sig.	VIF
(Constant)	-3.100E-02	.058	537	.592	
PROC_MGM	.387	.095	4.074	.000	2.291
HR	.285	.075	3.772	.000	1.729
INFO_ANL	.178	.075	2.388	.019	1.650

a. Dependent Variable: RESULTS

In MBNQA model, Process Management, Human Resources, and Business Results are grouped together in a 'business triad' and the first two directly affect Business Result. The result supports the existence of significant direct effect of Process Management and Human Resources on Business Results. It should also be noted that Process Management solely explained 48.97% of total variation. This indicates that Process Management is a very significant indicator of Business Results and that Business Results is eventually realized in large part by Process management. Information & Analysis dimension serves as a moderator in MBNQA model, thus this dimension directly affects all the others simultaneously. All the other independent variables, Leadership, Strategic Planning, and Customer Focus, may affect the Business Results indirectly. The regression result supports the partial relationship of seven dimensions in MBNQA framework and the appropriateness of Information dimension as a moderator.

Confirmatory Factor Analysis

DeLone & McLean's IS Success Model

DeLone & McLean's IS Success model consists of six variables representing the relationships among them. The covariance matrix for the 6 input variables was calculated and used as an input to perform a maximum likelihood linear structural relation analysis. The LISREL 8.30 program (Jörekog and Sörbom, 1999) was used for this confirmatory factor analysis. Major objective of confirmatory factor analysis is to empirically validate the hypothesized model. The confirmatory factor analysis estimates the parameters of the hypothesized model with a sample covariance matrix and determines the fit of the hypothesized model.



Chi-square=35.10, df=6, p-value=0.00000, RMSEA=0.269 (X1: System Quality, X2: Information Quality, Y1: Use, Y2:User Satisfaction, Y3:Individual Impact, Y4:Organizational Impact)

Figure 10. Path Analysis: DeLone & McLean's Model (t-value estimations)

The results of the analysis were examined to determine the degree of fit of the model. There is not a clear single measure for testing model fit, thus several measures should be considered together to reach a conclusion.

Analysis of the model resulted in a chi-square (6, N=116)=35.10 (p=0.0000) which indicates that data does not fit the model. Goodness-of-Fit index (GFI) of 0.86 indicates that the model moderately fits. GFI of 1.0 indicates a perfect fit. The root mean square error of approximation (RMSEA) value of 0.27 is above the acceptable limit of 0.08 and implies a poor model fit. The adjusted goodness-of-fit index (AGFI) value is 0.49 and is far below its recommended value of 0.9. Overall, indicators showed poor fit and the fit indices indicate that the model did not reproduce the covariance matrix very

well. It may imply that a model test with an inclusion of Individual and Organizational Impact altogether does not guarantee to reveal sound causal relationship.

IS-MBNQA Model

This research proposes that the integration of the IS-SERVQUAL and DeLone & McLean's IS Success model into the MBNQA framework allows development of a new organizational-level framework. This new framework will enhance the examination of how organizational dimensions interact with each other and how they singularly or jointly result in organizational outcomes within a larger organizational context. Two dimensions in DeLone & McLean's IS Success model, Impact on individual and organization, are assumed to be absorbed into the other six socio-organizational dimensions in the new framework. Thus the two Impact dimensions do not appear in the model, though they are represented inside the model. In this way we can ensure discriminant validity avoiding measurement redundancy.

The new model enhances the MBNQA framework by modifying the Information & Analysis dimension. The dimension is reinforced by replacing it with IS-SERVQUAL and DeLone & McLeans's IS-Success model. Like MBNQA, the new model consists of three major components: 1) Leadership triad (Leadership, Strategic Planning, and Customer & Market Focus), 2) Result triad (Human Resources, Process Management, and Business Result), and 3) Information System. Thus the model consists of three latent variables (IS assessment, Leadership triad, and Results). Both leadership and results have three indicating variables. IS assessment includes five indicating variables: System Quality, Information Quality, Use, User satisfaction, and IS-SERVQUAL. In this model,

the Leadership triad is linked to result triad. Information system is critical to the effective management and serves as a foundation for the whole system.

The covariance matrix for the 11 input variables was calculated and used as input to perform a maximum likelihood linear structural relation analysis. The LISREL 8.30 program (Jörekog and Sörbom, 1999) was used to empirically validate the hypothesized model.



Chi-Square=43.37, df=39, P-value=0.29032, RMSEA=0.040 (X1: System Quality, X2: Information Quality, X3:IS-SERVQUAL, X4: Use, X5: User Satisfaction, Y1: Leadership, Y2: Strategic Planning, Y3: Customer & Market Focus, Y4: Human Resources, Y5: Process Management, Y6: Business Result)

Figure 11. Path Analysis: Proposed IS-MBNQA (t-value estimations)

Analysis of the model resulted in a chi-square (39, N=116)= 43.37 (p=0.29) which indicates that the data fit the model. Other indicators also confirmed the good fit. Goodness-of-Fit index (GFI) of 0.90 indicates that the model fits very well because a GFI of 1.0 indicates a perfect fit. The root mean square error of approximation (RMSEA) value of 0.04 is under the acceptable limit of 0.08 and implies a good model fit. The adjusted goodness-of-fit index (AGFI) value is 0.83 and is close to its recommended

value of 0.9. Overall, the fit indices indicate that the model reproduces the covariance matrix well. Also all the loadings (squared multiple correlations) between indicator and latent variables are above 0.6, except Use dimension. Using all these criteria uniformly shows the overall adequacy of factor solutions.

The path coefficients were examined to determine whether or not they implied significant relationships between the corresponding variables. All the coefficients were positive and significant at 5% level. Coefficient between Leadership triad and Use was negative but was not significant at the 0.10 level. All the other coefficients, between latent variables and observed variables (lambda-X and lambda-Y), were significant at the 0.05 level. In addition, the total effects were significant on all causal relationships in the model at the 0.05 level. Conclusively, the results show that the proposed IS-MBNQA model fits the data very well and the causal relationships in the framework are validated. However, further investigation is needed on the Use dimension.

Table 42

Total ej	ffects of	construct	on the	indicators:	IS-MBNQA
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Construct	Total effects on						
	Leadership	Str. Plan	Cust & Mkt.	HR	Prcs. Mgmt	Result	
Leadership	0.87* (8.75**)	0.91 (9.54)	0.91 (8.55)	0.50 (8.54)	0.52 (6.04)	0.48 (5.93)	
Triad							
Result				0.74 (2.41)	0.77 (2.41)	0.72 (2.43)	
Triad							
Info	0.47 (4.34)	0.49 (4.44)	0.49 (4.29)	0.59 (5.92)	0.61 (6.07)	0.57 (6.15)	

* coefficient

** number in parenthesis represents t-value

Table 42 shows total effects of constructs on each dimension. The effect of Leadership triad is significant on all dimensions but more significant on the first three dimensions than on the next three dimensions. The effect of Information construct is significant on all the dimensions. Information is more significant on the Result triad than on the Leadership triad. Its effect is most evident on Result dimension (t=6.15) and next on the Process Management (6.07). It implies that Information plays a key role on all the facets of an organization and that it directly and indirectly affects the business result.

MBNQA Framework (NIST, 2000)

MBNQA framework has been updated several times to meet the experts' changing theoretical views. Updates generally involved modifications on subcategories or changing the weights that were assigned to categories. However, recently there was a change on the causal relationships of the seven dimensions. The Information and Analysis category was formerly (NIST, 1995) one of system components that link the Driver (Leadership) and Goal (Customer Satisfaction and Business Results), while it serves as a foundation for the whole framework in the latest version (NIST, 2000). However, very little effort was made on the testing the MBNQA framework and no validity tests on the current MBNQA framework (NIST, 2000) were published. The causal relationship in MBNQA framework (NIST, 2000) is empirically tested with structural equation modeling in this study.

As stated before, the difference between MBNQA and IS-MBNQA framework is on the Information dimension. In this section, variables measured in the original MBNQA Information & Analysis dimension will be used for confirmatory factor analysis.

The covariance matrix for the 7 input variables was calculated and used as an input to perform a maximum likelihood linear structural relation analysis. The LISREL 8.30 program (Jörekog and Sörbom, 1999) was used for this analysis.



Chi-Square=17.83, df= 12, p-value=0.08567, RMSEA=0.095

(X1: Information & Analysis, Y1: Leadership, Y2: Strategic Planning, Y3: Customer & Market Focus, Y4: Human Resources, Y5: Process Management, Y6: Business Result)

Figure 12. Path Analysis (t-value estimation): MBNQA (NIST, 2000)

Analysis of the model resulted in a chi-square (12, N=116)= 17.83 (p=0.086) which indicates that the data fit the model at 5% significance level. Goodness-of-Fit index (GFI) of 0.90 indicates that the model fits very well because GFI of 1.0 indicates a perfect fit. However, the adjusted goodness-of-fit index (AGFI) value of 0.77 is not close to its recommended value of 0.9. The root mean square error of approximation (RMSEA) value of 0.095 is slightly higher than acceptable limit of 0.08 and implies a unsatisfactory model fit. The fit indices indicate that the model reproduces the covariance matrix well. All the loadings (squared multiple correlations) between indicator and latent variables are above 0.6. Overall, most of the measures showed a moderate fit but a few did not.

