The Relationship between ISO 9001 certification status and Operational Performance of Government Agencies in Kenya.

Owino Agaya Okwiri
MSc (Portsmouth), MCQI CQP (UK)

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Business Administration, School of Business, University of Nairobi.

2010

DECLARATION

I hereby declare that the work contained in this Thesis is my original work and has not previously, in part or in its entirety, been presented at any other university towards the award of any degree. Where I have taken ideas and or wording from another source, this has been explicitly acknowledged in the text.

Signed _____ Date 22 - NOV. 2010

Supervisors

This Thesis has been submitted with our approval as the university supervisors.

Signed _____ Date 22nd NOV. 2010
Prof. I. M. Mbeche

Signed _____ Date 22nd Nov. 2010
Dr. J. M. Njihia

COPYRIGHT

Department of Management Science,
University of Nairobi,
P.O. Box 30197 – 00100,
Nairobi,
Kenya.

Telephone: +254 (0) 20 2017428.

Email: owino.okwiri@uonbi.ac.ke

DEDICATION

To my late father, Okwiri Mugenya, and mother, Monica Adhiambo Okwiri. To my wife, Goreti, and children, Caroline, Owino (junior), and Oki.

ACKNOWLEDGEMENTS

The three years preceding the completion and submission of this Thesis report have been extremely rewarding, both educationally and intellectually. The credit must go to my supervisors, Professor Isaac M. Mbeche and Dr. James M. Njihia and other doctoral study resource persons whose comments and suggestions guided me in developing a better structured proposal grounded on thorough understanding of the subject matter. I am extremely grateful to Professor Mbeche and Dr. Njihia for their contribution especially in structuring and sharpening the research proposal. I especially appreciate that they have always been available for me despite their very busy work schedule in their academic and administrative roles. Their encouragement and support has been such that they have shared with me the burden of bringing the research project to a successful completion.

Credit goes to Dr. Elija Omwenga, Dr. John Yabs, and all the doctoral study resource persons who participated during the proposal seminar and doctoral committee proceedings of this research. This thesis is immeasurably better as a result of their comments and suggestions at the pre-fieldwork stage. Credit also goes to Dr. Gituro Wainaina for his invaluable guidance during the early stages of preparing the proposal for the research and I sincerely thank him for this, as well as Dr. Martin Ogutu and Prof. G. P. Pokhariyal for their guidance, advice and encouragement during the process.

I am also grateful to the forty-seven organizations that allowed me free access to the information in their records and their staff for completing the questionnaire. I am especially appreciative of the wonderful cooperation and assistance of The Kenya Power & Lighting Co. Ltd., and specifically, special thanks must go to Mr. Kuria Kibiru who has always been willing to accord me access right from the time I was writing the conceptual paper that eventually led to this research. In no lesser way, I would have liked to acknowledge by name all those in the other forty six organizations that made the research possible through their enthusiastic cooperation and support but for want of space.

TABLE OF CONTENTS

LIST OF TABLES

List of tables

List of tables

LIST OF FIGURES

List of figures

ABREVIATIONS AND ACRONYMS

CF	-	Customer Focus
DC	-	Document Control
GOK	-	Government of Kenya
MR	-	Management Review
PDCA	-	Plan-Do-Check-Act
QM	-	Quality Manual
QMS	-	Quality Management System
QO	-	Quality Objectives
QP	-	Quality policy
RBA	-	Results Based Management
RRI	-	Rapid Results Initiative
TQM	-	Total Quality Management
VIF	-	Variable Inflation Factor

ABSTRACT

The objectives of this research were to determine the relationship between ISO 9001:2008 standard certification status and operational performance of government agencies in Kenya, the extent the levels of adoption of the implementation factors influence that relationship, and to develop a theoretical framework to explain the relationships involved. An outcome thinking view was applied in examining the behavioral input factors prescribed by the ISO 9001 quality management system standard. Each of the factors was evaluated on the extent of alignment to the fundamental principles of quality management that underpin the management system standard.

Various statistical analyses were conducted on the secondary and primary data obtained from 47 government of Kenya owned organizations selected randomly. Quantitative data was obtained from 6 to 14 informants from each organization using a self-administered questionnaire. A cluster analysis was completed to develop a taxonomy of the participating organizations based on the standard's implementation factors and organizational system outcome variables. Finally regression analysis was completed to develop a theoretical framework of the concepts in involved.

The results of the study demonstrate that the ISO 9001 management system standard's prescribed practices of quality policy and management review are the key enablers of performance both in the internal and external focus. The study finds that performance drivers in an organization are the ISO 9001 management system standard prescribed practice of quality objectives and the organizational system outcomes of customer focus and process approach. According to the results, it is through these performance drivers that the enablers of performance help achieve performance objectives.

The main contribution of this study has been to develop a theoretical framework to explain the inconsistencies in findings of certification/performance relationship studies and some paradoxes relating to ISO 9001 management system adoption. The theoretical framework helps characterize organizations and show how alignment of the adoption to the organizations' strategic objectives enables organizations to achieve their goals using the management system framework.

The conclusion drawn from the study is that the framework provided by the ISO 9001 management system standard can help optimize operational performance when the prescribed practices are applied appropriately. Another conclusion is that observed cases of certification leading to reduction of performance are due to the effects of minimalist adoption approach with focus on iconic objectives.

As opposed to many studies that are based on problem/solution thinking approach, this study sheds light on why some organizations are reported to perform poorly after certification by adopting the outcome thinking approach to understanding how the framework is able to enhance performance. This approach has lead to a more comprehensive examination of the quality management standard adoption and what makes some certified organizations fail to achieve the intended goals of certification. The study achieves this objective by examining the standard's behavioral inputs, their organizational system outcomes and how they relate to the internally and externally focused output performance outcomes.

CHAPTER ONE: INTRODUCTION

1.1 Background of Study

Published texts on quality management discuss the subject along two differing lines: Quality Management as a program and Quality Management as a management approach resulting from the ongoing evolution of the field of management (Bounds, Yorks, Adams and Ranney, 1994; Evans and Lindsay, 2002). In the "quality management as a program" viewpoint, quality management is looked at in terms of Total Quality Management (TQM) – with the three-letter acronym emphasized (Dale, 1999; Oakland, 1993; Terziovski and Samson, 1999) and ISO 9000 management system standard certification (Chin and Pun, 2002; Franceschini et al., 2006). As a management approach resulting from ongoing evolution of the management field, quality management is looked at as "just effective management" and a result of expected evolution as "generations rearrange, repackage, or sometimes create new knowledge to meet new challenges" (Martin, 1995).

The term ISO 9000 has been used to refer to the family of standards that were initially adaptations from United Kingdom product quality assurance standard, BS 5750, which came in three models, ISO 9001, ISO 9002, and ISO 9003, with the model selection based on the specific organization's activities. The term continues to be used to refer to the later issues and editions that now comprise a vocabulary standard, ISO 9000:2000, a requirements standard, ISO 9001:2000 and a guideline standard, ISO 9004:2000. As the certification industry maintains common validity criteria, any reference to ISO 9000 is considered to mean the latest edition in the family, hence, ISO 9000 refers to the family of standards that now comprises ISO 9000:2005, ISO 9001:2008 and ISO 9004:2000. ISO 9000 certification is taken in quality management field to mean certification under any editions of the ISO 9001, and which can mean ISO 9001:1994, ISO 9002:1994, ISO 9003:1994, ISO 9001:2000 or ISO 9001:2008

In the "quality management as a program" viewpoint, the term Total Quality Management (TQM) is described as "all activities of the overall management function that determine the quality policy, objectives and responsibilities, and implements them by means such as quality planning, quality control, quality assurance and quality

improvement within the quality system" (Dale, 1999). Taking a more philosophical line, the quality management as "effective management" viewpoint holds that TQM is a philosophy and hence a start and end implementation initiative and or a standard cannot be appropriate. This school of thought also takes the view that the term, Total Quality Management (TQM), is merely a "buzzword and a convenient label for the thoughts and practices currently being adopted that is different from the traditional management" (Bounds et al., 1994: xxi).

The authors suggests that, in the "quality management as just effective management" thinking, TQM is merely of "milestone" value, but an important one – in that, it marks the beginning of an era in the expected ongoing evolution in the field of management. In this new era, it is suggested, managers focus on customer value, cross-functional systems and continuous improvement. It is a "Total System approach" (not a separate area or program) and an integral part of high-level strategy. In the viewpoint, Quality Management, without the three-letter acronym – TQM, or Total Quality is defined as "a people focused management system that aims at continual increase in customer satisfaction at continually lower cost" (Evans and Lindsay, 2002). This demarcation in thinking has been said to be probably a question of maturity level or eras in the evolution path of quality. At each level or era, organizations are described as exhibiting characteristics that indicate increasingly less programmatic approach towards quality management as they move along the maturity or evolution path.

Crosby (1979) proposes five stages in an organization's Total Quality maturity ladder: uncertainty, awakening, enlightenment, and wisdom and certainty. The uncertainty stage is characterized by autocratic and bureaucratic management by directive, and the customer is only talked about in terms of the revenues obtainable. The awakening and enlightenment stages see some participation in a directed management-driven fashion, management by objectives is adopted, use of statistical quality control tools, with quality assurance in product/service areas and the customer would have become important. The wisdom and certainty stages provide an environment in which management is not only supportive and participative but provides an environment for active teamwork.

In the evolutionary path eras spanning over 100 years beginning in the early 20th century, the differentiating characteristics of the organizations in each of the eras are in the focus, view of quality itself, the methods employed, the role of quality professionals, and where the responsibility for quality lies (Garvin, 1988). While in the inspection era, the key quality function is one of sorting and separating the defective from the good by inspectors, in the quality control era, it becomes one of trouble shooters within manufacturing/operation. Expansion of quality responsibility to all departments in the quality assurance era essentially means the role of quality professional is basically one of coordination.

A change from internal to external focus in the strategic quality management era results in a changed view of quality and where the responsibility lies. No longer viewed as a problem to be solved by inspectors or departments, quality becomes a competitive opportunity for which senior managers in an organization now take full responsibility. In this era, the role of the quality professional is not just one of coordination but strategic. It now becomes one of ensuring external inputs into the organization's strategic planning process so as to achieve continuous improvement. The function of managing quality becomes enhanced and goes beyond a quality system to a management framework.

In this era, TQM principles are applied to organization's value creating processes in order to have products and services that fulfill the customer's needs. This era is characterized by application of an array of management techniques to achieve the desired continuous improvement in products and services. One consequence of the development of these techniques has been capability to go beyond the context of quality control and move quality upstream to the earliest stages of product or service conception. Kaye and Dyason (1995) have suggested what they have described as the fifth era. In this era, TQM becomes just about effective management.

1.1.1 ISO 9001 as a Framework for Quality Management Approach

The different approaches for evaluating quality use methods of measurement that range from auditing, self-assessment of quality, to other forms of measurement and feedback systems including benchmarking. Incidentally, the most widely recognized evaluation framework did not itself originate from the thinking and principles that are

said to underpin quality management but from the principles advanced by organizational behavior theorists. Using auditing as the method of measurement, ISO 9001 standard has its origin in the development of "organization as a system" concepts in the 1960s by Emery and Trist (1965).

According to the author, application of systems thinking to management of an organization operating in open environments can assure survival in a "turbulent field" type environment by ensuring the required constant adaptation through cycles of exchange of materials to and from the environment. Initially a US Military quality assurance standard, Mil-Q-9858A, the standard was aimed at assuring the quality of goods and services supplied against the US military contracts (Portsmouth Business School, 2001). Its adoption for general capability beyond a single contract use and across industries and sectors as ISO 9001, ISO 9002 and ISO 9003 has provided organizations the world over with a model for setting up their quality assurance systems. This, however, has not always been without disappointments and criticism.

Some have argued that application of the systems thinking to management in the form of written standards would make the management system itself too rigid for the required adaptation. A common criticism leveled against the ISO 9001, ISO 9002 and ISO 9003 quality assurance standards has been this presumed rigidity and inability to allow that adaptation (Barnes, 1998; Dick, 2000). Yet, despite this, it has gained international status as a generic non-industry specific quality management system standard.

The publication of ISO 9000:2000 family of standards, incorporating quality as an aspect of general management was a response to this criticism. Using a Business Process Model, the new version of quality management standard has, for the first time, adopted one of the major concepts in Total Quality Management (TQM) approach: the Deming Plan-Do-Check-Act cycle (the PDCA cycle). The emphasis has now been on overall process management rather than conformance with procedures. This is unlike the case with the 1994 versions ISO 9001, ISO 9002 and ISO 9003, which were actually "quality assurance" standards.

The term "quality assurance" connotes an operation at quality assurance (QA) era in Garvin (1988)'s quality evolution path. To reflect the new emphasis that now goes

beyond quality assurance of product to include enhancement of customer satisfaction, the words "quality assurance" in the title of the standard has been replaced with "quality management system" (ISO 9000:2005). Underpinning the value and type of documentation in the new version of standard are the eight TQM principles of customer focus, leadership, people participation, systems approach, process approach, fact-based decision making, continuous improvement, and mutually beneficial supplier relationship.

This together with the use of the PDCA cycle is meant to bring about the systems thinking to the organization and customer-driven quality as the anchor (Howard and Hoverstadt, 2005). A key element of systems thinking is process-based continuous improvement (Deming, 1994). It has been suggested that the importance of process-based management, as a component of systems thinking, is related to the importance the customer's position has become. The argument is that as organizations become accustomed to the customer economy "process thinking" becomes essential and organization around the axis of processes becomes imperative.

While the developers of the standard have argued that this fundamental change makes the standard a general management framework for better management of organizations, observations indicate the mixed signals from both researchers and practitioners have not grown any less. To some critics, ISO 9001 still means excessive paperwork from documentation of every activity, rigidly following the documented process even when it is clear doing so increases the work and cost of doing it, and keeping records for everything (Capistrano, 2008; Casadesus and Karapetrovic, 2003). To some practitioners, it is still the same procedure-based, documentation oriented quality management tool with expected benefit being in terms of a new image, and improved market acceptance rather than a better way of managing for organizational success (Boiral and Roy, 2007). A common thread in all these is "quality management as a program" viewpoint.

With the emphasis on the program implementation, management of the quality system itself and dedicated resources, "quality management as a program" viewpoint is considered one cause of criticism of the quality management approach and its dismissal as a fad (Sousa and Voss, 2002). This criticism has come against the

backdrop of frequent entry into the management scene of one change technique after another. Organizational Development (OD), Management By Objectives (MBO), Business Process Reengineering (BPR), Just-In-Time (JIT), Value Management (VM), Total Quality Management itself, are some of these change techniques. Other initiatives, which like the listed ones, go by two or three-word acronyms and which have been promoted for public sector management are Rapid Results Initiative (RRI) and Results-Based Management (RBM). The following statement by Nahmias (2001) aptly sums up the development:

> *"Seemingly on schedule, every few years a hot new management technique comes along, almost always described by a three-word or two-word acronym"(p. 18)*

Massie (1998) had earlier made similar observations asserting that the management scene has seen "one fad after another", which he gave a life of no more than two years at the most. Oxford dictionary defines a "fad" as a "fashion, an interest, a preference, an enthusiasm, etc that is not likely to last". Yet it is now nearly three decades since the term, Total Quality Management (TQM), was first used to refer to the management approaches that were being developed in the Strategic Quality Management era (Bounds et al., 1994). The authors have argued that its continued development despite being bundled together with "the hot-new management techniques" that have been dismissed as fads can be credited to its grounding on a broader concept of quality. This conceptual foundation is said to be based on the self-reinforcing principles of customer-focus, leadership, people participation, systems approach, process approach, fact-based decision-making, continuous improvement and mutually beneficial supplier relationship (Sousa and Voss, 2002).

The have suggested that understanding of what quality management constitutes through assessment at principles level is made difficult by the general nature of principles. The dilemma is that the approach's sustainability amidst the criticism must come from being able to separate these principles from the hypes that have given the approach connotations of a fad. This separation must happen at the point of connection between the people and the social structure of the organization – the practices.

1.1.2 ISO 9001:2000 implementation factors

The point of study of quality management as an approach has been the practices. According to Sousa and Voss (2002), the general nature of the fundamental principles does not allow reliable results from empirical research. They argue that it is through practices that managers work to achieve organizational improvements in terms of specific dimensions and strategic concerns. Practices have been described as the activities that occur within the organization's infrastructure so as to achieve the organization's goals (Evans et al., 2002). The different terms that have been used in reference to practices include "steps" (Crosby (1979), "implementation constructs" (Ahire et al., 1996 and Anderson et al., 1995) and "factors" (Sharma and Gadenne, 2002).

ISO 9000 quality management system framework's requirements are superimposed upon the overall operational structure of the organization and how it functions through prescribed practices that ensures the fundamental principles guide decisions relating to the imperatives of organization's existence. ISO 9004:2000, a guideline standard publication, specifies the goals of application of quality management's fundamental principles as optimization of cost and risk management in addition to direct impact on the capability to meet the needs and expectations of the customers and interested parties. The manner in which ISO 9001:2008 and ISO 9004 sets out to achieve these goals is through a Business Process model based on a four stage problem solving process referred to as Plan-Do-Check-Act (PDCA) cycle. Each of these stages is achieved by ISO 9001:2008 quality management system through a set of practices prescribed in the different paragraphs in the standard document.

According to the publications, application of specific prescribed practices constitutes implementation of the ISO 9000 quality management system and should promote organizational system in which value creation is managed through a system of interrelated processes. This process approach of work requires interaction between the process to be managed and results in having in place a set of procedures that cover all key processes in the business, keeping of adequate records, and monitoring processes to ensure they are effective. Another set of practices have been prescribed to achieve the goal of emphasizing the customer as the starting point for identification of

requirements and feedback on the achievement. This customer focus orientation is aimed at, according to the standard publication, enhancing satisfaction of the customer and achievement of regulatory requirements.

Other goals of application of the prescribed practices are having in place facilities for checking output for defects, with appropriate corrective action where necessary, regularly reviewing individual processes and the quality system itself for effectiveness and facilitating continual improvement. These factors of implementation are described in terms of their points of application and are identified as quality manual, quality policy, quality objective, document control and management review. ISO 9000:2005 specifies quality manual as the vehicle for bringing about the superimposition of the requirements of the quality management system framework upon the overall operational structure of the organization and how it functions.

The quality manual is a formal statement from management, closely linked to the business of the organization and its operating plan and to customer needs. Understanding of the quality manual enables all members of the organization to know and understand the objectives to work towards. The standard prescribes the formulation of Quality Policy statements by top management as the starting point for planning and to guide the establishment of the quality management system. The quality policy statements are prescribed to ensure decisions are guided in a manner that leads towards achievement of quality outcomes. The publication also prescribes the establishment of the quality objectives in accordance with the expected output and which are specific and measurable. Focus on the expected output means that completeness and accuracy of the output specification is part and parcel of the improvement.

As an important aspect of the "Do" stage of the Plan-Do-Check-Act cycle, the standard prescribes control of document as a practice aimed at ensuring documents are developed and handled in a manner that helps achieve consistency of work output as well as continuous improvement. According to the standard, documents are required for evidence of conformity or definition of the controls needed. To ensure activities in the "Check" stage of the Business Process Model are applied, the standard prescribes the implementation factor of management review. To ensure

adaptation to a changing environment and to take account of the learning process and emerging opportunities for improvement management review is prescribed as an embodiment of the continuous learning principle of quality management.

The dynamics at play when the framework is superimposed on an organization's management system cannot, however, be ignored. Quality Policy statements and quality objectives reflect the management thinking as regards what is important. Linking the business plan of the organization to the requirements of the management system is only possible if organizational thinking creates internal drives associated with the systems thinking (Seddon, 2008).

An internally driven integration combines knowledge of the core activity of the area or function involved, the systems thinking, and the core concepts of quality management. The contextual issues this introduces gets more complex when one tries to assess the quality management system and management approach in general for its application across different types of organizations and across different socio-economic contexts. This is especially so when the framework of application is ISO 9001, a framework originating from a context of contractual relationship between two parties – the USA military and its individual contractors. Of interest is then how this management approach, as embodied in the standard's framework, can be adopted within the public sector management, with the peculiarities of public service provider-consumer relationship.

1.1.3 ISO 9001:2000 and public service management

The means by which governments justify their right to exist has, through the ages, changed from being anchored on the divine right of rulers to achievements that can be quantified and spelt out (Talbot, 2006). In exchange for taxes paid by the citizens, governments and political parties running them have found themselves having to do what the private sector has always had to – match the spoken needs of its citizens with the programs it implements. As part of this reform, theories hitherto only used in the private sector have found their way into the public sector management through such approaches as Results Based Management (RBA) and Rapid Results Initiative (Asian Development Bank, 2009). Key aspects of Results Based Management have been stated as performance issue focus; customer needs orientation; and application of

modern management practices (Binnendijk, 2000). As part of the toolkit for RBA implementation, Rapid Results Initiative (RRI) has been developed anchored on defined targets, and focus on outcomes (Obong'o, 2008).

According to Deming (1994), the fundamentals that drive organizations' management systems can be summarized in terms of understanding what the customer needs; continuous cost reduction; and supplier relationship. The arguments are that an organization must know what its customer actually needs, else it will lose the customer to another organization which does; and it must reduce the cost of its products and services continuously otherwise it will eventually lose the market dominance. Failing to frequently provide more performance for the same price is a recipe for losing the competitive edge; while failure to nurture suppliers is recipe for loss of needed supplies from a supplier who has gone out of business as a result of pricing the supplies at a loss to win the contract (Deming, 1994). He suggests that a product or service only possesses quality if it helps somebody and enjoys a good and sustainable market. The view is that enjoying a good and sustainable market is linked to the cost.

The convergence of public-private sector thinking in terms of these imperatives is evidenced by the growing use of catch phrases such as "doing more with less" and "value for money" in reference to public sector service delivery in many countries (Binnendijk, 2000). The new focus on clients, their needs and client value creation are the essence of quality, which has been defined variously in terms of the customer, the cost, the use requirements and the net value. ISO 9000:2005, a fundamentals and vocabulary standard document defines "quality" as "the degree to which a set of inherent characteristics fulfils requirements".

These definitions provide basis for what has been referred to as customer-driven quality (Evans and Lindsay, 2002), the core of "quality as a management framework" concept. In this concept, quality is not viewed as a technical issue but as the core of management discipline. The authors suggest the change can be discerned in changes in quality objectives themselves: from operation/manufacturing-centric to customer-focused objectives in all functions. The result has been expansion of application of the

concept that now reaches all forms of organizations, including non-commercial public service entities.

The New Zealand Police Service's "Policing 2000" program is one such attempt at application of quality as a management framework to align a public service organization to a more customer-focused operating strategy much like a commercial entity (Duncan et al. 2001). The Citizens' Charter in the United Kingdom and the National Performance Review Report in the United States of America have stated goals of provision of customer service "equal to the best in business" (Economic Commission for Africa, 2003). These goals are based on the principle of "focus on the customer", the core of quality as a management framework concept.

Quality Management has even been cited in public sector reform forums as one means through which an efficient, customer-driven government, capable of high productivity can be achieved in the poor under-developed nations of the world (Economic Commission for Africa, 2004). ISO 9001:2000, built around the Deming Plan-Do-Check-Act cycle, and encompassing the TQM philosophy should, arguably, provide the framework for bringing about that customer-driven, efficient and productive government. The universality of this premise comes under severe test from the diversity of the socio-economic and political contexts that result in differing public service performance regimes. This diversity is bound to result in differences in outcome performance evaluation systems, with performance criteria influenced by the specific institutional contexts (Talbot, 2006).

ISO 9000 certification follows an evaluation of an organization's quality system against specified context neutral audit criteria. Individuals and organizational perceptions of the quality system are bound to the organizational outcome performance evaluation results. The possibility of the conflicting perceptions being caused by the contextual effects on performance evaluation outcomes rather than actual performance outcome cannot be dismissed. Another issue for consideration is that what are evaluated in a pre-certification audit are the static processes that are reducible to auditable standards, leaving the quality related behaviors that are supposed to result from these in a longer term. How this quality related behaviors are

influenced by the context influenced performance regime and other public sector management concepts that have been adopted need to be understood.

1.1.4 Public Service Performance Regimes.

Contemporary debate concerning application of private enterprise management principles to public administration has revealed a demarcation of thinking when it comes to the concept of "performance" (Talbot, 2006). It is suggested that this is probably due to the differences in institutional contexts. These contexts are made up of various institutional actors, the totality of which makes up the "performance regime". Performance regime influence on the view of performance arises from the roles played by the various actors in deciding on the measures. In contexts in which users and user-groups have been given formalized right to be consulted on what is important to them and the goals to achieve, then the measurements tend to be more organizational focused, customer oriented and quantitative-based (Talbot, 2006). Other institutional actors that have influenced the performance regime in some nations and the performance measures it emphasizes are courts of law. This influence from courts has come through interpretation of legal mandates such as in awards against a state agency with a mandate to maintain specific infrastructure which is later found directly responsible for a citizen's loss.

This variation shows in the degree to which the approach employed integrates the policy evaluation aspect and the performance measurement aspect. While the policy evaluation aspect is focused on the programs, is more qualitative with the output more at policy level, the performance measurement is organizational based, service-user oriented, more quantitative-based and less concerned with spending plans and spending results. The variation in the performance regimes, as brought about by the existence and the nature and degree of influence of the various types of institutional actors varies from nation to nation, with a corresponding variation in the view of performance and its measures (Dhameja, 2003; Easterbrook-Smith, 1999).

These differences result in differences in the way performance is operationalized (Dhameja, 2003; Easterbrook-Smith, 1999). From utilization of annual purchase agreements in Singapore and New Zealand to the definition of the citizen's entitlements to service through Quality Service Delivery concepts in Singapore,

Malaysia and other countries. These have included defining counter service specification, citizen's charters that include service specification, and a quantitative service throughput in the United Kingdoms. This context sensitivity would probably be even more significant when one tries to judge outcomes of application of private enterprise management principles such as those underpinning quality management frameworks in the varying performance regimes. The Kenyan public agencies' application of these principles provides a practical case scenario for investigation of such context sensitivity.

1.1.5 Kenyan Public Agencies

The government of Kenya has institutionalized performance contracting system for all its agencies. This also involves publication of the results of annual evaluation of performance against a set of criteria, the weight for each being set at the beginning of the contract period. The criteria includes Financial and Stewardship, Service delivery, Non-financial aspects, operations, and other qualitative criteria.

According to a report by the Government of Kenya - GOK (2007), within the criteria of financial and stewardship are compliance with set budgetary limits, cost reduction, appropriation in aid, utilization of allocated funds, development index, and debt equity ratio. Compliance with strategic plan, disposal of idle assets, ISO 9001 certification, corruption eradication, prevention of HIV infections, and meeting statutory obligations are labeled as non-financial. Other criteria listed as non-financial include organizational and capacity, employee satisfactions, submission of pension documents to pension department, and prevention of drug and substance abuse.

The service delivery related criteria, which together have a total weighting of 30%, include whether the agency has implemented a service delivery charter, has carried out customer satisfaction survey, and can show that it has made some service delivery innovations. The goal is to enhance and measure "the quality of service delivery". The results of the customer satisfaction survey are not themselves part of the annual performance evaluation for the performance purpose of contract fulfillment nor are they published as the composite criteria evaluation ratings are.

Under operations criterion which has a weighting of 30%, there are project timelines, project cost efficiency, project quality, project relevance, and project completion rate. It is also presumed that these projects, conceived by the agencies themselves are appropriate for meeting the service needs of users. The inclusion of project relevance criteria checks against this. The cost is not against a benchmark but against a set savings target.

While all the agencies are required to achieve ISO 9001 certification status, past published data have indicated no significant difference between the certified and the uncertified agencies in terms of performance as evaluated against the listed criteria. Significantly, performance variability within the certified organizations has remained the same as that within the uncertified ones. Issues of context have been raised as possible explanation for this lack of discernible difference. The contextual issues include the performance regime in which the performance contracting and evaluation has been established and carried out, and the resulting performance measurement system as well as the assumptions underlying the quantitative indicators. The appropriateness of the measurement system in evaluating the value of the certification-prescribed management methodologies has not been tested.

Also not lost on the critics of the management system standard is the possibility that the ISO 9001 standard itself probably adds no value to the way an organization is managed and hence of no performance value. Another possibility has been that while the management system standard's prescribed management methodologies may be sound, some contextual aspects of application may render these methodologies value-less. ISO 9000:2005 vocabulary standard defines a Quality Management System as "a system to establish quality policy and quality objectives and to achieve those objectives". Lack of integration of the implemented quality management system to the strategic planning process would probably create an environment in which performance, as a concept, and the established quality objectives are seen as unrelated.

Any variation between what is viewed as constituting "performance" and what is established as "quality objectives" would require to be taken into account when evaluating the role and effect of the quality management system on performance. This

is because the fundamentals around which quality management system standard is built would then probably be at variance with what has guided performance objectives and aims of the organization's managers. Such a variance, if it exists, complicates the discussion of ISO 9000 family of management system standards and performance within government agencies in Kenya, as the question would then be what really had the managers aimed to achieve? This research sought to provide a route to understanding of these dynamics by examining these issues in a specific context in which the performance regime is the same.

Research on ISO 9001 quality management system's application in private enterprises globally has considered these same issues in terms of the relationship between certification and quality and between quality and economic gain. The findings have, however, not been consistent as concerns the relationship between certification and quality nor between certification and economic gain. While some have returned findings suggesting a relationship exists between ISO 9001 certification and better quality and economic gain (Feng et al., 2008; Heras et al., 2002; Withers and Ebrahimpour, 2000), other studies have found that no such relationships exist (Dick, 2000; Santos and Escanciano, 2002; Heras et al., 2006). Some studies have gone as far as concluding from their findings that ISO 9001:2000 quality management system certification can actually reduce quality-related benefits and profitability in private enterprises (Martinez-Costa and Martinez-Lorente, 2007).

Lack of discernible difference between the certified and the non-certified government agencies would appear to be consistent with what the studies have noted in the private sector. By examining the issues in a context in which the performance regime is held constant, this study hoped to shed some light not only on possible explanations for the inconsistencies but also on the contextual aspects of application of the standard. This required looking beyond the prescribed tools and frameworks and to examine philosophical aspects informing the prescription of these tools and frameworks.

1.2 Statement of Research Problem

One issue that has not been clear even in the observed cases of economic gain by commercial enterprises following certification is whether the critical factor is certification's success in distinguishing the firm positively in the market place or it is

the management methodology prescribed by the standard. If it is the former, then the role played by certification volume saturation in the observed cases of no economic gain would have needed to be examined. If it is the latter, then the absence of a link with non-economic, quality related benefits in some observed cases needed explanation.

With conclusions from observations not consistent, managers have been in a dilemma of having to assign scarce resources not only to ISO certification efforts but also to management of quality systems or risk negative responses from powerful stakeholders. Lack of clear theoretical reasoning of how ISO 9001 management system is expected to bring about desired outcomes have left managers with no basis to ground their certification decisions on, and understand how to adapt the framework to their unique operating contexts. The first question would be whether it should be assumed that any two organizations will have implemented the ISO 9001 quality management system to the same level. Such an assumption cannot be valid unless there is first an understanding of how the different organizations implement their management systems.

Internationally published works relating to quality management in Africa in general, and Sub-Saharan Africa in particular, have mostly been prescriptive. Madu (1997)'work discusses how developing economies can adopt TQM and how the change can be managed, while the focus of Mersha (1997)'s study is identification of the forces restraining and driving the implementation of TQM in Least Developed Countries (LDCs) and Africa in particular. Temtime (2003)'s focus was on the elements of TQM and the emphasis they are given in organizations of different sizes in Botswana. All these studies, which were carried out in Sub Saharan Africa, exemplify "solution thinking" view in the sense that the researchers have already locked into TQM and or its elements as solution, leaving only the issue of its acceptance and implementation for examination (Williams, 1996).

Lakhal et al. (2006) is one of the notable exemptions. The study, which was carried out in Tunisia, focuses on the desired outcome and explores the relationship between various quality management practices and organizational performance outcome. But generalization of this study's findings to the rest of Africa and Sub-Saharan Africa in

particular, would be problematic. This is because such generalization would have to be based on classification from geographical perspective with Africa as a continent providing the basis for classification. According to Pagell (2005), national culture is important in operations management research and basing classification from a geographical perspective without considering the cultural element would be problematic.

Studies along these lines in Sub-Saharan Africa's socio-cultural context have not been common. The aim of this research was to fill this gap, by specifically examining, in a non-prescriptive way, the ISO 9001 quality management system implementation levels in Kenya and to try and identify the factors that can explain the inconsistencies in the findings of the other studies. It examined the implementation of ISO 9001:2000 quality management systems, its later revisions and its consequences within the government agencies in Kenya. It sought to answer the following research question:

1. Can the inconsistencies in the relationship between ISO 9001:2000 certification status and operational performance be explained by the level of the quality management system implementation factors in place?

1.3 Research Objectives

The broad objectives of this research were to determine the relationship between ISO 9001:2008 standard certification status and operational performance of government agencies in Kenya and the influence of the level of ISO 9001:2008 implementation factors on that relationship. The research also sought to explain whether there is a basis for assuming that any two ISO 9001 certified organizations will have implemented the ISO 9001 quality management system to the same level and in the same way. This would help achieve the main research aim of a clearer understanding of how the implementation factors converge to act on organizational activities to create desired operational output outcomes.

The specific objectives of the research were:

1. To determine the relationship between ISO 9001:2008 standard certification status and operational performance of government agencies in Kenya.

2. To determine the relationship between ISO 9001:2008 implementation factors and operational performance of government agencies in Kenya.
3. To determine the relationship between ISO 9001:2000 implementation factors and customer focus orientation in an organization.
4. To determine the relationship between ISO 9001:2000 implementation factors and process approach orientation in an organization.
5. To determine the ISO 9001:2000 implementation factors that are significantly associated with customer focus orientation in an organization.
6. To determine the ISO 9001:2000 implementation factors that are significantly associated with process approach orientation in an organization.
7. To determine the relationship between customer focus orientation and an organization's operational performance.
8. To determine the relationship between process approach orientation and an organization's operational performance.
9. To develop a theoretical framework for ISO 9001:2008 quality management system implementation and operational performance relationship.

These specific objectives were achieved by testing four key hypotheses. The first specific objective was achieved by testing the hypothesis of there being a relationship between ISO 9001:2000 certification status and operational performance of an organization. The hypothesis test relates to ISO 9001 certification status-performance linkage using the different measures of operational performance as identified in the performance regime. To achieve the second specific objective, a hypothesis that the level of ISO 9001 implementation factors and an organization's operational performance are related was tested successively using the different measures applicable in the performance regime.

To achieve the third and fourth specific objectives, hypotheses that the customer focus and process approach orientations in an organization are related to the level of the ISO 9001 implementation factors were tested. These concern how the manner in which the practices prescribed by ISO 9001 management system standard are implemented

affects the extent an organization exhibits customer focus and process approach orientation. The results of these hypotheses tests were used to develop a theoretical framework to help achieve objective 9.

1.4 Significance of this Research

The results from this research were meant to benefit management practitioners, governments and researchers. Clarification of the role of Quality Management System standard in bringing about improved performance in organizations, and how this comes about is important to managers in terms of the ability to make rational and informed decisions regarding change initiatives. Observations in the different business contexts have challenged the theory that ISO 9001 has positive effect on performance. This research has added to the advancement of knowledge through the process of the thesis and antithesis by attempting to confirm or disconfirm this theory.

The study has provided useful information relating to what organizations need to do to improve their performance using ISO 9001 framework or rationalize their expectations. The benefits to governments include a theoretical basis for the currently emphasized certification method of bringing about organizational change in public agencies, or for re-assessment of this decision. A more fact based resource allocation decisions becomes one outcome since certification efforts consume scarce resources.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The research objectives and the related hypotheses concern a proposition that there is a link between ISO 9001 Quality Management System certification status and operational performance. Another proposition has been that there are factors moderating this relationship, and which can explain why different organizations return different results following certification. Past studies relating to these issues have been reviewed in three streams: literature on organizational performance; literature on ISO 9001 implementation factors and its impact on organizational performance; and literature on implementation level as a factor in ISO 9001-Performance relationship.

The findings of these studies have been summarized and issues requiring further examination identified. The review must essentially start with getting clarification on the organizational performance as a dependent variable. One main objective is to get clarification on how operating contexts influence what constitutes performance and its measurement. A conceptual framework representing the entities that have been identified from the review of literature on ISO 9001 and its underlying principles is developed and the hypothesized relationships identified to facilitate the empirical examination of the propositions advanced.

2.2 Organizational Performance

The word "performance", in the context of doing anything, is defined in English dictionary as "how well or badly a person does a particular activity or job" (Longman Dictionary of Contemporary English, 2005, p. 1220). This definition is extended to the context where it is an organization that does a job or an activity. In organizational context, there has been a tendency to narrow the term to what is applicable in the discipline concerned. The strategic management discipline has tended to discuss performance of organizations in terms of economic gain and how well or badly an organization does in the market activities (Johnson and Scholes, 1999). The discipline considers organizational performance in terms of three specific outcomes: financial

performance outcomes; market performance outcomes; and shareholder return outcomes.

To operations management discipline, performance is in terms of three elements: operations effectiveness, customer management and product innovation (Chase, Jacobs and Aquilano, 2004). Operations effectiveness relates mainly to cost, quality and time-based performance outcomes. Customer management element concerns the leveraging of customer relationships and its outcomes which can be in terms of quality perception and related market performance outcomes. The product innovation element is to do with introduction of new products and services, and development of new relationships in the market and is discussed in operations management text in terms that reflect how an organization handles market dynamism.

Armstrong (2006) has argued that performance does not only relate to what has been achieved but also how it was achieved. The argument is that performance should be considered in terms of both output and input. In input terms, performance refers to the behaviors emanating from the performer and relates to the level of effectiveness in using required skills, competencies and knowledge, while in output terms, it is the achievement of quantified outputs. This thinking is consistent with the definition of performance as how well or badly an activity is done and points to the shortcomings of restricting the consideration of performance to the narrow quantified outputs only.

This broad treatment of performance as a concept can be seen in Kaplan and Norton (1992)'s Balanced Scorecard, which extends consideration of organizational performance beyond the outputs to include the related input behavior aspects. The framework sets out to present performance in terms of four perspectives. In addition to the financial perspectives indicated by a range of financial measures, how the customer, the source of financial gain, sees the organization is accorded equal importance. Other aspects Balanced Scorecard framework considers equally important are what the organization must excel in, and whether it is built with capability to continue so as to create value in the future. These, according to the authors, constitute the internal business operations, innovation and learning perspectives, respectively.

2.2.1 Measures of organizational performance

The practice of management emphasizes efficient provision of relevant products and/or services in order to meet the needs of customers as a means of achieving the stated goals of the organization. The importance of organizational performance arises from the fact that it is the only means by which an organization can be evaluated and compared with its rivals. Richard, Devinney, Yip and Johnson (2008) have pointed out the pervasive use of organizational performance in management research as the dependent variable as attesting to this importance. The challenges of how to determine the methods and aspects of organizational performance to measure is a hurdle a researcher has to surmount. Risks include erroneous interpretation of findings especially where causative relationships are concerned such as is the case in ISO 9001-performance studies.

In a paper reviewing the contexts that frame organizational performance as a dependent variable and its measure in management research, the authors have emphasized the importance of aligning the research context with the measure of organizational performance. The literature suggests the multi-dimensionality of organizational performance which arises from the operating context in which the focus must be on the stakeholder and therefore heterogeneity of resource pool and environment, varying strategic choices, and varying the time frame of interest. The argument is that, with the different stakeholders having different measurement needs, each stakeholder group is bound to and is expected to concentrate on the specific measures relating to their own goals.

Basing their study on this view of resource and environment heterogeneity, Talbot (2006) has examined organizational performance in public service contexts in terms of the institutional actors that shape the operating performance regime which in-turn influences the type of measures used. The author suggests this performance regime varies from one political and socio-economic context to another and results in the differences seen in organizational performance measurement systems. These can range from the narrow economic valuation measures of spending plans and spending results in public service agencies and financial and market performance in private

enterprises to a wider measure of organizational effectiveness that covers internal operational performance outcomes, as suggested by Richard et al. (2008).

Tangen (2003) has also emphasized the importance of matching the type of measures used to the situations and objective of the measurement. The author argues that the situational effects on nature and type of measures arise from the effect on the source of measurement data, type of measurement data, the reference point, and process orientation of the data to be used. Measurement data can be from sources internal to the organization being studied or external to it, and can be based on observable facts or based on perceptions or opinions. Measurement data can also be self-referenced, in which case no comparison with any other organization is meant or could be based on a benchmark as reference point. Whether the data relates to an input or an output aspect is another aspect to consider.

The type of measurement data has implications on the difficulty and practicality of collection exercise. A researcher wishing to obtain objective data from internal sources has to contend with issues of access. As Ailawadi, Dant and Grewal (2003) point out, objective performance measures applicable across organizations operating in diverse fields is also difficult to obtain. Use of self-reported perceptual measures provides an alternative, but, being based on perception or opinions, comes with potential biases that can lead to inaccuracies.

They list the major causes of biases associated with subjective self-report performance measures as: positive illusion in which individuals show poor recall to information related to failure; the need for cognitive consistency in which individuals change relative importance of knowledge elements that are deemed dissonant; and self-serving bias in which individual may attribute failure to external factors. To minimize the effects of these potential biases, avoidance of mixing of measures of performance and potential antecedents when collecting subjective data is suggested.

Further, it is pointed out that objective data is itself not always the ideal and hence should not necessarily form the validation reference for the self-report perceptual measures. They suggest that while subjective judgment of performance may take into account longer term view and the organizational strategy, it may be difficult for a single objective measures to encompass the facets that need to be covered. The

argument is that part of the reasons for reported low correlation between the subjective perceptual measures and the objective ones could be explained by incompleteness of the latter.

2.2.2 Operations management perspective of performance

When considering organizational goals, one function that is common to both profit making and non-profit making organizations is the operations function. It concerns the day to day operations relating to the transformation of resources to outputs useful to the intended consumers. Richard et al. (2008) has pointed out that the time frame of interest is a contributor to multi-dimensionality of performance. With a time-frame of interest being minute by minute, performance multi-dimensionality in operations management perspective becomes a significant decision point.

From the results of their study which examined the knowledge and capability based view of operational strategy research, Ketokivi and Schroeder (2004) have argued that strategic contingency arguments have strong merit in explaining operational performance. Their conclusion is that the practice of using composite measures for operational performance in research fails to consider the strategic contingencies involved in decisions relating to operational management practices implemented in organizations. They have suggested researchers should instead be using a separate model for each operational performance dimension, reasoning that operational strategy in the performance perspective ought to be viewed in terms much like generic strategy models suggested by Porter (1980).

As the determinants of performance in the different dimensions are different, it follows that organizations must decide on what is strategically important and the researcher's greatest contribution would come from the development of a model based on each dimension. It is argued that comparison of two organizations based on generic, composite measures would probably face hurdles of what is important to the key stakeholders and the differing operations strategy elements emphasized. The role of strategic contingency when considering the input behaviors and outputs, as aspects of performance in operations function becomes significant. This would make comparison between organizations in performance, in terms of input behaviors and outputs, sensitive to the elements of operations strategy in these organizations.

Comparing organizations with ISO 9001 certification as a controlling variable is one such scenario.

2.3 ISO 9001:2000 Implementation Factors and Performance

The formation of International Organization for Standardization (ISO) in 1946 was necessitated by the drive to standardize as a method of controlling quality of products (Portsmouth Business School, 2001). The organization's extension of its standards development activities to include management systems started in 1987 with the adaptation of what originally started as Mil-Q-9858A, a United States of America military standard. The underpinning of the standard's framework on the fundamental principles of Total Quality Management in 2000 has introduced the question of validity of the management approach itself and how the standard's framework embodies its principles in an organization.