The path coefficients were examined to determine whether or not they implied significant relationships between the corresponding variables. All the coefficients were

positive and significant at the 5 or 10% significance level except one. The path from Information to Result triad was significant only at the 10% level $(1.53 > t_{0.1, 12}=1.356)$. Comparing with other paths, t-value of this path is substantially small, indicating slightly significant relationship. However, the total effects of Information on each of three Result dimensions were significant. Total effect is sum of direct and indirect effect. This means that indirect effect of Information on Result triad is very significant. It supports the hypothesis that Information system indirectly affects business results through the other functions in an organization.

Table 43

Total effects of construct on the indicators: MBNQA (NIST, 2000)

Construct	Total effects on						
	Leadership	Str. Plan	Cust & Mkt.	HR	Prcs. Mgmt	Result	
Leadership	0.84* (8.20**)	0.88(8.95)	0.87 (8.32)	0.50 (3.97)	0.50 (4.11)	0.49 (4.06)	
Triad							
Result				0.79 (6.06)	0.78 (6.48)	0.77 (6.34)	
Triad							
Info	0.61 (7.15)	0.64(7.73)	0.64(7.23)	0.54 (5.70)	0.53 (6.13)	0.52 (5.96)	

* coefficient

** number in parenthesis represents t-value

Table 43 shows the coefficient and t-value measuring the strength of total effects of constructs on each dimension. The effect of the Leadership triad was consistent with the total effect in the IS-MBNQA framework. Its effect was significant on all dimensions but more significant on the first three dimensions (Leadership, Strategic Planning, and Customer & Market Focused) than on the next three (Human Resource, Process Management, and Result). Also the effect of Information was significant on all the dimensions. However, in the contrast to the IS-MBNQA framework, the Information was more significant on the Leadership triad than on the Result triad. The Information shows the strongest effect on Strategic Planning (t=7.73) followed by Customer & Market Focus (7.23). Conclusively, the results show that the MBNQA model (NIST 2000) fits the data and the causal relationships in the framework were validated.

IS-MBNQA vs. MBNQA (NIST 2000)

Confirmatory factor analysis supported the validity for both models with similar results. Given that IS-MBNQA is a modified version of MBNQA, the similar result of the two models can be a natural consequence. However, the effort is warranted on comparing and investigating differences between the two. In addition, to make the comparison in a more structured way, all the other dimensions except Information remain the same. In this way, the role of new Information dimension can be examined more clearly while holding all the other conditions the same.

Table 44 summarizes result of fit test measures of the two models. There is no single statistical test that best describes the strength of the model's predictions. Instead, several indicators are used in combination to assess the results. The better result of the two is bolded inside the table. However, some measures are not bolded when the measure cannot be directly compared.

Tests of absolute fit are concerned with the ability to reproduce the correlation/covariance matrix. Chi-square test shows IS-MBNQA has better absolute fit than MBNQA model. RMR, RMSEA, GFI, and AGFI measure testing fit of the model and indicate the two models are a good fit to the data. RMR and RMSEA indicate that IS-SERVQUAL model has better fit. MBNQA has a better GFI. Both models have the same AGFI. Overall, IS-MBNQA showed a better fit.

Table 44

Comparison of	f Goodness-of-fit	Measures for	IS-MBNQA	and MBNQA
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Statistics	Criteria	IS-MBNQA	MBNQA
Degrees of Freedom		39	12
Absolute Fit			
Chi-Square (p-value)		43.37(0.29)	17.83 (.086)
Minimum Fit Function Chi-Square	Small	50.75	17.26
Normal Theory Weighted Least Squares	Small	43.37	17.83
Chi-Square			
Root Mean Square Error of Approximation (RMSEA)	Below 0.1	0.04	0.095
Root Mean Square Residual (RMR)	Below 0.5	0.035	0.036
Goodness of Fit Index (GFI)	Above 0.9	0.9	0.93
Adjusted Goodness of Fit Index (AGFI)	Above 0.9	0.83	0.83
Comparative Fit			
Expected Cross-Validation Index (ECVI)	Small	1.71	0.75
Normed Fit Index (NFI)	Above 0.9	0.93	0.95
Non-Normed Fit Index (NNFI)	Above 0.9	0.97	0.96
Comparative Fit Index (CFI)	Above 0.9	0.98	0.98
Incremental Fit Index (IFI)	Above 0.9	0.98	0.98
Relative Fit Index (RFI)	Above 0.9	0.90	0.91
Parsimonious Fit			
Parsimony Normed Fit Index (PNFI)	Above 0.9	0.66	0.5
Parsimony Goodness of Fit Index (PGFI)	Large	0.53	0.37
Independence AIC	Small	716.7	374.77
Model AIC	Small	97.37	51.83
Saturated AIC	Small	132	56
Independence CAIC	Small	752.43	397.51
Model CAIC	Small	185.08	107.05

The comparative fit deals with whether the model under consideration is better than another competing model. In some sense, the tests of model fit of this study are based on a comparison of models. That is, indices of comparative fit typically choose as the baseline of a model that is known a priori to provide a poor fit to the data. The most common baseline model is the null (or independence) model. IS-MBNQA was better on NNFI and MBNQA was better on NFI and RFI. Overall, both models showed a similar level of comparative fit. Parsimonious fit indices are concerned primarily with the cost-benefit trade-off of fit and degrees of freedom. PNFI and PGFI indicate IS-MBNQA has a better parsimonious fit than MBNQA. Neither the AIC nor the CAIC index is scaled to range between 0 and 1 and cannot be directly compared because the two models have a different number of estimated variables and degrees of freedom.

In overall, both of the two models are a good fit to the data but the comparison of several measures indicated that the IS-MBNQA framework showed a better fit than the MBNQA.

Effect of Information

The previous section described the difference of the path analysis results between the two models. The major difference was on the role of the Information dimension in the causal relationship. In MBNQA, Information dimension showed more in common with Leadership triad and it affected Result indirectly. The path from Information to Result dimension was slightly significant, though the total effect of the path was highly significant. This means that the indirect effect of Information on Result triad is highly significant. On the contrary, in IS-MBNQA, Information dimension was more related to the Result triad. Its effect was most evident on Result and Process Management. The total effect of Information on all the dimensions was highly significant.

This discrepancy might come from different characteristics of the variables used to measure the dimension. The Information and Analysis category in MBNQA primarily examines information performance measurement systems such as effectiveness of measures, data completeness, reliability, and timeliness. Also it places heavy emphasis on the analysis of performance data and information. In the previous CFA result, it was

found that the Information dimension was the most highly related to Strategic Planning. This result supports that a performance measurement system is more likely to be an input to the strategic planning process. It implies that the Information & Analysis dimension of MBNQA lacks adequate guidance for the development of a comprehensive IS assessment system. This narrowly defined Information dimension cannot serve as a sufficient moderator for the organizational-level causal relationship model.

On the other hand, IS-MBNQA employs Information dimension that measures IS system thoroughly. Information dimension in IS-MBNQA is believed to be a better measure to examine Information's role and relationship along with other dimensions in an organizational-level framework.

CHAPTER 6

CONCLUSION

A discussion of the findings in the dissertation is presented in this chapter. Results and support for the findings are summarized and discussed in this chapter. Recommendations for future research and a discussion of the implications of the study conclude the chapter.

Summary of the Study

The purpose of this study was: 1) to develop and refine effective assessment measures of information systems quality and organizational quality, 2) to test the validity of theoretical models of these instruments, and 3) to investigate the relationship among the different components in an organization, especially on the effect of Information Systems on the other system components in the utilization of the proposed IS-MBNQA framework.

An IS quality assessment was developed on the basis of the Information Systems Assessment model (Myers, Kappelman, and Prybutok, 1997), which has a theoretical foundation on DeLone & McLean's IS Model (1992) and Pitt et. al.'s IS model (1995). An organizational quality assessment tool is built on the MBNQA framework (NIST, 2000). By integrating these established tools, a comprehensive organizational IS quality assessment framework, IS-MBNQA, was proposed in order to examine various relationships between the IS subsystem and the other subsystems in an organization.

An on-line survey was conducted at the City of Denton, Texas, for data collection. A total of 339 responses were received, resulting in a response rate of 30.82%. Seventy eight responses were discarded because of inconsistent responses by checking reversed and redundant questions, leaving 261 usable surveys. The survey was taken by an almost equal number of male (48%) and female (52%) respondents. The average age of the respondents was 40. About half of the participants have a degree from a four-year college or graduate school. About half of them held a managerial or professional position. On average, the respondents worked over 40 hours per week and utilized Information System for about 25 hours per week. These results suggest the respondents are well qualified for the survey participant group in this study.

Summary of the Findings

Exploratory Factor Analysis

The original MBNQA framework has seven dimensions. Principal axis factoring extracted ten factors with eigen-value-greater-than-one out of 69 variables. However, only six out of the ten factors were found to have significant factor loadings between variables and factors. Leadership and Strategic Planning were extracted into one dimension. Except for this joint loading, the factor grouping was exactly the same as MBNQA's theoretical dimensions and most of the variables were extracted to their intended dimensions. Given the large number of items and considerable correlations among the items, the grouping result was excellent.

IS-SERVQUAL has ten dimensions. Factor analysis extracted six factors with eigen-value-greater-than-one. However, only three of them are found to have significant factor loadings between variables and factors. Reliability, Responsiveness, and

Timeliness were grouped into one. Training, Empathy, and Attitude/Commitment were grouped into another factor. The Relationship dimension remained the same. The other three were removed because of insignificant or overlapped factor loadings. The result implies that ten dimensions with a 54-item-set are too many to measure IS service quality, which is a narrowly defined construct.

DeLone & McLean's IS success model has six dimensions. Two factors were extracted with eigen-value-greater-than-one. All variables except Use had high loadings on factor 1. About three different loading groups were identified. The first group is System Quality and Information Quality. The second group is Satisfaction and Impact dimensions. The third group is a Use dimension.

Instrument Development

The best set of variables to measure each factor was determined by exploratory factor analysis. The primary selection rule was to include variables that have factor loadings greater than 0.50 on one factor and less than 0.40 on all the others.

The MBNQA instrument was reduced to 42 variables from the original 69variable set. The IS-SERVQUAL instrument was reduced to 23 variables from an original 54-vriable set. There was no instrument modification on DeLone & McLean's instrument because all the factor loadings were deemed appropriate. Variables selected in these modified instruments were used as an input for the subsequent analysis.

Validity test on DeLone & McLean's IS-Success

Confirmatory factor analysis of the model resulted in a chi-square (6, N=116)= 35.10 (p=0.0000) which indicates that data does not fit the model well. Other indicators also showed poor fit and the fit indices indicated that the model did not reproduce the

covariance matrix very well. It implies that, in such a IS-specific-perspective model like DeLone & McLean's, a causal relationship test along with Individual and Organizational Impacts altogether is not appropriate. In other words, more macro-level IS framework is desired to provide a holistic view on how information system is related to other organizational components.

Validity test on IS-MBNQA

An IS-MBNQA framework was proposed in this study. Confirmatory factor analysis of the model resulted in a chi-square (39, N=116)=43.37 (p=0.29), indicating that the data fit the model. Other indicators also confirmed good fit. Conclusively, the proposed IS-MBNQA model fit the data very well and the framework was validated. However, a path from Information dimension to Use was not significant and further investigation is needed on the Use dimension.

Validity test on MBNQA Framework (NIST, 2000).

Confirmatory factor analysis of the model resulted in a chi-square (12, N=116)= 17.83 (p=0.086), indicating that the data fit the model at 5% significance level. Most of the other measures showed moderate fit but a few did not. Conclusively, the results showed that the MBNQA model (NIST 200) also fits data but it was not as good as the IS-MBNQA model. Also it should be noted that a significant indirect effect exists on the path from Information to Business Results. It supports the hypothesis that Information system indirectly affects business results through other functions in an organization.

Regression Analysis

Business Results was dependent variable and the other six (Leadership, Strategic Planning, Customer & Market Focus, Information & analysis, Human Resources, and

process management) were independent variables. Process Management, Human Resources, and Information & Analysis were selected as significant predictors to the Business Results. The three-variable regression model was significant at a 0.01 level (p=0.000) and explained 57.5% (R^2) of the total variation. Process Management was the most significant variable in explaining Business Results and it solely explained 48.97% of total variation. Process Management is the most closely related to Business Results and it eventually realizes Business Results. Also the results indicated that the Information & Analysis dimension in the model significantly contributes to Business Results.

Effect of Information System on Organization Results

Table 45

Summary of Findings

Test	IS-Success	IS-MBNQA	MBNQA (2000)				
Validity	No	Yes	Yes				
	IS-MBNQA showed better fit than MBNQA (2000)						

	Stepwise Regression	IS-MBNQA	MBNQA (2000)
Findings	1) Process	1) All causal paths	1) All causal paths
	Management, HR, and	significant except one,	significant, except
	Information are	Information to Use	Information to Result
	significant predictors to	2) Effect of IS is	triad.
	Business Result.	a. significant on all the	2) But indirect effect of
	2) Process	other dimensions	Information on Result is
	Management is the	b. the most significant	significant.
	most significant to	on Business Result	3) Effect of IS is
	Business Result.		a. significant on all the
			other dimensions
			b. the most significant
			on Strategic Planning

The effect of Information on all the other dimensions was highly significant in both IS-MBNQA and MBNQA (NIST, 2000) models. However, in the MBNQA model, the effect on the Result triad was not as significant as in IS-MBNQA model. In the MBNQA, the Information dimension showed more in common with the Leadership triad and it affected Results indirectly. To the contrary, in the IS-MBNQA, Information dimension was more related to the Result triad. Its effect was most evident on Result and Process Management dimensions. Conclusively, a significant total effect of Information System was detected on all the other organizational dimensions. In addition, its role as a moderator was verified.

Discussion

The primary limitation in this study was the use of factor scores. Factor scores are functions of the original standardized variables and the loading matrix. Due to the factor indeterminacy problem a number of loading matrices are possible. In other words, the factor scores are not unique. For this reason, some researchers hesitate to use the factor scores in further analysis (Sharma, 1996). However, this study involves a large set of variables, a total of 23 dimensions with 140 questions. To achieve a meaningful overidentified SEM solution, sample size should be well above 1,000 given the number of parameters to be estimated in the model. Even after exploratory factor analysis was used to reduce the number of variables the result still contained 16 dimensions with 90 variables and the same under-identified problem remained. Therefore reducing the number of indicators further was necessary to make exploring causal relationship possible and the use of factor scores was the only solution. Future study with a larger sample size could allow examination on the relationships among the dimensions and variables involved in this study without limitation of using the factor scores.

The response rate was about 31% and this is much better than the usual rate for mail surveys. A response rate greater than 30% is rare with mail survey (Alreck & Settle, 1985). Both of the estimation methods and tests of model fit in LISREL are based on the assumption of large samples. Even though there is not a definite rule, at least 200 observations are recommended (Kelloway, 1998). This study used 116 observations after a data cleaning process. Missing values can be dealt with several ways such as a substitution by average. However, it was decided that a higher priority should be put on the accuracy and reliability rather than on the sample size, as long as the sample size is not very small (e.g. less than 100). Thus a strict rule was applied during data cleaning process to achieve highly reliable response while sacrificing sample size. Listwise deletion was used for missing values. Also by checking reversed and redundant questions, all responses were eliminated when the responses show more than a 2-scale difference (in 7-Likert-scale) between the same two questions. In spite of relatively small sample size, the analysis yielded theoretically plausible and satisfactory results overall.

The use of an on-line survey inherently entails the respondent selection bias due to the technological gap among various groups of respondents. Some respondents may not possess adequate computer experience and may be unwilling to work on an on-line survey. However, this inbuilt selection bias brings a positive impact on this research. Because the survey in this study has many questions regarding information system, the respondents are expected to have adequate information system experience and skills to answer those questions. Thus the use of an on-line survey does not harm the sample representativeness in this study and it helps preclude the possibility of participation by under qualified subjects.

A further validity test on the complete IS-SUCCESS model is recommended with the use of multiple measures for Impact dimensions. In this study, a single variable measured the Individual Impact or Organizational Impact. The reasons for adopting a single variable were: 1) testing IS-Success model with Impact dimensions is not a preferred approach of this study because the Information dimension cannot be a single predictor of Individual and Organizational performance, 2) reducing the number of questions was an important issue to increase response rate, and 3) several questions regarding the impacts are also included in the MBNQA part. However, we can never be assured of that the use of single measure does not affect the poor validity results of the IS-Success model. Thus, testing the IS-Success model with a complete set of indicators for Individual and Organizational Impact is suggested.

Finally, data set in this study was from a government organization. Though it is believed that use of the MBNQA framework is appropriate for the government sector as discussed in chapter 2, further replicate effort is desired to allow comparison among various types of organizations. Furthermore the failure to validate DeLone & McLean's model in this study does not imply disapproval of the model's utility. To this date, most validity tests on DeLone & McLean's model have been done with a subset of full model using only selected variables. These previous studies on portions of DeLone & McLean's model supported most of relationships in the model. However, this study tested the model with the inclusion of all six dimensions at one time. The approach taken in this work was based on the desire to study the relative efficacy among the models. Future replication of this work is required to examine the validity issue raised about DeLone & McLean's model and this replication should include other industries.

Implications and Concluding Summary

A self-assessment MBNQA survey was developed in this study to assist mangers and researchers in measuring Total Quality Management (TQM) practices more efficiently in an organization. The MBNQA self-assessment survey may serve as a much more convenient and economical alternative to the full scale MBNQA evaluation. The use of audit teams to complete the evaluation takes considerable time and expends more resources than the proposed instrument does. Individual organizations can use their selfassessment MBNQA instrument results to determine their strengths and areas for improvement.

Evidence was found in this study that an integration of the IS-SERVQUAL into the IS-SUCCESS promises to more effectively measure total Information System quality. The result of this study also supports that IS-SERVQUAL and IS- SUCCESS should be combined into the MBNQA framework to more effectively measure the role of the information dimension in an organization. This new framework, IS-MBNQA, will enhance the examination of how organizational dimensions interact with each other and how they singularly or jointly result in organizational outcomes within a larger organizational context.

The results of this study also indicate that although all the dimensions in MBNQA framework contribute to Business Results, Information System and Process Management dimensions are the most important factors of Business Results. At the same time, researchers and managers should be aware that the Information System positively affects all the other dimensions in an organization and these dimensions collectively contribute to Business Results.

Appendices

APPENDIX A

THE CITY OF DENTON SURVEY COVER LETTER

Welcome to The City of Denton Information Technology Survey

University of North Texas College of Business Administration Information Systems Research Center

Thank you for agreeing to participate in this survey. As part of the City of Denton's efforts to improve its performance, they are working with a research team from the University of North Texas (UNT) to conduct a study about how information technology (IT) relates to organizational performance. Your candid answers are important to help improve your work environment.