Extant literature suggests that, as an integrative concept, quality management utilizes aspects of both sides of the divide separating the classical management theories on the one hand and the human relations, systems and contingency approaches. According to Anderson et al. (1994), quality management's human resource practices such as the assumption that people care about their work are very much the same as McGregor (1960)'s theory Y assumptions and Ouchi (1981)'s theory Z assumptions. Bounds, Yorks, Adams, and Ranney (1994) have argued that quality management's emphasis on standardization and diffusion of best work practices throughout the organization is rooted on the scientific management's concept of "finding one best way to do a job". By introducing the concepts of customer-focus and fact-based decision-making, quality management fills the gaps in these schools of thought (Dean and Bowen, 1994). A review of the literature on ISO 9001:2000 will help in understanding how the principles with which these theories shape organizational systems are embodied in organizational activities.

2.3.1 Practices as the embodiment of Quality management principles

The principles underpinning ISO 9000:2000 family of management system standards have been described as Total Quality Management (TQM) principles. Yet in many of the literature on the subject, reference has been made to just "Quality Management".

Use of the three-word acronym – TQM, has sometimes taken faddish connotations with the underlying body of knowledge being obscured. Bounds et al. (1994) have suggested the term Total Quality Management (TQM) is merely a convenient label to signify a change from the traditional management paradigm to a new management paradigm based around customer value strategy, organizational systems and continuous improvement.

A reflective review of the literature on quality management at a broad level was published by Sousa and Voss (2002). A conceptual study, the paper has shed light on the current body of knowledge on quality through synthesis of the literature on quality management published over a period spanning one and a half decades. Seeking to determine if the set of practices associated with quality management are valid as a whole and how quality management can be adopted in a real business setting, Sousa and Voss (2002) have argued that significant agreement exists among the founders about key principles of the management approach.

Quoting Hackman and Wageman (1995) have asserted that the philosophy, principles and practices of quality management can be distinguished reliably from other strategies for organizational improvement. They have, however, argued that what constitutes quality management can only be assessed empirically at practices level in two categories: infrastructure and core practices. Lack of standardized definitional term for "practice" has been identified as a major issue to be resolved. The terms "practices", "factors", "implementation constructs" and "interventions" have been used to refer to practices.

Even though there has been no consensus on the direct influence of either category of practices on performance, Sousa and Voss (2002) have found high level correspondence between the different researchers on the dimensions of these practices. Under infrastructure practices category, they find that different researchers' descriptions within the four identified sub groupings closely correspond. According to the authors, top management support, top management commitment, visionary leadership, executive commitment and adoption of the philosophy, the role of management leadership and quality policy can all be considered to describe the same thing.

Similarly customer relationship, customer focus and being closer to customers are basically describing the same customer facing activities. On the supply side are the supplier relationship, supplier quality management, and being closer to suppliers. Other practices reported by Sousa and Voss (2002) to have been described variously by different researchers relate to employees. They identify workforce management, work attitudes, employee involvement, employee empowerment, employee training, internal cooperation, employee fulfillment, learning, continuous improvement, open organization and employee relations as describing practices that involve the same activities. The link between a management framework and organizational performance can be understood in terms of the link between the practices that it integrates and specific aspects of performance.

2.3.2 Practices mix and performance

If the embodiments of management principles are the practices as suggested by Hackman and Wageman (1995), then one can probably argue that whether or not a framework underpinned by those principles can bring about the outcome desired can only be examined at the practices level and not the framework as a whole. In this case, based on the strategic contingency arguments (Ketokivi and Schroeder, 2004), identification of theoretical explanation for a link between a framework application and outcomes would probably need to start from identifying theoretical explanation for the link between specific practices and aspects of outcomes.

Zhang (2001), in addition to providing useful rationalization for linking the quality practices-mix decisions to the operations elements mix in an organization's operations strategy, has provided a useful sub-categorization of each category of practices based on the stakeholder focus. The author has categorized the infrastructure practices in terms of whether they focus internally or externally, and to which stakeholder groups' activities the practices relate to. The value creating activities within the infrastructure category are carried out within the organization by employees and management, and externally by customers and suppliers.

Employee-based, management-based, customer-based and supplier-based practices are, therefore, consistent with the groupings described as infrastructure practices. The practices categorized as process-based and information-based and grouped together in

terms of their internal focus and objective nature of measures easily corresponds to the core practices listed in Sousa and Voss (2002). It is also proposed that different categories of quality practices play unique roles in achieving strategic objectives, suggesting that the deciding factors are the type of measures applicable to the objective dimension, the direction of focus, and the perspective from which the strategic objective is specified.

Where objectively measurable dimension of quality is specified from the manufacturing/operations-based perspective, then the process and information-based practices are emphasized. These mechanistic practices are implemented within an environment with unique organizational context made up of varying levels of commitment to quality management principles and employee motivation. This context is shaped by the practices categorized as management-based which provide the infrastructure to enable the resources deployed to achieve quality outcomes. These practices have been described variously as top management support, top management commitment, visionary leadership, executive commitment, the role of management leadership, and the role of quality policy.

The ISO 9000:2000 family of standards specifies adoption of the process approach as the key aspect of the development and implementation of quality management system. (ISO 9001:2008 (E)). The document states that organizations using the standard as a framework for management emphasize consideration of a process in terms of value-add, determination of the process performance and effectiveness and use of objective measurement to continually improve the processes. Under the chapter titled "Measurement, analysis and improvement", the standard specifies planning and implementation of monitoring, measurement and analysis of data to enable demonstration of conformity to requirements and improvement.

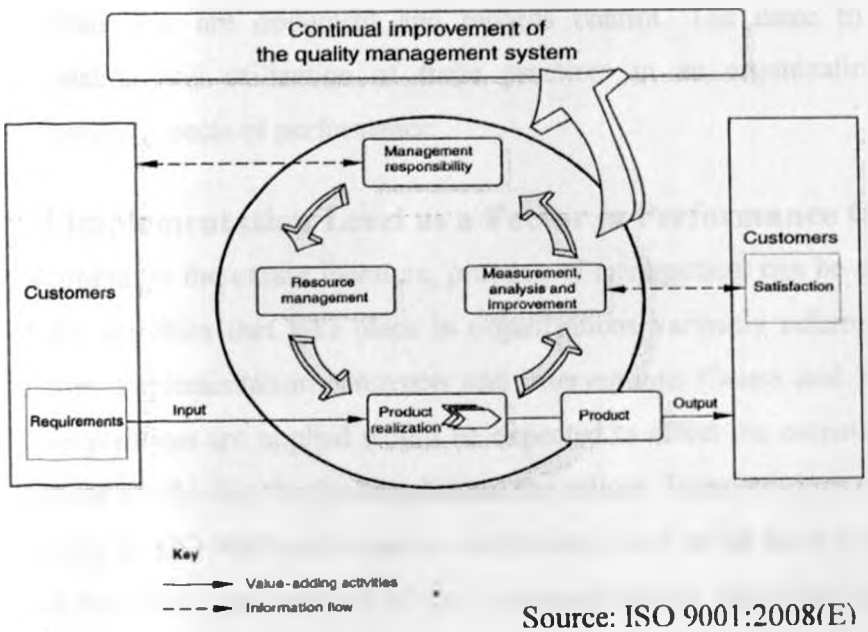
Through these practices an organization enhances customer satisfaction through process outcomes that meet products and services requirements as stated by the customers. This is consistent with Zhang's (2001) argument suggesting that the process and information-based practices are key to achievement of objectively measurable dimensions in the internally focused perspectives. This would be on assumption that the standard is also successful in helping to bring about the required

level of commitment to quality management principles, employee motivation, and an organizational paradigm that considers the need to identify and determine customer needs as paramount.

Such an environment would be shaped by management-based, employee-based and customer-based practices. In this respect, ISO 9001:2000's requirement for establishment of a quality policy and quality objectives is consistent with the consensus on the current knowledge in the field of quality management. The quality policy statement underscores the commitment and paradigm change by providing guiding framework for the establishment of appropriate quality objectives.

By formulating a quality policy, the top management communicates its commitment to the fundamental principles of quality management and to the development of the appropriate culture in which there is emphasis on the customer role and an environment that appreciates this. This role played by the customer as the provider of the key inputs to the value creating process in the form of customer requirements and customer feedback is illustrated in the model in Figure 2.1. The information is obtained through application of Plan-Do-Check-Act (PDCA) cycle framework, which prescribes that the requirements of the customer must be identified, measurable objectives defined and the process for achieving objectives defined.

Figure 2.1: ISO 9001:2000 quality management system model.



Source: ISO 9001:2008(E)

As illustrated in the model, monitoring of customer satisfaction, being part of the 'Check' phase of the cycle, requires measurement and analysis of the data collected through customer feedback activities. Such an integration of customer-based, process-based, information-based practices and the practices relating to the internally focused and subjectively measurable dimensions and perspectives should, on the basis of Zhang's (2001) analysis, bring about performance that is significantly better than the others. To superimpose these and the requirements for the management of interactions between the processes related to them onto the organization's structure, ISO 9001:2000 prescribes the quality manual, which acts as a vehicle for the integration of the infrastructure and core practices.

One conclusion is that ISO 9001:2000's prescription is consistent with Zhang (2001)'s recommendation for an integrated system in which the different perspectives and dimensions of quality and the different focus areas are taken account of using specific types of practices. Implementation should therefore result in significant improvement in operational performance. The issue to determine is the level at which the certified organizations have implemented the prescribed practices.

Considering that value creation takes place in a context in which managing interactions between subsystems, management of knowledge, speed of information processing and measurement of feedback are critical components, consistency of information has to be assured. Key practices prescribed by ISO 9001 standard to facilitate this are document and records control. The issue to examine is the orientation and utilization of these practices in an organization and how this influences aspects of performance.

2.4 Implementation Level as a Factor in Performance Outcomes

According to the extant literature, practice of management can be examined in terms of the activities that take place in organizations variously referred to as practices, factors, implementation constructs and interventions (Sousa and Voss, 2002). How these practices are applied would be expected to affect the extent the principles put forward are driving the thinking behind the actions. Interpretations of the observations relating to ISO 9001-performance relationship have so far been making assumptions that the nature and method of the concerned quality practices' application are the

same across different organizations and contexts. Empirical observations have returned results that put these assumptions into question.

Soltani and Lai (2007) sought to examine the distinctive features of contemporary forms of Quality Management systems so as to determine the most common approaches to quality management in the United Kingdom. While the findings suggest that organizations see ISO 9000 standards as useful in achieving business excellence, the evidence indicate discrepancy between the rhetoric and reality in the practices in these organizations. With little evidence of strategic approach to managing soft aspects of quality management in the organizations surveyed, the conclusion from the study was that the management approaches in many of the certified organization are the opposite of what would be expected considering the standards' underpinning principles.

A limited scope of empirical research, focused on the socio-behavioral aspects of implementation of ISO 9001:2000 certification, the study's usefulness is among the questions it has raised. These are: which of the ISO 9001:2000 prescribed infrastructure practices have been in deficit in terms of application? Were the core practices of process and information and analysis also in deficit? If not, then were the practices not in deficit enough to lead to some improvement in outcome?

Boiral and Roy (2007) report that motivation for certification is a factor in certification's performance outcome. The specific objectives of this study were to determine the impact the motive for pursuing certification has on ISO 9001 certification-organizational performance relationship and to develop a typology of certified organizations based on the factors relating to the motivations. Using data from a survey of over 2000 ISO 9001 certified Canadian firms, the study's findings suggest that motivational factors driving the quest for certification influence the benefits derivable from it.

How the motivation affects the performance outcome, according to the study, is through what the researchers call "integration rationale", suggesting that within each certified organization one finds four integration rationales: quality enthusiasts, ISO integrators, ritual integrators and dissidents. According to the typology, quality enthusiasts see the ISO 9000 standard as both a managerial and a marketing tool, and

the certification as a business requirement that leads to commitment to achieve internal and external focused goals. The results of the study suggest that quality enthusiasts-driven motivation for certification leads to higher level performance outcome benefits from the certification.

The ISO integrators see the management system standard primarily as a managerial tool, with the certification driven purely by internal requirement to integrate the standard's prescribed practices. While ISO integrators-driven motivation for certification leads to less benefit in performance outcome than is the case when the motivation is quality-enthusiast-driven, the benefit is still significant. In sharp contrast, the ritual integrators and the dissidents see the standard as of questionable internal relevance and as an "irrelevant bureaucratic iron cage" (p. 229), respectively. While the dissidents see certification as constraining and hence something to resist, the ritual integrators view it purely as a marketing tool, obtaining slightly higher but insignificant benefit in performance outcomes.

An interesting finding of Boiral and Roy (2007) is the relationship between the level of organizational problems associated with certification and the benefits obtainable. According to the data, quality enthusiasts-driven motive for certification, for its higher benefit in performance outcomes, also comes with increased level of organizational problems experienced during the early stages of the initiative. The ISO integrators-driven motive for certification leads to an organization experiencing significantly less of these organizational problems, while the dissidents-motivation for certification results in the least organizational problems.

Questions the study has left unanswered relate to how these integration rationales and related view of the standard and certification influence the performance benefits and the connection with organizational problems is not clear. An examination of these issues on the basis of the background theories explaining the practices-performance outcome relationship as proposed by Zhang (2001) could provide useful information. Delineation of the ISO 9001:2000 management system framework into its component practices or implementation factors and investigation of the extent these have gone beyond ritualistic level and become true embodiment of the principles of TQM would fall within this remit.

2.5 Summary of Research Studies and Knowledge Gaps

The issue to be determined is whether there is a theoretical basis for expecting that achievement of a standard of operations that meets specification of ISO 9001:2000 management system standard should be expected to lead to improved organizational performance. Specifically, the following need to be clarified: what really constitutes organizational performance? Can there be a measure of performance that can apply across different sectors and across different functions within an organization? Are the management system standard prescribed methodologies meant to directly lead to improved financial and market performance measures or is the medium of that improvement expected to be through internal business operations? Finally, what assumptions have been made in past observations and are there bases for these assumptions?

According to the literature, performance must be considered beyond the quantitative outputs and to include behavioral inputs as well (Armstrong, 2006; Kaplan and Norton, 1992). This forms a key basis for management system requirements standards such as ISO 9001:2008, being basically performance evaluation tools for the behavior input aspects (ISO 9001:2008(E)). Further research to determine whether the thinking behind the standard's audit evaluation criteria is indeed embedded in the certified organizations' managerial paradigms or ritualistic approach has been taken by the organizations' management would be useful. This gap has somewhat been alluded to in Boiral and Roy (2007) and Soltani and Lai (2007).

Whether there can be a measure of the output aspect of performance that can apply across different sectors, functions and situations has been discounted (Ketokivi and Schroeder, 2004; Richard et al., 2008; Talbot, 2006; Tangen, 2003). Context, research situations and objectives, according to the literature, has major influence on nature and type of measures. With a possibility that the differing nature of organizational performance as a dependent variable in different studies have contributed to the inconsistencies in findings, a research that considers the strategic contingency issues would be useful. In the context of ISO 9000 family of management system standards and quality management, such a study would basically be an empirical examination of the conclusions from Zhang (2001).

Boiral and Roy (2007) exposed the weaknesses in the assumption that every organization that is ISO 9001 certified has done so because of faith or acceptance of the usefulness of the methodologies prescribed. These differing assumptions would probably result in differences in opinions relating to the medium of transmitting the improved outputs and by extension the emphasis placed on behavior inputs aspect and the outputs aspect of performance. One possible line of inquiry would be to examine the behavior inputs that are meant to be the outcomes of the implementation factors in the ISO 9001 management system framework.

Another assumption has been that organizations that are ISO 9001 certified are able to apply the underlying principles to the same extent while those that are not certified do not apply them. This assumption would drive a researcher into a line of inquiry in which output performance of two organizations of different certification statuses are compared and conclusion made based on whether the certified organization's performance is any better. Studies reported in Dick (2000), Feng et al. (2008), Heras et al. (2002), Heras et al. (2006), Santos and Escanciano (2002), Martinez-Costa and Martinez-Lorente (2007) and Withers and Ebrahimpour (2000) are all along this line. Examination of the basis of this assumption is another research area that can enrich the body of quality knowledge. Such a research would be based on quality management as "the better way to manage" viewpoint.

2.6 Conceptual Framework

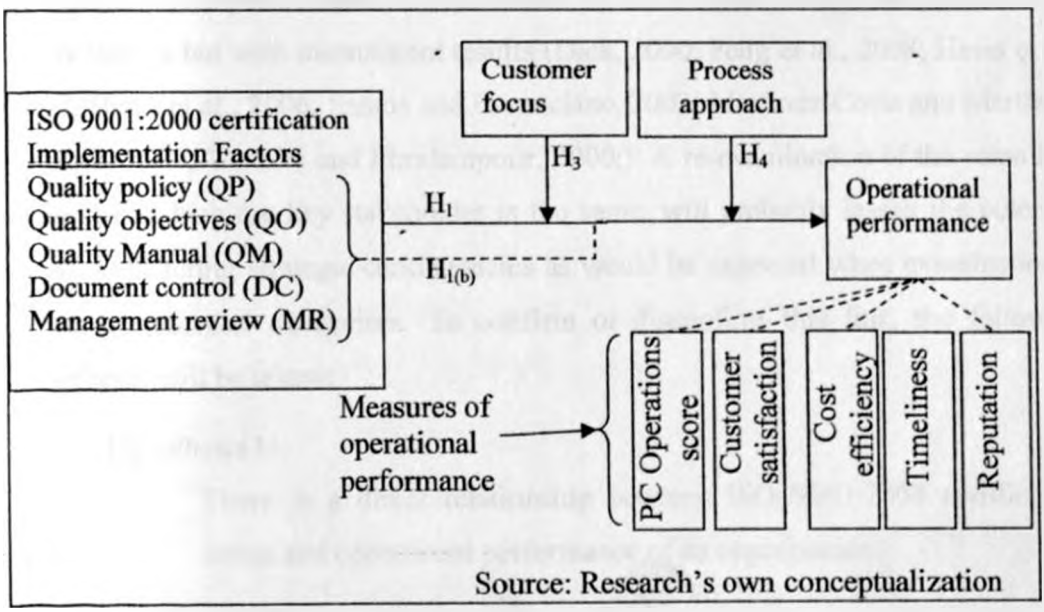
On the basis of the conclusions from reviewed literature, it can be argued that, all things being constant, it would be expected that variations in actions relating to implementation of ISO 9001:2000 management system standard will probably cause differences in the output aspects of performance. The constants in the context would include performance regime, evaluation system in use, customer expectations, and other operating peculiarities that can be shaped by socio-economic and cultural factors. One proposition is that variations in actions relating to the implementation can come from the motivation for certification through its influence on the perception and reception of the implementation factors in the organization.

This, in turn, would influence the intended organizational outcomes, which constitute the behavioral inputs as described by Armstrong (2006). ISO 9000 management

system standard recognizes the importance of these behavioral inputs when it specifies the development of customer focus orientation and process approach in the organizations that use it as the framework for their management systems (ISO 9001:2008 (E)). Although achievement of these behavioral inputs are listed as some of the outcomes the ISO 9000:2000 family of standards seeks to promote, it is not clear how it achieves this and the role they play.

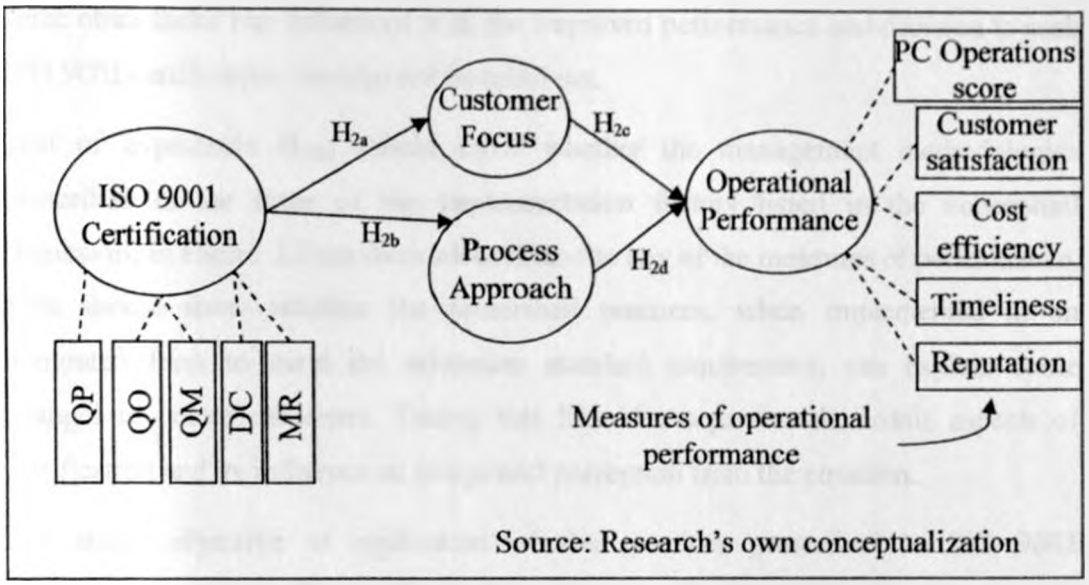
There are two propositions as regards these behavioral inputs and the ISO 9000:2000 family of standards: One proposition is that the behavioral inputs constitute how the motivation for certification influences the perception and reception of the ISO 9001 standard implementation factors in the organization and consequently, the output outcomes. This would suggest a moderating influence and is conceptualized in Figure 2.2 below, with the measures for the output outcome as customer satisfaction, cost efficiency, timeliness and reputation.

Figure 2.2: Moderating factors in ISO 9001-performance relationship



Another proposition emphasizes the standards' stated aim of promotion of these same behavioral inputs. These, according to ISO 9001:2008 (E), are the critical influencers of the output aspects of organizational performance. This proposition hypothesizes customer focus and process approach as results of ISO 9001 standards' implementation factors. An alternative conceptualization of the linkages is as per Figure 2.3 below:

Figure 2.3: Customer focus and process approach as outcomes of ISO 9001 certification



The relationships between ISO 9001:2000 certification status and various dimensions of organizational performance as represented by H_1 in figure 2 have been examined in many studies but with inconsistent results (Dick, 2000; Feng et al., 2008; Heras et al., 2002; Heras et al., 2006; Santos and Escanciano, 2002; Martinez-Costa and Martinez-Lorente, 2007; Withers and Ebrahimpour, 2000;). A re-examination of the same in a context in which the key stakeholder is the same, will probably lessen the potential effect of differing strategic contingencies as would be expected when examination is across commercial enterprises. To confirm or disconfirm this link, the following hypotheses will be tested:

Hypothesis H_1.

There is a direct relationship between ISO 9001:2000 certification status and operational performance of an organization.

Hypothesis $H_{1(b)}$

There is a significant relationship between the level of ISO 9001 implementation factors and an organization's operational performance.

Confirmation of relationships through testing of hypothesis H_1 does not, however, show that the relationship is causative. It can be that an ISO 9001 certified organization is more likely to perform well. Then again, it could be that an already

high performing organization is probably more likely to seek certification so as to display its superior management to all. In an Exp post facto study, a possibility that some other factor has influenced both the improved performance and decision to seek ISO 9001 certification can also not be ruled out.

Test of hypothesis $H_{1(b)}$ should show whether the management methodologies prescribed in the form of the implementation factors listed in the conceptual framework in Figure 2.2 are themselves linked to any of the measures of performance. This should show whether the prescribed practices, when implemented in an integrated form to meet the minimum standard requirement, can explain some changes in output outcomes. Testing this link also separates the iconic aspects of certification and its influence on image and perception from the equation.

The stated objective of application of the practices prescribed in ISO 9001 management system framework is the creation of customer-focus and process approach environment in the organizations (ISO 9001:2008(E)). Implementation factors represent the instruments with which ISO 9001 standard influences activities in an organization toward this stated objective. Therefore, the value of ISO 9001:2000 prescribed practices in bringing about intended organizational system that is customer focused and process based can be determined through examination of links H_{2a} and H_{2b} in Figure 2.3. The prescribed practices include quality manual, quality policy, quality objectives, management reviews, document and records control procedures.

It can therefore be hypothesized that the extent the instruments and documentations included in the ISO 9001 management system implementation are anchored to the underlying principles of quality management has influence on the extent the organizational systems exhibit customer focus and process approach. To confirm or disconfirm this, the following hypotheses will be tested:

Hypothesis H_{2a}.

> There is a direct relationship between the level of ISO 9001:2000 implementation factors and an organization's customer focus orientation.

Hypothesis H_{2b}.

There is a direct relationship between the level of ISO 9001:2000 implementation factors and an organization's process approach orientation.

Links H_3 and H_4 suggest there could be an interaction effect of a managerial thinking that emphasizes customer focus and process approach and ISO 9001 certification on organizational performance. The proposition is that the relationship between ISO 9001 certification status and performance changes with the extent the managerial paradigm emphasizes customer focus and process approach. To confirm or disconfirm these interaction effects, the following hypotheses will be tested:

Hypothesis H_3.

The level of customer focus orientation in an organization moderates the effect of ISO 9001 certification status on operational performance of the organization.

Hypothesis H_4.

The level of process approach orientation in an organization moderates the effect of ISO 9001 certification status on operational performance.

If ISO 9001:2008 is intended to bring about the stated input behavior outcomes, then their link to the intended output outcomes need also to be confirmed. Links H_{2c} and H_{2d} in Figure 2.3 are examined by testing the following hypotheses:

Hypothesis H_{2c}.

The level of customer focus orientation is significantly related to operational performance of an organization.

Hypothesis H_{2d}.

The level of process approach orientation is significantly related to operational performance of an organization.

2.7 Operationalization of the Variables

The conceptual framework in figure 2 identifies the variables of ISO 9001 certification status, management system implementation factor level, customer focus, process approach and organizational performance. ISO 9001 certification status is a binary variable representing the certification status with the reference time being 1st

October 2007. This variable shall be set to 1 if the organization has been audited and given a certificate of confirmation that its management system conforms to the requirements of ISO 9001:2000 or later edition by a body recognized by ISO Central Secretariat. The remaining variables are multi-dimensional and can be operationally defined based on constructs as defined in published material (Ailawadi et al., 2003; ISO 9001:2008(E); Sousa and Voss, 2002; Tangen, 2003).

2.7.1 Implementation factor variable and its components

Management system implementation factor level variable represents the extent the various implementation factors, as defined in ISO 9001:2008 standard document, embody the principles underpinning the management system framework. As the vehicle for superimposing the ISO 9001:2000 quality management system standard's requirements upon the overall operational structure of an organization and how it functions, the quality manual, as prescribed by the standard, would be expected to embody the principle of systems approach. ISO 9001:2008(E) prescribes the quality manual as the instrument with which an organization is able to set out the scope of the organization as a system, identify the procedures within the system and description of the interactions between these procedures.

ISO 9004:2000(E), a guidance standard specifies identifying, understanding and managing interrelated processes as a system as the embodiment of the fundamental principle of systems approach to management. Attitudinal indicators of quality manual's suitability to play its role as the embodiment of the systems approach are, therefore, the extent it is seen to promote "organization as a system" attitude throughout the organization, and the extent it is made available at the point of work of every member of the organization. On the basis of the ISO 9004:2000(E) guideline, another indication of quality manual's suitability is the extent it is perceived to describe the interactions between the different procedures in the organization as well as the extent it clarifies the aims of the organizational system. These indicators together with the single dimension attitudinal measure of how the quality manual is regarded provide the level measurement for the implementation factor.

ISO 9001:2008 standard defines quality management system as "establishment of quality policy, quality objectives, and to achieve these objectives. Quality policy

embodies the principle of leadership (Sousa and Voss, 2002). It is prescribed in the ISO 9001:2008(E) standard document as an instrument for embodying management commitment. The variable factor of quality policy can therefore be operationalized based on constructs specified in the above literature. Indicators will be the extent the quality policy statement is perceived to convey to the employees the desired degree of customer satisfaction, the type of future improvement that is needed, how the organization intends to develop them, and its emphasis on customer-supplier chain through specification of suppliers' contribution. These together with the single dimension attitudinal measure of how the quality policy is regarded provide the level measurement for the implementation factor.

The practice of establishing quality objectives as the starting point in a quality management system embodies the principle of process approach and is based on the framework of the PDCA cycle. Indicators of the factor implementation level include the extent customer needs and the process of achieving these have been emphasized as well as application of the check phase through inclusion of requirement for analysis of improvement opportunities. This together with perception of the factor importance, as based on the single dimension measure, provides the measurement for the factor implementation aspect of implementation factor variable.

Process approach and customer-value outcomes can be gauged from the extent process approach and customer requirements are emphasized in the organization when "developing, implementing and improving effectiveness" of the organization's management system, as described in the standard publication document. Attitudes, perceptions and expectations within an organization can reveal the extent the organizational system outcomes have resulted from management practices implemented. The extent process approach is emphasized in an organization is gauged from the importance attached to given aspects of task performance.

These include the extent process and system factors are emphasized as opposed to social factors in task performance goal achievement (Dean and Bowen, 1994); and the importance attached to stability and capability of processes as a means of assuring work output in the organization (Deming, 1994). Other indicators of process approach are the importance attached to the way everyone in the organization works as opposed

to inspection in assurance of quality of work output, and the extent reduction of complexity is emphasized rather than means to deal with complexity. The importance attached, in the organization, to interactions between activities as opposed to perfection of individual actions as a means to improvement of output quality also indicates the process approach orientation in an organization (Deming, 1994).

Indicators of customer focus are the extent there are systems and processes for identification of the customer to every activity, listening to customers, translating customer needs to products and services, and identification of the processes through which customers derive value (ISO 9001:2008(E)). Regular measurement of customer satisfaction, use of customer satisfaction measures to evaluate and improve internal processes and evaluation of every activity in the business process to determine its contribution to meeting customer requirements also indicate customer-value orientation. A customer-focused organization is also expected to have systems and processes for customers to comment and complain and receive prompt resolution for their concerns.

The extent the prescribed practices of document and records control embody their underlying principles can be assessed through the behavioral inputs into the system that their implementation entails. These include the ease of determining the currency of a document, analysis of information contained in records of work, use of the information for planning performance improvement, and for review of how work has been performed as described in the standard publication document. By assessing the use of customer feedback, quality system audit results, performance information, process change information and externally sourced information in the management review, the extent management review embodies the process approach and the PDCA cycle concept can be gauged (ISO 9004:2000(E)).

2.7.2 Organizational performance variable

Use of objective organizational performance data derived from records of past performance evaluation would raise the issue of demarcation of thinking as argued by Talbot (2006). This problem arises when institutional context creates a conflict between what is emphasized in the performance regime and the focus of the management system framework development. A performance indicator that would be

consistent with the context in which the standard document has been developed would be expected to be customer focussed. As for many of the Kenya government public agencies, operations criterion in the 2006/2007 performance evaluation framework provides this measure. Another customer focused performance indicator would be obtainable from customer feedback survey data. ISO 9001:2008 specifies customer feedback as a requirement.

The incompleteness of the objective performance data such as is explained above has been noted in Ailawadi et al. (2003) and Tangen (2003). A perceptual self-report data that considers strategic contingency arguments as advanced by Ketokivi and Schroeder (2004) would provide useful supplement to the information obtained. Indication of performance against a given operations dimension, as perceived by the members of the organization, but relative to a benchmark, is one such alternative way to operationalize organizational performance. Subjective perceptual data has been used for organizational performance variable in Boiral and Roy (2007), Gustafsson, Nilsson and Johnson (2003) and Heras et al. (2006).

Performance in the operations effectiveness element can be gauged by how members of the organization perceive themselves in terms of cost and timeliness of responding to customer needs (Chase et al., 2004). For the customer management element, performance can be gauged by the perception in the organization of their relative position in provision of quality products and services, and the relevance or the extent the products or service, as perceived by the members of the organization, meet the customer needs. Performance in the customer management element can also be gauged by finding out how the members of the organization perceive themselves in terms of reputation and their customers' satisfaction relative to others.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides the link between the research model and the empirical results sought. It answers the what, the how and the why questions relating to the approaches and methodological choices that were made relating to the study. Issues such as the need to test for proof of relationship, study timeframe, desire for generalisability of the research outcome and the topic of the study were key considerations in these decisions.

The chapter sets out the research paradigm against which the research was based, and the research strategies used. It also sets out the type of analyses that were employed as well as how the issues relating to the validity and reliability of data collection instrument were handled.

3.2 Research Paradigm

This research concerned understanding of the present with a view to being able to predict the future situation. It sought to determine if the extent of consistency with the TQM principles of the listed implementation factor instruments would explain observed inconsistencies on the value that can be derived from ISO 9001:2000 certification (Dick, 2000; Feng et al., 2008; Heras et al., 2002; Martinez-Costa and Martinez-Lorente, 2007). This was with a view to being able to predict future outcomes in situations where a given level of consistency of these implementation instruments with TQM principles can be achieved.

According to W. Edwards Deming (1994) "management in any form is prediction" (p. 101). For a statement to convey knowledge, it must be able to predict future outcome, but with risk of being wrong (Deming, 1994). Epistemologically, there are two broad views of knowledge (Marsden and Littler, 1996): Positivism and social constructivism (phenomenological viewpoints). Lather (2006) has presented the scenario in terms of what is desired: to know and prediction; or understanding? Positivism sees the need to know in a context when the truth is one and to predict as the important means to knowledge creation.

This research was therefore grounded on positivist research paradigm, a paradigm characterised by a belief in theory before research (Cooper and Schindler, 2003), statistical justification of conclusions and empirically testable hypothesis, the core tenets of scientific methods (Cooper and Schindler, 2003). This required that facts must be established for the causal relationships, if any, that may be observed. Empirical studies based on hypothetical-deductive research approach in which the study begins with a hypothesis, are most appropriate for this kind of investigations.

Deming's (1994) argument for being able to predict the future with the risk of being wrong makes untenable the absolute objectivism of logical positivists research paradigm due to its emphasis on verifiability. Popper (1972) has asserted that obtaining conclusive proof which is at the core of the concept of verifiability is not possible. Through Popperian falsifiability as a criterion for the scientific method, a theory can conclusively be eliminated after being falsified through observations (Popper, 1972). Since theories make predictions, if the prediction cannot come true during scientific observations the theory becomes false and is eliminated. Popper has argued that a theory is only legitimate as a science when it is possible to find it as false through some observations that can be conceived.

The theoretical basis for this research was that the nature and strength of the relationship between ISO 9001:2000 certification status and performance is dependent on the level at which the management system has been implemented. This theory explains a controversy relating to management decisions as they concern expected outcome of adoption of ISO 9001:2000 quality management system standard and revises presumed falsification by other research studies, of the linkage theory. Falsification would leave the controversy unsettled, but eliminate the identified variable, implementation level, as a factor in the context for operation of ISO 9001-performance relationship theory.

3.3 Research Design

To investigate the issues involved in the research, methodological choices made concerned the research approach to adopt and the research strategies to employ. The research paradigm in which the study was to be placed, the degree to which the research question had been crystallized, purpose of the study, desired time dimension,

and the research environment were some of the factors to consider. Other factors considered were the nature of the variables, topical scope, and the nature of the issues to be investigated.

The placement of the study in the positivist research paradigm entailed a need to operationalize concepts so that they are able to be measured. Kothari (1990) recommends a quantitative research approach in such a situation. To find out if the inconsistencies in the relationship between ISO 9001:2000 certification status and performance can be explained by the level of quality management system implementation factors in place, hypotheses were formulated for testing. The need to test specific hypotheses and answer specific research questions meant that exploratory research design could not be considered and this left a formalized research as the only appropriate design (Cooper and Schindler, 2003). Information from empirical sources was used to arrive at the study's conclusions.

Since the need was to obtain an explanation for the inconsistencies in the relationship between ISO 9001:2000 certification status and performance under actual operating environment without regard to trend or changes overtime, a causal, cross-sectional, ex post facto research strategy was adopted. This decision was based on the issue being a snap shot based "why" question in a context in which researcher control of environment is restricted to selection of the sample subjects only. Accordingly, a causal, cross-sectional research is appropriate when there is a need to find out the "why" of a phenomenon in a single time period.

Since the research direction and the issues to be examined partly arose from observations made by management practitioners and partly from the inconsistencies reported in other studies, a statistical research design was chosen so as to achieve some generalisability of the results. This entailed collecting data from a large sample of the population and basing statistical inference on the conclusions drawn from the results. A survey method of data collection was chosen as recommended by Kothari (1990).

The design approach and strategies proposed have not, however, been without limitations. These range from the scope-related limitation associated with cross-sectional study and the limited depth achievable in a statistical study. First, without

studying the trend over a period, and determining what came first, the effect on the dependent variable, or the change in the explanatory and or moderating variables, changes arising from other extraneous variables can be mistaken as relating to the change in the moderating and explanatory variables. However, the constraints arising from the reason for the research, which essentially brought in the time factor, and the need to be able to generalize the findings, made a compelling case for a cross-sectional, statistical study. Boiral and Roy (2007), Soltani and Lai (2007), and Martinez-Costa and Martinez-Lorente (2007) have used the research approach and strategies to investigate similar issues in Canada, United Kingdom and Spain, respectively.

3.3.1 The population

The issues involved concerned organizational practices, their outcomes in terms of performance, and the extent these change when ISO 9001 quality management system standard prescribed methodologies are put in practice. This dictated that having used the standard to guide the setup of a management system should be one criterion for inclusion. A major difficulty in a study such as this is finding a common performance measure that an adequate number of the qualifying organizations have deemed strategically important, and which can be used for comparison. This is because the measures that are important may potentially dictate the aspects of management methodologies that are emphasized in the different organizations, hence introducing variation in a given performance dimension (Ketokivi and Schroeder, 2004; Zhang, 2001).

The institutionalization of the performance contracting system for agencies of Kenya government provided the best context in which measures that are, to some extent, strategically closely related, and, at the same time, coming with reasonable numbers that can meet requirements for such a study, could be obtained. These organizations, having been put through a regime of annual performance evaluations, also had ready secondary data for some of the measures. Accordingly, participation in the annual performance evaluation as part of performance contracting system was the overarching criterion for inclusion in the population for the study.

This restriction meant that only Kenya government agencies that have taken part in the annual performance evaluation qualified for inclusion in the population, with the number being, according to a report published in 2007 (GOK, 2007), 336. This number included 175 local authorities that had participated in the evaluation exercise only once and 37 parent ministries. Another issue considered was the potential extraneous factors associated with the late program entry and possible difference that would be expected between the performance regimes that apply in the ministries and in the state owned service delivery enterprises. The latter tend to operate along the lines of commercial enterprises.

The need to avoid these potential extraneous factors led to the decision to exclude the local authorities and the line ministries from the population. This left 124 public service agencies as the population for the study. Observations by, and feelings and attitudes of members of these organizations can be indicators of the thinking and systems orientation of these organizations. Similarly, the extent, nature or level of implementation of the practices prescribed by ISO 9001 management system standard can be discerned from these observations, feelings and attitudes. Consequently, the status of the different management practices and the organizational systems orientations was obtained from informants drawn from the staff of the organizations. In deciding on how to select these informants, consideration was given to the fact that quality management, as a management approach, emphasizes strategy deployment as opposed to strategy content (Dean and Bowen, 1994).

On this basis, information on the issues to be examined was obtained from those at deployment/implementation levels rather than at corporate strategy and top management levels. Therefore lower/functional level managers and staff at the supervisory and professional cadres provided the information required. Since this group would probably not have been the major influencers in key strategic decisions such as those to do with organizational change, obtaining information from them about how the change is felt on the ground would, potential biases from self-praise is reduced.

3.3.2 Sampling

A study such as this could have probably sought to obtain information from all the organizations that qualify for inclusion into the population, since the number is manageable. With the issues for examination being a mix of events, processes and some attitudinal aspects, multiple informants were needed for each organization. The accuracy of data handling, the time factor and cost is important in such circumstances.

With a population of 124, information relating to each being from multiple informants, taking a sample provides a more reliable data gathering exercise, with adequate accuracy during the processing of the data. Using a sample also makes it possible to have a snap-shot window that is short enough so that the continuously changing environmental issues – both internal and external to the elements, would not introduce variations. Potential environmental changes could be change of chief executive officers, agency mandates, staff and other business related environmental changes. Greater speed of data collection from a selected sample of the population reduced the threats to reliability of results that could be expected from these changes.

With a 5 percent accuracy level at 95 percent confidence level, on a five-point Likert type measurement scale intended, Zikmund (2003)'s sample size calculation formula was used to arrive at the minimum sample size. The objective was to achieve an accuracy level that provides 95 percent confidence that the mean chance score, in a 1 – 5 scale, will be 3±0.15. Using the z-score value for the desired confidence interval, the desired accuracy level, and the standard deviation, the sample size calculation formula, $n = (Z^2S^2)/E^2$, returns a minimum sample size of 75. This is with z-score for 95 percent confidence interval as 1.96, accuracy of 5 percent that works out as 0.15 of the mean score of 3 in a 1 to 5 scale, and the standard deviation estimated using a rule of thumb as (5-1)/6 = 0.6667.

Since the calculated sample size was greater than five percent of the population, a finite population correction factor, $\sqrt{((N-n)/N-1))}$ was applied to arrive at a sample size of 47.4 as the minimum to achieve the accuracy required. A sample of sixty organizations was drawn based on the expectation that not all organizations could be expected to agree to participate. Sampling was systematic, with the names of organizations arranged in alphabetical order.

Within each organization that agreed to participate, a sample of fourteen members of staff for questionnaire administration was drawn from the internal staff telephone directory using random sampling method. In the few cases that internal telephone directory was found unusable, a list was obtained from human resource departments for use as sampling frame. Where an organization is multi-location, only those at the headquarter offices were surveyed.

The basis for taking a sample of fourteen irrespective of the size of organization is that the unit of analysis is the organization and thus the interest was for the means of the sample in each organization rather than the values obtained from each questionnaire. In this case all the members of the sampled organizations are considered as making up one large population of informants. The central limit theorem applies when multiple informants from each of the different organization are taken as samples of the larger population with the organizational mean as the value of interest (Oakland and Followell, 1990). According to the authors, the distributions of the means of the samples will get nearer to normal irrespective of the distribution in the population provided the sample size is four or more. This means the samples of informants drawn from each of the organizations need not be based on Zikmund's (2003) sample size calculation but can be any size greater than four and need not be greater than thirty for acceptable level of normality. In thus case, convenience and cost become key considerations.

Boiral and Roy (2007), Martinez-Costa and Martinez-Lorente (2007) and Soltani and Lai (2007) have used single respondents as informants for each organization irrespective of size. In each case the survey instrument was mailed addressed to the quality manager with the covering letter indicating that where no such title existed, the person responsible for quality is requested to respond. Use of single respondent for each organization was defended on the grounds that the person to which the questionnaire was addressed would be expected to be knowledgeable about the ISO 9001 and quality issues. Like in this research, the units for analysis in the above studies were organizations.

Using more than one informant from each organization reduces the effect of response biases that would be particularly very high if persons responsible for specific related

activities are used as single informants for each organization. Another factor favouring use of multiple informants from each organization is the line of inquiry, which, in this study emphasizes outcome orientation. Fourteen as the number of informant to survey was decided on purely because the number is greater than four. It can statistically capture the variances within each organization much better than would be possible with only one informant and it was convenient in this case. Van der Wiele and Brown (2002) have used four informants to represent each organization in a study of the factors impacting sustainability of quality in organizations.

3.4 Data Collection

The objectives of the research informed the selection of the type of data to be used, the data collection method, and the decision on the data collection protocol. What was to be measured, how convenient a given data type was deemed, the practicality of the data type in the given situation, and the interpretation requirements were the main bases for deciding on the data type. The nature of what needed to be measured and the source of information were factors in choice of the method of data collection.

Data relating to binary variable of ISO 9001 certification status (ISO_{stat}) was available from records of the organizations in the population. Organizations that have status of certified would be expected to have obtained certificates of confirmation of conformity of their management systems to the requirements of ISO 9001:2000 or later version. These certificates would have been issued by an ISO national member institute or an independent certification body accredited by International Accreditation Forum (IAF) (ISO/CS, 2007).

Also available from records in the participating organizations was customer satisfaction survey score obtained for these organizations in the preceding performance contracting period. Other information from the records of the participating organizations related to performance score in the 2007/2008 performance evaluation exercise. This and customer satisfaction score together constituted one form of operational performance data.

A self-administered questionnaire was used to collect the data relating to the variables of ISO 9001 implementation factor levels, customer focus, process approach, and the

operational performance measures of cost efficiency, timeliness and reputation. As Cooper and Schindler (2003) assert, a self-administered survey method is especially appropriate when it is important for the respondent to have adequate time to carefully consider their responses as was the case in this research. Other advantages for the self-administered questionnaire are cost and the anonymity provided to the respondent. These decisions were aimed at improving the quality of the data collected.

The issues for examination in this study relate to the decisions by organizations to implement specific sets of management practices as prescribed in specific management system standards. Consequently, the constructs used to operationalize the variables representing these practices were as determined in the standards publications and other studies of the issues. The ISO 9001 implementation factors were identified from the twin standard documents, ISO 9001:2008(E) and ISO 9004:2000(E), as quality policy, quality objectives, quality manual, document and records control, and management review.

These variables are operationalized by the extent the characteristics they posses conform to the principles the practices are meant to embody. These are fundamental principles of quality management and are stated by the ISO 9000:2000 management system standard publications as underpinning its framework and documentation requirements. A factor characteristics' conformity to the underlying principle is an indicator of the extent to which the particular practice or documentation is the principle's embodiment and provides a measure of the implementation level. The absence of such conformity would be an indicator that the implementation is iconic, ritualistic and superficial.

These construct items were identified from the management system standards publications, ISO 9001:2008(E), ISO 9004:2000(E), and other publications that have either contributed to the information in these publications (Deming, 1994) or have examined the role of the practices as embodiments of these principles (Sousa and Voss, 2002;). Scale reliability tests were carried out to further refine the measurement instruments. Scale items retained after the instruments refinement are listed in Appendix 2a.

For the measures of the organizational system outcome variables of customer focus and process approach, construct items were adopted from past studies as well as official International Standards Organization's official publications. Construct items for operationalizing customer focus variable were adopted from the twin publications of the management system standard, ISO 9001:2008(E) and ISO 9004:2000(E). Operationalization of the variable of process approach was based on construct items identified from Dean and Bowen (1994), Deming (1994), ISO 9001:2008(E), and ISO 9004:2000(E).

Customer focus variable concerns the behavioral outcomes that are consistent with organizations that emphasize customer-value, while process approach variable concerns the behavioral outcomes that are consistent with organizations that emphasize process approach in management of value creating activities. Indicators of these variables are the existence of these expected behavioral outcomes. Listed in Appendix 2b are the behavioral input outcomes which, according to Dean and Bowen (1994), Deming (1994), and the ISO publications, would be expected when an organization is customer focused and process approach oriented.

As for the performance variable, performance contracting regime established to guide the organizations that form the population identifies key dimensions to be used to assess the level of performance. The variable was therefore operationalized using single items to represent each dimension of performance. The dimensions are as specified in the performance contracting document that the government of Kenya uses to evaluate operations criteria performance for its agencies. These are cost efficiency, timeliness, quality of service, relevance, satisfied customers, and reputation (GOK, 2007). The measurement scale is based on self-report performance perception against a benchmark as described in Tangen (2003) and Richard et al. (2008). Measurement scale relates to an informant's subjective perception of their organization's performance, in a given dimensions, relative to a benchmark.

These measurement items were framed in a four-page structured questionnaire that simply required placing a mark against one of six choices. Depending on the variable being measured, the five-point scales required estimation of the importance, estimation of frequency, or estimation of the extent a statement, in the respondent's

subjective opinion, represents what happens in the organization. Therefore choices to be made were in ranges of "Not important at all" to "Extremely important", "Extremely not true" to "Extremely true", and "Never" to "Always". In each case a choice for "Don't know" was provided to ensure there were no forced guesses, except with regards to performance measures in which the subjective opinions sought could be describe in options that ranged from "Much worse than others" to "Much better than others".

Before the commencement of data collection exercise, written requests were made to the chief executive officers of the sixty organizations selected using systematic random sampling. The request was for permission to obtain the data from these organizations' official records and to be allowed to take a random sample of fourteen members of staff for the purpose of administering self-report questionnaires. Enclosed with the letter of request was another letter from the National Council for Science and Technology authorizing the researcher to carry out the research described.

Of the sixty organizations, one had to be left out because it would have required higher level security clearance to gain unfettered access, while three wrote back declining to participate. Many others contacted the researcher expressing willingness to participate and advising him of the persons who had been assigned to facilitate his information gathering exercise. In a few of the cases the organizations did not call or write back but responded positively to the phone calls by the researcher or his assistants and appointments were made for the purpose of collecting the information and sampling the workforce at the headquarter level.

Within each organization that agreed to participate, the internal telephone directory or, in the few cases that one was not useable, human resource departments provided staff lists to use as sampling frame. Approximately 70 percent of the questionnaires issued were returned filled. As indicated in Table 3.1, a minimum of six questionnaires were returned from each of the participating organizations. 68 percent of the organizations returned 8 or more questionnaires, with nearly 32 percent of the participating organizations having between 12 and 14 informants filling and returning the questionnaires.

Analysis indicated that the non responders were from across the organizational hierarchy and no particular group dominated. Further analysis was done to try and determine potential effect of the number of questionnaires returned from a participating organization on the means of the data relating to the measures of key variables. This showed the correlation between the number of responses from a participating organization and the mean for the ISO 9001 implementation factors was -0.050 and was insignificant with a p-value of 0.739. This would appear to confirm that the number of questionnaires returned from each participating organization has no significant influence on the organization's mean score on the key multi-item variables.

Table 3.1: Responses from sampled members of staff in the participating organizations.

Number of responses out of the 14 questionnaires issued	Count
Between 6 and 8	15
Between 8 and 11	17
12 or more	15

In 9 organizations, the persons assigned were not able to facilitate the information gathering within the desired time frame. Problems were mainly of repeated failure to honour appointments reportedly because of unscheduled urgent meetings to. In one case, the assigned person went on leave without reassigning someone else to handle the issues and was not reachable. Six of the nine non-cooperative group are ISO 9001 certified while five are not. The mean overall score in the 2007/2008 performance evaluation for the non-cooperative group of nine was 2.34 with a standard deviation of 0.29 against the mean score of 2.39 with a standard deviation of 0.35 for the cooperative group of 47.

With a distribution that is more or less balanced between the ISO 9001 certified and non-ISO 9001 certified and performance score in a past measure being not significantly different from that of the participating group, the non participation of these thirteen organizations would not be expected to introduce any systemic effect on the results. The 47 organizations that agreed to and actually participated also met the

adequacy requirements since the un-rounded calculated sample size figure for 5 percent accuracy at 95 percent confidence level was 47.4. A 78 percent response is just about what was expected when a sample of 60 was drawn

Within the participating organizations, the staff sampled were issued with the questionnaires and requested to return them after completion to a collection point. The persons at the collection points were employees of the organization thus the respondents could have ample time to complete the four-page questionnaire at their own pace. In some organizations the researcher had very free access either because of the links or the organizations' management had given written blanket authorization for the researcher or his assistants to obtain the information from whoever in the organization was able to provide it.

3.5 Data Analysis

This study used both non-parametric and parametric statistical techniques to examine and analyze the relationships involved. The first question to be answered was: are ISO 9001 certified organizations better performers than their non-certified counterparts? In the event that the answer to this question is found to be in the affirmative, one proposition put forward considers that the standard's influence on performance arises directly from the management methodologies' embodied in the implementation factors. But this would be happening in the context in which behavioral input outcomes are thought to also have influence.

The inclusion of promotion of these behavioral input outcomes as part of the ISO 9001 implementation objectives would appear to suggest that any similarities within groups of certified organizations would be by both the implementation factor variables and these behavioral input outcomes as well. The proposition represented by figure 2.3 in section 2.6 assumes that the behavioral input outcomes do not exist independent of the implementation factors, which constitute the behavioral inputs, but will be their outcomes. Exploratory analysis techniques are applied to try and clarify the context in which these two categories of behavioral inputs exist in organizations as based on the data collected.

If organizational system outcome variables, thought to constitute behavioral input outcomes, can form natural groupings with the implementation factors, which constitute prescribed behavioral inputs, then support for the proposition represented in figure 2.3, section 2.6, will be strengthened. An alternative proposition, represented in figure 2.2, is that these organizational system outcomes are related to the managerial paradigm and are independent of the behavioral inputs prescribed by ISO 9001 management system standard in the form of the ISO 9001 implementation factors. Also to be clarified through the exploratory analysis was whether the prescribed behavioral inputs themselves, as prescribed in the forms of quality policy (QP), quality objectives (QO), quality manual (QM), document control (DC) and management review (MR) are themselves associated. In the event the data failed to indicate association between these behavioral inputs, in the forms prescribed, an exploratory analysis was to try and determine if there is any association between any of them and the behavioral input outcomes of customer focus (CF) and process approach (Pra). Cluster analysis technique was applied to the data to clarify these issues.

The issue of whether ISO 9001 certified organizations are better performers than their non-certified counterparts can be determined by examining performance variables based on a single factor grouping. The single factor, ISO status, has only two levels, certified (1) or and not certified (0). Additionally, all the cases come from one sample. A non-parametric statistical technique, Chi-Square (X^2), was employed to test a hypothesis that the distribution of the participating organizations to the performance categories of low and high performers could be influenced by the certification status of the participating organizations.

Acceptance or rejection of the hypothesis is probably not enough for the decision-makers. The failure or success, as the case may be, of the management methodologies, embodied in the ISO 9001 implementation factors, to influence operational performance was examined further using parametric statistical techniques of regression analysis. Parametric tests were chosen because ISO 9001 implementation factors levels and the operational performance variables are represented by aggregated means and hence are in ratio scale.

As shown in Tables 3.4 and 3.5, Chi-Square test, and model estimation techniques were used to test the hypotheses so as to determine statistical significance of the relationships, if any. Stepwise method of regression was used to identify the smallest set of predictors, among the prescribed behavioral input variables in the hypothesized models so as to test the hypotheses. Enter and Backward methods of regression were used in further analysis needed to identify interaction effects between the variables. These methods of multiple regression were chosen in these specific cases because no prior model had been hypothesized.

Table 3.2: List of tests for ISO 9001 certification-performance relationship.

Objective	Hypothesis	Statistical test	Results interpretation
Determine the relationship between ISO 9001:2008 certification status and operational performance.	Null hypothesis, Ho: Oi = Ei Being classified in low or high performer category is independent of certification status	Chi-Square (X^2) test.	p-value for X^2 and Likelihood ratio statistics < 0.05 means certification status has influenced the distribution into the performance categories.
Determine the relationship between ISO 9001:2008 implementation factors and operational performance.	Null hypotheses Ho: $\beta_1 = 0$ Where β_1 is the coefficient of the composite variable of the implementation factors.	Regression analysis: $Y = \beta_0 + \beta_1 X_1 + E_1$	The confidence that the difference of β_1 and or β_2 from 0 is significant is indicated by the p-value of the t-statistic and hence significance of the relationship.

Table 3.3: List of tests for Implementation factors – organizational system outcome relationship

Objective	Hypothesis	Statistical test	Results interpretation
Determine the relationship between ISO 9001:2000 implementation factors and customer focus orientation.	Null hypotheses Ho_1: $\beta_1 = 0$ Ho_2: $\beta_2 = 0$ Where β_1 and β_2 are coefficients of the composite implementation factors variable and its squared term, respectively, with customer focus as dependent variable.	Regression analysis with model, $Y_{cf} = \beta_0 + \beta_1 X_1$ Alternatively: $Y_{cf} = \beta_0 + \beta_1 X_1 + \beta_2 X_1^2 + E_1$	The confidence that the difference of β_1 and or β_2 from 0 is significant is indicated by the p-value of the t-statistic and hence significance of the relationship.
Determine the relationship between ISO 9001:2000 implementation factors and process approach.	Null hypotheses Ho_1: $\beta_1 = 0$ Ho_2: $\beta_2 = 0$ Where β_1 and β_2 are coefficients of the composite implementation factors variable and its squared term, respectively, with process approach as dependent variable.	Model estimation with model, $Y_{pra} = \beta_0 + \beta_1 X_1 + E_1$ Alternatively: $Y_{pra} = \beta_0 + \beta_1 X_1 + \beta_2 X_1^2 + E_1$	The confidence that the difference of β_1 and or β_2 from 0 is significant is indicated by the p-value of the t-statistic and hence significance of the relationship.
Determine the ISO 9001:2000 implementation factor that is significantly associated with organizational system outcome variables.	Null hypotheses Ho_1: $\beta_{IF} = 0$ Where β_{IF} is the coefficient of the individual implementation factor (QP, QO, QM, DC, or MR)	Multiple regression analysis. $Y_z = \beta_0 + \beta_{IFn} X_1 \ldots + \beta_n X_n + E_1$. Y_z is customer focus and process approach in successive models	The confidence that the difference of β_{IFn} from 0 is significant is indicated by the p-value of the t-statistic.

Table 3.4: List of tests for moderating effect of organizational system outcomes influence on output performance

Objective	Hypothesis	Statistical test	Results interpretation
Determine the relationship between organizational system outcome variables and operational performance.	Null hypotheses Ho: $\beta_1 = 0$ Where β_1 is the coefficient of the customer focus or process approach variable in successive models with operational performance as dependent variable.	Regression analysis: $Y_{perf} = \beta_0 + \beta_1 X_1 + E_1$ Y_{perf} is the different measures in successive regressions	The confidence that the difference of β_1 from 0 is significant is indicated by the p-value of the t-statistic and hence significance of the association.
Determine influence of customer focus on ISO 9001 certification and performance relationship	Null hypotheses Ho_1: $\beta_x = 0$ Where β_x is a coefficient of the product of certification status and customer focus variable.	Multiple regression analysis. $Y = \beta_0 + \beta_1 X_1 \ldots + \beta_n X_n + \beta_x X_{ISO}.X_{cf} + E_1$	The confidence that the difference of β_x from 0 is significant is indicated by the p-value of the t-statistic.
Determine influence of process approach on ISO 9001 certification and performance relationship	Null hypotheses Ho_1: $\beta_x = 0$ Where β_x is a coefficient of the product of certification status and process approach variable.	Multiple regression analysis. $Y = \beta_0 + \beta_1 X_1 \ldots + \beta_n X_n + \beta_x X_{ISO}.X_{pra} + E_1$	The confidence that the difference of β_x from 0 is significant is indicated by the p-value of the t-statistic.

CHAPTER FOUR: DATA ANALYSIS AND RESULTS

4.1 Introduction

In this chapter, the results of the research activities as defined in the methodology chapter are presented. First, profiles of participating organizations are presented so as provide a broad indication of the context. Section 4.2 explains the context by presenting the information on the sectors of operation, organizational sizes and geographical spread. Information on tests of reliability of the data collection instrument, and the tests of assumptions that form the bases for choices of tests listed in Tables 3.2 to 3.4 are presented in sections 4.3 and 4.4.

Data collected from the participating organizations relating to the concepts involved are presented in sections 4.5 and 4.6. Output performance data is presented both graphically and in descriptive statistics forms, and based on the objectives of the research. The descriptive statistics for the output performance variables are presented by ISO 9001 certification status to indicate relative group levels. These values are also presented in a correlation matrix to indicate how each variable level changes with another variable.

Data relating to the behavioral inputs in the form prescribed by ISO 9001 standard are then presented in section 4.6. The results of the cluster analysis on the behavioral inputs, as based on the five ISO 9001 implementation factors, and organizational system outcome variables are then presented. The values of the different factors are presented based on the classifications identified from the results of the cluster analysis.

4.2 Profile of participating organizations

Table 4.1 presents a breakdown of the participating organizations by the sectors they operate in. The Table shows that more than half of the participating organizations are in commercial/manufacturing and service sectors, with the two sectors represented almost equally. Other sectors represented in the study are education, training and research, finance, regulatory, and regional development. Participating organization in

education, training and research include public universities, tertiary education institutions, and training and research institutes.

Table 4.1: Participating organization by sector

Operating sector	Participants
Commercial/manufacturing	14
Service	13
Regulatory institutions	10
Public universities	3
Financial institutions	3
Tertiary education institutions	2
Training and research institutions	1
Regional development authorities	1
Total	47

The median size of these organizations was 726 employees, with the smallest having 43 employees and the largest 7213 employees. 33 of the organizations were certified against the ISO 9001 quality management system standard as at the time the data was collected. Of the 33 certified organizations, 21 had held the certification for at least 2 years, while 12 had been certified less than 10 months at the time data was collected. All the 14 organizations that were not ISO 9001 certified were in the process of being so. All indicated that their organizations' performance contracts with the parent ministries included achievement of ISO 9001 certification as one of the targets.

While the majority of the participating organizations have their headquarter offices in Nairobi, upcountry-based organizations were well represented. 4 of the organizations are based in or around the cities of Mombasa and Kisumu. 7 other upcountry-based organizations operate in or around the smaller towns of Nakuru, Eldoret, Kitale, Bungoma, Kakamega, and Athi River. The upcountry-based organizations were mainly in commercial/manufacturing and service sectors with only 1 being a public university.

4.3 Tests of reliability of the data collection instrument

The general question of reliability and validity of the instrument for measuring the multi-item variables has been considered against the criteria suggested by Cooper and

Schindler (2003). As indicated in Appendices 2a and 2b, constructs for the multi-item variables used in the study had been tested and used in official publications of the standard and past studies. For this reason, construct validity was not considered a major issue.

Internal consistency, as an indicator of reliability, were determined by computing Cronbach's coefficient α (alpha) values for the multi-item datasets that provided scale measurement for the multi-item variables. Cronbach's α indicates the extent to which a set of non-dichotomous items in a scale measures the single variable. On the basis of scale alpha specification in Nunnelly (1978), the minimum scale alpha for the items to be used as a scale in this study was set at 0.7.

Listed in Appendix 3 are the items retained after some were deleted because their Item-Total Correlations were below 0.5 and reliability statistics indicated their deletion would not reduce the scale alpha for the variable. As shown in Appendix 3, the scales that were used for the multi-item variables had scale α values that ranged from 0.7495 to 0.9540. The Item-Total Correlations for the retained items were all greater than 0.5000 except in the case of the document control (DC) and management review (MR) variables. In these two variables, items with Item-Total Correlations of 0.4879, 0.4992 and 0.4624 were retained in the scale because, as indicated in the 'alpha-if-item-is-deleted' statistic column in Appendix 3, their deletion would reduce the scale α.

In summary, the multi-item datasets used in the measurement of the variables representing ISO 9001 implementation factors have scale alpha (scale $\propto$) values that are greater than 0.74. For the measurement of quality policy, quality objectives, and quality manual, the scale alpha values (scale $\propto$) are greater than 0.91 for each of the datasets. The multi-item dataset with the lowest scale alpha (scale $\propto$) is that for the measurement of management review, which, at 0.7495, is still well above 0.70 as recommended by Nunnelly (1978). With the computed scale alpha for the multi-item datasets used to measure the organizational system outcome variables of customer focus and process approach being greater than 0.87, internal consistency of the data collection instrument used in this research is therefore statistically confirmed.

4.4 Tests of assumptions

The analytical models and the techniques listed in Tables 3.3 and 3.4 for examining, estimating and testing the relationships involved include parametric techniques that work on assumptions of independence of observations, scales that are at least interval, and normality of values in the population. Other assumptions are equal variance within the populations and, in the case of multiple regression techniques, variations in independent variables that are not strongly linked to variations in other independent variables in the same regression model. The assumption of independence of observations were satisfied through the sampling method used to select participating organizations, and the informants for the attitudinal measures within these organizations. The assumption of scales that are at least interval has also been satisfied in terms of the aggregate data values for each organization as one case.

In this section, normality of the collected data is tested using computed Kolmogorov-Smirnov and Shapiro-Wilk test statistics. Both techniques are used because each has its strengths. The null hypothesis that a data group comes from normally distributed population is rejected where the test statistic is significant at 0.05. Q-Q plots and skew statistics are also used where the two techniques have not handled deviations that may originate from outliers with the same robustness.

Assumption of equal variance within populations has been tested using Homogeneity of variance test. A Levene statistic for each of the variables to be used as independents in the analytical models is computed and its level of significance used to determine if the data within groups have equal variance. The null hypothesis that each group of the data has equal variance is rejected where the Levene statistic is significant at 0.05.

The general question of collinearity in the regression models is considered based on the recommendations of Cooper and Schindler (2003). First, pairs of variables with correlation levels that have potential to significantly affect the regression coefficient estimates in a multiple regression model are identified from a correlation matrix. According to Cooper and Schindler (2003), a coefficient of 0.80 or greater needs to be dealt with appropriately before application of regression technique with the variables

as independents. Further assessment for collinearity is obtained from variable inflation factor (VIF) statistics computed in the multiple regression analysis.

The results of these tests are presented in sections 4.4.1 to section 4.4.3. Results of normality are presented in section 4.4.1 and decisions on choice of statistical techniques to be used later are based on the findings presented in the section. Section 4.4.2 presents results of tests for homogeneity of variances and decisions on applicability of data in the later parametric tests are based on the results of the tests to the extent assumption of homogeneity of variances form a basis for application of a statistical technique. Finally, the multiple regression techniques presented in the later chapter have considered the results of the tests of multicollinearity as presented in section 4.4.3, in the decisions to enter the different variables as independent variables in one regression model.

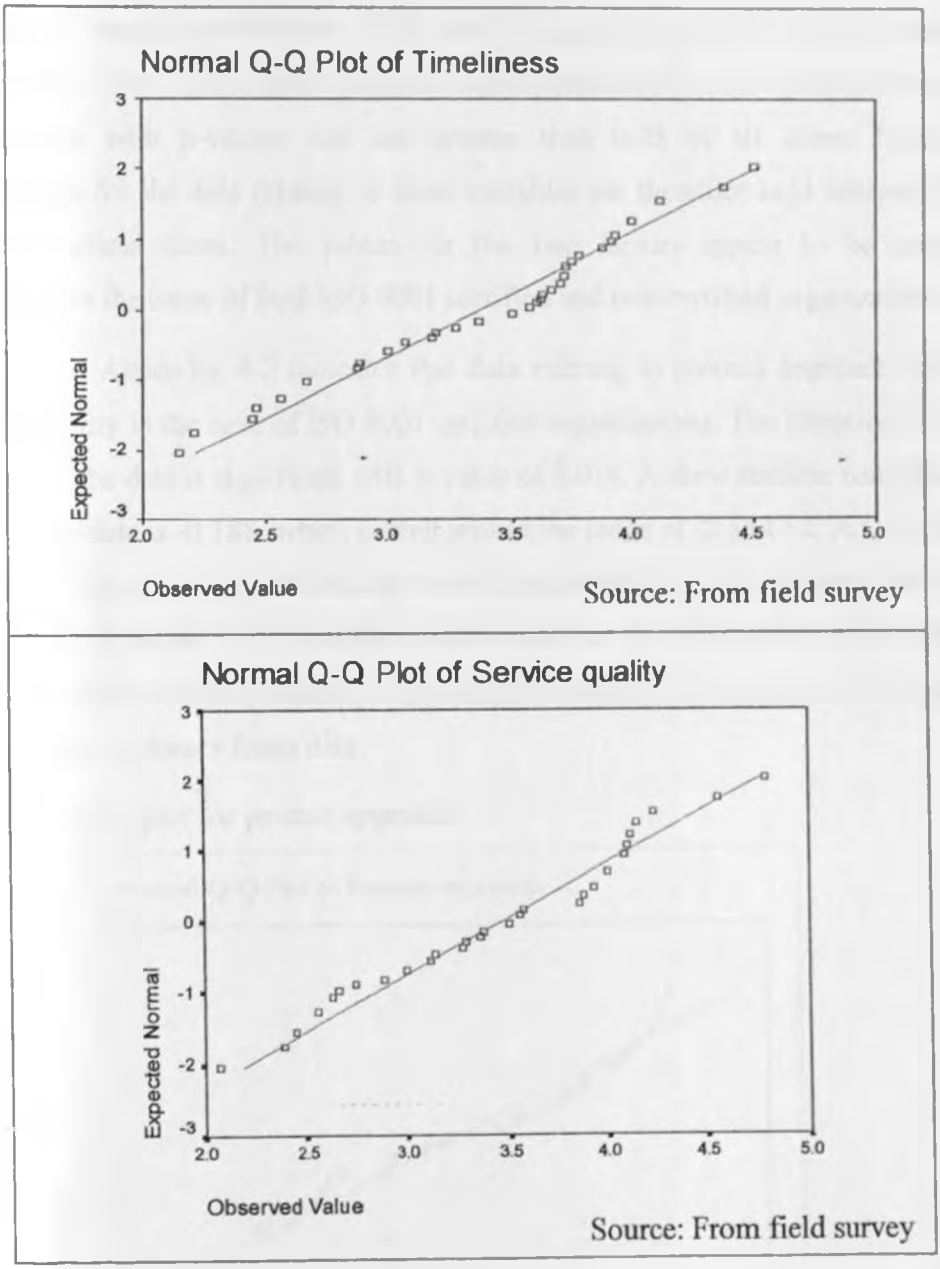
4.4.1 Tests for normality

As shown in Appendix 4-1, the normality test statistics computed in both Kolmogorov-Smirnov (KS) and Shapiro-Wilk tests are insignificant with p-value greater than 0.05 for all output performance variables except for the 2007/2008 Performance score in operations criteria and timeliness. Data for these variables have different origins. The data for the 2007/2008 performance score variable is based on self-assessment by the individual organizations' management with moderation by a government of Kenya secretariat. In contrast, data for customer satisfaction survey score and other variables came from a survey by independent researchers, either as primary data in this study or commissioned by the management of the respective organizations. The uniqueness of the 2007/2008 Performance score in operations criteria is hence explained.

The Kolmogorov-Smirnov statistic for the timeliness and service quality data appear to be significant with p-values 0.018 and 0.007 respectively, indicating significant deviation from normality. While Shapiro-Wilk test statistics for the same data are not significant at 0.05, computed skew statistics for the data relating to the two performance dimensions are -0.348 and -0.267 respectively. Q-Q plots in Figure 4.1 further indicate that deviation from normality for the two variables can be expected at low to mid levels for these variables. On the basis of the test statistics and the Q-Q

plots, it has been considered that normality assumptions can be maintained in the cases of customer satisfaction survey score and overall perceived performance and its dimensions of cost, relevance, and reputation but not timeliness and service quality.

Figure 4.1: Q-Q plots for timeliness and service quality data



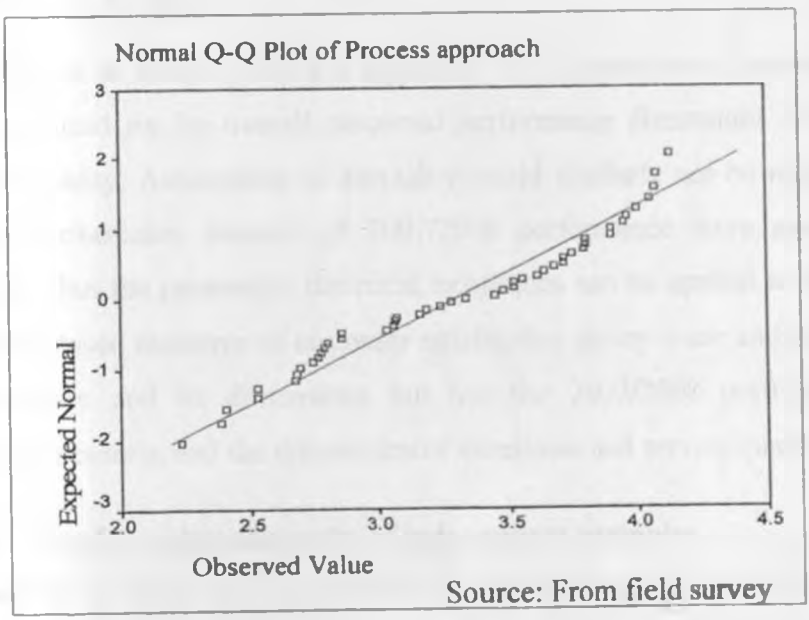
Appendix 4-2 shows that only in the case of ISO 9001 certified organizations is the data relating to the ISO 9001 implementation factor variables of quality policy (QP), quality objectives (QO) and quality manual (QM) meet the normality assumptions. This is expected as only the certified organizations have the practices relating to these

variables in place. On the basis of the computed statistics, normality assumptions are maintained for the data relating to the entire implementation factor variables as regards organizations that are ISO 9001 certified.

The table in the Appendix 4-2 also shows that data for the implementation factor variables of management review (MR) and document control (DC) meet normality assumptions with Kolmogorov-Smirnov and Shapiro-Wilk test statistics that are insignificant with p-values that are greater than 0.05 in all cases. Normality assumptions for the data relating to these variables are therefore held irrespective of the certification status. The values for the two factors appear to be normally distributed in the cases of both ISO 9001 certified and non-certified organizations.

The table in Appendix 4-3 indicates that data relating to process approach deviates from normality in the case of ISO 9001 certified organizations. The Shapiro-Wilk test statistic for the data is significant with p-value of 0.018. A skew statistic computed for the variable data is -0.188, which is well within the range of -2 and +2. A Q-Q plot in Figure 4.2 appears to indicate the deviation from normality is not extreme, and hence is probably allowable. The normality assumptions can thus be maintained to a degree that allows more robust parametric statistical techniques to be applied to the process approach and customer focus data.

Figure 4.2: Q-Q plot for process approach



4.4.2 Test for Homogeneity of variances

Achievement of the objectives listed in Tables 3.2 to 3.4 involves comparison of the values of performance outcome, customer focus, and process approach variables based on the dichotomous factor variable of ISO 9001 certification status. Test results concerning the assumptions that the variances within each population grouped by ISO 9001 certification status factor are shown in the tables in Appendices 5-1 and 5-2. Appendix 5-1 shows the test statistics for customer satisfaction survey score, overall perceived performance as well as its dimensions of cost efficiency, timeliness, relevance, reputation, and service quality. The test statistics for customer focus and process approach variable data are shown in Appendix 5-2.

As shown in the appendices, the Levene statistics computed based mean, median with adjusted degree of freedom and trimmed mean are insignificant at 0.05 for all the variables. On the basis of the insignificance of the Levene statistics, the hypothesis that the variances of the means within the groups based on ISO 9001 certification status are equal can be accepted. It can be concluded that the variances of the means of performance measures of customer satisfaction and overall perceived performance together with its dimensions within groups based on ISO 9001 certification status are equal. Similarly, the assumptions of homogeneity of variances within groups based on certification status for the variables of customer focus and process approach are supported by the data.

As indicated in section 4.4.1 and Appendix 4-1, assumptions of normality could not be maintained for the overall perceived performance dimensions of timeliness and service quality. Assumption of normality could similarly not be maintained for the output performance measure of 2007/2008 performance score against operations criteria. Thus the parametric statistical techniques can be applied to the data relating to performance measures of customer satisfaction survey score and overall perceived performance and its dimensions but not the 2007/2008 performance score in operations criteria, and the dimensions of timeliness and service quality.

4.4.3 Test for multicollinearity of independent variables

As shown in table 3.3, to achieve the objective of determining the ISO 9001 implementation factors that are significantly associated with the organizational system

outcome variables of customer focus and process approach, coefficients for individual factors as independent variables in an analytical model are to be estimated. One assumption is that variations in each of these factors that include quality policy (QP), quality objectives (QO), quality manual (QM), document control (DC) and management review (MR) are not themselves associated and hence interlinked. When the factor variables are highly correlated, it becomes statistically difficult to attribute the variation in the dependent variable given that the variations in independent variables are themselves associated.

Similarly, to determine the relationship between organizational system outcome variables and operational performance, table 3.4 specifies estimation of the coefficients for the two variables as independent variables in a regression model with operational performance as dependent variable. The assumptions are that variations in the two variables of customer focus and process approach are not associated. A high degree of correlation between the two variables of customer focus and process approach would mean variation in one is associated with variation in another, hence making it statistically difficult to attribute variation in operational performance to either.

Table 4.2 shows that, according to the data, four of the five variables that make up ISO 9001 implementation factors, namely, quality policy, quality objectives, quality manual, and document control, are highly correlated. These strong correlations indicate a potential collinearity problem when these variables are independent variables in a multiple regression analysis. Data also shows that the fifth ISO 9001 implementation factor variable, the management review (MR) and the two organizational system outcome variables of customer focus and process approach are highly correlated.

Table 4.2: A correlation matrix of ISO 9001 implementation factors and organizational system outcome variables

		QP	QO	QM	DC	MR	CF	PrA
Quality policy (QP)	Pearson Correlation	1.000	**.993**	**.982**	**.972**	.602	.552	.393
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.010

Table 4.2 continues

		QP	QO	QM	DC	MR	CF	PrA
Quality objectives (QO)	Pearson Correlation	**.993**	1.000	**.985**	**.970**	.592	.544	.380
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.013
Quality manual (QM)	Pearson Correlation	.982	.985	1.000	.962	.565	.480	.319
	Sig. (2-tailed)	.000	.000	.	.000	.000	.001	.039
Document control (DC)	Pearson Correlation	.972	.970	.962	1.000	.697	.683	.528
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000
Management review (MR)	Pearson Correlation	.602	.592	.565	.697	1.000	**.838**	**.782**
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000
Customer focus (CF)	Pearson Correlation	.552	.544	.480	.683	**.838**	1.000	**.904**
	Sig. (2-tailed)	.000	.000	.001	.000	.000	.	.000
Process approach (PrA)	Pearson Correlation	.393	.380	.319	.528	**.782**	**.904**	1.000
	Sig. (2-tailed)	.010	.013	.039	.000	.000	.000	.

Source: From field survey

Therefore, to deal with the potential collinearity problems, two composite variables are created for the two sets of highly correlated variables. IF_{ISOR} is a composite of the highly correlated ISO 9001 implementation factors of quality policy, quality objectives, quality manual and document control variables. The fifth ISO 9001 implementation factor, the socio-behavioural management review, forms a composite variable with another group of soft elements – the organizational system outcomes variable of customer focus and process approach with which it is highly correlated.

IF_{ISOR} composite variable represents the aspects of the standards that appear to be present to the same level in organizations, depending on their certification status, and constitutes the visible part of ISO 9001 implementation. For this reason it can be more appropriately referred to as the "ISO hard elements". The composite variable that represents the organizational system outcome variables of customer focus and process

approach and the ISO 9001 implementation factor variable of management review (MR) represents attitudinal aspects in an organization and can be considered to embody the systems thinking in the organization. This composite variable can be more appropriately referred to as the systemic variable. Table 4.3 shows that the correlation between the two composite variables is stronger than the correlation between the pairs of the components from each composite.

Table 4.3: A correlation matrix of the composite ISO rituals and Systemic variable

		ISO hard elements	Systemic variable
ISO hard elements	Pearson Correlation	1	.722(**)
	Sig. (2-tailed)	.	.000
Systemic variable	Pearson Correlation	.722(**)	1
	Sig. (2-tailed)	.000	.

** Correlation is significant at the 0.01 level (2-tailed).

Source: From field survey

According to the data, four of the implementation factors, namely, quality policy (QP), quality objectives (QO), quality manual, (QM) and document control (DC) are highly correlated, with the correlation coefficients that are above 0.97. The data also reveals that the other ISO 9001 implementation factor, the management review (MR), is highly correlated with the organizational system outcomes variables of customer focus and process approach, computed Pearson coefficients being about 0.8. On the basis of these findings, composite measures for these highly correlated variables are used in the later sections and chapters of this report. Additionally, as asserted by Cooper and Schindler (2003), collinearity statistics are computed in multiple regression models where these variables are the independent variables in model estimation.

4.5 Operational performance

In this section, data relating to the operational performance variables in the conceptual frameworks in figures 2.2 and 2.3 are presented. Descriptive statistics for each performance measure is presented in a summary form grouped by the hypothesised predictor variable. In the case of the non-binary coded predictor variables, categorized

transformations into high and low are used as factor variables. Visual presentations of the relative locations of various variable statistics by given factor variable are through boxplots.

Table 4.4 presents the case processing summary for the key output outcome performance variables of 2007/2008 Performance score in operations criteria, customer satisfaction survey score and the perceived overall operational performance variable. In Table 4.5 is a correlation matrix for the three measures indicating the zero order coefficients of correlation and coefficients of correlation when ISO 9001 certification status is controlled for. The partial correlation coefficients in the Table show that the correlation between customer satisfaction survey score, a measure from customer's viewpoint of the output, and the two other performance measures based on internal perception and orientation become insignificant when certification status is controlled for.

2007/2008 Performance score in operations criteria comes from records of the organizations' self-assessment against performance contracting goals as moderated by the government of Kenya's performance contracting secretariat. Customer satisfaction survey score are from the records of customer satisfaction surveys carried out by independent research organizations commissioned by the respective organizations as part of performance contracting requirements. While customer satisfaction survey score is from the viewpoint of the consumer of output from the organizations operations activities, the 2007/2008 performance score in operations criteria indicates how the organizations think they have performed based on the performance regime in operation.

Data for the overall perceived performance is primary data collected as part of this research. It is a composite measure of the dimensions of operational performance as emphasized by the performance regime in which the agencies of the government of Kenya operate. These dimensions are cost efficiency, timeliness, relevance, quality, and reputation.

Table 4.4: Case Processing Summary for performance data

	ISO 9001 status	Cases					
		Valid		Missing		Total	
		N	%	N	%	N	%
2007/2008 Performance score in operations criteria	Not Certified	13	92.9	1	7.1	14	100
	ISO 9001 certified	31	93.9	2	6.1	33	100
Overall perceived performance	Not Certified	14	100.0	0	0	14	100
	ISO 9001 certified	33	100.0	0	0	33	100
Customer Satisfaction score	Not Certified	14	100.0	0	0	14	100
	ISO 9001 certified	32	97.0	1	3.0	33	100

Source: From field survey

Table 4.5: A correlation matrix for the performance measures

		$Perf_{07op}$	CSSurv	$Perf_t$	ISO_{stat}
2007/2008 Performance score in operations criteria ($Perf_{07op}$)	Zero order	1.000	.423	.516	.398
	ISO_{stat} controlled for	1.00	$.272^{ns}$	.359	
Customer Satisfaction score (CSSurv)	Zero order	.423	1.000	.422	.532
	ISO_{stat} controlled for	$.272^{ns}$	1.000	$.056^{ns}$	
Overall perceived performance ($Perf_t$)	Zero order	.5155	.4224	1.000	.734
	ISO_{stat} controlled for	.359	$.056^{ns}$	1.000	

Notes: ns - Not significant at p = 0.05

Source: From field survey

The multiple boxplots in Figure 4.3 visually presents the location of the performance measures of customer satisfaction survey score, operations criteria score in 2007/08 performance evaluation, and the self-reported overall perceived performance. In the multiple boxplots, customer satisfaction data collected in a scale of 1 to 10 is rescaled to a 1 to 5 scale so as to provide uniform visual presentation with the operational criteria performance score and the self-reported overall perceived performance data collected in a 1 to 5 scale. Descriptive statistics from the data collected and relating to these performance measures are also presented in Tables 4.6 to 4.9, with detailed

presentation of the results relating to each of the measures presented in sections 4.5.1 to 5.5.3.

Figure 4.3: Boxplots of performance variables by ISO 9001 certification status.

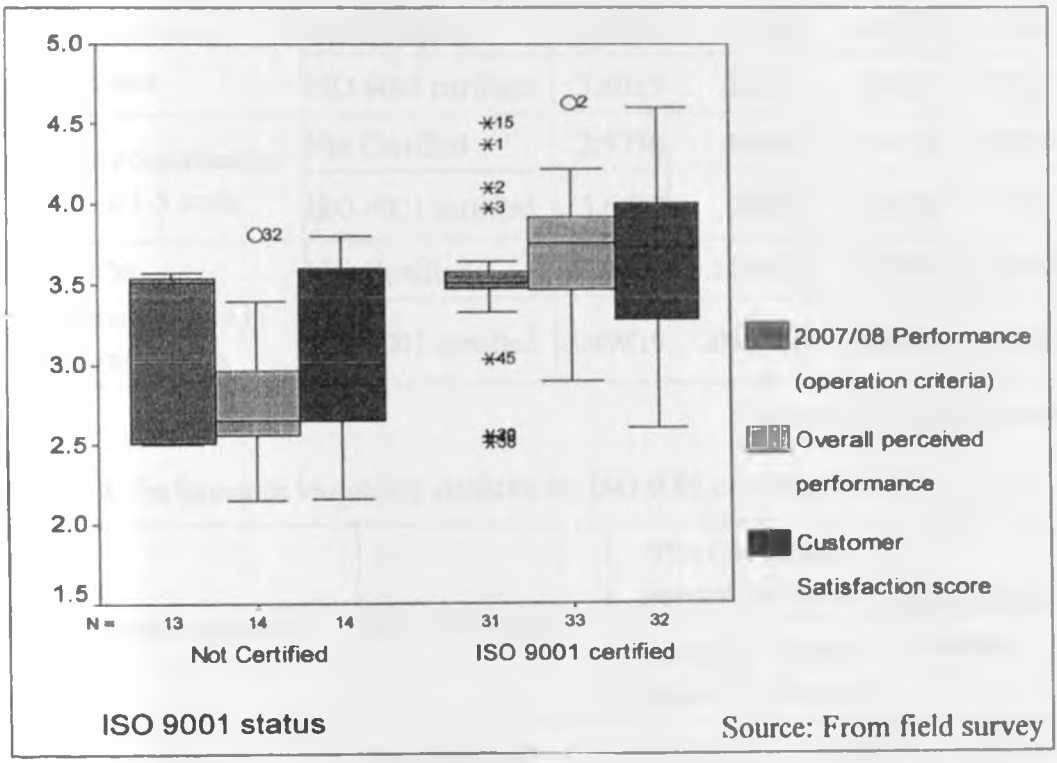


Table 4.6: Descriptive statistics for participating organizations' performance data

Performance measure	Overall Mean		Participating group Std. Deviation	Participating group Median performance
	Statistic	Std. Error		
Overall perceived performance	3.4259	.08194	.56174	3.5000
Customer Satisfaction score in a 1-5 scale	3.4527	.08856	.60067	3.5650
2007/2008 Performance score in operations criteria	3.3719	.074825	.496332	3.51000

Source: From field survey

Table 4.7: Performance statistics by ISO 9001 certification status

Performance measure	ISO 9001 status	Mean		Std. Deviation	Median
		Statistic	Std. Error		
Overall perceived performance	Not Certified	2.7999	.12020	.44975	2.6498
	ISO 9001 certified	3.6915	.06211	.35677	3.7567
Customer Satisfaction score in a 1-5 scale	Not Certified	2.9750	.14466	.54128	2.8750
	ISO 9001 certified	3.6617	.08887	.50272	3.7225
2007/2008 Performance score in operations criteria	Not Certified	3.07069	.148602	.535793	3.51000
	ISO 9001 certified	3.49819	.076721	.427164	3.51000

Source: From field survey

Table 4.8: Performance variability statistics by ISO 9001 certification status

Performance measure	ISO 9001 status	95% Confidence Interval for Mean		Interquartile Range
		Lower Bound	Upper Bound	
Overall perceived performance	Not Certified	2.5403	3.0596	.5046
	ISO 9001 certified	3.5649	3.8180	.4737
Customer Satisfaction score in a 1-5 scale	Not Certified	2.6625	3.2875	.9875
	ISO 9001 certified	3.4805	3.8430	.7375
2007/2008 Performance score in operations criteria	Not Certified	2.74692	3.39447	1.04000
	ISO 9001 certified	3.34151	3.65488	.13000

Source: From field survey

Table 4.9: 5% trimmed mean and mean performance statistics

	ISO 9001 status	Mean	5% Trimmed Mean
Overall perceived performance	Not Certified	2.7999	2.7805
	ISO 9001 certified	3.6915	3.6885

Table 4.9 continues

	ISO 9001 status	Mean	5% Trimmed Mean
Customer Satisfaction score in a 1-5 scale	Not Certified	2.9750	2.9750
	ISO 9001 certified	3.6617	3.6696
2007/2008 Performance score in operations criteria	Not Certified	3.07069	3.07466
	ISO 9001 certified	3.49819	3.49941

Source: From field survey

4.5.1 2007/2008 performance score in operations criteria

As indicated by the statistics in Table 4.6, the participating group overall mean score in the 2007/2008 performance evaluation score in operations criteria was 3.37189 in a scale of 1-5, with the standard error of the mean being 0.07482 and standard deviation of 0.496. Data presented in Table 4.7 shows that the median performance score for the ISO 9001 certified participating group is the same as for the non certified participating group. This is also indicated visually in the multiple boxplots in Figure 4.3. However, the mean performance score for the certified participating group is 2.64 standard errors above that of the non-ISO 9001 certified group.