This on-line survey is being conducted by the UNT's Information Systems Research Center (ISRC), Center for Quality and Productivity (CQP), and Center for the Study of Work Teams (CSWT). The survey runs on the university's computers and the UNT research team will analyze the data and share only summaries to help the City of Denton enhance its ability to utilize IT, improve operational performance, and get ready for digital government. Only the UNT research team will see any individual survey responses, and we will keep your identify and individual responses absolutely confidential and anonymous.

The survey asks your opinions about the ITs that you use in your employment, as well as about other organizational and demographic characteristics. There are no right or wrong responses. There are three main parts to the survey. Please dedicate approximately three 1-hour sessions of your work time or, if you prefer, your time on-line at home, to complete this survey. If you don't have access to a computer at work please get with your supervisor to make arrangements. To access the survey, you have to use the personal code that was provided to you via email. The purpose of this code is to ensure the security and integrity of the survey, and to allow you to complete the survey in more than one online session. Only the UNT researchers have access to this code and it will not be disclosed to anyone. If you have not received the code or have any questions, please call Dr. Leon A. Kappelman at (940) 565-4968 or email to kapp@unt.edu.

Your participation in this study is voluntary, not required, and your refusal to participate will not adversely affect you in any way (other than your opinion will not be counted). In addition, you may withdraw from this study at any time; although, once you participate your contribution cannot be taken back. Participation in this study does not require you to reveal any personal information, aside from some demographics about things like your education and the ITs that you use at work. Do not put your name or address on any portion of the survey.

Your efforts and those of your colleagues will be used to help the City of Denton become a better place to work. Thank you for your time and assistance.

Best wishes

Dr. Victor R. Prybutok, Director, CQP College of Business Administration (940) 565-3110

Dr. Leon A Kappelman, Director, ISRC College of Business Administration (940) 565-3128

Dr. Michael Beyerlein, Director, CSWT

College of Arts and Sciences (940) 565-3096

APPROVED BY THE UNT IRE 3/26/02 3/27/01 FROM

This project has been approved by the University of North Texas Committee for the Protection of Human Subjects, (940) 565-3940. Please retain a copy of this letter for your records.

P.O. Box 310530 · Denton, Texas 76203-0530 (940) 565-3128 · Fax (940) 565-4317 · Metro (817) 267-3731 x3128 TDD (800) 735-2989
APPENDIX B

THE CITY OF DENTON SURVEY INSTRUMENT

The City Of Denton Survey Instrument

This survey is comprised of three parts and each part consists of three pages. You must take them in order. Each time you complete a page, we will take you to the next page. Once you have completed a page, you will not be able to return to that page. You won't be able to return to those pages that you have already completed. You may take as many parts or pages as you wish in one session. You may stop at any time and continue later. We will keep track of your progress and bring you to the first page that you have yet to complete. Please remember your access code. You must use it each time you start a new session.

Please take a moment to familiarize yourself with the following terms and definitions used in the survey.

Terms and Definitions

The following terms and definitions are used throughout the questionnaire. You will be able to reference this page from each part of the survey. You may print a reference copy.

City of Denton (CoD):

The entirety of governing bodies, operating units, and all of the departments and employees that provide products and services to the customers and citizens of the city of Denton, Texas.

Customer/citizens:

Those persons who live and/or work in the city of Denton and/or receive products and/or services from the CoD.

Goals and objectives:

The intended results or outcomes to be achieved. Goals and objectives answer the question, "Where do we want to go?" Goals and objectives are set for short-, mid-, and long-term time horizons.

Information Technology (IT):

Computers, software, and the networks that connect them, but not the phone system or reprographics.

Internet:

The global public access collection of interconnected networks for communicating digital information. The World Wide Web (WWW) is a hypertext publishing facility of the Internet.

Management:

That group of people in the CoD who provide leadership and make decisions about goals, objectives, plans, and strategies; specifically, the City Manager, Assistant City Managers, Directors and other department heads.

Plans and strategies:

The actions to be taken in order to reach goals and objectives. Plans and strategies answer the question, "How are we going to achieve our goals and objectives?"

Supplier/partner:

An organization or person(s) that makes resources, products and/or services available to the CoD.

Technology Services Department (TSD):

The functional unit of the CoD that provides information technologies and other products and services to the CoD.

Part A-1.

1. Please check the department in which you work:

(1) Budget & Fiscal Operations (including Accounting, Warehouse, Purchasing, Tax, & Treasury)

- (2) Building, Planning, & Zoning (including Bldg. Inspection & Consumer Health)
- (3) Community Development
- (4) Customer Service
- (5) Engineering
- (6) Electricity
- (7) Facility Management
- (8) General Govt. (including CMO, PIO, & Internal Audit)
- (9) Human Resources
- (10) Legal
- (11) Library
- (12) Motor Pool and Maintenance (including Vehicles & Parts)
- (13) Municipal Court
- (14) Parks

(15) Public Safety (including Police, Fire, Animal Control, & Code Enforcement)

- (16) Safety, Training, and Risk Management
- (17) Solid Waste, Landfill, & Recycling
- (18) Technology Services
- (19) Transportation (including Traffic Control, Street, Public Transportation, & Airport)
- (20) Utilities Administration
- (21) Water, Wastewater, & Drainage
- (22) Others _____

2. For each of the following software applications:

Please check column A if you use the software at work.

Please check column B if you would like to have more training for the software.

	А.	В.
Software applications	Software used	More training
Adobe Illustrator		
Aldus Page Maker		
Amazon Billing		
ArcExplorer (ESRI)		
ArcInfo		
Brio		
C/S Fleet Maintenance System		
CityWorks		
Civicall		
Class		
Court Specialists Inc System		
CRW Trak-it		
Dynix Library System		
Excel		
Geographic Information System		
Groupwise		
Harris Billing System		
ICS/VisionAir		
JDEdwards Human Resources		
LaserFiche		
MetaCube Data Warehousing		
Microsoft Project		
Microsoft Publisher		
Microsoft Request		
Powerpoint		
SpindleMedia		
Tax Accounting System		
Teleworks		

Trashflow	
Veritas Backup Express	
Web Casting	
Word	
WordPerfect	
Other	

3. Please check all the training that you have completed.

A+ Certification	
A+ Complete	
Access - Part 1	
Access - Part 2	
Excel - Expert User	
Excel - Proficient User	
GroupWise	
PowerPoint	
PowerPoint 2000 Cheat Sheet	
PowerPoint 2000 Exam Prep	
TimeQuest	
How Computers Work	
Windows 98	
Windows 98 Upgrade Training	
Word - Expert User	
Word - Proficient User	
Other	

- 4. How many hours per week do you work for the CoD? ______ hours
- 5. How many hours per week do you use IT to perform your CoD work? ______ hours
- 6. How long have you worked for the CoD? _____ years _____ months
- 7. How long have you been in your current job? _____ years _____ months
- 8. How many years of experience do you have using Information Technology? ______ years _____ months
- 9. Please check the type of your job.

(1) Field Service
 (2) Mid-level managers
 (3) Office/Clerical
 (4) Professionals
 (5) Supervisors
 (6) Technical paraprofessionals
 (7) Others _____

10. What is the highest formal schooling you have completed?

(1) High School
 (2) Some college
 (3) 2-year college
 (4) 4-year college
 (5) Graduate school
 (6) Others

11. What is your age? _____ years

12. What is your gender? (1) Female (2) Male

Part A-2	2							
Please read each question carefully and check the response	se that	best	expr	esses	your	view.	If yo	u do not
know the answer you should check N/A.								
1 = Strongly Disagree								
2 = Disagree								
3 = Weakly Disagree								
4 = Neutral								
5 = Weakly Agree								
6 = Agree								
7 = Strongly Agree								
NA = Not Applicable or Don't Know	T							
	Stron	ngly				Stro	ngly	Not
	Disa	gree	N	Jeutra	l	Ag	ree .	Applicable
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
1. The CoD has strong values for achieving high quality	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
performance that apply consistently throughout all								
facets of the organization.								
2. The CoD has good communication channels through	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
which management's direction (values and								
expectations) clearly delivered to employees.								
3. Management of the CoD clearly sets strategy, goals,	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
and objectives for future directions for the organization.								
4. Management of the CoD establishes and reinforces	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
environment for empowerment and innovation.								