While boxplots in Figure 4.3 in respect of the measure show there are a number of outliers in the performance of the ISO 9001 certified group, the statistics in Table 4.9 indicate there is no significant difference between the means and the 5% trimmed mean statistics. This is an indication that the performance statistics shown in Table 4.7 have not been affected by the extreme values of the outliers. This also indicates that the relatively higher mean score for the ISO 9001 certified group is not as a result of these extreme values of the outliers.

The data in Table 4.8 indicates differences between the two participating groups in terms of group uniformity in performance during 2007/2008 performance evaluation. The Interquartile Range statistic for the ISO 9001 certified participating group is little higher than 10% of that of the uncertified group. The values for the Upper Bound and Lower Bound of 95% Confidence Interval for Mean similarly indicate much lower variability among the ISO 9001 certified participating group than it is among the non-certified group. Unaffected by the extreme values, these statistics clearly show that

within-group uniformity in the above measures were much better among the ISO 9001 certified organizations than it was among the uncertified ones.

4.5.2 Overall perceived performance and customer satisfaction survey score

As shown in Table 4.6, the overall mean score for the performance variables of overall perceived performance and customer satisfaction survey score was 3.4259 and 3.4527, respectively. The summarized statistics in respect of the two variables grouped by certification status of the organizations are also shown in Tables 4.7 to 4.9. The statistics in Table 4.7 indicate the mean performance score in the two measures of performance are significantly higher amongst the ISO 9001 certified participating group than it is amongst the non certified participating group. Computed standard errors of the difference between the mean score for the certified and non certified groups are 6.5 and 4.0 in respect of overall perceived performance and customer satisfaction survey score, respectively.

Tables 4.6 and 4.7 also show that the group mean performance score in the two variables for non-ISO 9001 certified participating group are significantly below the overall participating group means. The mean perceived performance and customer satisfaction survey score for the ISO 9001 certified participating group was 3.6915 and 3.6617, respectively, compared to the overall group means of 3.4259 and 3.4527 for the two measures. In the non ISO 9001 certified participating group, the mean score in the two measures of performance was 2.7999 and 2.9750, respectively against the overall participating group means of 3.4259 and 3.4527, respectively.

Table 4.7 also shows higher median values in the two variables for ISO 9001 certified participating group than for the non – certified group. This is also visually presented in the multiple boxplots in Figure 4.3. It would appear that for the participating organizations that are ISO 9001 certified, the performance based on the two variables is skewed towards the higher level unlike the case with the participating organizations that are not certified. This is indicated by the median values that are higher than the mean values in the ISO 9001 certified participating group and lower for the non certified group.

In addition to the higher score in these performance variables for the ISO 9001 certified participating group, the statistics for the 95% Confidence Interval for Mean in respect of these two variables indicate a lower within-group variability of performance than is the case with the non ISO 9001 certified participating group. These statistics indicate the variation within the 95% Confidence Interval for Mean of 0.25 and 0.36 for the two measures in case of the ISO 9001 certified group as compared to 0.52 and 0.62, respectively, in the case of the non-certified group.

4.5.3 Operational performance dimensions

The data shown in Table 4.8 appears to suggest that uniformity of operational performance is greater within ISO 9001 certified organizations than within the non certified group. The multiple boxplots in Figure 4.4 locates the separate dimensions of operational performance by the certification of the organizations. As shown in the boxplots, the median performance for the group of ISO 9001 organizations participating in the study is above 3.5 level in all the dimensions whereas the group median values in the case of non ISO 9001 certified organizations is 3.0 or below.

As shown in Table 4.10, in all the five dimensions, the mean performance score in all the dimensions is significantly greater for the ISO 9001 certified participating group than the overall mean of performance for all the organizations that participated in the study. In Table 4.11 are statistic by statistic comparisons of the values for the ISO 9001 certified group with the values for the non ISO 9001 certified group of participating organizations. In all the dimensions, the non certified group has the Upper Bound 95% Confidence Interval for the mean that is equal to or below the chance value in a 1 to 5 scale. In contrast, the Lower Bound 95% Confidence Interval for mean value for the ISO 9001 certified group is above the upper bound value for chance at 5 percent accuracy with a 95% confidence interval.

Table 4.10: The means of operational performance dimensions

	Participating group statistics					ISO 9001 certified group		Difference
	N	Min.	Max.	Mean	Std. Deviation	N	Mean	Sig. at 0.05
Cost	47	2.14	4.50	3.2725	.56064	33	3.5331	Yes
Timeliness	47	2.15	4.50	3.3721	.56664	33	3.6198	Yes
Service quality	47	2.07	4.79	3.4736	.63227	33	3.7542	Yes
Relevance	47	2.21	4.71	3.5096	.61613	33	3.8020	Yes
Reputation	47	2.21	4.93	3.5605	.59856	33	3.8338	Yes

Source: From field survey

Figure 4.4: Multiple boxplots for the overall perceived performance dimensions

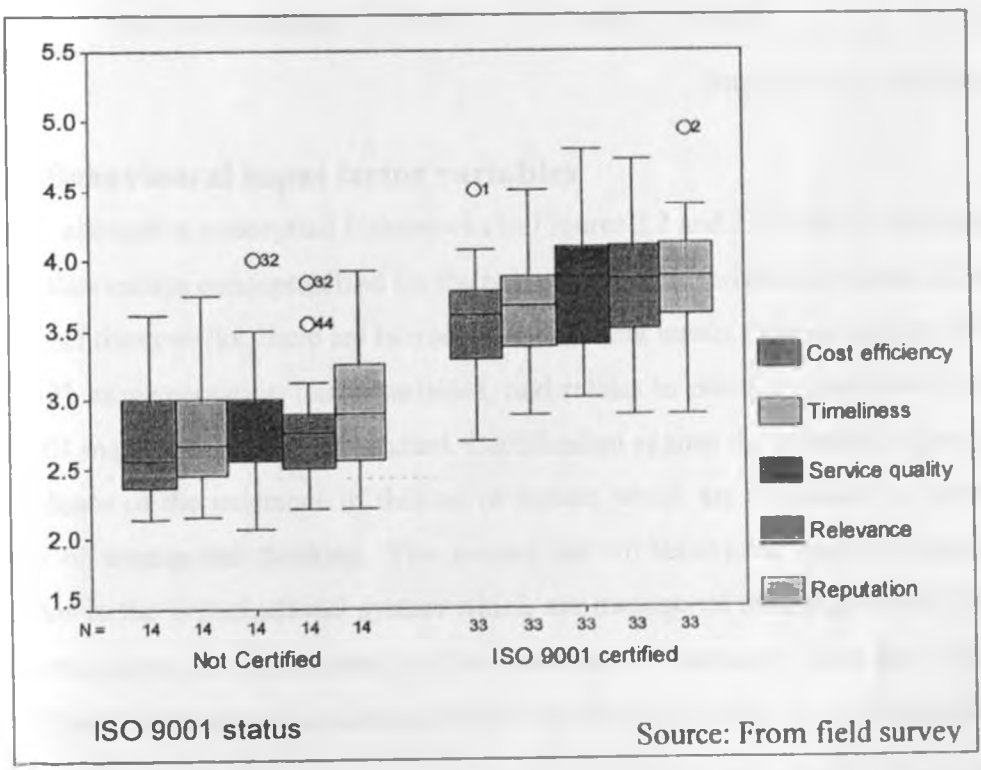


Table 4.11: Descriptive statistics for operational performance dimensions

	ISO 9001 status	95% Confidence Interval for Mean		5% Trimmed Mean		Median
		Upper Bound	Lower Bound	statistic	SEs of diff.	
Cost	Not Certified	2.8948	2.4216	2.6337	7 .0	2.5556
	ISO 9001 certified	3.6698	3.3965	3.5343		3.6000
Timeliness	Not Certified	3.0624	2.5143	2.7701	5.8	2.6667
	ISO 9001 certified	3.7606	3.4790	3.6145		3.6667
	Not Certified	3.1054	2.5193	2.7875		2.6515
	ISO 9001 certified	3.9118	3.5966	3.7438		3.8750
	Not Certified	3.0759	2.5645	2.7969		2.7525
	ISO 9001 certified	3.9482	3.6558	3.8001		3.8571
	Not Certified	3.1864	2.6466	2.8996		2.8889
	ISO 9001 certified	3.9790	3.6885	3.8354		3.8750

Source: From field survey

4.6 Behavioural input factor variables

The two alternative conceptual frameworks in Figures 2.2 and 2.3 differ in the manner of the relationships conceptualized for the behavioral input variables involved. In both conceptual frameworks, there are two sets of behavioral inputs. One set consists of the ISO 9001 implementation factor variables, and relates to practices prescribed by the ISO 9001 management system standard. Certification against the standard is based on the evidence of the existence of this set of inputs, which are considered to embody aspects of managerial thinking. The second set of behavioral inputs consists of outcomes in the organizational system which are managerial thinking-related. These behavioral inputs are represented by the variables of customer focus and process approach and are themselves outcomes of the managerial thinking in an organization.

Determination of the linkage between the former and the latter and the nature of that linkage was one of the objectives of this study. The hypothesized conceptual

framework in Figure 2.2 considers that the second set of behavioral input, the organizational system outcomes, is an outcome of some other factors and hence are independent of the practices prescribed by ISO 9001 management system standard but influence their benefits. According to this proposition, customer focus and process approach, as behavioral inputs into an organizational system occur independently of the practices of quality policy, quality objectives, quality manual, document control and management review as prescribed by ISO 9001 standard but moderate their effect on output performance outcomes. The alternative hypothesized conceptual framework in Figure 2.3 proposes that the set of behavioral inputs that relate to the prescribed ISO 9001 implementation factors bring about or enhances customer focus and process approach and through such enhancement, the output performance outcome is influenced.

Findings presented in the previous section suggested that one of the behavioral input factors prescribed in the form of ISO 9001 implementation factors did not appear to be as highly correlated to the other four. The findings, instead, suggest that management review is highly correlated with customer focus and process approach. This section reports on the results of cluster analysis technique applied on the data so as to determine if, in view of the stated findings of inter-correlations, these variables can be used to describe the different configurations of organizations. Specifically, can ISO 9001 certified organizations be described based on the levels of the behavioral inputs prescribed in the form of the implementation factors, in view of the roles they play in qualifying organizations for certification? Another issue to specifically determine is, in view of the hypothesized involvement of customer focus and process approach, whether as a moderating factor or an outcome of the other behavioral input factors, if there is a strong linkage between the two sets of behavioral input variables.

Results of these exploratory analyses, which clarify whether ISO 9001 certified organizations can be considered to be the same in terms of their configurations based on the specified behavioral input variables are presented in subsection 4.6.1. The subsection presents analysis of data so as to set out what the certification means in terms of these behavioral inputs, and how organizations can be classified based on these behavioral input factors. Section 4.6.2 presents findings relating to the

implications of belonging to a given configuration classification on operational performance measures. Finally, subsection 4.6.3 presents the findings on how an organization's classification based on the emphasized behavioral inputs can affect its capability to achieve its goals on different dimensions of overall performance.

4.6.1 Factor configurations in ISO 9001 certified organizations

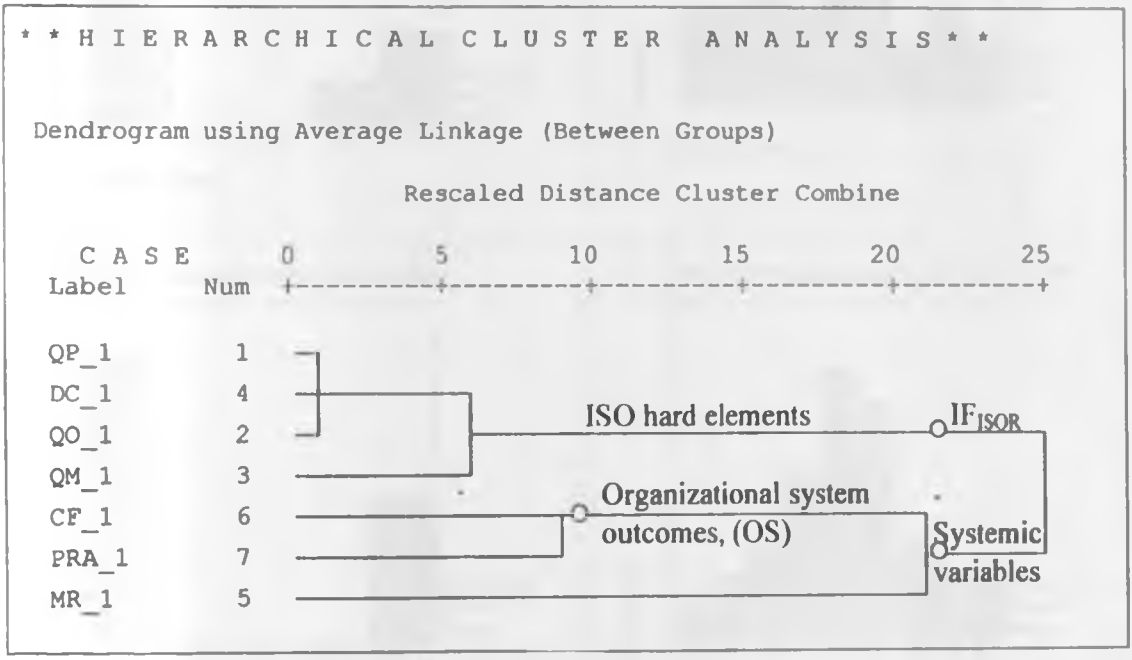
Figure 4.5 shows a dendrogram obtained from a hierarchical cluster analysis technique. The dendrogram shows that two broad taxonomies of certified organizations can be derived from the data relating to the 7 variables. With no pre-determined number of clusters to start with, a Hierarchical method of clustering has an advantage that it starts with the variables forming one large cluster and then progressively dividing that cluster into smaller clusters until all have been identified. As shown in Figure 4.5, the smallest cluster, with greatest level of similarity, has 3 of the ISO 9001 implementation factor variables of quality policy (QP_1), quality objectives (QO_1) and document control (DC_1) as the defining characteristics. These 3 factors are then joined in one natural grouping by a fourth implementation factor variable of quality manual (QM_1). The status of these variables as the most visible and distinctive facets of ISO 9001 standard certification can be discerned from the descriptive statistics and boxplots in Table 4.12 and Figure 4.6 respectively.

One of the five ISO 9001 standard prescribed practices, the management review (MR_10), appears to be very dissimilar from the other four. The properties of this variable appear to differ from the others even in the manner and level of variation with ISO 9001 certification status. As indicated by the statistics in Table 4.12 and the histograms in figures 8, 9 and 10, the properties of the management review variable (MR_1) are different in terms of the effect of certification status on variability and minimum values. Rather than the on/off effect the certification has on the other implementation factors, management review (MR_1) appears to exist, to some degree, independent of certification status.

As shown in the dendrogram, management review (MR_1) appears to have closer similarity with the organizational system outcome variables of customer focus (CF_1) and process approach (PRA_1) than with the other factors of ISO 9001 implementation. Figure 4.8 further emphasizes how different management review

variable is when it comes to the effect of ISO 9001 certification status on the group median value of the variable. This is a visual indicator of what has been shown in Table 4.12, which indicated the median variable score for the certified group is less than 10 percent up from that of non-certified group.

Figure 4.5: Configurations of ISO 9001 certified organizations



Source: From field survey

Figure 4.6: Histograms for the ISO hard elements: Comparison by certification status

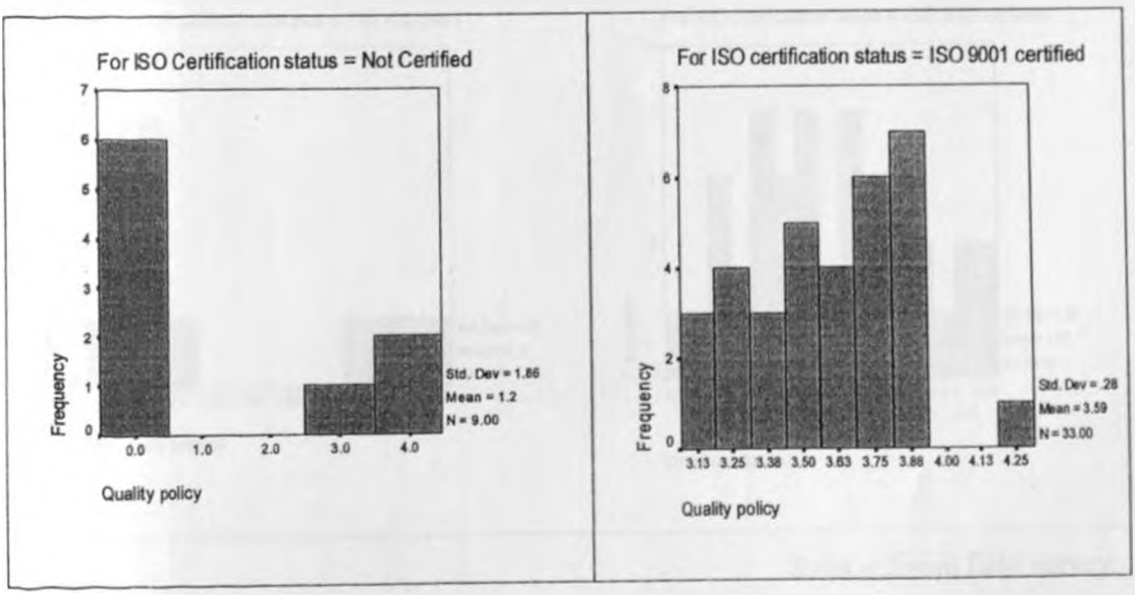
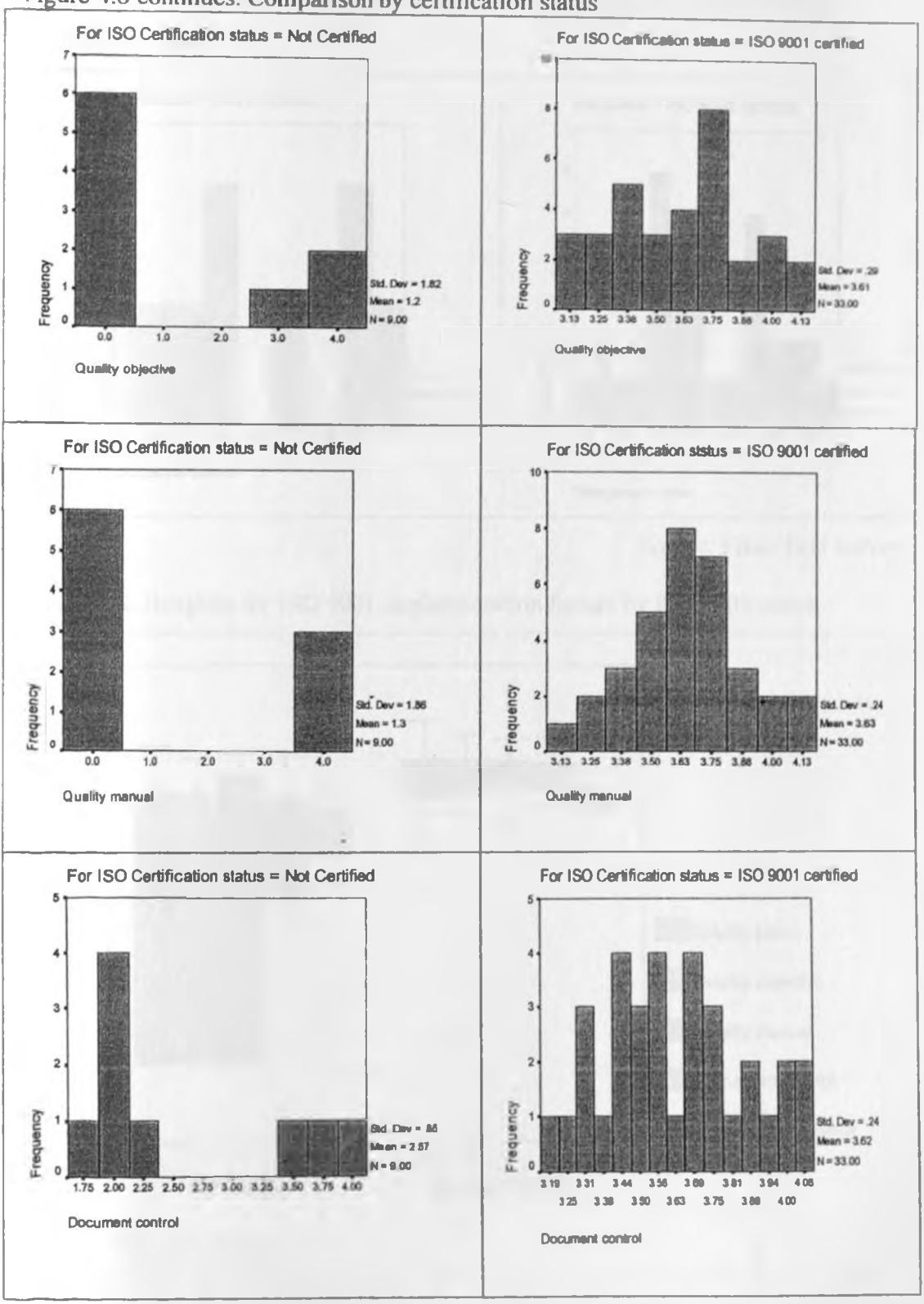
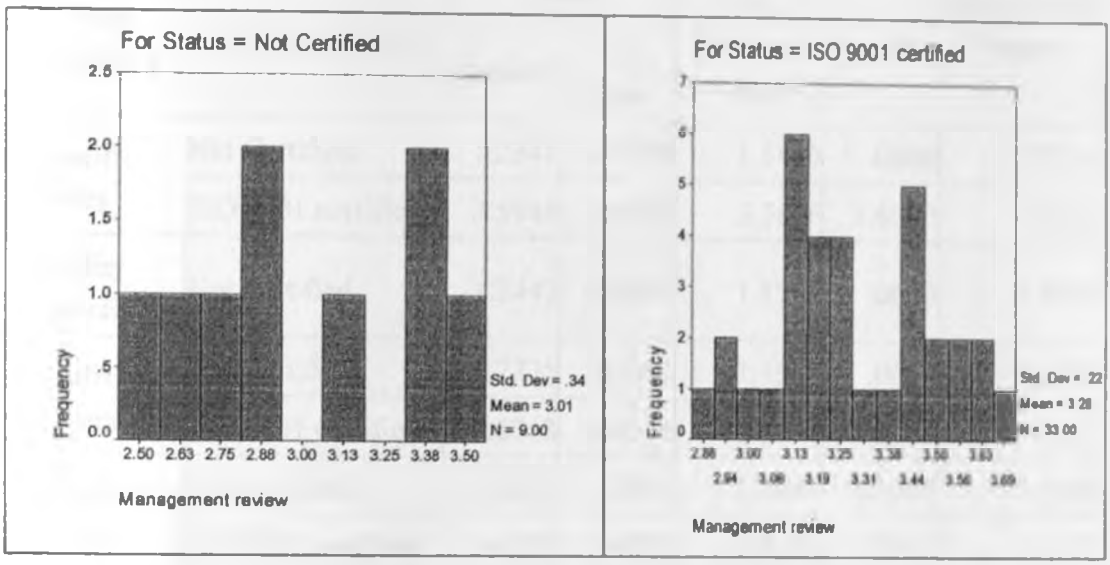


Figure 4.6 continues: Comparison by certification status



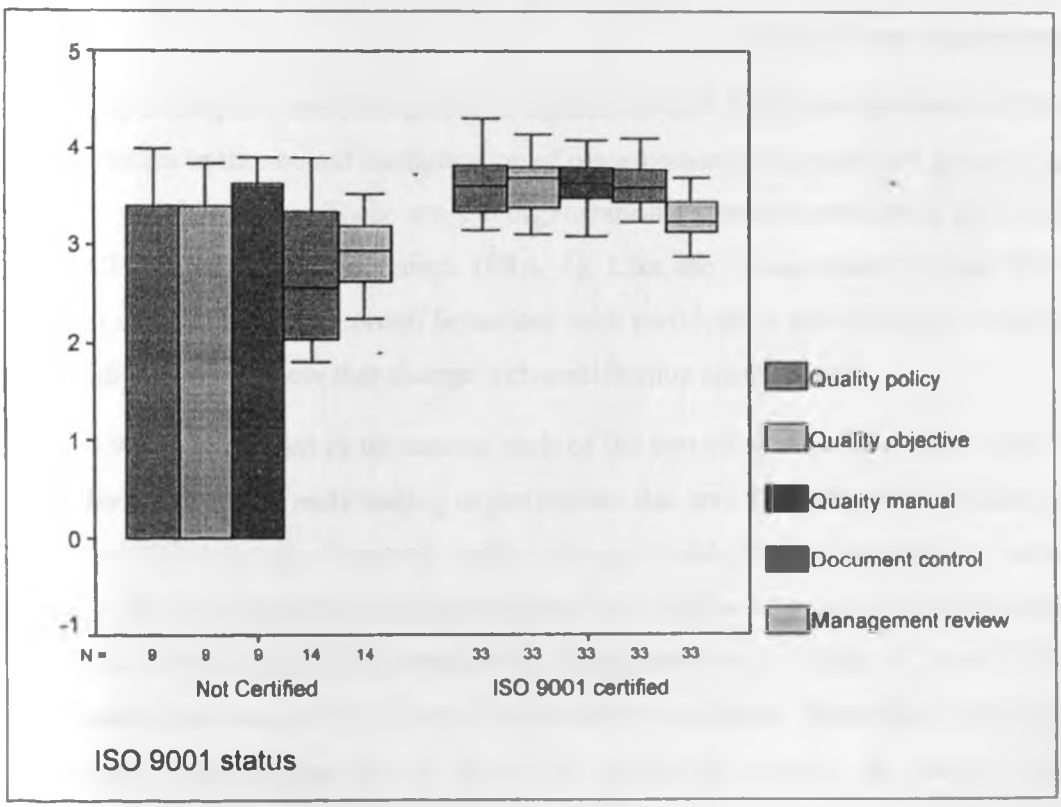
Source: From field survey

Figure 4.7: Histograms for management review variable values: Comparison by certification status



Source: From field survey

Figure 4.8: Boxplots for ISO 9001 implementation factors by ISO 9001 status



Source: From field survey

Table 4.12: Descriptive statistics for ISO 9001 implementation factor variables

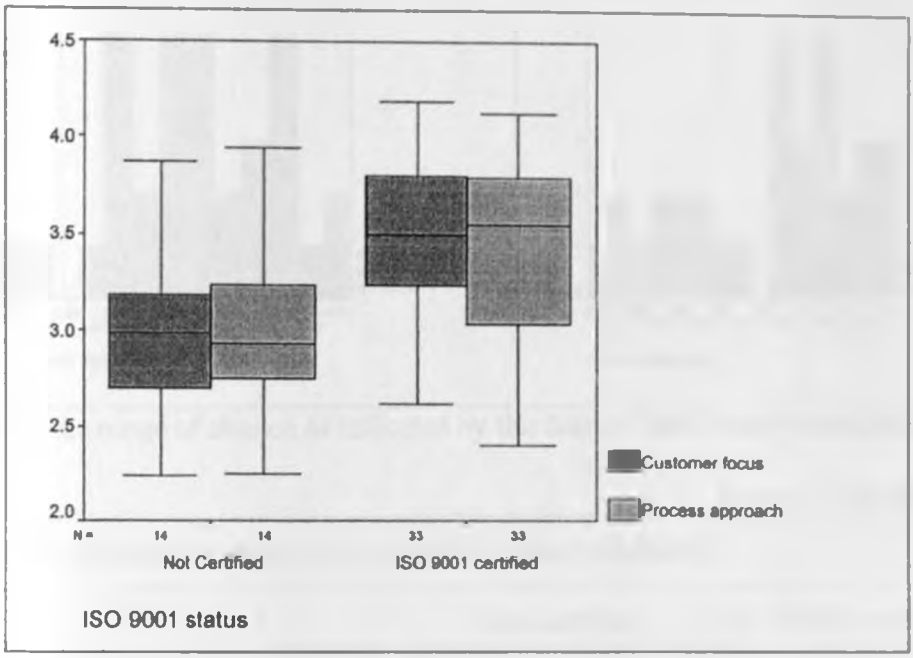
Factor variable	ISO 9001 status	Mean		5% Trimmed Mean	Median	Interquartile Range
		Statistic	Std. Error			
Quality policy	Not Certified	1.2341	.61920	1.1490	.0000	3.5534
	ISO 9001 certified	3.5948	.04878	3.5886	3.6000	.4808
Quality objectives	Not Certified	1.2443	.60687	1.1700	.0000	3.5838
Quality manual	Not Certified	1.2725	.62002	1.1981	.0000	3.6818
	ISO 9001 certified	3.6318	.04206	3.6344	3.6250	.3112
Document control	Not Certified	2.6739	.18965	2.6547	2.5585	1.3459
	ISO 9001 certified	3.6235	.04243	3.6206	3.5833	.3705
Management review	Not Certified	2.9250	.09354	2.9295	2.9333	.5929
	ISO 9001 certified	3.2764	.03775	3.2763	3.2250	.3095

Source: From field survey

The multiple boxplots and histograms in figures 4.9 and 4.10 show the levels of the other variables in the second configuration of organizations, described in Figure 4.5 as systemic variable group. These are the organizational system variables of customer focus (CF_1) and process approach (PRA_1). Like the management review, these variables do not display the on/off behaviour with certification status change. Instead, it is the directions of skew that change with certification status change.

Figure 4.9 also show that in the case of each of the two variables, the median level is higher for the group of participating organizations that are ISO 9001 certified than for the non-certified group. However, unlike the case with the implementation factor variables, the within-group variability appears to be higher to some extent as can be seen in the differences in the Interquartile Range statistics in Tables 4.26 and 4.27. Additionally, the boxplots in Figure 4.9 also shows that despite the median values for the variables being higher for the ISO 9001 participating group, the range of the values appears to be not significantly different. This is indicated by the relative ends of the boxplot whiskers.

Figure 4.9: Multiple boxplots for customer focus and process approach by certification status.



Source: From field survey

Figure 4.10: Histograms for customer focus and process approach: Comparison by certification status

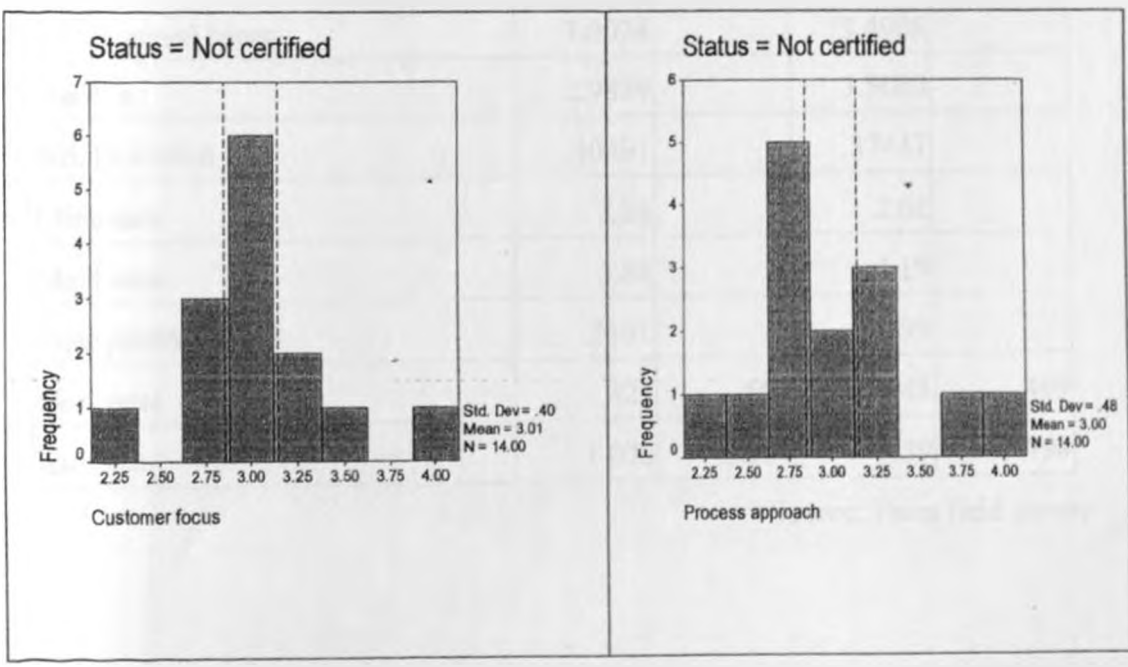
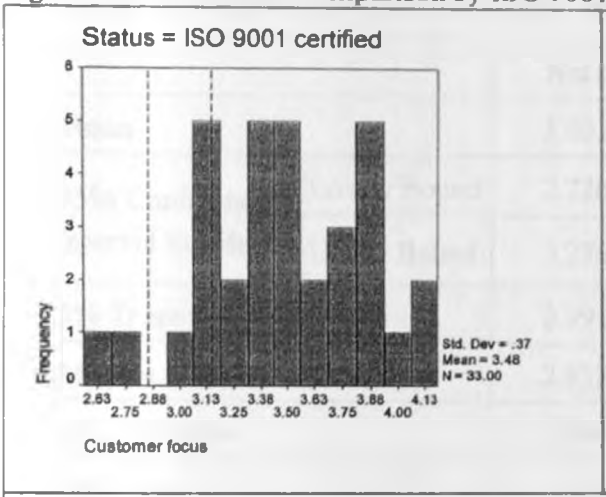


Figure 4.10 continues: Comparison by ISO 9001 certification status



Note the range of chance as indicated by the dashed lines in each histogram.

Source: From field survey

Table 4.13: Descriptive statistics for customer focus variable (CF_1)

		Not certified		ISO 9001 certified	
Mean		3.0078	.10822	3.4830	.06519
95% Confidence Interval for Mean	Lower Bound	2.7740		3.3502	
	Upper Bound	3.2416		3.6158	
5% Trimmed Mean		3.0024		3.4906	
Median		2.9859		3.5000	
Std. Deviation		.40491		.37447	
Minimum		2.24		2.62	
Maximum		3.88		4.19	
Interquartile Range		.5101		.6099	
Skewness		.423	.597	-.148	.409
Kurtosis		1.070	1.154	-.439	.798

Source: From field survey

Table 4.14: Descriptive statistics for process approach variable (PRA-1)

		Not certified		ISO 9001 certified	
Mean		3.0017	.12723	3.4287	.09055
95% Confidence Interval for Mean	Lower Bound	2.7268		3.2443	
	Upper Bound	3.2766		3.6131	
5% Trimmed Mean		2.9914		3.4456	
Median		2.9328		3.5536	
Std. Deviation		.47604		.52016	
Minimum		2.24		2.40	
Maximum		3.95		4.13	
Interquartile Range		.5350		.8981	
Skewness		.545	.597	-.544	.409
Kurtosis		.112	1.154	-.959	.798

Source: From field survey

The results of analysis presented in this subsection suggest that certified organization when described in terms of the behavioral inputs prescribed in the forms of ISO 9001 implementation factors are not the same. While one group emphasizes the visible aspects described as ISO hard elements, another group emphasizes the less visible management review factor and the organizational system outcomes of customer focus and process approach. The demarcation line between the certified and non-certified organizations is less distinct when it comes to organizations with configurations that emphasize these latter factors, the systemic factor variable. The histograms in figure 4.11 show that the systemic factor variable is present irrespective of the certification status, the difference being only that the values are skewed toward higher than chance level among the ISO 9001 certified organizations. While the values within the non-ISO 9001 certified organization range from 2.25 to 3.75, within the ISO 9001 certified organization the range is between 2.75 and 3.88

In contrast, no valid cases can be obtained from among organizations that are not ISO 9001 certified when it comes to the composite variable representing the visible and

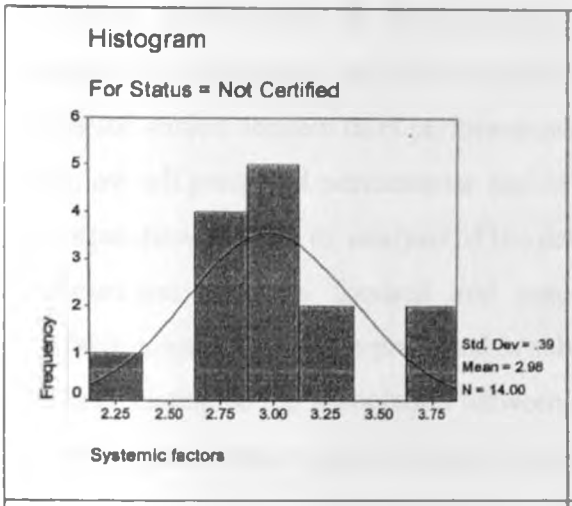
distinctive practices of ISO 9001 implementation – the ISO hard elements. Unlike the case with systemic factor variable, ISO hard elements variable appears to be either present or not present with the presence indicated by levels above chance. In Figure 4.11, the range of values for the ISO 9001 certified participating organizations are shown to be between 3.19 and 4.06.

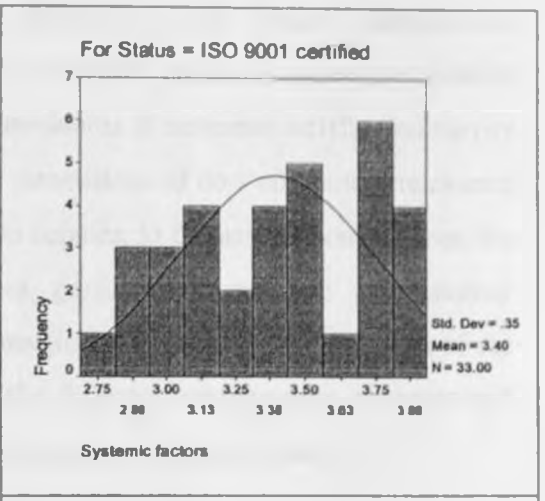
It can be summarized that there are two configurations found in ISO 9001 certified organizations. The ISO hard elements focused group emphasizes the standard prescribed practices of quality policy, quality objectives, quality manual and document control. This group are distinct from the non certified organizations in the sense these practices are not noticeable in these organizations. For some reason, a fifth prescribed practice, the management review, does not appear to be closely linked to organizations emphasizing these practices.

A second organizational configuration is found in organizations that emphasize the ISO 9001 prescribed practice of management review and the organizational system outcome variables of customer focus and process approach – the systemic factor focused group. As socio-behavioral inputs, these systemic factors are shown to be present across all the organizations but more enhanced among the ISO 9001 certified organizations. Unlike the ISO hard elements focused group, this configuration is found among both certified and non certified organizations.

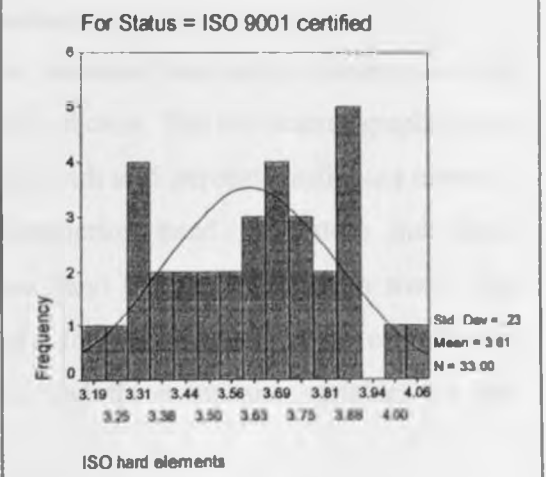
The analysis presented in subsection 4.6.2 that follows concerns the link between the configuration adopted and performance in the various measures. This analysis is extended in subsection 4.6.3 to identify the extent belonging to an organizational configuration grouping affects achievement in the different dimensions of overall operational performance. Curve estimation techniques are applied to determine the models that can best describe the relationship between the configuration variables and the different dimensions of overall performance.

Figure 4.11: Histograms for composite systemic and ISO hard elements variables: Comparison by ISO 9001 certification status





No valid cases for ISO hard elements values when status is "Not Certified"



Source: From field survey

4.7 Organizational configuration group and output performance

The analysis presented in the preceding section identifies two configuration groupings that organizations can be classified into. One group, the ISO hard elements focused group is made up of exclusively ISO 9001 certified organizations. The second group, systemic factor focused group includes both certified and non-certified organizations. In this section, the results of parametric tests meant to determine the association between belonging to either configuration group and performance in the various measures are presented.

As indicated in section 4.4, the normality assumptions required for application of parametric statistical techniques could not be maintained for the data relating to the 2007/2008 performance in the operations criteria and the overall performance dimensions of timeliness and service quality. Therefore, statistical analysis presented in this subsection concern only performance measures of customer satisfaction survey score, overall perceived performance and its dimensions of cost efficiency, relevance and reputation. Results of analysis of the data relating to the association between the configuration elements focused and output performance measure of customer satisfaction survey score are presented in subsection 4.7.1. Similarly, the results of the analysis relating to the association between the different configuration elements and the overall performance and its dimensions are presented in subsection 4.7.2.

4.7.1 Customer satisfaction and configuration elements emphasized

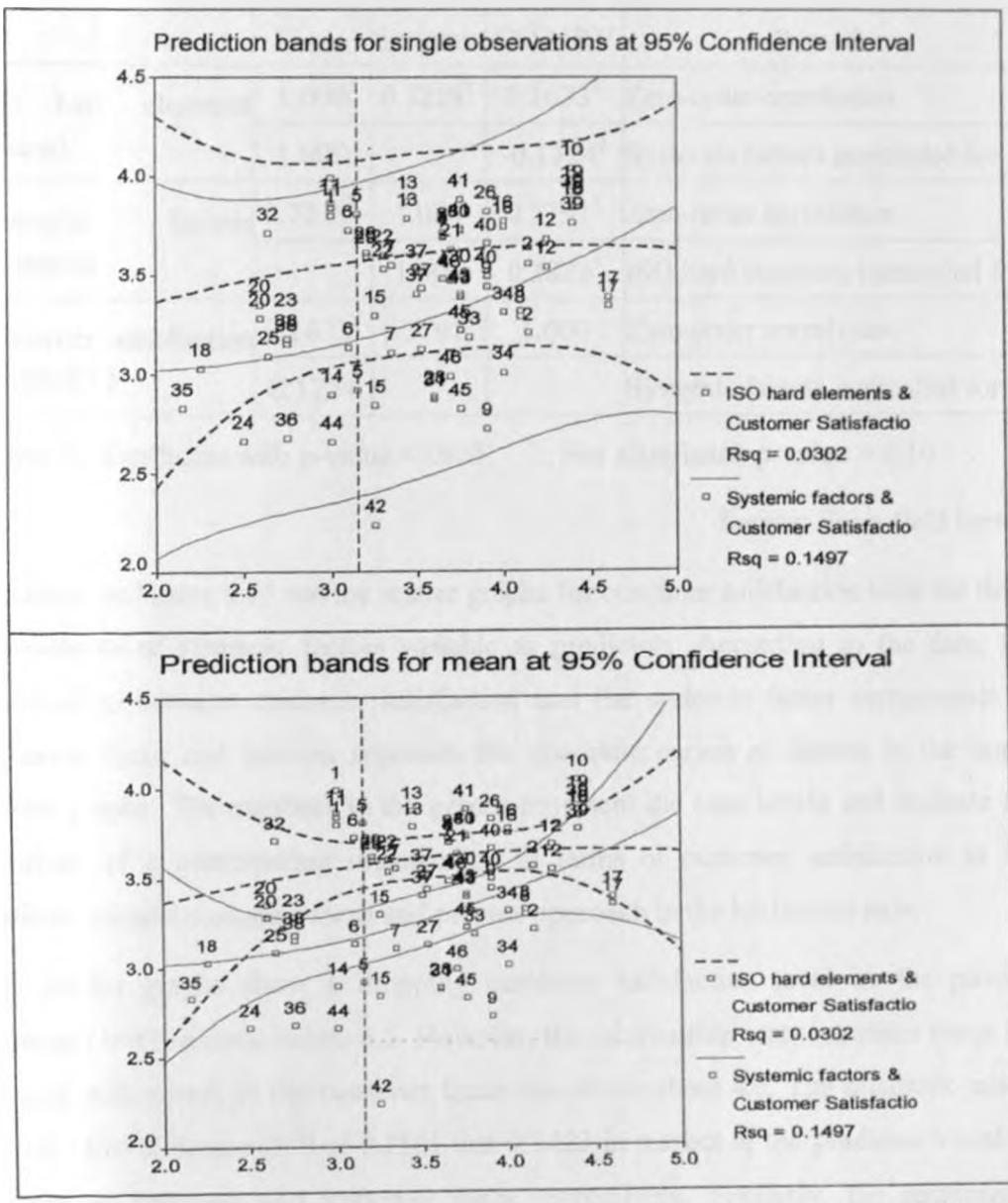
Scatter graphs in figure 4.12 show values for customer satisfaction survey score by the levels of the ISO hard elements and systemic factors. The two scatter graphs show predictive bands for customer satisfaction score with a 95 percent confidence interval. While the first graph shows the point prediction band for future individual observations, the second shows the prediction band for the future mean score. The numbers in the figure represent case labels and their positions in terms of customer satisfaction survey score in the vertical axis and the composite variables for the configuration elements in the horizontal axis.

The blue dashed lines in the two graphs show the bands as predicted from a quadratic regression model with ISO hard elements as predictor variables. This prediction line has R-Square (R^2) of 0.0302. Similarly, the red unbroken lines show the bands with systemic factors variable as the predictor. The prediction line for systemic factor as predictor has R-Square (R^2) of 0.1497.

The reference points indicated by the vertical dashed lines represent the upper boundaries for chance response score for the variables with 5 percent accuracy of measurement and 95 percent confidence interval. The intersection of the blue dashed line and the vertical reference lines appears to indicate that the rise in customer satisfaction that can be predicted from a rise in the levels of ISO hard elements on their own, beyond the intersection point may not be much. The graphs, however,

show that the situation is different when it comes to the systemic factor variables. As the middle red unbroken lines show, a steeper rise in customer satisfaction can be predicted from the systemic factor levels above the reference point than is the case when the level is below the reference point.

Figure 4.12: Scatter graphs for customer satisfaction and configuration elements



Source: From field survey

The two sets of model fitting lines in both graphs in Figure 4.12 are non-parallel and possibility of interaction effects is indicated. Table 4.15 shows that both the zero-order and partial correlations between the ISO hard elements (IF_{ISOR}) and customer

satisfaction (CSSURV) are not significant. The table also shows that when ISO hard elements variable is controlled for, the partial correlation between systemic factors variable (Systemic) and customer satisfaction not only remains significant but gets slightly stronger.

Table 4.15: Correlation matrix for Customer satisfaction and configuration elements

	IF_{ISOR}	Systemic	CSSURV	Remarks
ISO hard elements (IF_{ISOR})	1.000	0.7219[1]	0.1633[2]	Zero-order correlation
	1.000		-0.1724[2]	Systemic factors controlled for
Systemic factors (Systemic)	0.7219[1]	1.000	0.3791[1]	Zero-order correlation
		1.000	0.3826[1]	ISO hard elements controlled for
Customer satisfaction (CSSURV)	0.1633[2]	0.3791[1]	1.000	Zero-order correlation
	-0.1724[2]			Systemic factors controlled for

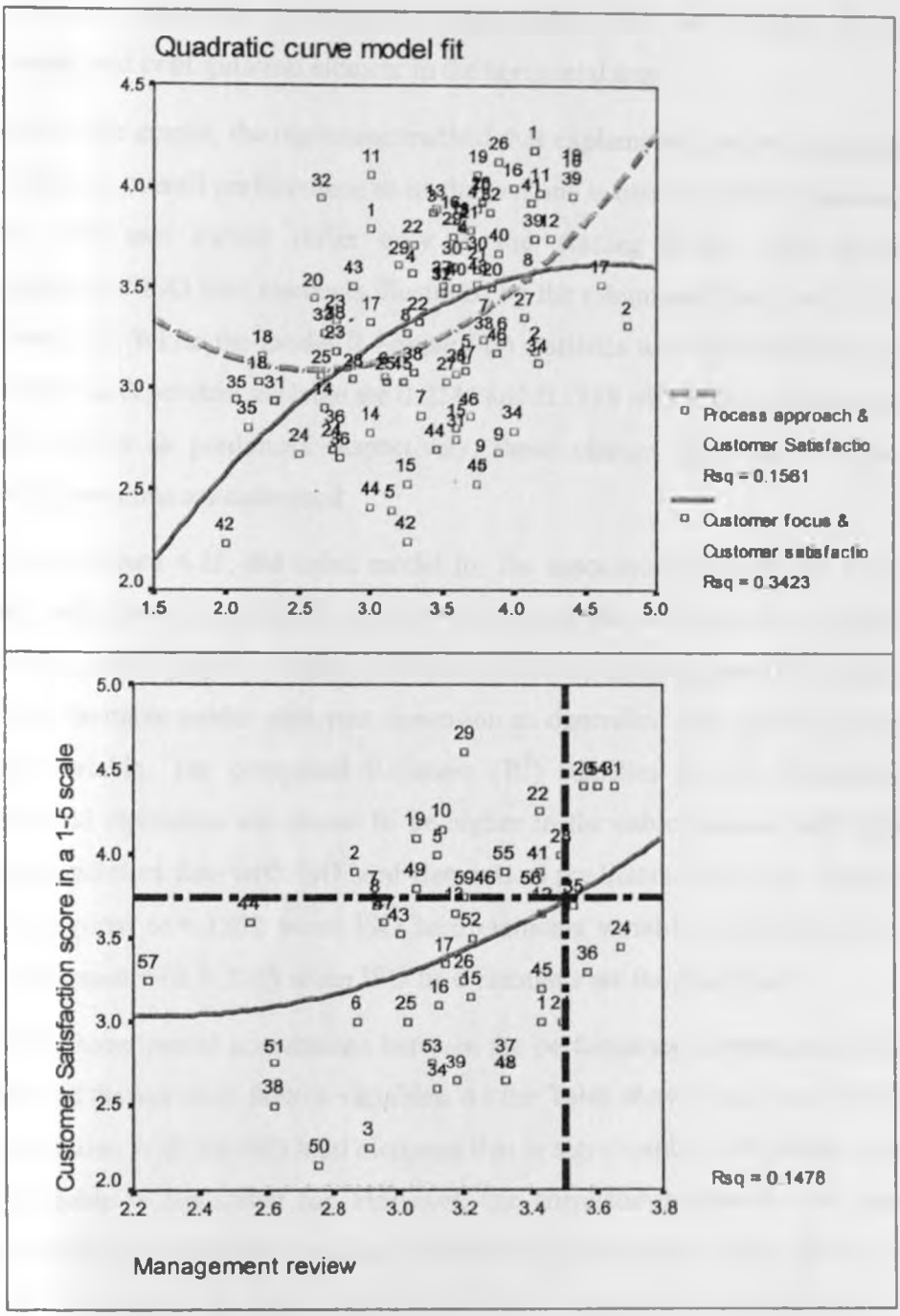
Notes: 1. Significant with p-value <0.005 2. Not significant. p-value > 0.10

Source: From field survey

Presented in Figure 4.13 are the scatter graphs for customer satisfaction with the three components of systemic factors variable as predictors. According to the data, the relationship between customer satisfaction and the systemic factor components of customer focus and process approach fits quadratic curves as shown in the upper scatter graphs. The numbers in the graphs represent the case labels and indicate the positions of a participating organization in terms of customer satisfaction in the vertical axis and customer focus and process approach in the horizontal axis.

The scatter graphs show a dropping customer satisfaction level as the process approach level remains below 3.5. However, the relationship with customer focus fits a curve with a peak as the customer focus rise above about 4.0. The quadratic model curves have R-Square (R^2) of 0.1561 and 0.3423 in respect of the predictor variables of process approach and customer focus respectively. Similarly, the relationship between customer satisfaction and the management review component of the systemic factors variable fits a quadratic curve with dip at about 2.6 level of management review application in a 1 to 5 scale. As indicated in the graph, the model regression line has an R-Square (R^2) of 0.1478.

Figure 4.13: Scatter graphs for customer satisfaction and components of systemic factors



Source: From field survey

4.7.2 Overall performance dimensions and configuration elements emphasized

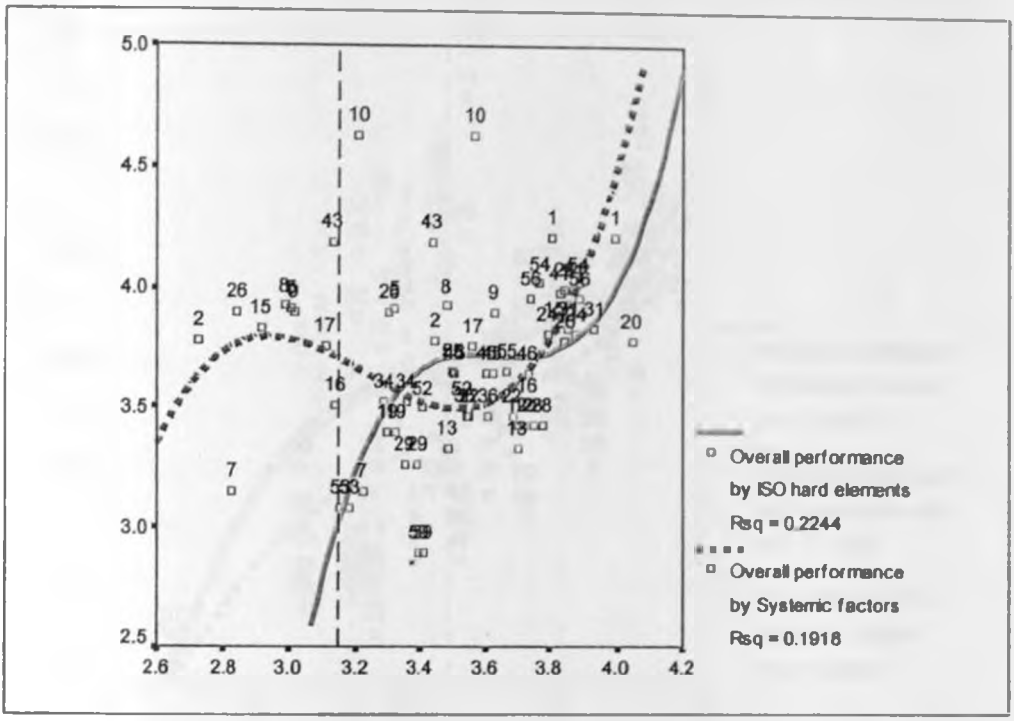
Figure 4.14 shows scatter graphs for overall performance plotted against ISO hard elements and systemic factor variables in the horizontal axis. The curves for the different dimensions of overall performance with the configuration elements as predictors are shown in figure 4.15. In each of the curves, the numbers represent case labels for the individual participating organization and its position in output performance and configuration element in the horizontal axes.

As shown in the graphs, the regression method that explains the greatest proportion of the variation in overall performance or its dimensions is based on cubic mathematical function. The two curves differ only in the starting point, with the on/off characteristics of ISO hard elements illustrated by the minimum value for the variable at just over 3.0. While the model R-Square (R^2) statistics with the composite overall performance as dependent variable are 0.2244 and 0.1918 with ISO hard elements and systemic factors as predictors respectively, these change significantly when the different dimensions are examined.

As shown in figure 4.15, the cubic model for the association between the ISO hard elements and cost dimension of overall performance has R-Square (R^2) statistic of 0.4884. The lower graph in figure 4.15 also indicates an R-Square (R^2) statistic of 0.4521 for the cubic model with cost dimension as dependent and systemic factors as predictor variable. The computed R-Square (R^2) statistics for the dimensions of relevance and reputation are shown to be higher in the cubic models with systemic factors as predictors than with ISO hard elements as predictors. These are shown to be 0.2372 compared to 0.1392 when ISO hard elements variable is the predictor; and 0.3470 compared with 0.2905 when ISO hard elements are the predictors.

Table 4.16 shows partial correlations between the performance dimensions, ISO hard elements and the systemic factors variables. As the Table shows, only cost dimension has a correlation with the ISO hard elements that is significant at 0.05 when systemic factors variable is controlled for. However, the correlations between the systemic factors variable and cost, relevance and reputation are indicated in table 4.16 as being significant only at p-value <0.07 when the ISO hard elements are controlled for.

Figure 4.14: Cubic regression of overall performance upon configuration variables



Source: From field survey

Figure 4.15: Cubic regression of performance dimensions upon configuration variables

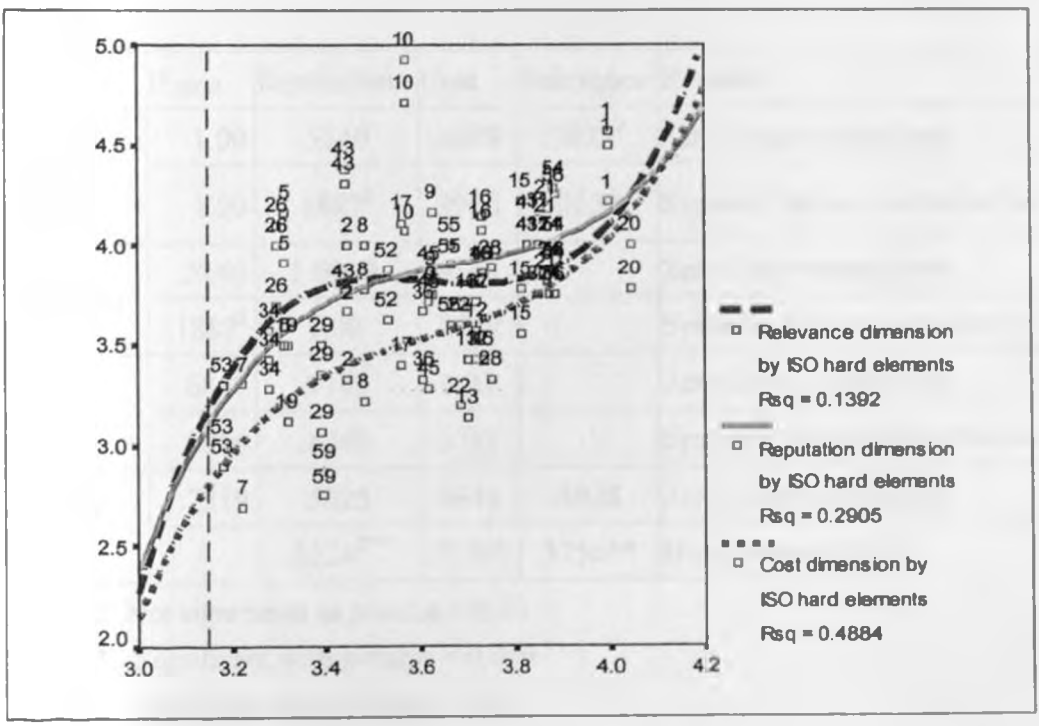
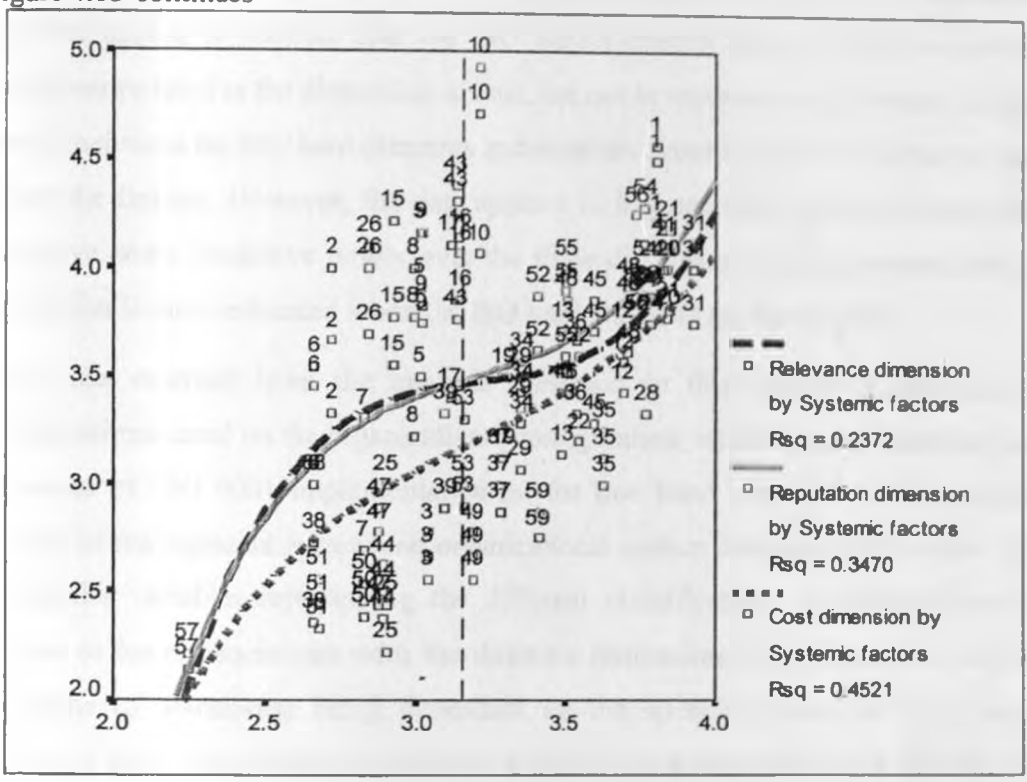


Figure 4.15 continues



Source: From field survey

Table 4.16: Correlation matrix for performance dimensions and configuration elements

	IF_{ISOR}	Reputation	Cost	Relevance	Remarks
ISO hard elements (IF_{ISOR})	1.00	.5140	.6849	$.3023^{2}$	Zero Order correlations
	1.00	$.1887^{2}$	.3966	$-.0150^{2}$	Systemic factors controlled for
Reputation	.5140	1.0000	.9143		Zero Order correlations
	$.1887^{2}$	1.00	.8749		Systemic factors controlled for
Cost	.6849	.9143	1.00		Zero Order correlations
	.3966	.8749	1.00		Systemic factors controlled for
Systemic factors	.7219	.5625	.6648	.4028	Zero Order correlations
		$.3224^{1**}$	.3379*	.3756**	IF_{ISOR} controlled for

Note: 2. Not significant at p-value = 0.10

*. Significant with p-value = 0.059

**. Significant with p-value = 0.07

Source: From field survey

The scatter graphs in Figure 4.15 and the partial correlations in Table 4.16 considered together appear to indicate that the ISO hard elements can, on their own predict performance level in the dimension of cost, but not in reputation or relevance. In these two dimensions the ISO hard elements and systemic factors appear to interact to bring about the linkage. However, the data appears to indicate that systemic factors alone can have some predictive power over the three dimensions of performance, but the prediction is more enhanced when the ISO hard elements are also in place.

What has emerged from the analysis presented in this chapter is taxonomy of organizations based on the organizational configuration variables that include the hard elements of ISO 9001 implementation on the one hand and the socio-behavioural factors of management review and organizational system outcomes on the other. The composite variables representing the different classifications of organizations are shown to have associations with the different dimensions of performance with the strengths of association being dependent on the specific dimension. The groups appear to have some interaction effects on performance dimensions, but with the ISO hard elements configuration being most dependent on co-application of systemic factor variables for its association with performance. The exception appears to be cost dimension for which the association with the ISO hard elements does not appear to be dependent on systemic factors.

The extent these associations can be inferred to the whole population was determined through the statistical tests reported in the chapters that follow. A theoretical framework is formulated to represent the linkages between these factors and the output outcome performance. This leads to the determination of the role of the organizational system variables of customer focus and process approach, whether moderating influence in the link between ISO 9001 and output outcome performance or outcomes of the ISO 9001 implementation and the direct drivers of performance.

CHAPTER FIVE: DISCUSSION OF RESULTS

5.1 Introduction

The results and analysis presented in the preceding chapter would appear to indicate that there are two configurations of various management practices found in ISO 9001 certified organizations. There are those organizations that emphasize mainly the visible, distinctive and documentation-based elements of the certification such as quality policy, quality objectives, quality manual and document control. In the second configuration are organizations that emphasize, in addition to the documentation-based elements, the socio-behavioral input factors of customer focus, process approach and management review. While the former would be compliance-focused, the latter focuses on systems.

Whether these configurations can explain the inconsistencies in findings of studies on ISO 9001 certification and performance should depend on the statistical inference that can be drawn from the evidence of association between their elements and aspects of performance. The starting point is the determination of the statistical significance of the association between certification status, as evidence of compliance with the standard's minimum requirements, and output performance as the findings presented in Figure 4.3 and tables 4.7 to 4.9 suggest. This chapter presents the inferential statistics concerning the extent such findings can be inferred to the whole population.

One objective of this research was to determine the relationship between ISO 9001:2008 certification status and performance of government agencies in Kenya. Section 5.2 presents the results of statistical tests used to determine the extent the findings presented in the preceding chapter can be inferred to the whole population as concerns this relationship. Specifically, statistical significance of the link between certification status and the different measures of performance is determined and reported.

A second objective of the research was to determine the influence of the level of ISO 9001:2008 implementation factors on the relationship between ISO 9001 certification status and operational performance of government agencies in Kenya. Results and analysis presented in the preceding chapter has indicated that ISO 9001 certified

organizations are not the same in terms of the focus given to certain components of ISO 9001 implementation factors and organizational system outcomes. Presented in section 5.3 are results of statistical tests used to determine the extent these findings can be inferred to the whole population. Specifically, statistical significance of the link between the level of ISO 9001:2008 implementation factors and an organization's performance in the different measures is determined and reported.

5.2 ISO 9001 Certification status and operational performance

The histograms in figures 4.6 and 4.7, and the Interquartile Range statistics in table 4.12 show significant variability of implementation factor levels within the ISO 9001 certified organizations. This essentially means the tests of the statistical significance of linkages between the certification status and performance are done without regard to the variability of these factors. The statistics presented in Table 4.8 also indicate that the effect of certification status on the performance variability differs from one measure of performance to another. The Interquartile Range statistic for the 2007/2008 performance score in the operations criteria is shown in the table to decrease from a high of 1.040 for the non-ISO 9001 certified group to a low of 0.130 for the certified group of organizations. In contrast, the Interquartile Range statistic for overall perceived performance measure, which considers wider stakeholder groups' needs and is a composite of costs, timeliness, relevance, reputation and service quality, is shown in the table to vary by a low 0.031.

The evidence, therefore, indicates that while Table 4.6 shows that the group scores in all the three measures of performance are statistically equal, statistical significance of the certification effect on the different measures of performance may not be the same. Presented in table 5.1 are statistics for the symmetric measures of association between ISO 9001 certification status and the different performance measures. As shown in the table, the statistical significance of the differences in levels of performance for the ISO 9001 certified and non certified groups shown in the boxplots in Figure 4.3 and the descriptive statistics in Table 4.7 is dependent on the performance measure of interest.

Table 5.1: Phi Correlation coefficients for categorized performance measures and ISO 9001 certification status.

		ISO 9001 certification status (ISO_{stat})
Overall perceived performance ($Perf_t$)	Phi Correlation	0.572
	Significance p.	0.000
	N of Valid Cases	47
Customer Satisfaction score in a 1-5 scale (CSsurv5)	Phi Correlation	0.283
	Significance p.	0.055
	N of Valid Cases	46
2007/2008 Performance score in operations criteria ($Perf_{07op}$)	Phi Correlation	0.020
	Significance p.	0.892
	N of Valid Cases	44

Source: From field survey

In view of the statistics in Table 5.1 that indicates that significance of the association is dependent on the performance measure, hypothesis H_1, that there is a direct relationship between ISO 9001:2008 certification status and operational performance, was therefore tested successively using each of the three performance measures. First, for the purpose of the hypotheses testing using non-parametric tests, the participating organizations were classified based on the measures of overall performance, customer satisfaction and the 2007/2008 performance evaluation in the operations criteria, into high performers and low performers. For each of the performance measures, cases with variable values up to 50th percentile are categorized as "low performers" while cases above the 50th percentile are categorized as "high performers".

5.2.1 ISO 9001 certification status and overall performance

A crosstabulation of the categorized overall performance in the 47 participating organization by ISO 9001 certification status is shown in Table 5.2. As shown in the Table, only 1 organization with the status of "Not certified" falls into the category of high performers against the expected 7. Of the 14 non ISO certified organizations, 13

have been categorized as low performers against expected number of 7. Similarly, while 10 of the ISO 9001 certified organizations are listed as low performers, this is against chance expectation of 16, while 23 certified organizations fall into the category of high performers against the expected 17.

Table 5.2: Overall performance score category by ISO 9001 status Crosstabulation

		ISO 9001 status		Total
Overall perceived performance score category		Not Certified	ISO 9001 certified	
Low performers	Count	13	10	23
	Expected Count	6.9	16.1	23.0
High performers	Count	1	23	24
	Expected Count	7.1	16.9	24.0
Total	Count	14	33	47
	Expected Count	14.0	33.0	47.0

Source: From field survey

Table 5.3 shows the non parametric statistics for the crosstabulation of overall performance score category by ISO 9001 status. As shown in the Table, the computed Pearson Chi-Square statistic for the crosstabulation is significant at p-value less than 0.05. As some of the expected frequencies are less than 10, a Yates corrected Chi-Square, shown in the Table as a continuity correction is computed and the statistic too is significant at p-value less than 0.05. A more exact statistical significance is provided by Fisher's exact test, shown in the Table as 0.000. With a chance likelihood of a participating organization falling into either category being 0.5, the likelihood ratio of 17.45 would appear to indicate that certification status can be used to rule in likelihood that the organization would be a high performer.

Table 5.3: Chi-Square Tests for Overall performance score category by ISO 9001 status Crosstabulation

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	15.393(b)	1	.000		
Continuity Correction	12.991	1	.000		
Likelihood Ratio	17.445	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	47				

Note: b The minimum expected count is 6.85.

Source: From field survey

On the basis of the statistics in Table 5.3, a null hypothesis that being classified into low performer or high performer category is independent of an organization's certification status is rejected. It can be concluded that, in terms of overall performance, a composite of cost efficiency, quality, timeliness, relevance and reputation, an ISO 9001 certified organization is more likely to be a high performer relative to the non certified ones. Similarly, a non ISO 9001 certified organization is more likely to be less competitive in terms of cost efficiency, quality of service offered, and timeliness. The non certified organizations are also more likely to have poor reputation and get involved in activities that are not relevant to what the organizations are there for.

Hypothesis H_1 that there is a direct relationship between ISO 9001:2000 certification status and operational performance is therefore accepted when overall operational performance is the output outcome of interest. The evidence in the boxplots in Figure 4.3 and the descriptive statistics in Tables 4.20 and 4.21 suggesting there is a relationship between ISO 9001:2008 standard certification status and overall operational performance can be inferred to all government agencies in Kenya. This, however, does not mean the customers of the certified organizations will record higher satisfaction level from the products and services provided nor that such organizations will obtain greater score in the Government of Kenya's performance contracting evaluation scheme. The non parametric tests confirm that between the overall performance, customer satisfaction survey score, and the performance

contracting evaluation score, the evidence shown in the boxplots in Figure 4.3 of association between certification status and median performance level is only significant with overall performance.

5.2.2 ISO 9001 certification status and customer satisfaction

A crosstabulation of the categorized customer satisfaction survey score for the 47 participating organization by ISO 9001 certification status is shown in Table 5.4. The Table shows that of the 32 participating organizations that are certified, 13 can be classified in the lower 50th percentiles and hence low performers. This is against expected chance count of 16. Against the expected chance count of 16 certified organizations in the higher performer group, a higher number of 19 were actually classified as high performers. In contrast, the non-certified group recorded higher than expected organizations in the low performer groups and lower than expected organizations in the high performer group.

The Chi-Square statistics in Table 5.5 gives the computed continuity correction statistic that is not significant at p-value of 0.05. As some of the cells have expected frequencies of only 7, the continuity correction statistic provides a better indicator of association than the Pearson Chi-Square. Fisher's Exact Test statistic similarly reported a p-value greater than 0.05. With a likelihood ratio well below 10 for a two state situation, the indications are that, from a customer's perspective, certification status cannot be used to rule in performance beyond what would be expected on average.

Table 5.4: Customer satisfaction survey score category by ISO 9001 status

Crosstabulation Source: From field survey

Customer satisfaction survey score category	Frequency	ISO 9001 status		Total
		Not Certified	ISO 9001 certified	
Low performer	Count	10	13	23
	Expected Count	7.0	16.0	23.0
High performer	Count	4	19	23
	Expected Count	7.0	16.0	23.0
Total	Count	14	32	46
	Expected Count	14.0	32.0	46.0

Table 5.5: Chi-Square Tests for customer satisfaction survey score category by ISO 9001 status Crosstabulation

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.696	1	.055		
Continuity Correction (a)	2.567	1	.109		
Likelihood Ratio	3.788	1	.052		
Fisher's Exact Test				.108	.054
N of Valid Cases	46				

Note: (a) The minimum expected count is 7.

Source: From field survey

On the basis of the computed continuity corrected Pearson Chi-Square and Fisher's Exact Test statistics that are both insignificant at 0.05, the null hypothesis that being classified into low performer or high performer category is independent of an organization's ISO 9001 certification status is accepted. It can be concluded that, in terms of customer satisfaction, ISO 9001 certification is probably not going to significantly influence the probability of an organization being a high performer relative to the non certified ones. Hypothesis H_1 that there is a direct relationship between ISO 9001:2000 certification status and operational performance is therefore rejected when customer satisfaction is the output outcome of interest.

The evidence in the boxplots in Figure 4.3 and the descriptive statistics in Tables 4.20 and 4.21 suggesting there is a relationship between ISO 9001:2008 standard certification status and customer satisfaction cannot be inferred to all government agencies in Kenya. Customer satisfaction being just one aspect of operational performance, the result of the test of this hypothesis would appear to indicate that achieving compliance to the minimum requirements specified in ISO 9001 standard will probably not help an organization to be competitive in the this dimension. This, however, does not mean the management practices prescribed by the standard would not lead to more satisfied customers. But it does indicate that a management objective that is focused on getting certified under the standard will not in itself come with being competitive in terms of satisfied customers.

5.2.3 ISO 9001 certification status and performance contracting evaluation scores

In a crosstabulation of the categorized performance contracting evaluation score for the 47 participating organization by ISO 9001 certification status 3 cases, representing 6.4 percent, had missing performance values leaving 44 valid cases for crosstabulation. Of the 31 participating organizations that were certified at the time of the research, 16 were classified in the lower 50th percentiles and hence low performers relative to the median performance of the group in terms of what the organizations scored in the performance contracting evaluation. Just about the same number was expected to fall into this low performer category if chance alone determined the category an organization falls into. Similarly, the counts for the non ISO 9001 certified organizations in high performer and low performer categories were not different from what would be expected if chance alone determined the category an organization falls into.

The computed Chi-Square statistics for a crosstabulation of the performance contracting evaluation score by ISO 9001 certification status is shown in Table 5.6. A likelihood ratio statistic of 0.018 with significance p-value of 0.892 rules out certification status as an aspect to use to rule in or out probability of belonging to either performance category. The computed Pearson Chi-Square, continuity correction and Fisher's Exact Test statistics are all insignificant with p-values greater than 0.5. This is consistent with the insignificant phi Correlation value of 0.020 in Table 5.1.

Table 5.6: Chi-Square Tests for performance contracting evaluation score by ISO 9001 status Crosstabulation

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.018(b)	1	.892		
Continuity Correction	.000	1	1.000		
Likelihood Ratio	.018	1	.892		
Fisher's Exact Test[(a)]				1.000	.578
N of Valid Cases	44				

Note: (a) The minimum expected count is 6.20.

Source: From field survey

On the basis of the statistics in Table 5.6, the null hypothesis that the distribution of organizations into performance categories of low and high performers, in the performance contracting operations criteria evaluation score, is not influenced by ISO 9001 certification status is accepted. Hypothesis H_1 that there is a direct relationship between ISO 9001:2000 certification status and operational performance is rejected when the performance measure of interest is the performance contracting evaluation score in operations criteria. It can therefore be concluded that certification status cannot be used in any way to rule in a possibility that an organization can achieve better performance in the performance contraction evaluation.

This would appear to suggest that achievement of certification as a requirement in the government's performance contracting does not in any way translate to better performance in the operations criteria and hence only has a value of improving the score for the managers involved. As is the case with customer satisfaction, this, in no way means the management practices prescribed by the standard would not lead to higher performance in operations criteria score in the government's evaluation scheme. But it does mean that simple compliance with the minimum requirements of ISO 9001 standard is probably not going to mean an organization can now perform better in the measures included in the operations criteria of performance contracting evaluation scheme.

5.2.4 Discussions of findings on ISO 9001-performance relationship

The hypothesis that there is a direct relationship between ISO 9001:2000 certification status and operational performance was accepted when the overall operational performance, a composite measure of cost efficiency, quality, timeliness, relevance and reputation, is the operational performance measure of interest. However the hypothesis is rejected when customer satisfaction survey score is the measure of interest. Yet, the ISO 9001:2000 quality management system model shown in Figure 2.1 emphasizes customer role as the provider of the key inputs to the value-creating processes. These inputs are in the form of specified customer requirements and customer feedback.

When quality is looked at in terms of Deming (1994)'s definition as a predictable degree of uniformity and dependability at low cost and suited to the market, then cost,

quality, timeliness, relevance and reputation are all aspects of quality. An impact on these aspects should translate into an impact on the level of satisfaction of customer needs. The aims of ISO 9001:2008 standard as stated in the publication (ISO 9001:2008(E)) is to "enhance customer satisfaction through the effective application of the system, including processes for continual improvement of the system and assurance of conformity to customer and applicable regulatory requirements" (p. 1). The findings of no significant relationship between customer satisfaction and ISO 9001 certification are inconsistent with this aim.

This raises two questions: has the standard failed to achieve its aims? Why should there be an impact on overall performance, a composite measure that includes aspects that add up to quality and effectiveness, and no significant impact when the focus is specific to customer satisfaction? Discussion of these apparent contradictory findings must essentially start with understanding what customer satisfaction is and whether quality, timeliness, relevance and reputation should all lead to customer satisfaction. Extant literature on service operations and customer satisfaction has held that customer satisfaction and quality of service are probably impacted differently by attributes in a customer-supplier exchange context.

Looy, Dierdonck and Gemmel (1998), suggest that customer satisfaction is a function of the difference between expected quality and perceived delivered quality. This would then suggest that the extent of the discrepancy between customer satisfaction survey score and quality, as a component of the overall performance, may be a reflection of the gap between the expectation of the customer and what the attributes brought on by the practices in place have enabled to be delivered. The differences in the findings may therefore be a reflection of the different ways in which attributes in customer – consumer context impact the measures and what has been emphasized when ISO 9001 standard's prescribed practices are adopted.

It could also be argued that some practices prescribed by the standard that are important for customer satisfaction are in deficit but not to the extent for the organization to fail the compliance test required for certification. This latter point is supported by Zhang (2001)'s suggestion that different categories of practices play unique roles in achieving strategic objectives, with the practices linked to strategic

objectives based on the focus and type of measure. In terms of Zhang (2001)'s analysis, customer satisfaction is externally focused, based on subjectively measurable perspective of quality and quality dimension. According to Zhang (2001), achieving strategic objectives defined in terms of customer satisfaction would therefore need customer-based practices.

The correlation matrix of implementation factor variables in Table 4.2 shows that four of the five implementation factors are highly correlated. The result of a hierarchical cluster analysis presented in the dendrogram in Figure 4.5 show that a natural grouping of organizations can be described in terms of these four factors, which form the most visible and distinctive facets of organizations that comply with the requirements of ISO 9001 standard. The distinctiveness of these factors can be discerned from the histograms in figure 4.6, with the characteristic on/off distributions between the certified and non certified organizations.

According to the quality management literature, quality policy and quality objectives belong to a management-based category of practices and embodies the fundamental principle of leadership. ISO 9001:2008(E) publication specifies the need for evidence of conformity to requirements as the key objective of the implementation factor of document control. In terms of Zhang (2001)'s analysis, these factors respond to the needs in the internally focused quality perspectives and dimensions. Similarly, the quality manual, which embodies the fundamental principle of systems approach, belongs to the category of management-based practices that respond to the needs in the internally focused perspectives.

As the above factors appear to be all internally focused, they would probably not respond to the needs in the externally focused and subjectively measurable dimensions in the user-based perspective. This would probably be the explanation for the failure of certification to have impact on customer satisfaction, except that, in addition to the four factors mentioned, the framework prescribes for one other implementation factor, the management review. As shown in Table 4.2, management review appears to be less correlated with the other four. In addition to being very dissimilar from the other four, as shown in Figure 4.5, the factor's group mean level score for the certified organizations was the lowest at 3.27 in a five point scale

compared to mean level scores greater than 3.5 for the others. Could it be that this is the factor that impacts customer satisfaction and its level is below a threshold?

The findings as regards the performance contracting annual evaluation score bring in another angle: what are the principals' objectives when they specify certification as part of performance targets? The standard's publication document states that the design and implementation is expected to be influenced by the specific organization's environment, needs, size and structure among other factors. As shown in Table 4.1, the sectors of operation for the public sector organizations are diverse and the performance measurement system would be trying to fit a rather disparate business types into one performance regime. In this situation, uniformity that could allow location transferability would be one objective in the background.

The triangle concept as proposed by Looy et al. (1998) holds that location transferability that would be required due to the nature of dispersed operations essentially needs to be underpinned by moving the service centre of gravity to the physical and process components end of the service triangle. As part of this physical and process component, does ISO 9001 management system standard help achieve this uniformity and hence location transferability objectives? Despite the outcome of the hypothesis H_1 test when performance contracting evaluation score is the outcome of interest, the low variability indicated for the measure in Figure 4.3 indicates the certification probably helps achieve this objective to some extent.

5.3 ISO 9001 implementation factor levels and performance

The results of the hypotheses tests presented in section 5.2 suggest that there is a significant relationship between ISO 9001 certification status and the internal measures of operational performance that make up the overall performance. However, the statistical tests do not confirm association between certification status and score in the government of Kenya's performance contracting evaluation scheme, nor any significant impact on the externally focused performance dimension of customer satisfaction. Could this be a result of differences in implementation?

Data presented in the results and analysis chapter show that the implementation factors and the organizational system outcomes of customer focus and process

approach may constitute characteristics with which natural groupings of organizations could be described. The evidence presented in Figure 4.5 has two implications: As one of the prescribed practices, management review's similarity to the organizational system outcome variables of customer focus and process approach would probably suggest a possible role in the promotion of the environment in which these outcomes are achieved. If this is so, then the conceptual framework in Figure 2.2 fails to be a suitable representation of the relationships in the phenomenon.

Another implication of the similarity of the management review to the organizational system outcomes as shown in Figure 4.5 is that management review may be the critical element in the conceptual framework in Figure 2.3. This is because, in the conceptual framework, the link between performance and certification is the two organizational system outcomes of customer focus and process approach and these are indicated to be very dissimilar to the other implementation factors. Determining the significance of this and the inference that can be drawn is part of the tasks of achieving the second of the two objectives of this study: to determine the influence of the level of ISO 9001:2008 implementation factors on the relationship between ISO certification status and operational performance.

Figures 4.12 to 4.15 and Tables 4.15 to 4.16 indicate that both as individual variables and collectively as composites with others, the levels of these factors and organizational system outcomes may be associated with performance levels in the different dimensions. In this section, statistical significance of the following relationships is tested: ISO 9001 implementation factor levels and operational performance measures; ISO 9001 implementation factor levels and organizational system outcomes of customer focus and process approach. The following hypotheses are tested:

Hypothesis $H_{1(b)}$

There is a significant relationship between the level of ISO 9001 implementation factors and an organization's operational performance.

Hypothesis H_{2a}.

There is a direct relationship between the level of ISO 9001:2000 implementation factors and an organization's customer focus orientation.

Hypothesis H_{2b}.

There is a direct relationship between the level of ISO 9001:2000 implementation factors and process approach adoption.

5.3.1 ISO 9001 Implementation Factors and output performance

Presented in Appendix 6 are the results of successive model estimations for the regressions of customer satisfaction survey score, CSSURV, and overall perceived performance, Perft, upon the ISO 9001 implementation factors. As the correlation matrix in Table 4.2 shows that the variables representing quality policy, quality objectives, quality manual and document control are highly correlated, a composite ISO hard elements variable (IF_{ISOR}) is used to represent these so as to avoid collinearity problems. The table also shows that management review factor is less highly correlated with the other implementation factors and hence model estimation with the factor as independent variable is separate in Appendix 6-2.

As indicated in Appendix 6-1, the association between the ISO hard elements variable and overall performance can be explained by an exponential mathematical function of the forms, $Perft = 1.9 \times e^{0.181FISOR} + E$, where IFISOR is the composite variable representing the ISO hard elements and e is the natural logarithm approximately equal to 2.71828. The R Square (R^2) statistics in the table indicate a model based on any of the three mathematical functions explains about 18 percent of the variation in overall performance, other factors endogenous to the model explaining the remaining. The statistic in the table indicate that by moving the levels of these distinctive practices prescribed by ISO 9001 management system standard to the threshold value of 3.0, an organization can improve their performance by about 10 percent.