5. Management of the CoD encourages and supports	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
organizational and employee learning.								
6. The CoD evaluates performance and capabilities of	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
all functions of the organization on a regular basis.								
7. The CoD uses recent performance review findings as	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
feedback for improvement and innovation								
opportunities.								
8. Management of the CoD is concerned with the	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
impact on society of our products, services, or								
operations.								
9. The CoD actively supports and strengthens our	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
relationships with key segment of the community (such								
as education, community service organizations,								
religious organizations, or professional associations).								
10. The CoD has a well-defined short-term (1-2 years)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
plan to help achieve its goals and objectives.								
11. The CoD has a well-defined long-term (2-5 years)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
plan to help achieve its goals and objectives.								
12. The CoD has a well-defined strategy/plan to	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
increase customer/citizen satisfaction.								
13. The CoD has well-defined human resource	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
requirements and plans which consider employees'								
capabilities and needs.								
14. The CoD has a well-defined strategy/plan to	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
enhance supplier/partner relationships.								
15. The CoD has well-defined strategy/plan to address	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
key goals and objectives.								
16. The CoD employs performance measures or	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
indicators for tracking progress relative to its action								
plans.								
17. The CoD allocates resources well to ensure	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
accomplishment of overall action plans.								
18. The CoD has a formal method for determining	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
current product/service requirements and expectations								
of its customers/citizens.								
19. The CoD has a formal method for determining	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
future product/service requirements and expectations of								
its customers/citizens.								
20. The CoD has a formal method for identifying	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
customer/citizen groups and market segments.								
21. The CoD has effective customer relationship	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
practices that enable customers/citizens to seek		-					-	
assistance, comments, or complaints.								
22. The CoD continuously improves its	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA

customer/citizen relationship management practices.								
23. The CoD determines key customer/citizen contact	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
requirements and delivers them to all employees								
involved in the response chain.								
24. The CoD resolves customer/citizen complaints	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
promptly and effectively.								
25. The CoD formally examines customer/citizen	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
complaints in order to make necessary improvements to								
its processes.								
26. The CoD measures and analyzes current levels of	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
customer/citizen satisfaction and dissatisfaction.								
27. The CoD compares its customer/citizen satisfaction								
results with those of similar organizations.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
The CoD provides effective performance measurement sy	stem	s and	techr	niques	s for e	ensuri	ng eacl	h of the
following (28-32):				-			-	
28. data and information reliability.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
29. data and information consistency.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
30. data and information accessibility.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
31. data and information review.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
32. timely update of data and information.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
33. The CoD regularly performs comparisons of its								
performance to similar world-class organization								
benchmarks in order to support its performance,								
evaluation, and improvement.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
34. Performance data and information gathered								
internally is systematically analyzed to help support								
overall quality objectives.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
35. Performance data and information gathered								
externally is systematically analyzed to help support								
overall quality objectives.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
36. The CoD has human resource plans derived from								
the strategic plan that is aimed at achieving the full								
potential of its work force.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
Part A-3	3							
The CoD exerts efforts toward building a work environm	ent ar	nd an	empl	oyee	suppo	ort cli	mate co	onducive
to the following (37-40):								
37. performance excellence.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
38. full involvement in their work.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
39. personal growth.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
40. organizational growth.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
41. The CoD promotes cooperation, individual								
initiatives, innovation, and flexibility to achieve its								
goals and objectives.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
42. The CoD's compensation, recognition, and related	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA

reward practices reinforce high performance.								
43. The CoD has a formal program for education and								
training that keeps up with business and individual								
needs.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
44. All employees in the CoD receive training (e.g.,								
diversity training, management development, new								
employee orientation, and safety, and information								
technology, etc.) required for them to meet the								
objectives associated with their responsibilities.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
45. The CoD maintains a work environment conducive								
to the well-being and growth of all its employees.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
46. The CoD regularly monitors employee satisfaction								
and uses the results to support its quality improvement								
and innovation efforts.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
The CoD has a systematic method for introducing new pr	oduct	ts and	l serv	ices v	vhich	inclu	de the	following
(47-49):								
47. designing in customer/citizen requirements.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
48. addressing quality issues early in the design								
cycle.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
49. analyzing relevant process capabilities.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
50. The CoD monitors the processes used to provide								
products and services in order to identify when it is								
necessary to make corrections.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
51. The CoD continuously improves the processes used								
to provide its products and services.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
The CoD formally assesses the quality of its (52-54):								
52. products and services.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
53. production and delivery systems.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
54. goods and services supplied by external suppliers								
and partners.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
55. The CoD's quality requirements are communicated								
to all external suppliers of goods and services.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
The CoD's current level of each of the following is super	ior to	simi	lar cit	ties (5	6-69))		
56. customer/citizen satisfaction.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
57. customer/citizen loyalty and positive referral.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
58. customer/citizen-perceived value.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
59. financial performance (e.g. return on								
investment, budget variance, profitability).	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
60. employee well-being and development.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
61. employee satisfaction.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
62. supplier and partner performance (e.g.								
performance/cost improvement, quality).	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
63. regulatory/legal compliance.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
64. quality.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA

65. productivity.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
66. environmental citizenship.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
67. fostering economic development.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
68. crime control.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
69. education.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
70. I like using computers and Information								
Technology.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
71. The CoD uses IT to achieve high quality								
performance that applies consistently throughout all								
facets of the organization.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
Part B-1	L							
Please rate the extent to which the performance of the Te	chnol	logy (Servio	ce De	partm	ent's	staff 1	meets your
expectations in each of the following areas. Please read e	each d	questi	on ca	refull	y and	click	on th	ne
appropriate response.								
1 = far short of expectations								
2 = short of expectations								
3 = slightly short of expectations								
4 = meets expectations								
5 = slightly exceeds expectations.								
6 = exceeds expectations.								
7 = greatly exceeds expectations								
NA – Not Applicable or Don't Know								
	1							
	far	short	of	į	greatly	y exce	eeds	Not
	far exp	short ectati	of	2	greatly exp	y exce	eeds	Not Applicable
	far exp [1]	short ectati [2]	of ions [3]	[4]	greatly expo [5]	y exce ectatio [6]	eeds ons [7]	Not Applicable NA
1. The TSD staff does what it promises to do.	far : exp [1] [1]	short ectati [2] [2]	of ions [3] [3]	[4] [4]	greatly expo [5] [5]	y exce ectatio [6] [6]	eeds ons [7] [7]	Not Applicable NA NA
1. The TSD staff does what it promises to do. 2. The TSD staff is reliable.	far : exp [1] [1] [1]	short ectati [2] [2] [2]	of ions [3] [3] [3]	[4] [4] [4]	greatly expo [5] [5] [5]	y exce ectatio [6] [6] [6]	eeds ons [7] [7] [7]	Not Applicable NA NA NA
 The TSD staff does what it promises to do. The TSD staff is reliable. The TSD staff performs services right the first time. 	far : exp [1] [1] [1] [1]	short ectati [2] [2] [2] [2]	of [3] [3] [3] [3]	[4] [4] [4] [4]	greatly expo [5] [5] [5] [5]	y exce ectatio [6] [6] [6]	eeds ons [7] [7] [7] [7]	Not Applicable NA NA NA NA
 The TSD staff does what it promises to do. The TSD staff is reliable. The TSD staff performs services right the first time. The TSD staff is dependable. 	far : exp [1] [1] [1] [1]	short [2] [2] [2] [2] [2] [2]	of ions [3] [3] [3] [3]	[4] [4] [4] [4] [4]	greatly expo [5] [5] [5] [5] [5]	y exce ectatio [6] [6] [6] [6]	eeds ons [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA
 The TSD staff does what it promises to do. The TSD staff is reliable. The TSD staff performs services right the first time. The TSD staff is dependable. Reliability means the extent to which the TSD staff 	far : exp [1] [1] [1] [1]	short [2] [2] [2] [2] [2]	of [3] [3] [3] [3] [3]	[4] [4] [4] [4] [4]	greatly expo [5] [5] [5] [5] [5]	y exce ectatio [6] [6] [6] [6]	eeds ons [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA
 The TSD staff does what it promises to do. The TSD staff is reliable. The TSD staff performs services right the first time. The TSD staff is dependable. Reliability means the extent to which the TSD staff performs promised service dependably. Please rate the 	far : exp [1] [1] [1] [1] [1]	short [2] [2] [2] [2] [2]	of [3] [3] [3] [3] [3]	[4] [4] [4] [4] [4]	greatly (5) (5) (5) (5) (5)	y exce ectatio [6] [6] [6] [6]	eeds ons [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA
 The TSD staff does what it promises to do. The TSD staff is reliable. The TSD staff performs services right the first time. The TSD staff is dependable. Reliability means the extent to which the TSD staff performs promised service dependably. Please rate the overall reliability of the TSD staff. 	far : exp [1] [1] [1] [1] [1]	short ectati [2] [2] [2] [2] [2] [2]	of [3] [3] [3] [3] [3] [3]	[4] [4] [4] [4] [4] [4]	greatly expo [5] [5] [5] [5] [5] [5]	y exce ectatio [6] [6] [6] [6] [6]	eeds ons [7] [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA
 The TSD staff does what it promises to do. The TSD staff is reliable. The TSD staff performs services right the first time. The TSD staff is dependable. Reliability means the extent to which the TSD staff performs promised service dependably. Please rate the overall reliability of the TSD staff. The members of the TSD staff have the technical 	far : exp [1] [1] [1] [1] [1]	short ectati [2] [2] [2] [2] [2] [2]	of [3] [3] [3] [3] [3] [3]	[4] [4] [4] [4] [4] [4]	greatly expo [5] [5] [5] [5] [5] [5]	y exce ectatio [6] [6] [6] [6] [6]	eeds ons [7] [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA
 The TSD staff does what it promises to do. The TSD staff is reliable. The TSD staff performs services right the first time. The TSD staff is dependable. Reliability means the extent to which the TSD staff performs promised service dependably. Please rate the overall reliability of the TSD staff. The members of the TSD staff have the technical skills needed to do their jobs well. 	far : exp [1] [1] [1] [1] [1] [1]	short ectati [2] [2] [2] [2] [2] [2] [2]	of [3] [3] [3] [3] [3] [3] [3]	[4] [4] [4] [4] [4] [4]	greatly (5) (5) (5) (5) (5) (5) (5)	y exce ectatio [6] [6] [6] [6] [6]	eeds ons [7] [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA
 The TSD staff does what it promises to do. The TSD staff is reliable. The TSD staff performs services right the first time. The TSD staff is dependable. Reliability means the extent to which the TSD staff performs promised service dependably. Please rate the overall reliability of the TSD staff. The members of the TSD staff have the technical skills needed to do their jobs well. The members of the TSD staff are appropriately 	far : exp [1] [1] [1] [1] [1] [1] [1]	short ectati [2] [2] [2] [2] [2] [2] [2]	of [3] [3] [3] [3] [3] [3] [3]	[4] [4] [4] [4] [4] [4] [4]	greatly (5) (5) (5) (5) (5) (5) (5) (5)	y exce ectatio [6] [6] [6] [6] [6] [6]	eeds ons [7] [7] [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA NA
 The TSD staff does what it promises to do. The TSD staff is reliable. The TSD staff performs services right the first time. The TSD staff is dependable. Reliability means the extent to which the TSD staff performs promised service dependably. Please rate the overall reliability of the TSD staff. The members of the TSD staff have the technical skills needed to do their jobs well. The members of the TSD staff are appropriately qualified for their jobs. 	far : exp [1] [1] [1] [1] [1] [1] [1]	short ectati [2] [2] [2] [2] [2] [2] [2] [2] [2]	of [3] [3] [3] [3] [3] [3] [3] [3]	[4] [4] [4] [4] [4] [4] [4]	greatly (5) (5) (5) (5) (5) (5) (5) (5)	y exce ectatio [6] [6] [6] [6] [6] [6]	eeds ons [7] [7] [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA NA NA
 The TSD staff does what it promises to do. The TSD staff is reliable. The TSD staff performs services right the first time. The TSD staff is dependable. Reliability means the extent to which the TSD staff performs promised service dependably. Please rate the overall reliability of the TSD staff. The members of the TSD staff have the technical skills needed to do their jobs well. The members of the TSD staff are appropriately qualified for their jobs. The TSD staff has the expertise required to create or 	far : exp [1] [1] [1] [1] [1] [1] [1]	short ectati [2] [2] [2] [2] [2] [2] [2] [2]	of [3] [3] [3] [3] [3] [3] [3]	[4] [4] [4] [4] [4] [4] [4]	greatly (5) (5) (5) (5) (5) (5) (5) (5) (5)	y exce ectatio [6] [6] [6] [6] [6] [6]	eeds ons [7] [7] [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA NA
 The TSD staff does what it promises to do. The TSD staff is reliable. The TSD staff performs services right the first time. The TSD staff is dependable. Reliability means the extent to which the TSD staff performs promised service dependably. Please rate the overall reliability of the TSD staff. The members of the TSD staff have the technical skills needed to do their jobs well. The TSD staff has the expertise required to create or evaluate for purchase the information technologies 	far : exp [1] [1] [1] [1] [1] [1] [1]	short ectati [2] [2] [2] [2] [2] [2] [2] [2]	of [3] [3] [3] [3] [3] [3] [3] [3]	[4] [4] [4] [4] [4] [4] [4] [4]	greatly (5) (5) (5) (5) (5) (5) (5) (5)	y exce ectatio [6] [6] [6] [6] [6] [6]	eeds ons [7] [7] [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA NA
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11. Competence means the technical skills and								
expertise of the TSD staff. Please rate the overall								
competence of the TSD staff.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
12. When I have a problem, the TSD staff does its best								
to respond as soon as possible.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
13. The people on the TSD staff return my calls								
promptly.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
14. Members of the TSD staff respond quickly to e-								
mails requesting information or assistance.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
15. Members of the TSD staff are always willing to								
help.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
16. The TSD department responds quickly to my								
requests for help with software applications.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
17. Responsiveness means the willingness and speed								
with which the TSD staff makes an initial response to								
inquires from users. Please rate the overall								
responsiveness of the TSD staff.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
18. When problems occur, the TSD staff solves them in								
a timely manner.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
19. The TSD staff finishes projects on time.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
20. The members of the TSD staff meet their deadlines								
during system development and implementation.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
						L * J	L·J	
21. Change requests are completed in a timely manner.	£1	Z2	æ3	<u>ه</u> 4	<u>دم</u>	£6	£7	≪ NA
21. Change requests are completed in a timely manner.22. Timeliness means the elapsed time between a user's	æ1	£2	£3	£4	<u>دم</u>	£6	£7	≪ NA
 21. Change requests are completed in a timely manner. 22. Timeliness means the elapsed time between a user's request and the design, development and 	æ1	£2	£3	£4	<u>€</u> 5	<u>€</u> 6	£7	≪ NA
 21. Change requests are completed in a timely manner. 22. Timeliness means the elapsed time between a user's request and the design, development and implementation of new applications or change requests 	æ1	£2	£3	£4	<u>£5</u>	£6	£7	≪ NA
 21. Change requests are completed in a timely manner. 22. Timeliness means the elapsed time between a user's request and the design, development and implementation of new applications or change requests by the TSD staff. Please rate the timeliness of the TSD 	æ1	£2	£3	<u>£4</u>	<u>£</u> 5	££6	<u>£</u> 7	≪ NA
 21. Change requests are completed in a timely manner. 22. Timeliness means the elapsed time between a user's request and the design, development and implementation of new applications or change requests by the TSD staff. Please rate the timeliness of the TSD staff. 	<u>€</u> 1	<u>ي</u> ا	<u>الا</u>	<u>£4</u>	<i>€</i> 5	<i>€</i> 6	£7 [7]	≪ NA NA
 21. Change requests are completed in a timely manner. 22. Timeliness means the elapsed time between a user's request and the design, development and implementation of new applications or change requests by the TSD staff. Please rate the timeliness of the TSD staff. 23. The members of the TSD staff are able to explain 	<u>£1</u>	<u>بر</u> 2 [2]	ي الاع [3]	<u>€</u> 4	[5]	<u>£6</u>	<u>€</u> 7	≪ NA NA
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Part B-2								
29. The TSD staff ensures that users are properly								
trained on new systems.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
30. The TSD staff provides adequate training support								
for my needs.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
31. The training provided by the TSD staff is helpful.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
32. The TSD staff understands that a new project is not								
over until the user training is complete.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
33. Training means the amount of instruction and								
support for learning that is afforded to the user to								
increase the user's proficiency in utilizing Information								
Technologies. Please rate the training provided by the								
TSD staff.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
34. The TSD staff understands the specific needs of the								
users.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
35. My IT-related problems are important to the TSD								
staff.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
36. The members of the TSD staff understand my								
frustrations with CoD ITs.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
37. The members of the TSD staff have my best interest								
at heart.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
38. The members of the TSD staff show a sincere								
interest in helping me with my problems.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
39. Empathy means the ability of the TSD staff to								
understand the specific needs of the user. Please rate								
the overall empathy of the TSD staff.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
40. People on the TSD staff are open to suggestions								
from users regarding how Information Technology								
systems can be improved.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
41. The members of the TSD staff are committed to user								
involvement in the design, development or alteration of								
CoD ITs.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
42. The members of the TSD staff seek input from users								
before making changes to existing systems.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
43. The TSD staff considers users to be part of the								
development team.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
44. Attitude/Commitment to user involvement means								
the commitment of the TSD staff to support user								
involvement and participation in the design.								
development, or alteration of computer-based								
information systems. Please rate the								
Attitude/Commitment to user involvement of the TSD								
staff.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA

45. The members of the TSD staff have a good working								
relationship with people in other departments.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
46. I have a good working relationship with the								
members of the TSD staff.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
47. The members of the TSD staff are courteous.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
48. I get along well with members of the TSD staff.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
49. Relationships mean the manner and methods of								
interaction, conduct, and personal association between								
users and the TSD staff. Please rate the relationships								
between you and the TSD staff.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
50. The CoD's computer/network is available when I								
need to use it.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
51. I can gain access to CoD system resources when								
needed for work.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
52. CoD Help Desk and system support have operating								
hours convenient to the users.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
53. The software that I need to do my job is available								
during working hours.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
54. Access means the availability or ease with which								
the appropriate hardware, software, and people can be								
utilized to support the performance of your work.	F43	[0]	[0]	E 4 3		[]	67 3	N T 4
Please rate the access provided by the TSD staff.		[2]	[3]	[4]	[5]	[6]	[7]	NA
Part B-3)			D			<u> </u>	
Part B-3 Please rate the extent to which the performance of the Te	s chnol	logy S	Servic	e Dej	partm	ent's s	staff 1	neets your
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read e	chnol each c	logy S Juesti	Servic on ca	e Dej refull	partm y and	ent's s	staff 1 on th	neets your ne
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read e appropriate response.	chnol each c	logy S Juesti	Servic on ca	e Dej refull	partm y and	ent's s click	staff 1 on th	neets your ne
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read e appropriate response. 1 = far short of expectations	chnol each c	logy S Juesti	Servic on ca	e Dej refull	partm y and	ent's s	staff 1 on th	meets your ne
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read e appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations	chnol each c	logy S questi	Servic on ca	e Dej refull	partm y and	ent's s	staff 1 on th	neets your ne
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read e appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations	chnol each c	logy S questi	Servic on ca	e Dej refull	partm y and	ent's s	staff 1 on th	neets your ne
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read e appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations 5 = slightly exceeds expectations	chnol each c	logy S questi	Servic on ca	e Dej refull	partm y and	ent's s	staff 1 on th	neets your ne
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read e appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations 5 = slightly exceeds expectations. 6 = exceeds expectations	chnol each c	logy S juesti	Servic on ca	e Dej refull	partm y and	ent's s	staff 1 on th	neets your ne
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read of appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations 5 = slightly exceeds expectations. 6 = exceeds expectations. 7 = greatly exceeds expectations	chnol ach c	logy S	Servic on ca	ze Dej refull	partm y and	ent's s	staff 1	neets your ie
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read e appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations 5 = slightly exceeds expectations. 6 = exceeds expectations. 7 = greatly exceeds expectations NA = Not Applicable or Don't Know	s chnol cach c	logy S	Servic on ca	e De _j refull	partm y and	ent's s	staff 1	neets your ne
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read e appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations 5 = slightly exceeds expectations. 6 = exceeds expectations. 7 = greatly exceeds expectations NA = Not Applicable or Don't Know	chnol each c	logy S questi	Servic on ca	refull	partm y and	ent's s click	staff 1 on th	neets your le Not
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read of appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations 5 = slightly exceeds expectations. 6 = exceeds expectations. 7 = greatly exceeds expectations NA = Not Applicable or Don't Know	far s	ogy S questi	Servic on ca of ons	ce Dej refull	partm y and greatly exp	ent's s click	staff 1 on the	neets your ne Not Applicable
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read of appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations 5 = slightly exceeds expectations. 6 = exceeds expectations. 7 = greatly exceeds expectations NA = Not Applicable or Don't Know	far s	short [2]	Servic on ca of ons [3]	refull	partm y and greatly exp [5]	ent's s click y exce ectation [6]	eeds	neets your ne Not Applicable NA
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Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read of appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations 5 = slightly exceeds expectations. 6 = exceeds expectations. 7 = greatly exceeds expectations NA = Not Applicable or Don't Know Regarding Information Technologies you use as a CoD e 1. reliability.	fars exp [1] [1]	short [2] [2] [2] [2]	Servic on ca of ons [3] olease [3]	refull [4] [4]	greatly greatly [5] the fo	ent's s click click y exce ectation [6] 1lowin [6]	eeds ons [7] ng (1- [7]	Not Applicable NA -7): NA
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read of appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations 5 = slightly exceeds expectations. 6 = exceeds expectations. 7 = greatly exceeds expectations NA = Not Applicable or Don't Know Regarding Information Technologies you use as a CoD e 1. reliability. 2. ease of use.	far s exp [1] [1]	short [2] [2] [2] [2]	of ons [3] olease [3] [3]	refull refull [4] [4] [4]	greatly exp [5] the fo [5]	y exce ectation [6] [6] [6]	eeds ons [7] ng (1- [7] [7]	Not Applicable NA -7): NA NA
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Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read e appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations 5 = slightly exceeds expectations. 6 = exceeds expectations. 7 = greatly exceeds expectations NA = Not Applicable or Don't Know Regarding Information Technologies you use as a CoD e 1. reliability. 2. ease of use. 3. accessibility. 4. usefulness.	far s exp [1] [1] [1] [1]	short ectati [2] yee, p [2] [2] [2] [2]	of ons [3] olease [3] [3] [3] [3]	ze Dej refull refull [4] [4] [4] [4]	greatly greatly exp [5] the fo [5] [5] [5]	y exce ectation [6] [6] [6] [6]	eeds ons [7] [7] [7] [7] [7]	Not Applicable NA -7): NA NA NA NA NA
Part B-3 Please rate the extent to which the performance of the Te expectations in each of the following areas. Please read of appropriate response. 1 = far short of expectations 2 = short of expectations 3 = slightly short of expectations 4 = meets expectations 5 = slightly exceeds expectations. 6 = exceeds expectations. 7 = greatly exceeds expectations NA = Not Applicable or Don't Know Regarding Information Technologies you use as a CoD e 1. reliability. 2. ease of use. 3. accessibility. 4. usefulness. 5. flexibility.	far s exp [1] [1] [1] [1] [1]	short ectati [2] yee, p [2] [2] [2] [2] [2]	Servic on ca of ons [3] blease [3] [3] [3] [3] [3] [3] [3] [3] [3] [3] [3]	ze Dej refull refull [4] [4] [4] [4] [4] [4]	partm y and y and greatly exp [5] the fo [5] [5] [5] [5]	y exce ectation [6] [6] [6] [6] [6] [6]	eeds ons [7] <u>ng (1-</u> [7] [7] [7] [7]	Not Applicable NA -7): NA NA NA NA NA NA NA

Technologies in the CoD.								
Regarding the data and information provided by the CoD	's Inf	orma	tion 7	[echn	ologie	es, ple	ease ra	te the
following (7-13)					-	_		
7. content.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
8. availability.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
9. accuracy.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
10. timeliness.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
11. conciseness.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
12. convenience.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
13. Please rate the overall quality of data and								
information provided by the CoD's Information								
Technologies.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
Please read each question carefully and check the response	se tha	t best	t expr	esses	your	view.	If you	ı do not
know the answer you should check N/A.			_		-		-	
1 = Strongly Disagree								
2 = Disagree								
3 = Weakly Disagree								
4 = Neutral								
5 = Weakly Agree								
6 = Agree								
7 = Strongly Agree								
NA = Not Applicable or Don't Know								
11	1							
	Stro	ongly				Stro	ngly	Not
	Stro Dis	ongly agree]	Neutr	al	Stro Ag	ongly gree A	Not Applicable
	Stro Disa [1]	ongly agree [2]	[3]	Neutr [4]	al [5]	Stro Ag [6]	ngly gree A [7]	Not Applicable NA
14. Overall, I am satisfied with the CoD's Information	Stro Disa [1]	ongly agree [2]	[3]	Neutr [4]	al [5]	Stro Ag [6]	ongly gree A [7]	Not Applicable NA
14. Overall, I am satisfied with the CoD's Information Technologies.	Stro Disa [1]	ongly agree [2] [2]	[3]	Neutr [4] [4]	al [5] [5]	Stro Ag [6]	ngly gree A [7] [7]	Not applicable NA NA
 14. Overall, I am satisfied with the CoD's Information Technologies. 15. Overall, there has been a positive impact as to how 	Stro Dis [1]	ongly agree [2] [2]	[3] [3]	Neutr [4] [4]	al [5] [5]	Stro Ag [6]	ngly gree A [7] [7]	Not applicable NA NA
 14. Overall, I am satisfied with the CoD's Information Technologies. 15. Overall, there has been a positive impact as to how much my performance was improved by the aid of 	Stro Disc [1]	ongly agree [2] [2]	[3]	Neutr [4] [4]	al [5] [5]	Stro Ag [6]	ongly gree A [7] [7]	Not applicable NA NA
 14. Overall, I am satisfied with the CoD's Information Technologies. 15. Overall, there has been a positive impact as to how much my performance was improved by the aid of CoD's Information Technologies. 	Stro Diss [1] [1]	ongly agree [2] [2] [2]	[3] [3] [3]	Neutr [4] [4] [4]	al [5] [5] [5]	Stro Ag [6] [6]	ongly gree A [7] [7] [7]	Not Applicable NA NA
 14. Overall, I am satisfied with the CoD's Information Technologies. 15. Overall, there has been a positive impact as to how much my performance was improved by the aid of CoD's Information Technologies. 16. Overall, there has been a positive impact as to how 	Stro Dis [1] [1]	ongly agree [2] [2] [2]	[3] [3] [3]	Neutr [4] [4] [4]	al [5] [5]	Stro Ag [6] [6]	ngly gree A [7] [7]	Not applicable NA NA NA
 14. Overall, I am satisfied with the CoD's Information Technologies. 15. Overall, there has been a positive impact as to how much my performance was improved by the aid of CoD's Information Technologies. 16. Overall, there has been a positive impact as to how much the CoD's performance was improved by the aid 	Stro Disc [1] [1]	ongly agree [2] [2] [2]	[3] [3] [3]	Neutr [4] [4] [4]	al [5] [5]	Stro Ag [6] [6]	ngly gree A [7] [7] [7]	Not Applicable NA NA
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 14. Overall, I am satisfied with the CoD's Information Technologies. 15. Overall, there has been a positive impact as to how much my performance was improved by the aid of CoD's Information Technologies. 16. Overall, there has been a positive impact as to how much the CoD's performance was improved by the aid of Information Technologies. 17. The CoD has a well defined plan for Information Technology (IT). 	Stro Diss [1] [1] [1] [1]	ongly agree [2] [2] [2] [2] [2] [2] [2] [2] [2]	[3] [3] [3] [3] [3]	Neutr [4] [4] [4] [4] [4]	al [5] [5] [5] [5]	Stro Ag [6] [6] [6] [6]	ngly gree A [7] [7] [7] [7]	Not Applicable NA NA NA NA
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 14. Overall, I am satisfied with the CoD's Information Technologies. 15. Overall, there has been a positive impact as to how much my performance was improved by the aid of CoD's Information Technologies. 16. Overall, there has been a positive impact as to how much the CoD's performance was improved by the aid of Information Technologies. 17. The CoD has a well defined plan for Information Technology (IT). The CoD's IT plan was developed taking the following in 18. organization's strategies and plans. 	Stro Diss [1] [1] [1] [1] [1] to co [1]	ongly agree [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2]	[3] [3] [3] [3] [3] ratior [3]	Neutr [4] [4] [4] [4] [4] [4] [4]	al [5] [5] [5] [5] [5] [5]	Stro Ag [6] [6] [6] [6]	ngly gree A [7] [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA
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 14. Overall, I am satisfied with the CoD's Information Technologies. 15. Overall, there has been a positive impact as to how much my performance was improved by the aid of CoD's Information Technologies. 16. Overall, there has been a positive impact as to how much the CoD's performance was improved by the aid of Information Technologies. 17. The CoD has a well defined plan for Information Technology (IT). The CoD's IT plan was developed taking the following in 18. organization's strategies and plans. 19. IT support for the CoD goals and objectives. 20. IT market. 21. assessment of current CoD systems in 	Stro Diss [1] [1] [1] [1] [1] [1] [1] [1]	ongly agree [2] [2] [2] [2] [2] [2] [2] [2] [2] [2]	[3] [3] [3] [3] [3] [3] [3] [3]	Neutr [4] [4] [4] [4] [4] [4] [4] [4] [4]	al [5] [5] [5] [5] [5] [5] [5] [5]	Stro Aş [6] [6] [6] [6] [6] [6] [6]	ngly gree A [7] [7] [7] [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA NA NA NA
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 14. Overall, I am satisfied with the CoD's Information Technologies. 15. Overall, there has been a positive impact as to how much my performance was improved by the aid of CoD's Information Technologies. 16. Overall, there has been a positive impact as to how much the CoD's performance was improved by the aid of Information Technologies. 17. The CoD has a well defined plan for Information Technology (IT). The CoD's IT plan was developed taking the following in 18. organization's strategies and plans. 19. IT support for the CoD goals and objectives. 20. IT market. 21. assessment of current CoD systems in terms of IT resources (people, applications, technology, facilities, and data). 	Stro Diss [1] [1] [1] [1] [1] [1] [1] [1]	ongly agree [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2]	[3] [3] [3] [3] [3] [3] [3] [3] [3]	Neutr [4] [4] [4] [4] [4] [4] [4] [4] [4]	al [5] [5] [5] [5] [5] [5] [5] [5]	Stro Ag [6] [6] [6] [6] [6] [6] [6]	ingly gree A [7] [7] [7] [7] [7] [7] [7] [7] [7]	Not Applicable NA NA NA NA NA NA NA NA