Statistics in Appendix 6-1 also indicate that the influence of the ISO hard elements variable, IF_{ISOR}, differs from one dimension of overall performance to another. There appears to be no association between the elements and timeliness dimension as the estimated models based on a range of mathematical functions were not significant at 0.05. Similarly, no significant model could be estimated with relevance dimension as dependent variable.

The greatest influence is on cost efficiency dimension in which an estimated model based on a mathematical function of the form, $Y_{cost} = e^{(2.43-(4.23/IFISOR))} + E$ explains about 47 percent of the variance in cost efficiency. According to the estimated cost model, enhancing the factors that form the ISO hard elements variable from the threshold of 3.0 to 3.5, in a scale of 1 to 5, has the effect of improving cost efficiency by 10 percent. The cost model has a significant F-statistic 27.42, $p < 0.001$ with 30 degrees of freedom.

The table in Appendix 6-1 also shows that approximately 29 percent of variation of performance in reputation dimension can be explained by a model based on the same mathematical function in the form: $Y_{rep.} = e^{(2.23-(3.23/IFISOR))} + E$. An enhancement of the composite ISO hard elements variable from threshold of 3.0 to 3.5 enhances the reputation of the organization by approximately 7 percent. This model has F-statistic 12.56, $p<0.005$, 30 degrees of freedom.

No model of customer satisfaction with ISO hard elements variable, IF_{ISOR}, as the independent variable was significant at p-value 0.05, a confirmation of the findings in the earlier non-parametric tests that ISO 9001 certification status has no impact on customer satisfaction. However, as shown in Appendix 6-2, a quadratic function model with management review as independent variable explains about 14 percent of variation in customer satisfaction. The model, with F-statistic 3.73, $p<0.05$, 43 degrees of freedom, represents the association between customer satisfaction and the level at which the ISO 9001 prescribed practice of management review is implemented by an equation: $Y_{CSSURV} = 5.3 - 2X_{MR} + 0.445X_{MR}^2 + E$.

The relationship is ditch-shaped and at lower levels of management review, the level of customer satisfaction would probably be falling. The reference lines in the scatter graph in Figure 4.13 mark the two points in the x axis at which Y_{CSSURV} values are equal. According to the model equation, an implementation level of 3.5, in a scale of 1 to 5, would be required for customer satisfaction to be above that of the organizations in which management review practice is at the lowest level.

The histograms in figure 4.7 show that being at such a low level of management review application does not depend on the certifications status. As shown in the histograms, only about 7 of the 33 ISO 9001 certified participating organizations have

implemented management review practice above 3.5, an indication that there would not be much difference in customer satisfaction between the certified and the non certified. This would probably explain why the hypothesis H_1 that there is a direct relationship between ISO 9001:2000 certification status and operational performance is rejected in the non parametric test with customer satisfaction as the measure of operational performance.

The value of management review relative to the other implementation factors in explaining the variance in overall performance is indicated by the estimated models of overall performance, PERFt, in Appendix 6-2. The model statistics indicate the best fitting mathematical function explains about 45 percent of the variance and is specified by the equation: $Y_{perft} = e^{(2.23-(3.43/MR))} + E$. Model has $F = 36.84$, $p<0.001$, degrees of freedom being 44.

5.3.2 Customer satisfaction as the measure of performance

The model estimations indicate that different factors impact different aspects of performance differently. Therefore hypothesis H_{1b} that there is a significant relationship between the level of ISO 9001 implementation factors and an organization's performance can only be validly tested by successively using the different measures of performance as the dependent variable. The model estimates in Appendix 6-1 indicates the ISO 9001 implementation factors of quality policy, quality objectives, quality manual and document control have no significant positive relationship with customer satisfaction. But as shown in Appendix 6-2, about 14 percent of the variance in customer satisfaction can be explained by a regression model with management review factor as the independent variable. A multiple regression analysis with ISO hard elements, IF_{ISOR}, and management review as predictor variables is used to provide self weighting estimation equation so as to test the following null hypothesis:

> Null hypothesis, Ho:
> The regression coefficients for both the ISO hard elements variable and management review are not significantly different from zero when customer satisfaction is the dependent variable.

Using Stepwise regression method, with the criteria to enter and remove a variable as Probability-of-F-to-enter at <= .050 and Probability-of-F-to-remove at >= .100, a linear regression model with $F_{1,45} = 7.184$, $p = 0.010$ and Adjusted R Square (R^2) of 0.119 is estimated. Stepwise method is used so as to be able have a model with only the predictor variable that significantly contributes to the model. The model summary, ANOVA statistics, and coefficients are shown in Tables 5.7 to 5.9. As the tables show, management review is left in the model as the only predictor after the composite ISO hard elements variable that represents quality policy, quality objectives, quality manual and document control are removed. Table 5.10 shows that the removed composite variable has a partial correlation with the dependent variable, customer satisfaction, of only -0.063.

Table 5.7: Model summary for regression of customer satisfaction upon implementation factor variables

Model predictors	R	R^2	Adj. R^2	Std. Error	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
(Constant), Management review	.371	.138	.119	.55779	.138	7.184	1	45	.010

Source: From field survey

Table 5.8: ANOVA Table for regression of customer satisfaction upon implementation factor variables

Model predictors		Sum of Squares	df	Mean Square	F	Sig.
(Constant) Management Review	Regression	2.235	1	2.235	7.184	.010
	Residual	14.001	45	.311		
	Total	16.236	46			

Source: From field survey

Table 5.9: Model coefficients for regression of customer satisfaction upon implementation factor variables

Model predictors	Unstandard-ized Coefficients		Standard-ized Coefficients	t	Sig.	Correlations			Collin-earity Stats.
	B	Std. Error	Beta			Zero-order	Partial	Part	VIF
(Constant)	1.169	.856		1.366	.179				
Management review	.720	.269	.371	2.680	.010	.371	.371	.371	1.000

Source: From field survey

Table 5.10: Variable excluded from customer satisfaction regression model

Excluded model	Beta In	t	Sig.	Partial Correlation	Collinearity Statistics	
					Tolerance	VIF
ISO hard elements	-.065	-.417	.679	-.063	.802	1.247

From the statistics in tables 5.7 to 5.9, the model equation 1 is estimated for the performance measure of customer satisfaction survey score with management review, one of the ISO 9001 implementation factors, as predictor. As the t-statistic for management review has a p-value of 0.010, the null hypothesis that the regression coefficients for both the ISO hard elements variable and management review are not significantly different from zero when customer satisfaction is the dependent variable is rejected. The alternative hypothesis that at least one of the coefficients is significantly different from zero is accepted. It can be concluded that the level of customer satisfaction is associated with ISO 9001 prescribed practice of management review, but not with the ISO hard elements aspects of implementation.

$Y_{CSSURV} = 1.169 + 0.720X_{MR} + E$ (Model equation 1)

SE = 0.856 0.269

T value = 1.366 2.680

Sig.T 0.179 0.010

$R^2 = 0.119$

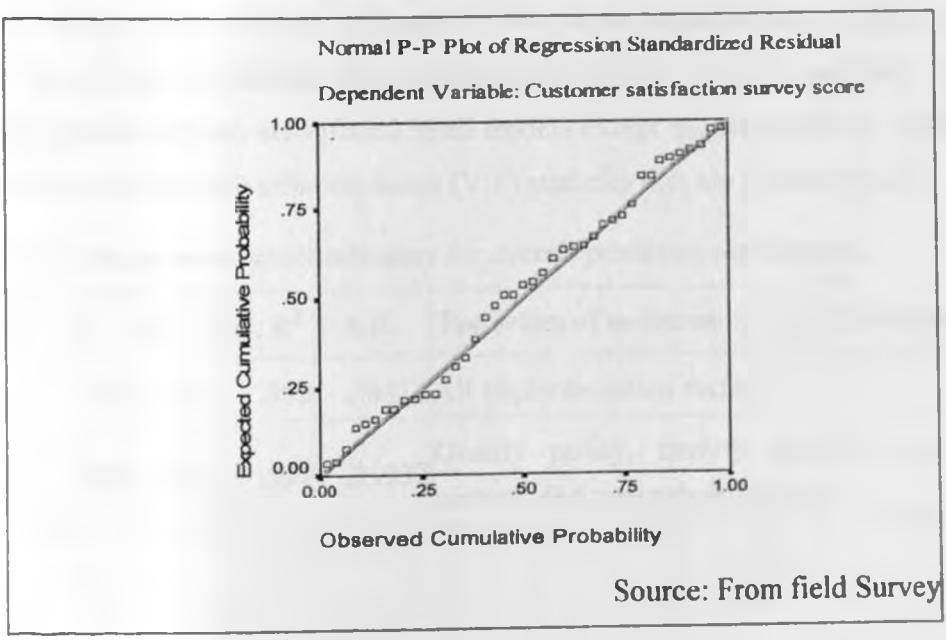
Y_{CSSURV} is customer satisfaction, X_{MR} is management review factor.

Source: From field survey

Hypothesis $H_{1(b)}$ that there is a significant relationship between the level of ISO 9001 implementation factors and an organization's performance is therefore accepted when the measure of performance is customer satisfaction. The data, however, suggests that the most visible aspects of implementation, embodied in the practices of quality policy, quality objectives, quality manual and document control, may not, on their own, have any influence on customer satisfaction. Customer satisfaction model equation estimated from the data has management review as the sole predictor variable amongst the ISO 9001 implementation factors with t-statistic that is significant at < 0.05, and Adjusted R square (R^2) of 0.119 for the model. As an indication that the proportion of the dependent variable that is influenced by management review is not influenced by any other factor, exogenous or endogenous, table 5.9 show that the correlations remain constant at 0.371 with a computed Collinearity Statistic of 1.00.

As shown in Figure 5.1, the P-P plot of Regression Standardized Residuals that constitute the error term, E, indicate that the observed probabilities against the expected probabilities for the residuals fit a 45 degree line. The error term can therefore be considered sufficiently close to normal distribution with the mean that is close to zero. This suggests the estimated model is an acceptable fit.

Figure 5.1: P-P Plots for ISO 9001 implementation factors and Customer satisfaction Regression residuals.



Source: From field Survey

5.3.3 Overall perceived performance as the measure of performance

The model equation 1 estimated in the multiple regressions using all the ISO 9001 implementation factors exclude the composite variable representing quality policy, quality objectives, quality manual and document control. However, Appendix 6-1 shows that the situation is different with cost efficiency and reputation dimensions of overall perceived performance. The regression of the composite overall performance of which these two dimensions are components returns t-values for both management review and the composite of the quality policy, quality objectives, quality manual and document control that are significant at <0.05. A multiple regression analysis using 'Enter' method with the composite ISO hard elements and management review, and all cases entered with missing values replaced with mean, returns a model with Adjusted R-square (R^2) of 0.363. ANOVA table reports an F-value that is significant at p-value = 0.001. The standardized Beta coefficients indicate a much greater contribution of management review and a small and negative contribution of the ISO hard elements variable to the model.

A regression of overall performance upon all implementation factors as separate variables, based on Backward method with Probability of F-to-remove >= .100, all cases entered, and cases with missing values excluded pairwise, results in the models summarized in Table 5.11. While F-statistics for the four estimated models are shown in Table 5.12 as significant at p<0.001, the statistics in Table 5.13 show that in all the models, except model 4, only management review has t-statistic that is significant at 0.05. The collinearity statistics also show that the effects of all the variables, except for management review, are inflated in all models except model number 4. These are indicated by the variable inflation factor (VIF) statistics that are greater than 10.

Table 5.11: Regression model summary for overall perceived performance.

Model	R	R^2	Adj. R^2	S.E.	Predictors of variation in overall performance
1	.794	.631	.580	.36412	All implementation factors
2	.794	.631	.591	.35937	Quality policy, quality objectives, quality manual, and management review

Table 5.11 continues

Model	R	R2	Adj. R2	S.E.	Predictors of variation in overall performance
3	.792	.627	.598	.35633	Quality policy, quality objectives, and management review
4	.788	.621	.602	.35439	Quality objectives and management review.

Source: From field survey

Table 5.12: ANOVA Table for overall performance as dependent variable

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.165	5	1.633	12.316	.000
	Residual	4.773	36	.133		
	Total	12.937	41			
2	Regression	8.159	4	2.040	15.794	.000
	Residual	4.779	37	.129		
	Total	12.937	41			
3	Regression	8.112	3	2.704	21.297	.000
	Residual	4.825	38	.127		
	Total	12.937	41			
4	Regression	8.039	2	4.020	32.004	.000
	Residual	4.898	39	.126		
	Total	12.937	41			

Source: From field survey

Table 5.13: Coefficients in the regressions of overall performance

Model		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		Beta			Tol.	VIF
1	(Constant)		1.261	.215		
	Quality policy	-.730	-.783	.439	.012	84.843
	Quality objective	1.027	1.049	.301	.011	93.486
	Quality manual	.392	.626	.535	.026	38.257
	Document control	-.118	-.206	.838	.031	31.983
	Management review	.314	1.866	.070	.361	2.768

Table 5.13 continues

Model		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		Beta			Tol.	VIF
2	(Constant)		1.404	.169		
	Quality policy	-.774	-.864	.393	.012	80.444
	Quality objective	1.003	1.045	.303	.011	92.147
	Quality manual	.358	.600	.552	.028	35.589
	Management review	.292	2.296	.027	.618	1.618
3	(Constant)		1.558	.128		
	Quality policy	-.659	-.759	.452	.013	76.761
	Quality objective	1.248	1.451	.155	.013	75.390
	Management review	.279	2.247	.031	.635	1.574
4	(Constant)		1.699	.097		
	Quality objective	.602	4.920	.000	.649	1.540
	Management review	.265	2.171	.036	.649	1.540

Source: From field survey

On the basis of the t-statistics, the associated significance p-values and the collinearity statistics in Table 5.13, the regression model 4, which has a constant, management review and quality objectives as predictors of overall performance is the only effective model. With Adjusted R Square (R^2) of 0.602, the model explains 60 percent of the variation in overall performance. As shown in Table 5.14, the model has standardized coefficient Beta of 0.265 for management review variable and 0.602 for quality objectives variable. The low variable inflation factor (VIF) levels of 1.540 for both variables suggest there are no collinearity problems to affect the regression. The t-statistics are significant at 0.036 in the case of management review variable and $p<0.001$ in the case of quality objectives variable.

Table 5.14: Coefficients for the significant overall perceived performance model

Predictors of variance in overall performance	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	1.072	.631		1.699	.097		
Management review	.487	.224	.265	2.171	.036	.649	1.540
Quality objective	.261	.053	.602	4.920	.000	.649	1.540

Source: From field survey

The non linear model estimates for overall performance shown in Appendix 6 have R Square (R^2) statistics of approximately 18 percent for the model with ISO hard elements (IF_{ISOR}) as independent variable and 43 percent for the model with management review as independent variable. The model estimated from the linear multiple regressions has management review and quality objectives factor, a component of the ISO hard elements, as predictors with R Square (R^2) of 0.602. This would appear to confirm and further refine the model estimations indicated in Appendix 6. The resulting regression equation 1b below therefore fits the data.

$$Y_{perft} = 1.072 + 0.487X_{MR} + 0.261X_{QO} + E \quad \text{(Model equation 1b)}$$

SE =	0.631	0.269	0.053
T value =	1.699	2.171	4.920
Sig.T	0.097	0.036	0.000

$R^2 = 0.602$ n = 41.

Y_{perft} is overall perceived performance, X_{MR} is the management review factor and X_{QO} is the quality objectives factor.

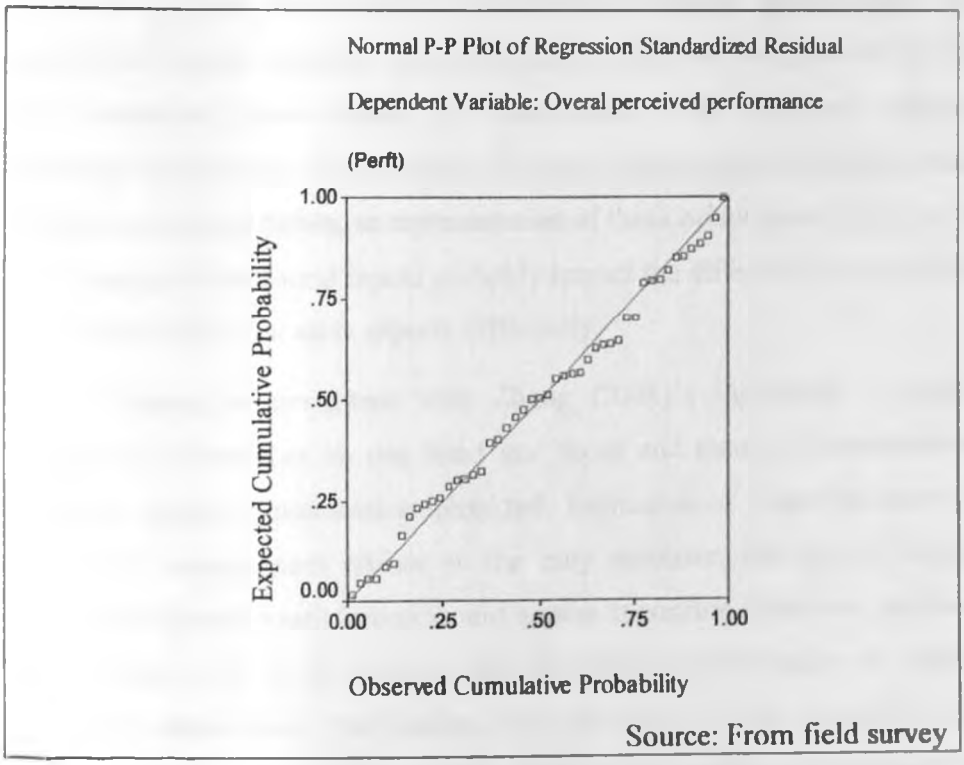
Source: From field survey

In view of the t statistics that are indicated in model equation 1b as significant at $p < 0.05$, the null hypothesis that regression coefficients for all the ISO implementation factors are not significantly different from zero when overall performance is the dependent variable cannot be accepted. The alternative hypothesis that the regression coefficient for at least one of the five implementation factor variables is different is therefore accepted. It can be concluded that management review and quality

objectives are the significant predictors of overall performance in an organization. Hypothesis $H_{1(b)}$, that there is a significant relationship between the level of ISO 9001 implementation factors and an organization's performance is therefore accepted. The relationship is through the ISO 9001 prescribed practices of management review and quality objectives.

Figure 5.2 shows P-P plots of Regression Standardized Residuals that constitute the error term, E. The P-P plots show the observed probabilities for the residuals against the expected probabilities fit a 45 degree line, an indication that the error term is normally distributed with a mean close to zero. This is a confirmation that the model is correctly used.

Figure 5.2: P-P Plots for the model residuals.



Source: From field survey

5.3.4 Discussions of findings on implementation factors-performance relationship

The outcomes of the hypotheses tests are that it would be expected that organizations which have in place selected practices prescribed by ISO 9001 management system standard are probably going to report better performance in certain measures. This would probably appear to be inconsistent with the findings of Martinez-Costa and

Martinez-lorente (2007). However, the non parametric test of hypothesis H_1 in the preceding chapter also found no relationship between certification and customer satisfaction or between ISO 9001 certification and performance contracting evaluation score. The findings of statistically significant relationship between the certification and the non financial internal measures of operational performance only goes to emphasize the fact that the factors that impact different aspects of an organization's performance are different and, at best, impact these aspects differently.

The differences between the hypotheses tests in the preceding section 5.2 and this section 5.3 are the concepts involved. Like in the Martinez-Costa and Martinez-Lorente (2007) study, hypothesis H_1 that there is a direct relationship between ISO 9001:2000 certification status and operational performance has, as the key concept, a certificate of compliance with the standard's minimum requirements. The test of hypothesis $H_{1(b)}$ concerns not the possession of ISO 9001 certificate of compliance but the behavioural inputs which that compliance to the standard's requirements is presumed to engender. The outcomes of the successive tests of the hypothesis with the factors of implementation, as representation of these behavioural inputs, as predictors, confirms that behavioural inputs probably impact the different aspects of performance or, at best, impact the same aspects differently.

This reasoning is consistent with Zhang (2001)'s suggestion of links between categories of practices on one hand and focus and nature of measurement for the perspectives and dimensions emphasized. Estimation of model equation 1 from the data, with management review as the only predictor, among the implementation factors, of customer satisfaction would appear to confirm this view. Another aspect of the finding to note is the specific implementation factor found to be associated with customer satisfaction. The finding that only one of five prescribed practices is significantly associated with customer satisfaction is notable in the sense that it would probably explain the findings of Martinez-Costa and Martinez-Lorente (2007), Dick (2000), Santos and Escanciano (2002), and Heras et al. (2006).

As shown in the ISO 9001:2000 quality management system model in Figure 2.1, the focus is on the implementation and continual improvement of the quality management system. Quality management system is defined in the vocabulary standard as "a

system to establish quality policy and quality objectives and to achieve those objectives" (ISO 9000:2005). This definition would appear to suggest emphasis on the two factors with pre-certification audit focused on assessing the static processes connected with these. It would therefore not be difficult to expect that efforts toward certification would focus on these static processes at the expense of the socio-behavioural aspects. With the finding that only management review is associated with customer satisfaction, observations of no relationships can be explained.

If it is considered that customer satisfaction is a driver in market share and profitability, then Martinez-Costa and Martinez-Lorente (2007)'s suggestion that quality management system certification can actually reduce quality related benefits and profitability can be explained by the models estimated. The refined estimated quadratic equation has a positive coefficient for the squared term, which means at some point in the application of management review practice, customer satisfaction level is on a reducing path until a critical level above 3.5, in a 5-point scale is reached. In a compliance-based management, this situation could mean perpetual low performance as an organization focuses on maintaining compliance.

Martin-Pena and Diaz-Garrido (2008) identifies three important generic operations strategies: a strategy aimed at minimizing costs, a strategy aimed at giving the customers the product rapidly and on time, and a strategy aimed at adapting to the needs and preferences of the customers as a way to achieve differentiation. The estimated model equation 1b has the ISO 9001 implementation factors of quality objectives and management review as predictors in a regression of overall performance, which is a composite of operations aspects central to these generic operations strategies, namely, cost, timeliness, and relevance. Again it would not be surprising for a compliance-based management to focus on the most visible aspects of standard implementation, and to bringing these only to the implementation threshold. Model 1b indicates that of the ISO hard elements factors, it is the quality objectives factor that is associated with overall performance.

The standard document (ISO 9001:2008(E)) states that "Top management shall ensure that quality objectives, including those needed to meet requirements for product are established at relevant functions and levels within the organization" (p. 4). The

estimated model in equation 1b indicates the influence of quality objectives, as a factor in a management system, on overall performance is dependent on the objectives themselves being consistent with given principles. The ISO 19011:2002, a guideline standard for quality and environmental management systems auditing document, provides that audit conclusion, the determinant of whether certification is achieved or not, follows from evidence of existence of, not of the characteristics of, such objectives.

The above probably explains why certification status in itself may not be significantly related to performance. The developers of the standard would probably have considered that it would be a framework to provide the foundation in which the socio-behavioral aspects of management would provide the drivers to performance. The 2000 version of the standard specifies the fundamental principles of quality management approach as providing the guiding principles for these socio-behavioral aspects. The standard could be the enabler but would probably require the driver to performance. An alternative viewpoint is that the enablers integrated into the five implementation factors achieve their objectives by promoting the existence of drivers to performance. This is investigated through the statistical tests in the chapter that follows.

CHAPTER SIX: TOWARDS A STRATEGIC CONTINGENCY APPROACH TO ISO 9001 MANAGEMENT SYSTEM STANDARD

6.1 Introduction

The hypotheses tested in the preceding chapter concern the link between ISO 9001 certification status and the different measures of operational performance. To help in better understanding of this relationship, hypothesis $H_{1(b)}$ that there is a significant relationship between the levels to which the practices that constitute the standard's application are implemented and performance of the organization has been tested. Identification of only two practices out of the five as predictors of aspects of operational performance provides possible explanation for the non significance of certification status as a factor to rule in good performance.

However, the regression curves in figures 4.12 to 4.15 illustrate how the different configuration factor elements in the ISO 9001 certified organizations not only impact different aspects of performance differently but have interaction effects that vary these impacts. The correlation matrix in Table 4.30 shows that the association between management review factor and customer satisfaction has a zero-order coefficient that is significant at 0.05. However, when customer focus is controlled for, the coefficient is not significant even at p-value = 0.1. Similarly, when process approach variable is controlled for, the correlation is not significant, returning a p-value that is greater than 0.30. This would appear to indicate that the relationship shown in the lower scatter graph in Figure 4.13, between customer satisfaction and management review factor, is not direct, but probably through either customer focus or process approach or both.

The classification dendrogram in Figure 4.5 shows that customer-focus and process approach variables form natural grouping with management review. This would appear to rule out any of these organizational system outcome variables being an outcome of any other implementation factor other than management review. This means the proposition on which the conceptual framework in Figure 2.2 is based is probably not tenable and hence hypotheses H_3 and H_4, that the effect of ISO 9001

certification status on performance is moderated by customer focus and process approach, are not testable.

The alternative conceptual framework in Figure 2.3 is based on the proposition that organizational system outcome variables of customer focus and process approach are at least enhanced by one or more of the implementation factors. The multiple boxplots in Figure 4.9 show that the group median levels for the customer focus and process approach variables are higher in the ISO 9001 certified participating group of organizations than for the non certified group. Test of hypotheses H_{2a} and H_{2b} below helps determine the statistical significance of the indicated linkages.

Hypothesis H_{2a}.

> There is a direct relationship between the level of ISO 9001:2000 implementation factors and an organization's customer focus orientation.

Hypothesis H_{2b}.

> There is a direct relationship between the level of ISO 9001:2000 implementation factors and an organization's process approach orientation.

6.2 ISO implementation factor levels and organizational system outcome variables

Table 6.1 shows model estimations for the variables of customer focus and process approach as dependent variables and ISO 9001 implementation factors as independent variables, based on different mathematical functions. The Table shows that, according to the data collected, there are relationships between the level of the composite ISO implementation factor variable and the different organizational system variables, which can be explained by different mathematical functions. The best fitting models for the relationships are indicated in the Table as quadratic and cubic models, with the models explaining over 72 percent and 52 percent of variances in customer focus and process approach respectively.

Table 6.1: Model estimations - ISO 9001 implementation factors (IF_{ISO}) as predictor

Mathematical function	Customer focus (CF_1)		Process approach (PRA_1)	
	Adjusted R^2	F. Significance	Adjusted R^2	Sign. F
Linear model	.31061	.0000	.17159	.0022
Logarithmic model	.21408	.0006	.10614	.0145
Inverse model	.14733	.0045	.06419	.0474
Quadratic model	**.72709**	**.0000**	.52747	.0000
Cubic model	.72650	.0000	**.53577**	**.0000**
Compound model	.30117	.0000	.15157	.0040
Power model	.20569	.0008	.09052	.0226
S-curve model	.13937	.0056	.05170	.0676[1]
Growth model	.30117	.0000	.15157	.0040
Exponential model	.30117	.0000	.15157	.0040

Notes: 1 Not significant at p=0.05

Source: From field survey

6.2.1 Predictors of Customer Focus

Table 6.1 indicates that the relationship between the composite variable for implementation factors and customer focus fits quadratic mathematical equation of the form: $Y_{cf} = b_0 + b_1X_{IFISO} + b_2X_{IFISO}^2 + E$, with over 72 percent of variation in customer focus explained by the regression. The model ANOVA statistics are $F_{2,44} = 62.27$, $p<0.0001$. The regression sum of squares = 6.53, with degrees of freedom = 2, and residual sum of squares = 2.31, with degrees of freedom = 44. The regression model has Adjusted R square (Adj. R^2) of 0.727 with the terms having standardized coefficients as shown below:

ISO 9001 implementation factors (IF_{ISO}): -3.862204, $p <0.0001$.

Square of ISO 9001 implementation factors (IF_{ISO}^2): 4.479197, $p <0.0001$.

The unstandardized coefficients in the estimated customer focus model are 4.415 with standard error of 0.2633 for the constant term, - 1.90 with standard error of 0.26 for the un-squared term and 0.46 with standard error of 0.055 for the squared term. The relationship between the ISO 9001 implementation factors, as a composite variable, and customer focus can therefore be explained by the equation:

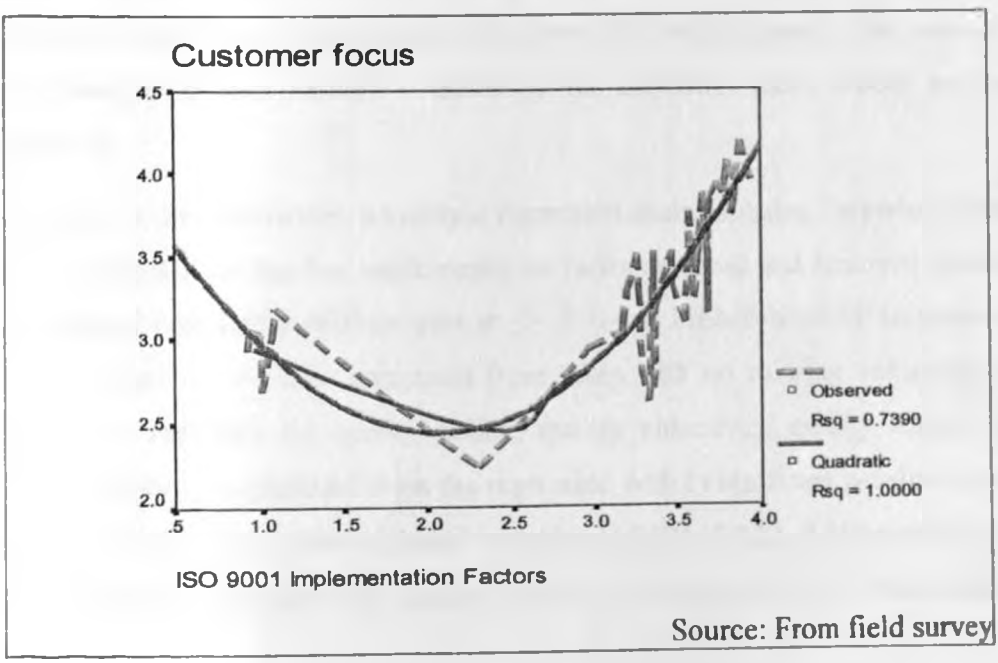
Y_{cf}	= 4.415 -	1.90 X_{IFISO}	+ 0.46X_{IFISO}^2 + E	(model equation 2a)
SE	= 0.2653	0.26	0.055	
T value	= 16.638	-7.197	8.347	
Sig.T	0.0000	0.0000	0.0000	
R^2	= 0.73896	n= 47	X_{IFISO} is Implementation factor levels.	

Source: From field survey

On the basis of the model F Significance and the t significance p-values for the predictor terms that are less than 0.0001, the null hypothesis that the coefficients for the implementation factors variable terms are not significantly different from zero is rejected. It is concluded that the levels of ISO 9001 implementation factors and the level of an organization's customer focus orientation are related. Hypothesis H_{2a} that there is a direct relationship between the levels of ISO 9001:2000 implementation factors and an organization's customer focus orientation is therefore accepted.

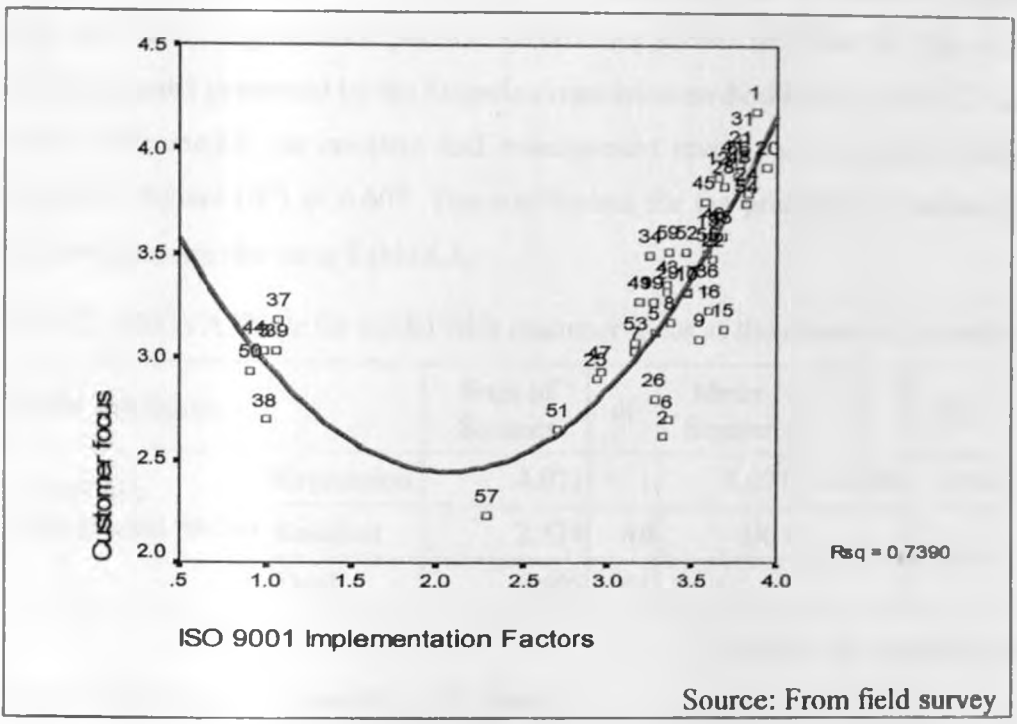
Figure 6.1 shows that the relationship fits a quadratic curve with a minimum customer focus orientation level being at the pre-ISO 9001 standard implementation levels. At this stage, the aggregated ISO 9001 implementation factor level is below threshold notwithstanding that the organization may be certified. The numbers in figure 6.2 show positions of the different participating organizations as regards implementation factor levels and associated customer focus orientation.

Figure 6.1: Model curve for ISO 9001 implementation factors and customer focus



Source: From field survey

Figure 6.2: Scatter diagram for customer focus with case identifiers



Source: From field survey

Model equation 2a represents the relationship between customer focus and the composite variable that represents the implementation factors of quality policy, quality objectives, quality manual, document control and management review. It is established in Figure 4.5 that the first four factors of quality policy, quality objectives, quality manual and document control do not appear to form a common natural grouping with customer focus nor with management review. It can therefore be reasoned that significant contributions from these ISO hard elements to the composite implementation factors variable's influence on customer focus would be most unexpected.

To confirm or disconfirm this, a multiple regression analysis, using Stepwise method, with the variables for the five implementation factors entered and removed based on the criteria of Probability-of-F-to-enter at <= .050 and Probability-of-F-to-remove at >= .100. Based on statistics computed from cases with no missing values for any variable, the variables for quality policy, quality objectives, quality manual and document control are excluded from the regression with t significant p-values greater than 0.05. The Beta In for the excluded variables is 0.125, 0.122, 0.054 and 0.204 for quality policy, quality objectives, quality manual and document control, respectively.

The regression model estimated accounts for 64 percent of the variation in customer focus, and has F. significance p-value <0.001. As shown in Table 6.2 below, the significant model generated by the Stepwise regression method has $F_{1,40} = 64.254$ and $p<0.001$. The model has constant and management review as predictors with the Adjusted R Square (R^2) of 0.607. The coefficients for the predictors of variance in customer focus are shown in Table 6.3.

Table 6.2: ANOVA Table for model with customer focus as the dependent variable

Model Predictors		Sum of Squares	df	Mean Square	F	Sig.
(Constant), Management review	Regression	4.071	1	4.071	64.254	.000
	Residual	2.534	40	.063		
	Total	6.605	41			

Source: From field survey

Table 6.3: Customer focus model coefficients

Predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tol.	VIF
(Constant)	-.362	.472		-.768	.447		
Management review	1.171	.146	.785	8.02	.000	1.00	1.00

Source: From field survey

In view of the computed t-statistics for the variables of quality policy, quality objectives, quality manual and document control of 1.017, 1.007, 0.447 and 1.586, respectively all of which have p-values > 0.1, the null hypothesis that all the coefficients are not significantly greater than zero is rejected. The alternative hypothesis that not all the coefficients for the variables that make up ISO 9001 implementation factors are significantly different from zero is accepted. It is therefore concluded that the implementation factors of quality policy, quality objectives, quality manual and document control are not associated with the organizational system outcome of customer focus.

This would mean that the objective of creation of customer focus in an organization cannot be achieved if emphasis is placed on the visible and hard elements of

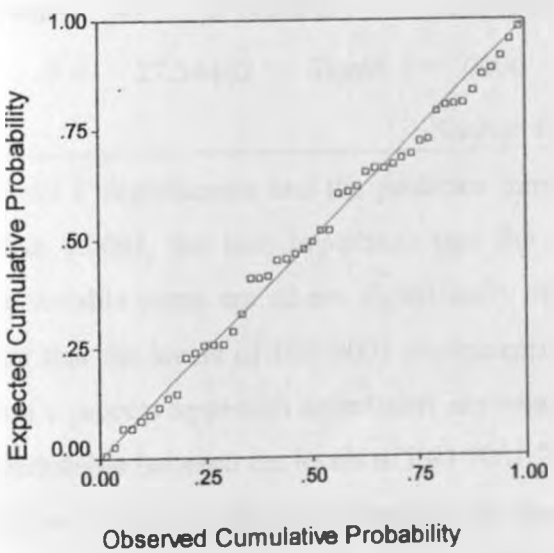
certification only. Instead, it is appropriate application of the practice of management review that will help create such an orientation in an organization. The model equation 2as represents an organization's customer focus orientation level based on the level of management review factor. Figure 6.3 shows a P-P plot of Regression Standardized Residuals that constitute the error term, E. The P-P plots show the observed probabilities for the residuals against the expected probabilities fit a 45 degree line, an indication that the error term is close to normal distribution with a mean that is close to zero.

Y_{cf}	=	1.171 X_{MR} - 0.362 + E	(model equation 2as)
SE	=	0.146 0.472	
T value	=	8.02 -.768	
Sig.T		0.000 0.447	
R^2 = 0.607		n= 41	

Y_{cf} is the customer focus outcome level, X_{MR} is management review practice factor.

Source: From field survey

Figure 6.3: P-P Plots for customer focus regression residuals.



Source: From field survey

6.2.2 Predictors of Process Approach

Table 6.1 shows that the relationship between the ISO 9001 implementation factors and process approach fits a cubic mathematical equation of the form: $Y_{pra} = b_0 + b_1X + b_2X^2 + b_3X^3 + E$. The regression model obtained from the data has Adjusted R square (Adj. R^2) = 0.53577; $F_{2,44} = 27.544$, $p < .0001$ (using the model estimation method). The significant terms for the ISO 9001 implementation factor variable in the estimated model have standardized coefficients Beta as shown below:

ISO 9001 implementation factors (IF_{ISO}) : 0.768, p = 0.8800
Square of ISO 9001 implementation factors (IF_{ISO}^2): -3.451, p <0.0001.
Cube of ISO 9001 implementation factors (IF_{ISO}^3): 4.004, p <0.0001.

The ISO 9001 implementation factors (IF_{ISO}) term has a partial statistic of 0.023146, with a p-value greater than 0.05. The tolerance for the variable term in the model estimation is less than 0.0001. The term is therefore excluded from the model equation generated. The Analysis of Variance statistics for the estimated model for the process approach are as follows:

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	2	7.4476839	3.7238420
Residuals	44	5.9486240	.1351960

F = 27.54402 Signif. F = .0000

Source: From field survey

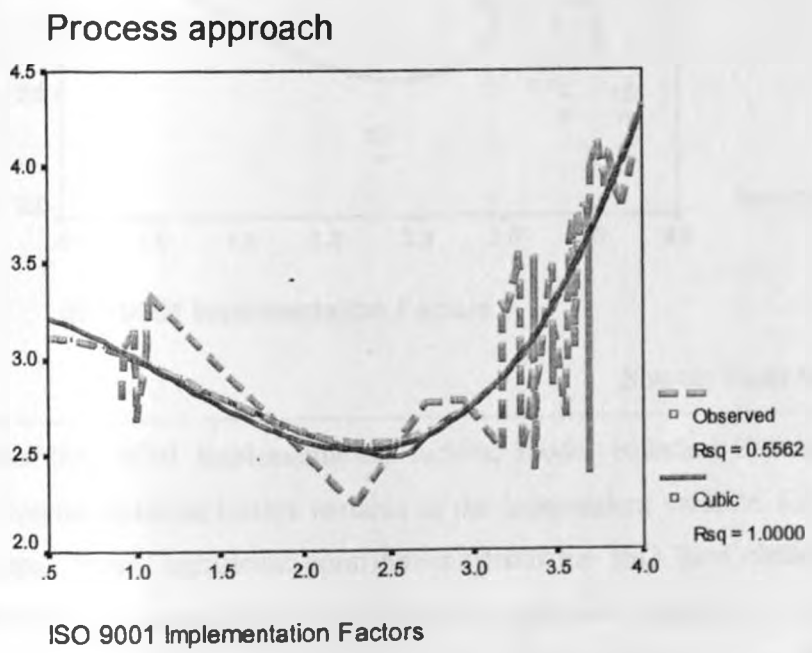
On the basis of the model F Significance and the predictor terms' t significance p-values that are less than 0.0001, the null hypothesis that the coefficients for the implementation factors variable terms are all not significantly different from zero is rejected. It is concluded that the levels of ISO 9001 implementation factors and the level of an organization's process approach orientation are related. Hypothesis H_{2b} that there is a direct relationship between the levels of ISO 9001:2000 implementation factors and an organization's process approach orientation is therefore accepted. The relationship between the ISO 9001 implementation factors and process approach can therefore be represented by model equation 2b below:

Y_{PRA}	= 3.316	- $0.436X_{IFISO}^2$	+ $0.125X_{IFISO}^3$ + E	(model equation 2b)
SE	= 0.1976	0.0947	0.0233	
T value	= 16.782	-4.611	5.350	
Sig.T	0.0000	0.0000	0.0000	
R^2 = 0.53		n= 47	X_{IFISO} is Implementation factor levels.	

Source: From field survey

Figures 6.4 and 6.5 show that the relationships involved have minimum process approach orientation levels that are below the pre-ISO 9001 standard implementation levels. At this stage, the aggregated ISO 9001 implementation factor level is below threshold notwithstanding that the organizations may be certified. The indications in the scatter graphs are that implementation that does not bring these factors above threshold levels of about 3.3 is probably going to result in the organization being less process approach oriented than it has been before implementing ISO 9001 management system.

Figure 6.4: Model curve for ISO 9001 implementation factors and process approach

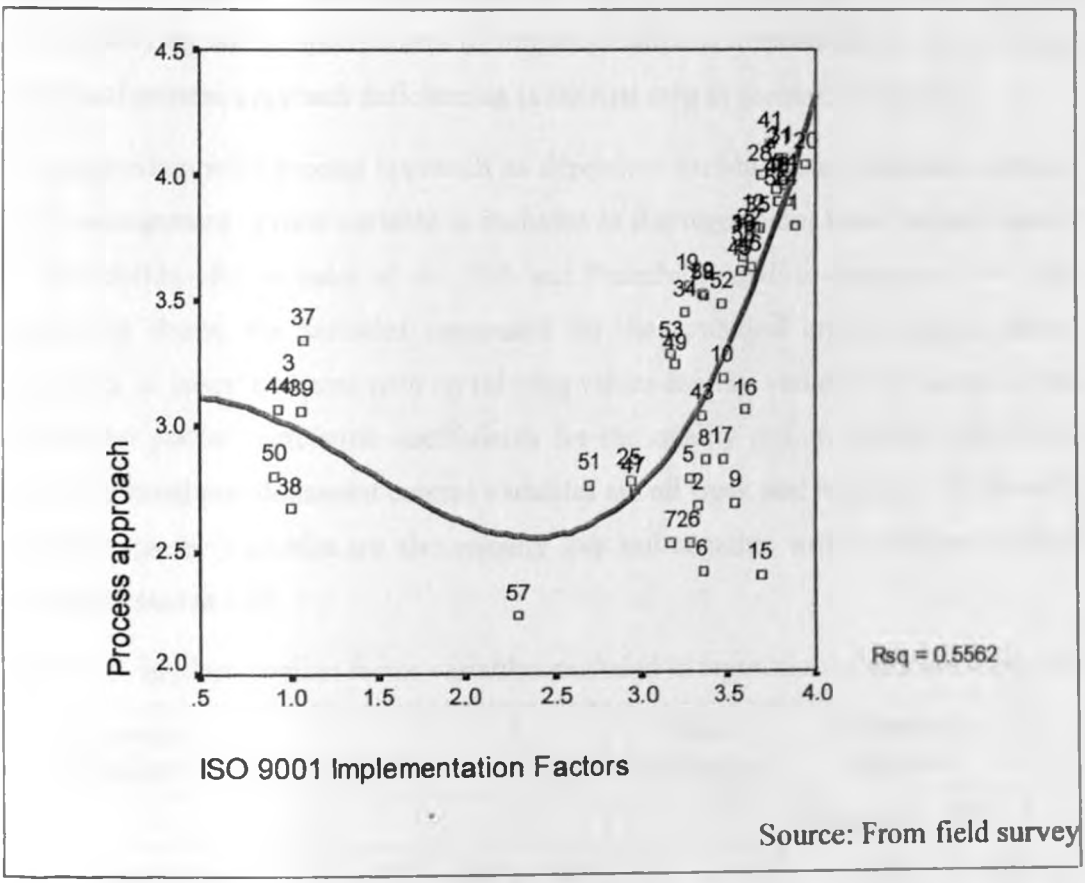


Source: From field survey

The situation with the participating organizations identified by case numbers 2, 6, 7,

15, 25, 26, 47, 51 and 57 exemplify this drop to pre-implementation levels of customer focus and process approach orientation. While case numbers 6, 25, 47, 51 and 57 are not certified, the others are certified but with implementation factors below the threshold and hence appear to have failed to make significant change in their customer focus and process approach orientation. The nature of deficiency can be assessed by determining which of the five implementation factors directly influences these organizational system outcomes.

Figure 6.5: Scatter diagram for process approach with case identifiers



Source: From field survey

As concerns ISO 9001 implementation factors, model equation 2b also has the composite implementation factors variable as the independent variable. Like the case with customer focus, significant contributions from the ISO hard elements to the composite variable's association with the process approach is unlikely in view of the distances between them. To confirm or disconfirm this, a null hypothesis, H_0, that the regression coefficients for all the five implementation factor variables, β_{0xx}, are not significantly different from zero when process approach is the dependent variable is

tested. The alternative hypothesis, H_i, is that the regression coefficients, β_{0xx}, for the different implementation factor variables are not equal.

H_o: $\beta_{0qp} = \beta_{0qo} = \beta_{0qm} = \beta_{0dc} = \beta_{0mr} = 0$

H_i: $\beta_{0qp} \neq \beta_{0qo} \neq \beta_{0qm} \neq \beta_{0dc} \neq \beta_{0mr}$

The hypotheses are tested so as to identify which one, between the five practices that form the ISO 9001 implementation factors composite variable is significantly associated with the organizational system outcome of process approach. For the organizations such as those represented by cases 2, 7, 15, and 26 in figures 6.2 and 6.5, identifying which specific area of implementation is responsible for the customer focus and process approach deficiencies is the first step to corrective actions.

In a regression with process approach as dependent variable using Stepwise method, only management review variable is included in the regression, based on the criteria of Probability-of-F-to-enter at <= .050 and Probability-of-F-to-remove at >= .100. Table 6.4 shows the statistics computed for the excluded implementation factor variables, as based on cases with no missing values for any variable. As shown in the Table, the partial correlation coefficients for the quality policy, quality objectives, quality manual and document control variables are all weak and negative. The Beta In statistics for the variables are also equally low and negative with t-statistics that are not significant at 0.05.

Table 6.4: Implementation factor variables excluded in regression of process approach

Excluded variables	Beta In	t	Sig.	Partial Correlation	Collinearity Statistics	
					Tolerance	VIF
Quality policy	-.092	-.695	.491	-.111	.638	1.568
Quality objective	-.099	-.762	.450	-.121	.649	1.540
Quality manual	-.153	-1.216	.231	-.191	.681	1.468
Document control	-.071	-.501	.619	-.080	.557	1.797

Source: From field survey

The regression model estimated accounts for 52 percent of the variance in process approach and has F- significance p-value <0.001. As shown in Table 6.5, the significant model generated by the Stepwise regression method has $F_{1,40} = 51.45$ and

$p<0.001$. Like the customer focus.model, the process approach model has constant and management review as predictors. The model has Adjusted R Square (R^2) of 0.552 with the coefficients for the predictors of variance in process approach as shown in Table 6.6.

Table 6.5: ANOVA Table for model with process approach as the dependent variable

Model predictors		Sum of Squares	df	Mean Square	F	Sig.
(Constant), Management review	Regression	6.312	1	6.312	51.451	.000
	Residual	4.907	40	.123		
	Total	11.219	41			

Source: From field survey

Table 6.6: Process approach model coefficients

Predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	S.E	Beta			Tol.	VIF
(Constant)	-1.325	.656		-2.019	.050		
Management review	1.458	.203	.750	7.173	.000	1.00	1.00

Source: From field survey

In view of the computed t-statistics for the variables of quality policy, quality objectives, quality manual and document control of -0.695, -0.762, -1.216 and -0.501, respectively, and with p-values greater than 0.05, the null hypothesis that all the coefficients in process approach model are not significantly greater than zero is rejected. The alternative hypothesis that at least one of the coefficients for the variables that make up ISO 9001 implementation factors in a process approach model are significantly different from zero is accepted. It is therefore concluded that of the implementation factors of quality policy, quality objectives, quality manual, document control and management review,. management review is the factor that is associated with the organizational system outcome of process approach.

This would mean that the objective of creation of process approach orientation in an organization cannot be achieved if emphasis is placed on the visible and hard elements of certification. Instead, it is the appropriate application of the practice of management review that will help create such an orientation in an organization. The

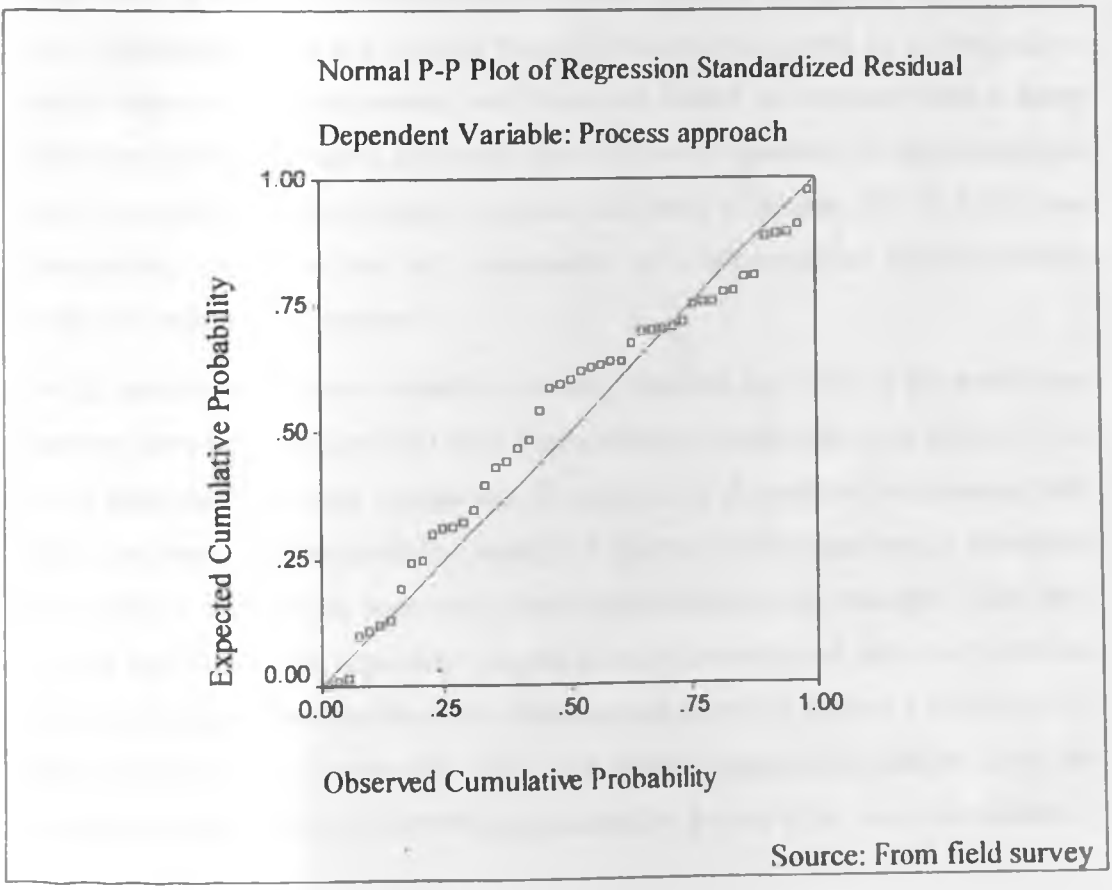
model equation 2bs can be used to explain an organization's process approach orientation level based on the level in the organization of the management review factor. Figure 6.6 shows a P-P plot of Regression Standardized Residuals that constitute the error term, E. The P-P plots show the observed probabilities for the residuals against the expected probabilities fit a 45 degree line, an indication that the error term is close to normal distribution with a mean that is close to zero. Like the case with customer focus residuals, some slight deviation is experienced at lower levels.

Y_{pra} =	$1.458X_{MR}$	− 1.325 + E	(model equation 2bs)
SE =	0.203	0.656	
T value =	7.173	-2.019	
Sig.T	0.000	0.05	
R^2 = 0.552		n= 41	

Y_{pra} is process approach orientation level, X_{MR} is management review practice factor.

Source: From field survey

Figure 6.6: P-P Plots for process approach regression residuals.



Source: From field survey

6.2.3 Conceptual model

Table 6.1 shows model estimates for customer focus and process approach outcome variables with a composite of ISO 9001 implementation factors (IF_{ISO}) as predictor variable. The Table shows that quadratic or cubic models with the implementation factors composite as predictor variable explain about 72 percent and 53 percent of variation in customer focus and process approach respectively. Figure 6.2 shows that the line of best fit for the observations relating to customer focus in the organizations that participated in the research is a quadratic mathematical function with ISO implementation factors variable as a predictor and explains over 70 percent of the variation in customer focus. As shown in figures 6.4 and 6.5, over 50 percent of variation in observed values of process approach can be explained by a cubic mathematical model with the implementation factors variable as a predictor.

However, as shown in Table 7.3, a linear regression of customer focus upon the five implementation factors leaves only management review in the model. Model equation 2as, with R Square (R^2) of 0.607, has management review, MR, as the only component of ISO 9001 implementation factors variable associated with customer focus. Similarly, Table 6.4 lists all four implementation factors of quality policy, quality objectives, quality manual and document control as excluded from a linear regression model of process approach upon all five components of implementation factors variable. Therefore model equation 2bs, with R Square (R^2) of 0.552, has management review as the only component of implementation factors variable associated with process approach.

As the significant predictor variable in model equations 2as and 2bs, the association between customer focus and ISO 9001 implementation factors appear to be solely due to the management review component. To confirm or disconfirm this, management review, as the significant predictor variable in the two model equations, is entered as the predictor variable in successive model estimations, with customer focus and process approach as the dependent variables, using quadratic and cubic mathematical functions. Models based on these two functions are shown in Table 6.1 to explain the greatest proportions of customer focus and process approach variation when the composite variable for the ISO 9001 implementation factors is the predictor variable.

The resulting estimated model for customer focus has Adjusted R Square (R^2) of 0.69 with management review component as predictor compared to Adjusted R Square (R^2) of 0.73 when the composite ISO 9001 implementation factor (IF_{ISO}) variable is the predictor. Similarly, the estimated process approach model has Adjusted R Square (R^2) of 0.63 with management review as the predictor variable compared to 0.53 when the composite ISO 9001 implementation factor (IF_{ISO}) variable is the predictor. It can therefore be concluded that the variance in customer focus and process approach explained by the composite implementation factors variable is probably wholly due to the management review component.

The view that emerges is consistent with links H_{2a} and H_{2b} in the conceptual framework in Figure 2.3. However, the exclusive role of management review in the creation of customer focus and process approach orientation in the organizational system is not affirmed unless rival theoretical possibilities can be eliminated. One such theoretical possibility is that that quality policy as an embodiment of leadership principle is a significant predictor of the application of management review practice. Another is that the top management's activities connected with the formulation of quality objectives can also influence the extent management review as a practice is adopted. Finally, the quality manual as a vehicle through which the management system is superimposed on the organization's basic structure and operating mechanism would probably have some predictive association with the management review.

These theoretical possibilities are examined by testing the following null hypothesis, H_o: that the regression coefficients for all the four implementation factor variables of quality policy, quality objectives, quality manual and document control, β_{0xx}, in a multiple regression model with management review as dependent variable are not significantly different from zero. The alternative hypothesis, H_i, is that at least one of the regression coefficients, β_{0xx}, is significantly different from zero. The hypotheses to be rejected or accepted are as set out below:

$$H_o: \beta_{0qp} = \beta_{0qo} = \beta_{0qm} = \beta_{0dc} = 0$$

$$H_i: \beta_{0qp} \neq \beta_{0qo} \neq \beta_{0qm} \neq \beta_{0dc} \neq 0$$

Tables 6.7 and 6.8 show the regression statistics computed following a regression of management review upon the variables representing quality policy, quality objectives, quality manual and document control. The computed t-statistics in Table 6.7 are all not significant at p = 0.05 except for the document control variable. However, the Eigenvalue statistic for the document control is shown in Table 6.8 as 0.001, a value too close to zero for the variable to be left in the regression model. The collinearity statistics in Table 6.7 also give a VIF well above 10, an indication that many other variables have contributed to the variable's role in explaining the dependent variable.

On the basis of the coefficients' t-statistics that are not significant at 0.05, the null hypothesis that the coefficients are not significantly different from zero is accepted in the cases of quality policy, quality objectives, and quality manual. On the basis of Eigenvalue that is close to zero, an indication of very low importance of the factor, document control variable is excluded from the model. It can therefore be concluded that management review as a prescribed practice of ISO 9001 standard is independent of the other implementation factors and hence, the outcome of its application will also be independent of the levels of the other factors of ISO 9001 implementation.

Table 6.7: Coefficients in a regression of management review

Predictor variables	Unstandard-ized Coefficients		Standard-ized Coefficients	t	Sig.	Correlations			VIF
	B	Std. Error	Beta			Zero-order	Partial	Part	
(Constant)	.660	.416		1.589	.121				
Quality policy	-.020	.214	-.083	-.091	.928	.602	-.015	-.009	84.82
Quality objective	-.090	.226	-.381	-.399	.692	.592	-.065	-.039	93.08
Quality manual	-.256	.138	-1.086	-1.858	.071	.565	-.292	-.184	34.99
Document control	1.093	.213	2.191	5.128	.000	.697	.645	.507	18.69

Source: From field survey

Table 6.8: Collinearity Diagnostics in the regression of management review

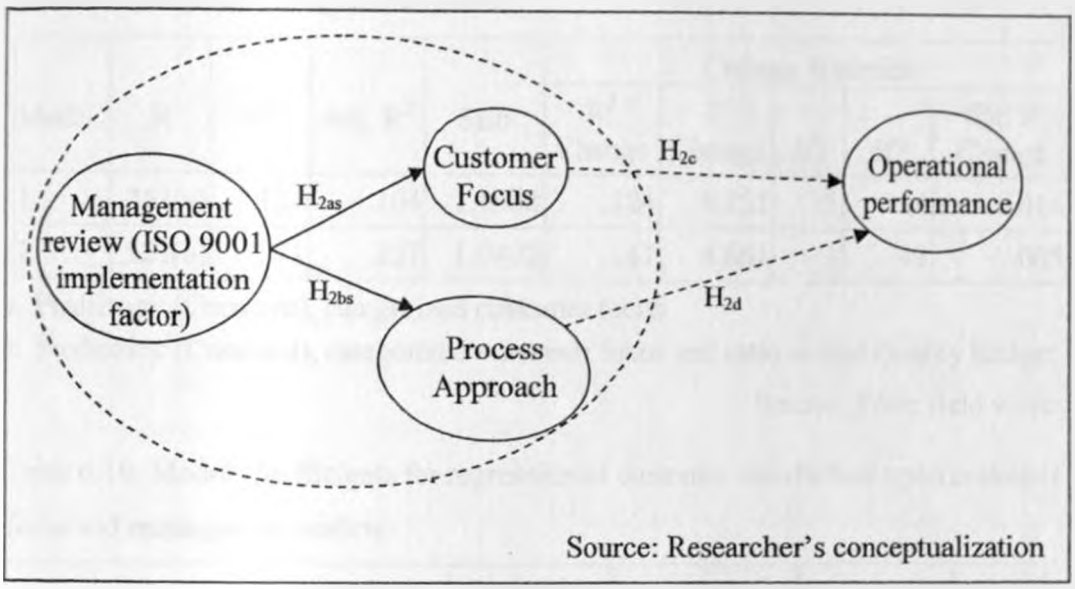
Dimension	Eigen-value	Condition Index	Variance Proportions				
			(Constant)	Quality policy	Quality objective	Quality manual	Document control
(Constant)	4.872	1.000	.00	.00	.00	.00	.00
Quality policy	.123	6.286	.02	.00	.00	.00	.00
Quality objective	.003	40.677	.01	.13	.04	.95	.01
Quality manual	.001	62.633	.85	.00	.20	.01	.88
Document control	.001	72.689	.11	.87	.76	.04	.11

Source: From field survey

The result of the above hypothesis test eliminates a rival theoretical possibility: that one or more of the other implementation factors, by actions of the fundamental principles they embody, influence the level of application of the practice of management review, and hence has indirect association with customer focus and process approach outcomes. The data from the participating organizations therefore supports the proposition represented inside the dashed circle in figure 6.7. This proposition is that customer focus and process approach are outcomes of ISO 9001 implementation but with a qualification. The qualification is that only management review has any association with these two organizational system outcomes.

The dashed circle in figure 6.7 represents the proposition that ISO 9001 certification, through one or more of the practices that make up the implementation construct, promotes an internal environment of customer focus and process approach. The theoretical reasoning in the conceptual framework in Figure 2.3 is that such an internal environment is associated with higher level output outcome. For this proposition to hold, the existence of direct link between the management review as an ISO 9001 prescribed practice and output outcomes has to be eliminated. The existence of a direct links from the customer focus and process approach variables to the output outcomes must then be confirmed.

Figure 6.7: Management review and organizational system outcomes linkage.



6.2.4 Customer satisfaction, management review and customer focus

Regression of customer satisfaction upon the variables of management review, customer focus, both being nominal scaled, and the ratio scaled quality budget variable returns results in the two estimated models in Table 6.9. The models are estimated using Stepwise method of regression, with cases excluded pairwise, and Probability-of-F-to-enter <= .050, and Probability-of-F-to-remove >= .100. Model 1 has the nominal scaled customer focus and the constant as predictors, hence unsuitable due measurement scale. With adjusted R Square (R^2) of 0.237, $F_{2,43}$ = 8.000, p = 0. .001, model 2 has the ratio scaled quality budget in addition to the nominal scaled customer focus variable, and hence is the suitable regression model.

The t-statistic for the customer focus variable shown in Table 6.10 is significant at p < 0.05. The Table also shows the unstandardized coefficient for quality budget variable is less than 0.0001, and hence the variable's role can be ignored. Table 6.11 shows that the excluded variable of management review has t-statistic with p-value > 0.4 in all the models estimated.

Table 6.9: Model summary Table of regression of customer satisfaction upon customer focus and management review.

Model	R	R^2	Adj. R^2	SEb	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.353(a)	.124	.104	1.1368	.124	6.251	1	44	.016
2	.521(b)	.271	.237	1.0492	.147	8.661	1	43	.005

a Predictors: (Constant), categorized customer focus

b Predictors: (Constant), categorized customer focus and ratio scaled Quality Budget

Source: From field survey

Table 6.10: Model Coefficients for regression of customer satisfaction upon customer focus and management review

Model	Model predictors	Unstandard-ized Coefficients		Standard-ized Coefficients	t	Sig.	Correlations		VIF
		B	SEb	Beta			Partial	Part	
1	(Constant)	5.639	.534		10.566	.000			
	Customer focus	.839	.335	.353	2.500	.016	.353	.353	1.000
2	(Constant)	5.148	.520		9.900	.000			
	Customer focus	.951	.312	.400	3.049	.004	.422	.397	1.015
	Quality Budget	5.867E-08	.000	.386	2.943	.005	.409	.383	1.015

Source: From field survey

Table 6.11: Excluded Variables from customer satisfaction regression model with customer focus as predictor

Model		Beta In	t	Sig.	Partial Correlation
1	Quality Budget	.386	2.943	.005	.409
	Management review	.144	.762	.450	.115
2	Management review	.102	.583	.563	.090

Source: From field survey

As the computed t-statistics for the management review variable is not significant at 0.05 in estimated model 2, the hypothesis that there is a direct and significant association between management review and customer satisfaction is rejected. The t-statistic for customer focus has p-value < 0.05 in the estimated model 2. Accordingly, the hypothesis that there is a direct and significant association between customer focus and customer satisfaction is accepted. It can therefore be concluded that management review factor's influence on customer satisfaction is not direct but through other organizational system outcomes the factor promotes and customer focus is one. It can also be concluded that creation of customer focus orientation is associated with improved customer satisfaction.

Tests of the above hypotheses confirm the existence of a direct link from customer focus to the output outcome of customer satisfaction. The results of the hypothesis tests also eliminate the rival theory of direct link between management review and customer satisfaction. The relationship covered within the long dash dotted circle in figure 6.8 is therefore confirmed as good explanation for how ISO 9001 implementation factors influence customer satisfaction. Link H_{2c} is also confirmed when customer satisfaction is the output outcome of interest.

6.2.5 Customer satisfaction, management review and process approach

Regression of customer satisfaction upon the variables of management review, customer focus, both being nominal scaled, and the ratio scaled quality budget variable returns results in the two estimated models in Table 6.12. The models are estimated using Stepwise method of regression, with cases excluded pairwise, and Probability-of-F-to-enter <= .050, and Probability-of-F-to-remove >= .100. Model 1 has the nominal scaled process approach and the constant as predictors, hence unsuitable due measurement scale. With adjusted R Square (R^2) of 0.207, $F_{2,43}$ = 6.889, p = 0.003, model 2 has the ratio scaled quality budget in addition to the nominal scaled process approach variable, and hence is the suitable regression model.

The t-statistic for the process approach variable shown in Table 6.13 is significant at p < 0.05. The Table also shows the unstandardized coefficient for quality budget variable is less than 0.0001, and hence the variable's role can be ignored. Table 6.14

shows that the excluded variable of management review has t-statistic with p-value > 0.50 in all the models estimated.

Table 6.12: Model summary Table of regression of customer satisfaction upon process approach and management review.

Model	R	R^2	Adj. R^2	SEb	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.350(a)	.123	.103	1.1378	.123	6.162	1	44	.017
2	.493(b)	.243	.207	1.0695	.120	6.803	1	43	.012

a Predictors: (Constant), Categorized process approach

b Predictors: (Constant), categorized process approach, Quality Budget

Source: From field survey

Table 6.13: Model Coefficients for regression of customer satisfaction upon process approach and management review.

Model	Model predictors	Unstandard-ized Coefficients		Standard-ized Coefficients	t	Sig.	Correlations		VIF
		B	SEb	Beta			Partial	Part	
1	(Constant)	5.647	.534		10.572	.000			
	Process approach	.833	.336	.350	2.482	.017	.350	.350	1.000
2	(Constant)	5.327	.517		10.307	.000			
	Process approach	.854	.316	.359	2.706	.010	.382	.359	1.001
	Quality Budget	5.263 E-08	.000	.346	2.608	.012	.370	.346	1.001

Source: From field survey

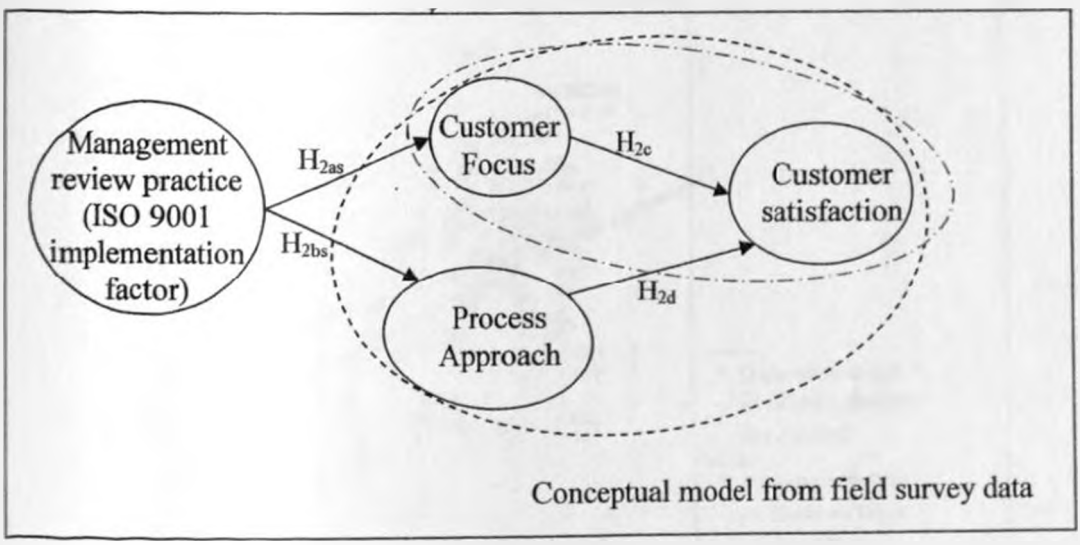
Table 6.14: Excluded Variables from customer satisfaction regression model with process approach as predictor

Model		Beta In	t	Sig.	Partial Correlation
1	Quality Budget	.346	2.608	.012	.370
	Management review	.118	.556	.581	.084
2	Management review	.118	.591	.557	.091

Source: From field survey

The t-statistic for process approach has p-value < 0.05 in the estimated model 2. Accordingly, the hypothesis that there is a direct and significant association between process approach and customer satisfaction is accepted. It can therefore be concluded that process approach orientation of an organization is associated with improved customer satisfaction. Link H_{2d} in figures 6.7 and 6.8 is therefore supported by the data when customer satisfaction is the output outcome of interest. The relationships within the dashed circle (in black) are therefore supported by the data.

Figure 6.8: Organizational system outcomes and customer satisfaction linkage.



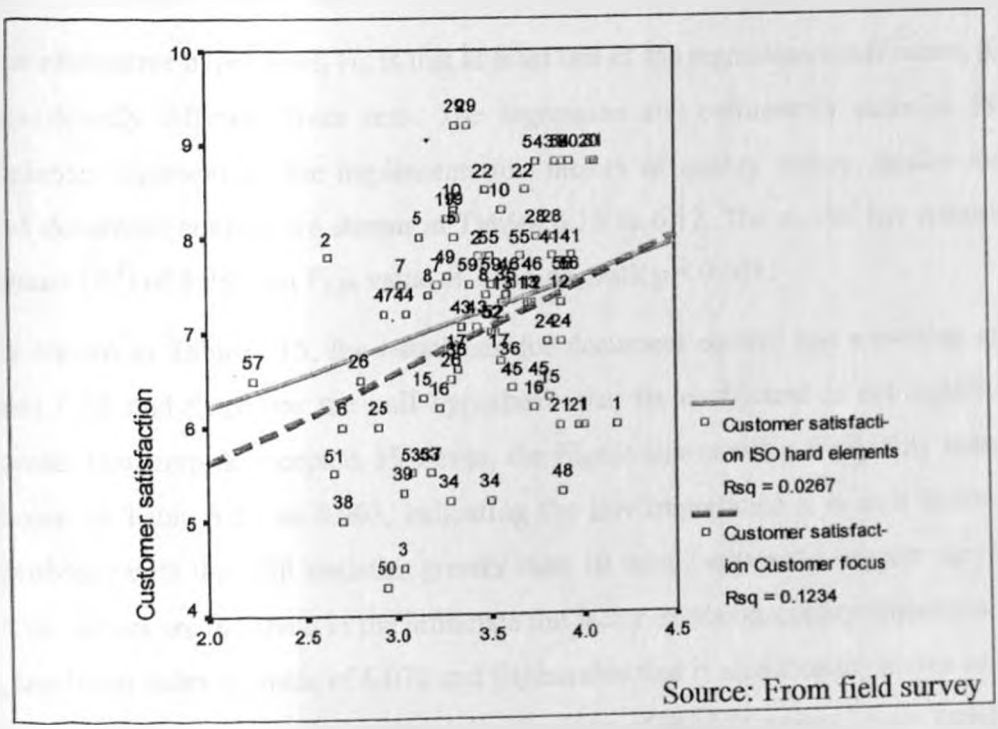
6.2.6 ISO hard elements as predictors of customer satisfaction

It has been established that there is no direct link between management review and customer satisfaction. It is now established that there are direct links from customer focus to customer satisfaction, and from process approach to customer satisfaction as

represented within the dashed circle in figure 6.8. The theoretical framework presented in the figure is therefore firmly established when customer satisfaction is the output outcome of interest. Links H_{2as}, H_{2bs}, H_{2c} and H_{2d} are confirmed. The conceptual framework in Figure 2.3 is established as a better representation of the phenomena than that in Figure 2.2, when the output outcome of interest is customer satisfaction.

The estimated model of customer satisfaction with the composite ISO hard elements variable as predictor shown in figure 6.9 explains less than 3 percent of variation in customer satisfaction. However, ANOVA statistics for a more refined model has a quadratic model as the closest fitting model with $F_{2,29} = 0.609$, $p = 0.55$, with the terms for the predictor variable significant at $p > 0.500$. In view of the t-statistics for the ISO hard elements variable's terms which are not significant at 0.05 it can be concluded that ISO 9001 standard's sole path to improve customer satisfaction is through the implementation factor variable of management review. This path is through the promotion of customer focus and process approach.

Figure 6.9: ISO hard elements, customer focus - customer satisfaction association



Source: From field survey

6.2.7 Predictors of overall performance as output outcome

The model equation 1b in section 5.3.3 identifies management review and only one other ISO 9001 implementation factor, quality objectives, as predictors in a regression of overall performance upon ISO 9001 implementation factor variables. A possible predictive influence over management review variable has been eliminated and support for the conceptual relationships represented by links H_{2as} and H_{2bs} within the dashed circle in figure 6.7 tested. Further examination of the proposition requires testing to determine if any of the implementation factor variables excluded from the model equation could be having indirect influence on overall performance through influence on quality objectives. This is achieved by testing a null hypothesis that the regression coefficients for all the three implementation factor variables of quality policy, quality manual and document control, β_{0xx}, in a multiple regression model with quality objectives as dependent variable are not significantly different from zero. Mathematically, this requires test for the following null and alternative hypotheses:

$$H_o: \beta_{0qp} = \beta_{0qm} = \beta_{0dc} = 0$$

$$H_i: \beta_{0qp} \neq \beta_{0qm} \neq \beta_{0dc} \neq 0$$

The alternative hypothesis, H_i, is that at least one of the regression coefficients, β_{0xx}, is significantly different from zero. The regression and collinearity statistics for the variables representing the implementation factors of quality policy, quality manual and document control are shown in Tables 6.15 to 6.17. The model has Adjusted R Square (R^2) of 0.988, an $F_{3,38}$ value of 1166.48, with $p < 0.001$.

As shown in Table 6.15, the t-statistics for document control has a p-value greater than 0.05 and therefore the null hypothesis that its coefficient is not significantly greater than zero is accepted. However, the Eigenvalue statistic for quality manual is shown in Table 6.16 as 0.003, indicating the low importance it is as a factor. This combined with the VIF statistics greater than 10 would appear to suggest very many other factors are involved in the influence the factor exerts on quality objectives. With a condition index statistic of 6.070 and Eigenvalue that is significantly above zero, the null hypothesis cannot be accepted in the case of quality policy, even though the correlations coefficients indicate that what is explained by the factor is also explained by other variables.

Table 6.15: Coefficients in a regression of quality objectives

Predictor variables	Unstandard-ized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	SEb	Beta			Zero-order	Partial	Part	Tol.	VIF
(Constant)	-.160	.298		-.537	.594					
Quality policy	.695	.105	.699	6.634	.000	.993	.733	.112	.025	39.301
Quality manual	.254	.090	.254	2.810	.008	.985	.415	.047	.035	28.973
Document control	.096	.153	.046	.629	.533	.970	.102	.011	.054	18.504

Source: From field survey

Table 6.16: Collinearity Diagnostics in the regression of quality objectives.

Dimension	Eigenvalue	Condition Index	Variance Proportions			
			(Constant)	Quality policy	Quality manual	Document control
(Constant)	3.891	1.000	.00	.00	.00	.00
Quality policy	.106	6.070	.03	.01	.01	.00
Quality manual	.003	37.781	.03	.54	.99	.03
Document control	.001	57.954	.95	.46	.00	.97

Source: From field survey

Table 6.17: ANOVA Table for the quality objectives model

Model predictors		Sum of -Squares	df	Mean Square	F	Sig.
(Constant), Quality policy	Regression	67.906	3	22.635	1166.41	.000
	Residual	.737	38	.019		
	Total	68.643	41			

Source: From field survey

It can therefore be concluded that quality policy has significant influence on the appropriateness of quality objectives and hence indirectly influences overall performance through its influence on quality objectives. The model explains 98

percent of the variance in quality objectives, and can be represented as shown in model equation 3.

(Model equation 3)

Y_{qo} = $0.695X_{QP}$ - 0.160 + E

SE = 0.105 0.298

T value = 6.634 -.537

Sig.T 0.000 0.594

R^2 = 0.98 n = 41.

Y_{qo} is quality objectives factor, X_{QP} is the quality policy factor.

Source: From field survey

A consideration of the predictors in model equation 1b and model equation 3 indicates that the theoretical framework specified for customer satisfaction also fits overall performance output outcome with the additional influence of quality policy through quality objectives. The theoretical framework therefore confirms the relative suitability of the conceptual framework in Figure 2.3 over the one in Figure 2.2. As shown in figure 7.10, the most important of the five ISO 9001 implementation factors in achievement of overall performance goals appear to be quality policy, quality objectives and management review.

6.3 Enablers and drivers of performance in ISO 9001 certified organizations

For an operations strategy to achieve the goals of an organization, it must achieve objectives on two directions of focus. In the external focus it must meet customer satisfaction objectives. Achievement of these externally focused objectives is through links H_{2c} and H_{2d} in Figure 6.10 with the drivers of performance being the two organizational system variables of customer focus and process approach.

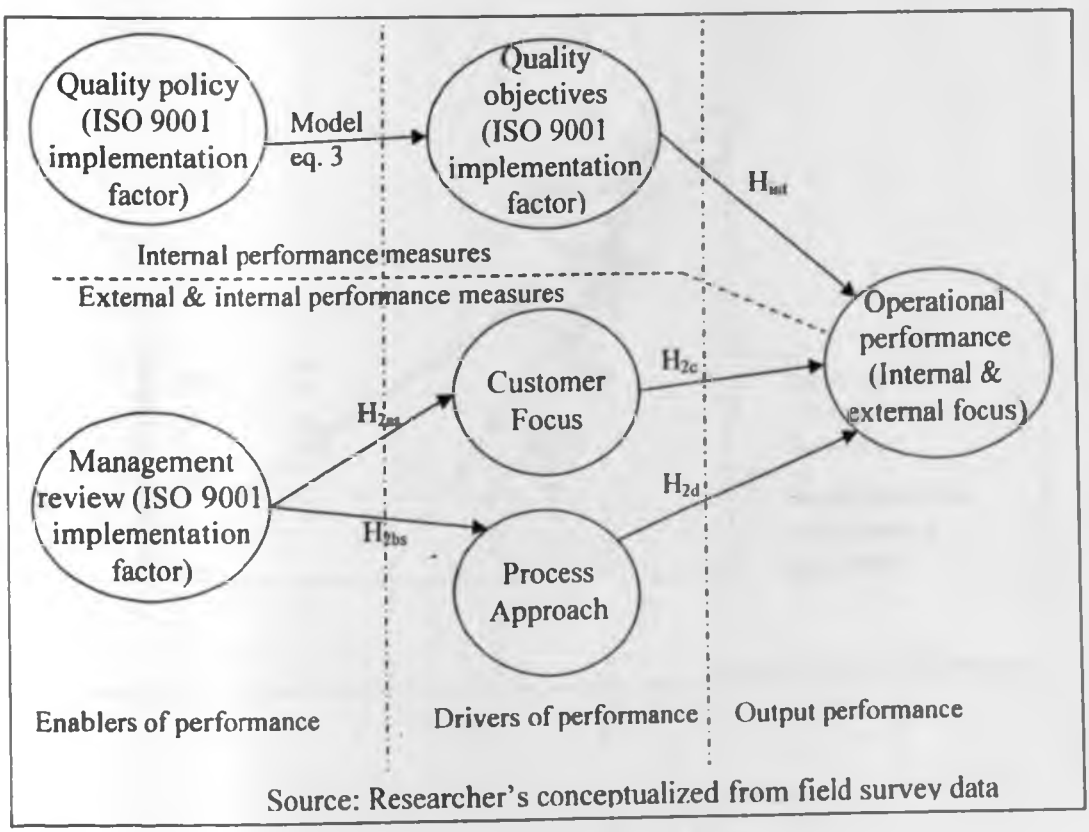
In the internal focus, the organization seeks to meet objectives in the criteria of cost and value delivered as represented by the overall performance measures. Achievement of these internally focused objectives is essentially driven by links H_{int}, H_{2c} and H_{2d} in Figure 6.10. An interpretation of the results of hypotheses tests reported in this chapter is that performance improvement in organizations using ISO 9001 in their organizational change strategies is through enabling the environment in

which process approach to work is emphasized and work activities are focused on customer value creation. The enabler for this environment is management review.

According to this interpretation, improvement of performance in the internal measures would, in addition to the environment described, require everyone to be focused through objectives that are accepted by members as important and should include need for continuous search for improvement opportunities. Having objectives that includes the needs of all interested parties, and organizational learning needs constitute one of the drivers to performance. ISO 9001 management system standard-based change strategy would therefore be reliant on quality objectives, customer focus and process approach as the drivers to performance.

What emerges from the data is that two of the practices prescribed as part of the implementation factors are responsible for enabling these drivers. These enablers of performance, through the promotion of the drivers to performance are management review and quality policy. Figure 6.10 shows how these factors link to influence performance in both external and internal directions of focus.

Figure 6.10: Performance model in ISO 9001 certified organization.

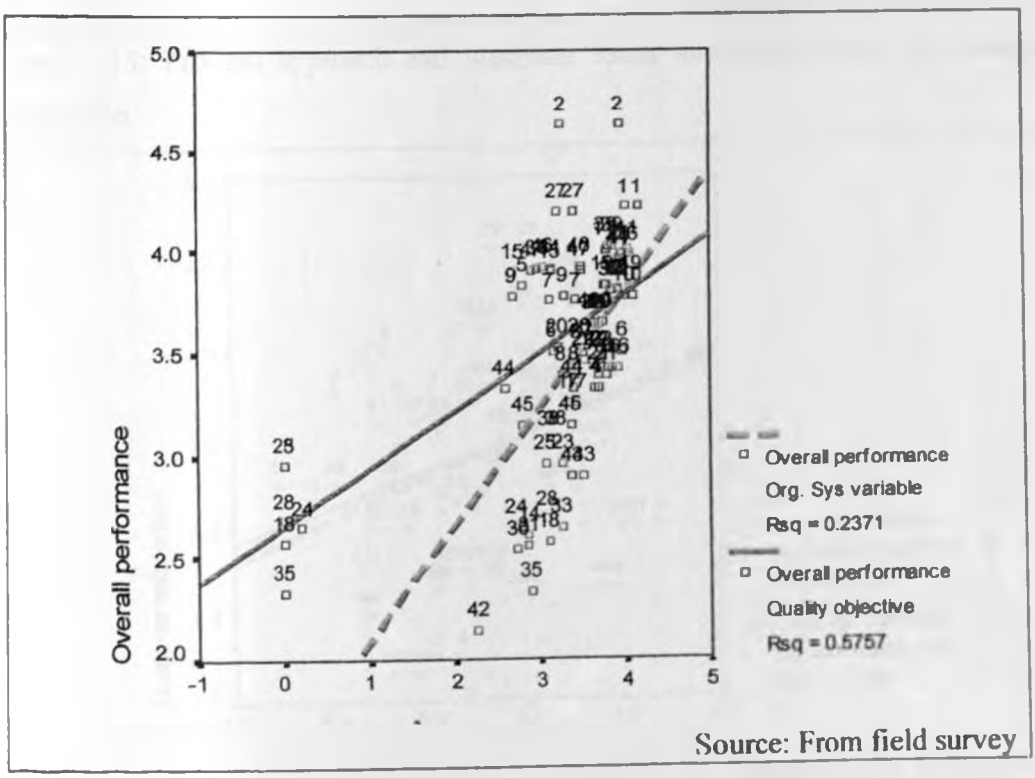


Source: Researcher's conceptualized from field survey data

6.4 Factor Interactions

The regression fitting lines and associated R Square (R^2) statistics in figures 6.11, 6.12 and 6.13 suggest effects of interactions between factor variables endogenous to the theoretical framework in figures 6.8 and 6.10, would probably be significant. In the theoretical framework in figure 6.10, drivers of performance are indicated to be the organizational system outcome variables of customer focus and process approach as well as the ISO hard element of quality objectives. The predictors of these drivers of performance are part of the integrated ISO 9001 implementation factor practices. To test the significance of the effect of interaction between these performance drivers, successive multiple regressions were completed with the products of the two-level categorized variables representing these drivers of performance and a ratio-scaled quality budget as predictors in the models.