guidelines to evaluate all requests for IT purchases and								
modifications.								
23. IT investments and operating budgets are								
established and approved with consideration of								
alignment with the CoD's strategies and plans.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
24. The CoD establishes and communicates IT policies								
and procedures to all employees.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
25. The CoD establishes and maintains IT standards and								
guidelines that take organizational goals and objectives								
into consideration.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
26. In the CoD, IT standards and guidelines are								
established and translated into practical and usable rules								
for employees.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA
27. Management in the CoD is not concerned with the								
impact on society of our products, services, or								
operations.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	NA

- ?? Please click (Reset) if you would like to reset (or clear) all your responses to this page and start again.
- ?? Please click (Submit) if you are satisfied with your responses AND you have completed ALL APPLICABLE AREAS of this page of the questionnaire.

Thank You!!

APPENDIX C

REFINED SETS OF QUES TIONNAIRE

Refined MBNQA questionnaire for City Government organization.

	1. Leadership
1	Management of the CoD clearly sets strategy goals, and objectives for future directions
1.	for the organization.
2.	Management of the CoD establishes and reinforces environment for empowerment and innovation.
3.	Management of the CoD encourages and supports organizational and employee learning.
4.	Management in CoD is concerned with the impact on society of our products, services, or operations
5.	CoD actively supports and strengthens our relationships with key segment of the
	community (such as education, community service organizations, religious organizations, or professional associations)
	2. Strategic Planning
6.	CoD has a well-defined short-term (1-2 years) plan to help achieve its goals and
7	objectives. CoD has a well-defined long-term (2-5 years) plan to belp achieve its goals and
/.	objectives.
8.	CoD has a well-defined strategy/plan to increase Customer/citizen/citizen satisfaction.
9.	CoD has well-defined strategy/plan to address key goals and objectives.
	3. Customer and Market Focus
10	
10.	CoD has a formal method for determining future product/service requirements and expectations of its Customer/citizens/citizens
11.	CoD has a formal method for identifying Customer/citizen/citizen groups and market
	segments.
12.	CoD determines key Customer/citizen/citizen contact requirements and delivers them to
13	all employees involved in the response chain.
13.	CoD formally examines Customer/citizen/citizen complaints promptly and effectively.
	improvements to its processes.
15.	CoD measures and analyzes current levels of Customer/citizen/citizen satisfaction and dissatisfation.
16.	COD compares its Customer/citizen satisfaction results with similar organizations.
	4. Information and analysis
	Demovidos offectivo monformanos macanyomantt
	be following (17-20):
	<u>iie lonowing (17-20).</u>
17.	Data and information reliability
18.	Data and information consistency
19.	Data and information accessibility
20.	Data and information review.
21.	Timely update of data and information Performance data and information gathered is systematically analyzed to help suggest
22.	overall quality objectives.

	5. Human Resources
<u>Co</u> coi	D exerts efforts toward building a work environment and an employee support climate nductive to the followings (23-26)
23 24 25 26 27 28 29 30	 performance excellence full involvement in their work personal growth organizational growth CoD promotes cooperation, individual initiatives, innovation, and flexibility to achieve its goals and objectives. CoD's comp ensation, recognition, and related reward practices reinforce high performance. CoD maintains a work environment conducive to the well-being and growth of all its employees. CoD regularly monitors employee satisfaction and uses the results to support its quality improvement and innovation efforts.
	6. Process Management
<u>Co</u> fol	D has a systematic method for introducing new products and services which include the lowing (31-32):
31 32	 Addressing quality issues early in the design cycle. CoD monitors the processes used to provide products and services in order to identify when it is necessary to make corrections.
<u>Co</u>	D formally assesses the quality of its (33-35):
33 34 35	 products and services. goods and services supplied by external suppliers and partners. CoD's quality requirements are communicated to all external suppliers of goods and services.
	7. Business Results
Th 36 37 38 39 40 41 42	 e CoD's current level of each of the following is superior to similar cities (36-41) Customer/citizen satisfaction. Customer/citizen loyalty and positive referral. Financial performance (e.g. return on investment, budget variance, profitability) Customer/citizen-perceived value Quality Environmental citizenship Crime control

Refined Set of IS-SEVQUAL Questionnaire

	Reliability
1.	The MIS staff does what it promises to do.
2.	The MIS staff is reliable.
3.	The MIS staff performs services right the first time.
4.	The MIS staff is dependable.
5.	Reliability means the extent to which the MIS staff performs promised service dependably.
	Please rate the overall reliability of the MIS staff.
6.	When I have a problem, the MIS staff does its best to respond as soon as possible.
7.	The people on the MIS staff return my calls promptly.
8.	Members of the MIS staff respond quickly to e-mails requesting information or assistance.
9.	Responsiveness means the willingness and speed with which the MIS staff makes an initial response to inquires from users. Please rate the overall responsiveness of the MIS staff.
10.	When problems occur, the MIS staff solves them in a timely manner.
11.	The MIS staff finishes projects on time.
12.	The members of the MIS staff meet their deadlines during system development and
12	implementation.
13.	Timeliness means the elapsed time between a user's request and the design, development
	timeliness of the MIS staff.
	Support
14.	The MIS staff ensures that users are properly trained on new systems.
15.	The MIS staff provides adequate training support for my needs.
16.	The MIS staff understands that a new project is not over until the user training is complete.
17.	Training means the amount of instruction and support for learning that is afforded to the user to increase the user's proficiency in utilizing Information Technologies. Please rate the training provided by the MIS staff.
18.	The MIS staff understands the specific needs of the users.
19.	My IT-related problems are important to the MIS staff.
20.	The members of the MIS staff understand my frustrations with computer-based information systems.
21.	Empathy means the ability of the MIS staff to understand the specific needs of the user.
22	People on the MIS staff are open to suggestions from users regarding how Information
22.	Technology systems can be improved
23.	The members of the MIS staff are committed to user involvement in the design.
	development or alteration of computer-based information systems.
24.	The members of the MIS staff seek input from users before making changes to existing
	systems.
25.	The MIS staff considers users to be part of the development team.
26.	Attitude/Commitment to user involvement means the commitment of the MIS staff to
	support user involvement and participation in the design, development, or alteration of
	computer-based information systems. Please rate the Attitude/Commitment to user involvement of the MIS staff
	Relationship
27	The members of the MIS staff are courteous.
27.	I get along well with members of the MIS staff
20. 29	Relationships mean the manner and methods of interaction conduct and personal
27.	association between users and the MIS staff. Please rate the relationships between you and the MIS staff.

Instrument of IS Success Model

System Quality
Regarding Information Technologies you use as a CoD employee, please rate the following (1-6):
1. Reliability.
2. Ease of use.
3. Accessibility.
4. Usefulness.
5. Flexibility.
6. Please rate the overall quality of Information Technologies in the CoD.
Information Quality
Regarding the data and information provided by the CoD's Information Technologies, please rate the
following (7-13).
7. Content.
8. Availability.
9. Accuracy.
10. Timeliness.
11. Conciseness.
12. Convenience.
13. Please rate the overall quality of data and information provided by the CoD's Information Technologies.
Use
14. Number of applications you use at work (Part A-1)
15. Number of computer related training you completed (Part A-1)
16. How many hours per week do you use IT to perform your CoD work? (Part A-1)
User Satisfaction
17. Overall, I am satisfied with the CoD's Information Technologies.

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