Figure 6.11: Composite organizational system variable and quality objectives interaction



Source: From field survey

Figure 6.12: Process approach and customer focus interaction effect on overall performance

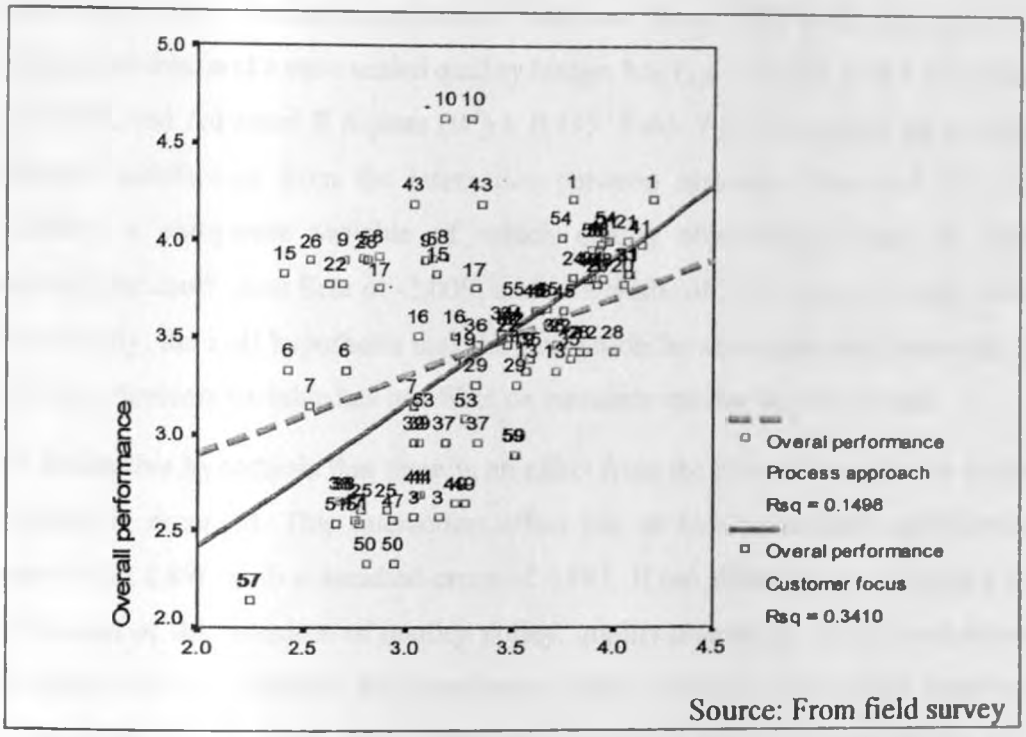
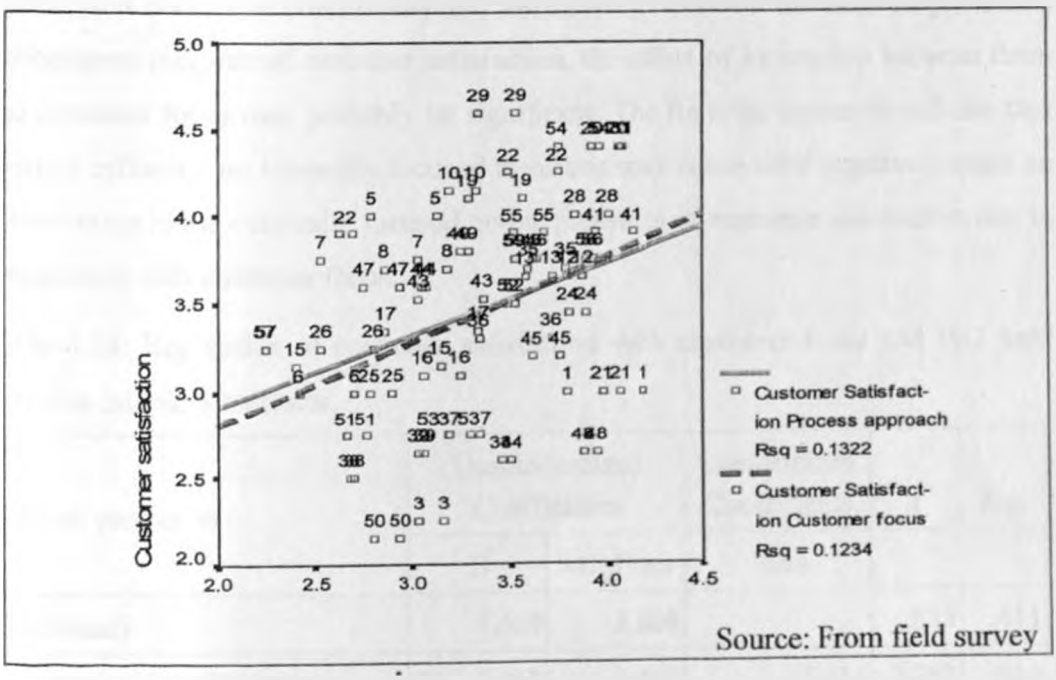


Figure 6.13: Process approach and customer focus interaction effect on customer satisfaction



6.4.1 Customer focus and ISO hard elements interaction effects

Using enter method, the significant model obtained from a regression of customer satisfaction upon nominal variables of customer focus, ISO hard elements, their product variable, and a ratio scaled quality budget has $F_{4,27} = 4.090$, with F.Significant $p = 0.010$, and Adjusted R Square (R^2) = 0.285. Table 7.18 shows that the effect on customer satisfaction from the interaction between customer focus and ISO hard elements, a composite variable of which quality objectives is part of, has a standardized coefficient Beta of -2.009, and a t-statistic of 2.123 with a p-value <0.05. Accordingly, the null hypothesis that the interaction between customer focus and the ISO hard elements variable has no effect on customer satisfaction is rejected.

The alternative hypothesis that there is an effect from the interaction between the two variables is accepted. This interaction effect has an Unstandardized coefficient of negative (-) 1.896 with a standard error of 0.893. It can therefore be concluded that application of the practices of quality policy, quality objectives, quality manual and document control interacts with customer focus orientation to affect negatively customer satisfaction as an output outcome. This would appear to suggest that, while quality objectives and the other ISO hard elements factors of quality policy, quality manual and document control may not have direct effect on the externally focused performance measure of customer satisfaction, the effect of interaction between them and customer focus may probably be significant. The findings appear to indicate that positive influence on internally focused measures may come with negative impact on achievement in the externally focused output measures of customer satisfaction due to interactions with customer focus.

Table 6.18: Regression of customer satisfaction with customer focus and ISO hard elements interaction effects

Model predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.509	1.808		.835	.411
Customer focus (2-levels)	3.363	1.217	1.414	2.763	.010
ISO hard elements (2-levels)	3.324	1.559	1.404	2.132	.042

Table 6.18 continues

Model predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
ISO hard elements x Customer focus (Interaction term)	-1.896	.893	-2.009	-2.123	.043
Quality Budget (ratio scale)	4.032E-08	.000	.265	1.620	.117

Dependent Variable: Customer satisfaction survey score

Source: From field survey

The scatter graphs in Figure 4.12 show that these ISO hard elements have little effect on customer satisfaction. Instead, it is the systemic factor variables that include organizational system outcome variables of customer focus and process approach and implementation factor variable of management review that are shown in Tables 5.7, 6.10 and 6.13 as predictors of customer satisfaction. The result of the test of the above null hypothesis indicates that one or more of the ISO hard elements variable components interact with customer focus orientation with a negative effect on customer satisfaction.

6.4.2 Process approach and ISO hard elements interaction effects

Using enter method, the significant model obtained from a regression of customer satisfaction upon nominal variables of process approach, ISO hard elements, their product variable, and a ratio scaled quality budget has $F_{4,29} = 4.646$, with F.Significant $p = 0.018$, R Square (R^2) = 0.243 and Adjusted $R^2 = 0.190$. Table 6.19 shows that the predictors in all the models except model 3 have t-statistics that are not significant at $p < 0.05$. The Table also shows that the product variable representing the effect of the interaction between process approach and the ISO hard elements has a computed t-statistic of -0.512, significant at p-value = 0.613.

In view of the t-statistic that is significant at $p > 0.05$, the null hypothesis that the interaction between process approach and the ISO hard elements has no significant effect on customer satisfaction is accepted. It is concluded that the association between process approach orientation in an organization is not affected by the implementation of the ISO 9001 practices of quality policy, quality objectives, quality

manual and document control. The results of the regression would appear to suggest that process approach has no moderating influence on the relationship between the ISO hard elements components of ISO 9001 management system standard and customer satisfaction as a measure of output outcome performance.

Table 6.19: Regression of customer satisfaction with process approach and ISO hard elements interaction effects

Model	Predictors of customer satisfaction	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.286	2.013		2.130	.042
	ISO hard elements (2 levels)	.919	1.669	.388	.550	.587
	Quality Budget	4.867E-08	.000	.320	1.814	.081
	Process approach (2 levels)	1.483	1.371	.624	1.082	.289
	ISO hard elements x Process approach (Interaction effect)	-.497	.970	-.538	-.512	.613
2	(Constant)	5.240	.754		6.951	.000
	ISO hard elements (2 levels)	.093	.426	.039	.218	.829
	Quality Budget	5.308E-08	.000	.349	2.117	.043
	Process approach (2 levels)	.817	.427	.344	1.916	.066
3	(Constant)	5.327	.629		8.468	.000
	Quality Budget	5.263E-08	.000	.346	2.142	.041
	Process approach (2 levels)	.854	.384	.359	2.223	.034

Source: From field survey

6.4.3 Process approach and customer focus interaction effects

Figure 7.13 also shows non parallel model fitting lines for customer focus and process approach as independent variables with customer satisfaction as dependent variables. A multiple regression of customer satisfaction upon the two predictor variables and their product, CF.PRA, results in a model in which the product variable representing the interaction term has a standardized coefficient Beta of 0.367, $p < 0.05$. The interaction terms has unstandardized coefficient of 0.151, standard error of 0.07 and t-

statistic of 2.159. The null hypothesis that there is no effect on customer satisfaction from the interaction between customer focus and process approach is therefore rejected. However, the effect of the interaction between the two organizational system variables on customer satisfaction is positive.

Similarly, a regression of overall performance upon customer focus, process approach and the product of the two variables, representing the interaction term returns product term t-statistics of -0.959 with significant $p > 0.05$. Similar non–significant p-values are reported with the dimensions of overall performance. Table 6.20 lists the product term t-statistics and associated p-values returned in the regression of the different dimensions of overall performance upon the different factors and their product terms using enter method of regression. -

Table 6.20: Interaction term t-significant p-values

Dependent variable	Interaction term	Unstandardized Coefficient		Standardized coefficient	t	Sig.
		B	Std Error	Beta		
Cost	Customer focus x Process approach	-0.116	0.164	-0.301	-0.708	.485
Timeliness	Customer focus x process approach	-.740	.717	-1.904	-1.033	.311
Relevance	Customer focus x process approach	-.240	.233	-.567	-1.030	.311
Reputation	Customer focus x process approach	-.551	.684	-1.341	-.805	.428

Source: From field survey

In view of the t-significant p-values in Table 6.20, the null hypothesis that there is no significant effect on the performance dimensions of cost, timeliness, relevance, and reputation from the interaction of customer focus and process approach outcomes cannot be rejected in respect of each dimension listed in the Table. It can therefore be concluded that the interaction between customer focus and process approach does not significantly affect the output outcomes of overall performance and all its dimensions. This would appear to suggest each of the organizational system outcomes has independent association with the output outcomes they influence and that there is no interaction effect when the two outcomes are achieved.

CHAPTER SEVEN: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

The major aim of this study was to help bring about a clearer understanding of how the implementation factors prescribed by ISO 9001 management system standard converge to act on an organization's activities so as to bring about desired output outcomes. The study's results, as presented in chapter four, have been analysed to arrive at some findings based on this aim and the specific objectives. Conclusions have, accordingly, been drawn from these findings as regards the research question which was: can the inconsistencies in the relationship between ISO 9001 certification status and operational performance be explained by the differences in the level of implementation factors in place?

In this chapter, these findings are summarized and conclusions drawn are presented. First a summary of the findings as they relate to each of the specific objectives is set out in the next section. These are evaluated on the basis of the research question and aim and the conclusions arrived at set out in section 7.3. Recommendations that can be made in response to the management dilemma that formed the basis for this research are then presented in section 7.4. Limitations connected with the methodological choices made in this study are then set out and areas for investigation to further the knowledge in the subject area set out in the last two sections.

7.2 Summary of findings

Chapter five presents the findings of this research, as arrived at based on the results presented. These findings are summarized in this section based on the specific objectives the research sought to achieve. First, the findings must be evaluated with a view to determining the extent the presented data supports a hypothesis of a relationship between ISO 9001:2008 standard certification status and operational performance of government agencies in Kenya.

The data establishes that the implementation factors prescribed by ISO 9001 quality management system standard affect different aspects of operational performance differently. The presented data also establishes that the practices set prescribed by the

standard integrate implementation factors that have positive effect on all aspects of operational performance. However, the findings that two ISO 9001 certified organizations are not necessarily the same and may be classified in different factor configuration groups confirms that not every organization that is certified has integrated the practices to the same level. This suggests the process used in certification does not assess all aspects of implementation. The implication of this finding is that, in terms of the practices prescribed by the standard, adoption of ISO 9001 quality management system standard as a framework for managing organization is associated with better operational performance. But it is the certification process that is a poor indicator of the management system standard adoption.

This means the implementation factor levels have some relationship with operational performance. According to the findings, this relationship is through the implementation factor levels' association with customer focus and process approach orientation in an organization. The findings further suggests that a moderate rise in the implementation factor levels such as such as would be experienced in a minimalist, compliance based implementation can decrease the levels of these orientations. A significant finding from the data is that, of the five ISO 9001 implementation factors, only management review is associated with higher levels of customer focus and process approach orientation.

Another finding of this research is the significant roles two of the ISO 9001 standard implementation factors play in helping achieve goals in the different perspectives. As the enabler of performance, management review is found to be the most important of the implementation factors. The practice influences operational performance both in the external and internal perspective through its association with higher levels of customer focus and process approach orientation in the organization. According to the findings, the later two are drivers to operational performance in both internal and external measures.

The findings suggest that a similarly enabling role is played, but only in the internal measures of operational performance, by the quality policy factor through its association with the appropriateness of the formulated quality objectives. Data indicates that these two implementation factors have no relationship with the

externally focused operational performance measures. Most importantly, the findings do not indicate any relationship between the other ISO 9001 implementation factors of quality manual and document control.

7.3 Conclusions

The conclusions from the research findings are that ISO 9001 management system standard, as a framework of management practices, is associated with enhanced operational performance. The framework's prescribed practices, if adopted in the integrated way they are meant to be, can enhance operational performance in both internal focused and external focused measures. The findings support the proposition that the reported failures to achieve performance gains are not due to the inadequacy of the management system framework but to the approach of adoption.

These conclusions are drawn from the findings that suggest there are two sets of factors at play in the relationship between ISO 9001 certification and performance. These are the drivers of performance and the enablers. According to the findings, the drivers of performance have direct impact on operational performance, but the nature of impact varies depending on whether the performance is externally focused or internally focused. These drivers of performance are influenced by the enablers of performance that are part of prescribed practices.

7.3.1 Externally focused operational performance

It is concluded from the findings that the non-association of ISO 9001 certification with externally focused performance measure of customer satisfaction is due to the deficit in the manner of adoption. Evidence suggests the drivers of performance in customer satisfaction are behavioral input outcomes of customer focus and process approach. Enhancement of these two factors is necessary for enhancement of performance in customer satisfaction terms.

The conclusions from the findings are that deficit in these drivers of externally focused performance is associated with deficit in their prescribed enabler, the management review practice. Of the five implementation factors, only management review is associated with these organizational system outcomes and hence the sole component in the framework that influences what happens in the externally focused

performance outcome. The findings of Dick (2000), Santos and Escanciano (2002), Heras et al. (2006), and Martinez-Costa and Martinez-Lorente (2007) must be considered in this light.

Another conclusion drawn from the findings is that the nature of association between management review as the performance enabler and the two organizational system outcomes, as the drivers of performance, makes it possible for performance to get worse following adoption. This is because the relationship fits quadratic and cubic mathematical functions, with the coefficients for the squared and cubic terms positive. Martinez-Costa and Martinez-Lorente (2007)'s conclusion that ISO 9001 quality management system certification can actually reduce quality related benefits and profitability is consistent with what would be expected with the relationship of this nature. The associated reduction of quality related benefits and profitability in such a case would not be due to the shortcomings in the prescribed practices but the approach of adoption.

7.3.2 Internally focused operational performance

From the research findings, it is concluded that the value of the management system standard is not in the image-related market differentiating aspects but the management methodologies prescribed. However, of the five practices prescribed as part of implementation, only quality policy and management review are found to be enablers of performance in the internally focused measures that include cost efficiency and reputation. Quality policy's influence on internally focused performance measures is through its association with enhanced appropriateness of quality objectives, one of the drivers of internally focused performance. Conclusions from the findings are that management review's influence is through its association with customer focus and process approach, the other two drivers of performance.

What follows from this link to the output performance is that the nature of the quality policy formulated can determine the difference between two organizations' performance. This difference would show in the type of quality objectives and, specifically, what is included. Similarly, management review as the enabler of performance can make a difference between two organizations. Association with more enhanced performance drivers is determined by the extent inputs to management

review include feedback from customers, changes from external environment, performance records information, process changes and audit results.

7.3.3 Taxonomy of ISO 9001 certified organizations

Another conclusion from the findings is that ISO 9001 certified organizations are not the same but can be classified into two based on organizational configurations of the factors associated with the management system standard. According to the findings, there is a category of organizations that emphasizes the static processes of certification with focus on what has been described as ISO hard elements. These are the visible, distinctive and mechanistic aspects of the standard's adoption and embody the quality as a program approach. It is concluded from the findings that such organizations would focus on the prescribed practices of quality policy, quality objectives, quality manual and document control.

This category of organizations would probably succeed in enhancing the internally focused performance aspects through appropriateness of quality policy, as enabler of performance, and quality objectives, as driver of performance. However, the failure in the externally focused aspects of performance would be the limiting factors in success for this category of organizations. This category of organizations would probably be good exemplification of the ISO integrators as described by Boiral and Roy (2007). Boiral and Roy (2007) described ISO integrators based on what the organization sees the management system standard as standing for, and their motivation to seek certification but did not specify the behavioral input outcomes that differentiate the group from others. The conclusion from this study is that the factor that the ISO integrators may be in deficit of and hence the limiting aspect is management review.

It would appear from the findings of this study that the differentiating management practice between the ISO integrators and quality enthusiasts, as described by Boiral and Roy (2007), is management review, with the consequent difference in customer focus and process approach orientation. With these being the sole drivers of performance in the external measures, deficit would, according to the findings mean enhancement of customer satisfaction would be stifled. In contrast, the second category has organizational configuration that emphasizes management review,

customer focus, and process approach, the enabler and drivers of performance in both externally focused and internally focused performance measures.

An organization in the later category would probably emphasize the iconic aspects of certification much less and hence the focus on the socio-behavioral management practice of management review. Such organizations would probably have enhanced customer focus and process approach levels that are above the threshold level below which the associated performance, according to the findings, would be lower than pre-implementation levels. As the factors that describe this category of organizations involve enabler and drivers of performance in both external and internal focus, performance level would probably be much higher.

7.3.4 ISO 9001 implementation factor levels

An important conclusion from the findings is that the level of implementation of the management system standard can be assessed and is associated with the level of performance of the organizations. This, by implication would mean that no two ISO 9001 certified organizations can be said to be the same. However, the difference is more on the emphasis given to specific factors than the presence or absence. This difference in emphasis may be critical to success in achievement of organizational goals.

The conflicting results of the studies that have taken the line of inquiry in which output performance of two organizations of different certification statuses are compared can be attributed to these differences. One would probably ask whether such differences is emphasis should not be spread across so that studies such as those of Feng et al. (2008), Heras et al. (2002), and Withers and Ebrahimpour (2000) would come to the same conclusion as Dick (2000), Santos and Escanciano (2002) and Martinez-Costa and Martinez-Lorente (2007). The fact that the models estimated for customer focus, process approach and quality objectives have R Square (R^2) statistics of 0.60, 0.55, and 0.98, respectively means factors endogenous to the estimated models explain bigger proportion of variation than is left to be explained by exogenous factors.

It can be concluded that the line of inquiry in which output performance of two organizations of different certification statuses are compared is probably not appropriate for the issues under examination. This is because such inquiries probably have not considered that the impacts of behavioral input outcomes involved in some of the practices differ from one aspect of performance to another. The taxonomy of organizations based on the configurations of the factors involved would probably be different from one geographical location to another based on the prevailing management paradigm.

7.3.5 Managerial implications

The fact that one of five implementation factors has such a far reaching impact on both external and internal performance aspects would appear to suggest that there is a need to change the approach to adoption of the management system standard. Rather than use the standard as an end in itself, the standard should come in as a method for sustaining the change. In such an approach, a guideline standard such as ISO 9004:2000 or a business process model would provide the guidelines for setting up the management system for continuous improvement. Third party certification then becomes a tool for keeping the process in control.

The conclusion from this study has also been that it is not just that documentations specified by the standard are set up but their content must be appropriate. Among the practices prescribed by the management system standard, only three significantly influence performance. It would be interesting to know the relative weight given to these three factors in audit activities.

The findings probably have implication on the nature and method of conducting the audit itself. According to the findings, it is the contents of the quality policy that provide the enabling influence not the existence nor the effort to achieve what is written there. A conduct of audit in which the focus is on how much effort has been put in trying to achieve what is in quality policy statements should be replaced by one in which the appropriateness of the quality policy statements are the focus. Focusing on achieving what is in the quality policy statements that are probably not appropriate nor aligned with the underlying principles of quality management approach is, according to the findings of this study, unlikely to lead to enhanced performance.

7.4 Recommendations

With the findings that the methodologies prescribed by ISO 9000 series of management system standards are effective as strategies to enhance organizational performance, any failure is probably attributable to use approach. One area to improve would be the purpose and conduct of audits. An audit exercise that would help enhance performance would probably want to assess if the practices identified as being associated with performance have the characteristics that make them capable of achieving the desired goals.

For an audit exercise to be meaningful, it would probably need to assess the extent a quality policy statement conveys to the members of the organization the desired degree of customer satisfaction, type of future improvement needed, and how the organization intends to develop them as part of the improvement. Assessment of how the members perceive the policy statements and how clearly the contribution of the suppliers to the organization has been specified would be some of the criteria for evaluation of application of quality policy as a prescribed management practice.

A performance enhancing audit would probably need to assess the extent the needs of customers and interested parties have been captures as part of the quality objectives. Organizational learning needs, and requirements for analysis to identify improvement opportunities would provide the most effective assessment of the managerial modernity as based on quality objectives. As an enabler of performance in a wider scope than quality objectives, the regularity with which the results of the above assessments are input to management review would provide a more effective audit of the application of the practice. The extent it is applied at all levels is the key evidence of application of process management concept of Plan-Do-Check-Act, as the management system standard specifies. The extent of use of information on changes in the environment, in the process, from performance records, and feedback from customers in the management review would probably relate the exercise more to performance enhancing ability.

7.5 Limitations

As a statistical study, the research would be expected to be limited in depth. Use of self administered questionnaire has its limitation in terms of understanding of the

questions for which the answers are being sought. To some extent the risks involved have been reduced by use of multiple informants from each participating organization. Other limitations are connected with the nature of issues being investigated.

Risks of response biases can be expected when questions relating to socio-behavioral aspects of organizational life are put to the respondents. In particular, risks of extremity bias can not be completely eliminated. With multiple informants used with means used to for organizations, expectations are that the extremes would cancel out.

Other potential biases connected with the socio-behavioral nature of the issues under investigation in this research concern social desirability biases as possibility of responses from some informants being influenced by the wish to appear as belonging to well ran organizations. These risks were minimized by careful wording of the questions in the instrument.

Another limitation concerns the sample. The participating organizations operate in desperately different sectors, differ in sizes and may be at very different levels in terms of organizational evolution. These differences can potentially lead to differences in the variables and hence results.

7.6 Areas for further research

Socio-behavioral issues are sensitive to cultural factors. This study has involved investigation of socio-behavioral issues such as the ISO 9001 implementation factors of management review, customer focus and process approach. Understanding the role the organizational and national cultures play in influencing these implementation factors would make interesting contribution to the body of knowledge.

Similarly, understanding the extent the size of an organization influences implementation of the listed implementation factors would contribute to further development of the strategic contingency approach to the quality management framework's application. This would be an important area for further research. It would also be interesting to determine if the factors identified as enablers and drivers of performance play these same roles irrespective of the size of the organization.

As the issues investigated concern an international management system standard, the impact of the interaction between the national culture and some of the prescribed

practices cannot be discounted. An investigation in this area would deepen the understanding of the management system standard, especially on the areas that are largely socio-behavioral in nature. It would, for instance, be interesting to find out if uncertainty avoidance, as a dimension of national culture, influences the process approach orientation in an organization and hence impact, one way or the other, on the benefit of the management system framework.

REFERENCES

Ahire, S., D. Golhar and M. Waller (1996). Development and Validation of TQM Implementation Constructs. *Decision Sciences, 27*(1), 23-56.

Ailawadi, K. L., R. P. Dant and D. Grewal (2003). *Perceptual and Objective Performance Measures: An Empirical Analysis of the Difference and its Impact*. Retrieved 20/05/2009, from //ssrn.com/

Anderson, J., M. Rungtusanatham, R. Schroeder and S. Devaraj. (1995). A path Analytic Model of a Theory of Quality Management Underlying the Deming Management Method: A preliminary Empirical Findings. *Decision Sciences,5(26)*, 637-58.

Armstrong, M. (2006). *Performance Management*. London: Kogan Page.

Asian Development Bank. (2009). Results Based Management Guide. Online Edition. Retrieved 28/12/2009, from http://www.adb.org/

Barnes, F. C. (1998). ISO 9000 Myth and Reality: A Reasonable Approach to ISO 9000. *Sam Advanced Management Journal. March 22 Issue.*

Binnendijk, A. (2000). Results Based Management in The development Co-operation Agencies: A Review of Experience. Retrieved 28/12/2009, from http://www.oecd.org/dac/

Boiral, O. and M. Roy. (2007). ISO 9000 Integration Rationales and Organizational Impacts. *International Journal of Operations and Production Management, 27*(2), 226-47.

Bounds, G., L. Yorks, M. Adams and G. Ranney. (1994). *Beyond Total Quality Management: Toward the Emerging Paradigm*. New York, McGraw-Hill.

Capistrano, E. P. (2008). ISO 9000 Certification and Business Performance of Selected Philippine Companies. *Philippine Management Review, 15(1), 15-36.*

Casadesus, M. and S. Karapetrovic. (2003). The Erosion of ISO 9000 Benefits: A Temporal Study. *International Journal of Quality & Reliability Management, 22(2), 120-136.*

Chase, R. B., F. R. Jacobs and N. J. Aquilano (2004). *Operations Management for Competitive Advantage*. New York: McGraw-Hill Irwin.

Chin, K. and K. Pun. (2002). A Proposed Framework for Implementing TQM in Chinese Organizations. *International Journal of Quality & Reliability Management, 19(3), 272-294.*

Combs, J. G., T. R. Crook, C. L. Shook. (2005). *The Dimensionality of Organizational Performance and its Implications for Strategic Management Research.* London, Emerald Group Publishing Limited.

Cooper, D. R. and Schindler, P. S. (2003). *Business Research Methods.* New Delhi: McGraw Hill.

Crosby, P. B. (1979). *Quality is Free*. New York: Mentor.

Dale, B. G. (1999). *Managing Quality*. Oxford, Blackwell Publishing.

Dean, J. and D. Bowen. (1994). Managing Theory and Total Quality: Improving Research and Practice Through Theory development. *Academy of Management Review, 19(3)*, 392-418.

Deming, W. E. (1994). *The New Economics for Industry, Government, Education.* New York: Routlege.

Dhameja, A. (2003). *Contemporary Debates in Public Administration*. New Delhi: Prentice-Hall of India.

Dick, G. P.M. (2000). ISO 9000 Certification Benefits: Reality or Myth?. *The TQM Magazine, 12(6),* 365-71.

Duncan, M., S. Mouly and V. Nilakant. (2001). Discontinuous Change in the New Zealand Police Service – A case Study. *Journal of Managerial Psychology, 16(*1), 6-19.

Economic Commission for Africa (ECA). (2003). *Public Sector Management Reforms in Africa*. Addis Ababa: Author.

Emery, F. and E. Trist. (1965). The Causal Texture of Organizational Environments. *Human Relations, 18*, 21-32.

Easterbrook-Smith, S. (1999). *Public Sector Performance Contracting in New Zealand: Case Studies of the Ministry of Justice and Department of Courts*. Retrieved 26/07/2009, from http://www.oecd.org/puma/

Evans, J. R. and W. M. Lindsay. (2002). *The Management and Control of Quality*. Ohio: South-Western.

Feng, M., M. Terziovski and D. Samson. (2008). Relationship of ISO 9001:2000 Quality System certification with Operational and Business Performance. *Journal of Manufacturing Technology Management, 19(1)*, 22-37.

Flynn, B., R. Schroeder and S. Sakakibara. (1995). The impact of quality management practices on performance and competitive advantage. *Decision Sciences, 5(*26), 659-92.

Franceschini, F., M. Galetto and P. Cecconi. (2006). A Worldwide Analysis of ISO 9000 Standard Diffusion: Considerations and Future Development. *Benchmarking: An International Journal, 13(*4), 523-41.

Garvin, D. (1988). *Managing Quality*. New York: The Free Press.

(GOK) Cabinet Office. (2007). *Report on Evaluation of the Performance of Public Agencies for the Financial Year 2006/2007*. Nairobi: Government of Kenya.

Gustafsson, A., L. Nilsson and M. D. Johnson. (2003). The Role of Quality Practices in Service Organizations. *International Journal of Service Industry Management, 14(2)*, 232-244.

Hackman , J. and R. Wageman. (1995). Total Quality Management: Empirical, Conceptual and Practical Issues. *Administrative Science Quarterly, 40*, 309-42.

Heras, I. S., M. Casadesus and G. P. M. Dick. (2002). ISO 9000 Certification and the Bottom Line: a Comparative Study of the Profitability of Basque Companies. *Managerial Auditing Journal, 16(1)*, 774-91

Heras, I. S.; G. A. Landin and M. Casadesus. (2006). The Impact of Quality Management in European Companies' Performance. *European Business Review, 8(2)*, 114-131.

Howard, D. and P. Hoverstadt (2005). Systemic Thinking: The New era of Quality Management. *Journal of Quality*, July 2005 issue, 16-18.

Iacobucci, D. and A. Ostrom (1995). Distinguishing Service Quality and Customer Satisfaction: The Voice of the Consumer. *Journal of Consumer Psychology, 4(3)*, 277-303.

ISO Central Secretariat (ISO/CS). (2007). *ISO Survey - 2006*. Geneva: ISO.

ISO 19011:2002. Guideline for Quality and Environmental Management Systems Auditing.

ISO 9000:2005. Quality management systems - Fundamentals and vocabulary.

ISO 9000-3:1997. Quality management and quality assurance standards — Part 3: Guidelines for the application of ISO 9001:1994 to the development, supply, installation and maintenance of computer software.

ISO 9001:2008(E). Quality management systems — Requirements.

ISO 9004-4:1993, Quality management and quality system elements — Part 4: Guidelines for quality improvement.

ISO 9004:2000(E), Quality management systems —Guidelines for performance improvements.

Johnson, G. and K. Scholes (1999). *Exploraing Corporate Strategy*. London: Prentice Hall.

Kaye, M. M. and M. D. Dyason. (1995). The Fifth Era." *The TQM Magazine, 7(1)*, 95-101.

Kaplan, R. S. and D. P. Norton. (1992). The Balanced Scorecard: Measures that Drive Performance. *Havard Business Review, 70(1)*, Jan/Feb. 71-79.

Ketokivi, M. and R. Schroeder. (2004). Manufacturing Practices, Strategic Fit and Performance: A Routine-Based View. International Journal of Operations and Production Management. Vol. 24, Issue 2, February, 171-91.

Kothari, C. R. (1990). *Research Methodology: Methods and Techniques*. New Delhi: Wishwa Prakashan.

Lakhal, L., M. Limam and F. Pasin. (2006). Quality Management Practices and their Impact on Performance. *International Journal of Quality & Reliability Management, 23(6)*, 625-646

Lather, P. (2006). Paradigm Proliferation as a Good Thing to Think With: Teaching Research in Education as a Wild Profusion. *International Journal of Qualitative Studies in Education, 19(1), 35–57*

Longman Dictionary of Contemporary English. 4th ed.) 2005. Harlow, England: Pearson Education Limited.

Looy, B., Dierdonck, R. & Gemmel, P. (1998). *Services Management: An Integrated Approach*. London: Financial Times Management.

Madu, Christian N. (1997). Quality Management in Developing Economies. *International Journal of Quality Science, 2(4)*, 348-355.

Marsden, D., D. Littler. (1996). Evaluating Alternative Research Paradigms: A Market Oriented Framework. *Journal of Marketing Management, 12*, 645-655.

Martin, D. (1995). From Mechanical Engineering to Re-engineering: Would Taylor be Pleased with Modern Management? *Journal of Management History, 1(2), 38-51.*

Martinez-Costa, M. and A. R. Martinez-Lorente. (2007). A Triple Analysis of ISO 9000 Effects on Company Performance. *International Journal of Productivity and Performance Management, 56(6)*, 484-99.

Martin-Pena, M. L. and E. Diaz-Garrido (2008). Typologies and Taxonomies of Operations Strategy: a Literature Review. *Management Research News, 31*(3), 200-218.

Massie, J. (1998). Essentials of Management. New Delhi: Prentice-Hall of India.

McGregor, D. (1960). *The Human Side of the Enterprise*. New York: Mcgraw Hill.

Mersha, T. (1997). TQM Implementation in LDCs: Driving and Restraining Forces. *International Journal of Operations & Production Management, 17(2)*, 164-82.

Nahmias, S. (2001). Production and Operations Analysis. Singapore, McGraw-Hill, Irwin.

Nunnelly, J. C. (1978). *Psychometric Theory 2nd ed.*. New York: Mcgraw-hill.

Oakland, J. S. (1993). *Total Quality Management*. Bradford: Butterworth.

Oakland, J. S. and R. F. Followell. (1990). *Statistical Process Control: A Practice guide*. London: Heinemann Newnes.

Obong'o, S. (2008). Rapid Results Approach: Institutionalization of Results Based Management. *Commonwealth Innovations*, 13-16. Retrieved 22/07/2009, from http://www.capam.org/

Ouchi, W. G. (1981). *Theory Z: How American Business Can Meet the Japanese Challenge*. Reading, Ma: Addison-wesley.

Porter, M. E. (1980). *Competitive Strategy*. New York: Free Press.

Pagell, M. (2005). The Importance of National Culture in Operations Management Research. *International Journal of Operations Management, 25(4), 371-94.*

Popper, K. R. (1972). *Conjectures and Refutations: The Growth of Scientific Knowledge*. Basic Books Inc.

Powell, T. (1995). TQM as a Competitive Advantage: A Review and Empirical Study. *Strategic Management Journal, 1(16)*, 15-37.

Richard, P. J., T. M. Devinney, G. S. Yip, and G. Johnson. (2008). *Measuring Organizational Performance as a Dependent Variable: Towards Methodological Best Practice*. Retrieved 26/09/2008, from http://ssrn.com/

Santos, L. and C. Escanciano. (2002). Benefits of ISO 9000:1994 System: Some Considerations to Reinforce Competitive Advantage. *International Journal of Quality & Reliability Management, 19(3)*, 321-44.

Saraph, J., P. Benson and R. Schroeder. (1989). An Instrument for Measuring the Critical Factors of Quality Management. *Decision Sciences, 4(20),* 810-29.

Saunders, M., P. Lewis and A. Thornhill (2000). *Research Methods for Business Students*. London: Pearson Education Limited.

Seddon, J. (2008). *Systems Thinking in the Public Sector: the failure of the reform regime and a manifesto for a better way*. London: Triarchy Press.

Sedlmeier, P. and G. Gigerenzer. (1997). Intuitions About Sample Size: The Empirical Law of Large Numbers. *Journal of Behavioral Decision Making, 10,* 33-51.

Sharma, B. and D. Gadenne. (2002). *Management Constructs, Industry Category, and Performance: An Empirical Investigation.*. Retrieved 18th January, 2004, from http://www.ifsam.org/2002/general-management/Sharma_PUB.htm.

Soltani, E. and P. Lai. (2007). Approaches to Quality Management in the UK: Survey Evidence and Implications. *Benchmarking: An International Journal, 14(4),* 427 – 54.

Sousa, R. and C. A. Voss. (2002). Quality Management Reivisited: A Reflective Review. *Journal of Operations Management, 20,* 91-109.

Talbot C. (Eds.). (2006).*Performance Regimes and Institutional Contexts: Comparing Japan, UK and USA*. Tokyo: International Symposium on Policy Evaluation.

Tangen, S. (2003). An Overview of Frequently used Performance Measures. *Work Study, 52,* 347-353.

Temtime, Z. T. (2001). TQM in SME's in Botswana: A Preliminary Investigation. *African Journal of Finance and Management, 10(1), 29-42.*

Temtime, Z. T. (2003). The Moderating Impacts of Business Planning and Firm Size on Total Quality Management Practices. *The TQM Magazine, 15(1)*, 52-60.

Terziovski, M. and D. Samson. (1999). The link Between Total Quality Management Practice and Organizational Performance. *International Journal of Quality & Reliability Management, 16(3), 226-237*

Portsmouth Business School. (2001). *Management Systems*. Portsmouth: University of Portsmouth.

Van der Wiele, T. and A. Brown. (2002). Quality Management Over a Decade: A Longitudinal Study. *International Journal of Quality & Reliability Management, 19(5)*.

Voss, C. A., P. Ahlstrom and K. Blackmon. (1997). Benchmarking and Operational Performance: Some Empirical Results. *International Journal of Operations & Production Management, 17(10)*, 1046 - 1058.

Williams, H. (1996). The Essence of MANAGING GROUPS AND TEAMS. Prentice Hall Europe, London. 5th ed.

Withers, B. and M. Ebrahimpour. (2000). Does ISO 9000 Certification affect the Dimensions of Quality used for Competitive Advantage? *European Management Journal, 18(4)*, 431-43.

Withers, B. and M. Ebrahimpour. (2001). Impacts of ISO 9000 Registration on European Firms: A Case Analysis. *Integrated Manufacturing Systems, 12(2)*, 139-51.

Zhang, Q. (2001). Quality Dimensions, Perspectives and Practices – A Mapping Analysis. *International Journal of Quality & Reliability Management. 18(7)*.

Zikmund, W. G. (1994). *Business Research Methods*. Wadsworth Publishing.

APPENDICES

Appendix 1: Key studies on ISO 9000 - Performance Relationship

Study	Type of study	Findings	Region
Dick (2000)	Exploratory studies	Finds no evidence of causative link	Europe
Withers and Ebrahimpour (2000)	Case study	ISO 9001 certification has effect on quality of products and services	Europe
Withers and Ebrahimpour (2001)	Case study	ISO 9001 certification's relationship with performance is dependent on culture and reasons for seeking certification.	Europe
Heras et al. (2002)	Statistical	Return on assets of ISO 9000 certified firms are significantly higher than those of uncertified firms.	Europe
Santos and Escanciano (2002)	Survey	Certification has no significant relationship to market related benefits but related to internal benefits	Europe
Sila and Ebrahimpour (2005)	Survey	Leadership and process management are the only QM practices with direct effect on business results	North America
Feng et al. (2008)	Survey	Strong positive relationship between commitment to ISO 9001 certification and operational and business performance	Australia and New Zealand
Heras et al. (2006)	Qualitative/ Delphi method.	Implementation of ISO 9001 quality management system may not, of itself, lead to economic gain, but adoption of quality management approach using EFQM framework as guide does.	Europe
Tzelepis et al. (2006)	Published statistical date	Combined effect of ISO 9001 certification with labor reduces managerial inefficiency, but combined effect with capital increases managerial inefficiency.	Europe.

Study	Type of study	Findings	Region
Boiral and Roy (2007)	Survey	Type of motivation driving decisions to adopt the ISO 9001 standard play the key role in the success of the implementation process.	North America
Martinez-Costa and Martinez-Lorente (2007)	Survey	ISO 9001 certification improves sales growth but results in reduction in earnings and increase in costs.	Europe

Appendix 2a: Operational definitions for ISO 9001 implementation factor levels

Factor Variable	Indicators of the level	Construct sources
Quality policy	The extent quality policy statement: • Conveys to the members the desired degree of customer satisfaction. • Conveys to the members the type of future improvement needed. • Clearly specifies contribution of suppliers. • Includes how the organization intends to develop its employees. • Is considered by the members as important for the ultimate performance of the organization.	ISO 9001:2008(E); ISO 9004:2000(E); Sousa and Voss (2002)
Quality objectives	Extent quality objectives: • Are considered by the members as important for the ultimate performance of the organization • Include the needs of customers and interested parties • Include organizational learning needs • Include requirements for analysis of improvement opportunities	ISO 9001:2008(E); ISO 9004:2000(E); Sousa and Voss (2002)
Quality Manual	Extent quality manual: • Is considered by the members as important for the ultimate performance of the organization. • Is available at the point of work of everybody in the organization • Describes interactions between the different procedures in the organization • Clarifies the aims of the organization	ISO 9001:2008(E), ISO 9004:2000(E) and Deming (1994)

Factor Variable	Indicators of the level	Construct sources
Document Control	• Extent control of documents is considered by the members as important for the ultimate performance of the organization. • Extent control of records is considered by the members as important for the ultimate performance of the organization. • Extent members are able to identify currency status of documents before use. • Extent information contained in records of work is analyzed to help prevent problems. • Extent information contained in records is used to plan performance improvement. • Extent information from records is used to review how the work has been performed	ISO 9001:2008(E); ISO 9004:2000(E)
Management review	• The extent feedback from customers is used as input to each unit's management review. • The extent results of quality system audits are used as input to each unit's management review. • The extent information from performance records is used as inputs to the units' management reviews • The extent changes in any process are used as input to a unit's management review • The extent changes from external environment are used as inputs to the units' management reviews	ISO 9004:2000(E)

Appendix 2b: Operational definitions for organizational system outcome variables

Outcome variable	Indicators of the level	Construct sources
Customer focus	• Systems for identifying who the customer to every activity is. • Systems for identifying the processes which are used to create value that is passed to the customer • Customer needs measurement system • Systems for translating customer needs to products and services • Systems and processes for regular measurement of customer satisfaction • Use of information from customer satisfaction measurement to evaluate and improve internal processes • Systems to evaluate every activity to determine its contribution to meeting customer requirements • Systems and processes for listening and learning from customers • Systems and processes for clearly defining key customer groups • Processes through which customers can easily comment, complain and receive prompt resolution of their concerns	ISO 9004:2000(E)
process approach	• More efforts are made to reduce complexity than to deal with complexity. • Statistical thinking is applied to variation as a means to achieve control. • Process and system factors are more important than social factors in task performance goal achievement. • Emphasis is on process stability and capability in assuring quality of work. • The way everyone works rather than inspection of work is emphasized more in assuring quality of work.	Dean and Bowen (1994), Deming (1994), ISO 9001:2008(E), and ISO 9004:2000(E)

Indicators of process approach – continued.

Outcome variable	Indicators of the level	Construct sources
	• Management of interactions between activities is considered more important than perfection in an activity. • Improvement activities target underlying work processes and not work roles.	

Appendix 3: Scale Reliability Statistics for the Survey Instrument

Item-Total statistics for Quality Policy scale items

Scale item	Corrected Item-Total Correlation	Alpha if item is deleted
The extent Quality policy statement conveys to the members the desired degree of customer satisfaction.	.9003	.9387
The extent Quality policy statement conveys to the members the type of future improvement needed.	.9003	.9383
The extent Quality policy statement clearly specifies contribution of suppliers.	.8235	.9516
The extent Quality policy statement includes how the organization intends to develop its employees.	.8731	.9431
The extent Quality policy statement is considered by the members as important for the ultimate performance of the organization.	.8666	.9441
Scale alpha	.9540	

Item-Total statistics for Quality Objective scale items

Scale item	Corrected Item-Total Correlation	Alpha if item is deleted
Extent quality objectives are considered by the members as important for the ultimate performance of the organization.	.8451	.9500
Quality objectives include the needs of customers and interested parties.	.9302	.9241
Quality objectives include organizational learning needs.	.8807	.9386
Quality objectives include requirements for analysis of improvement opportunities.	.8845	.9374
Scale alpha	.9524	

Item-Total statistics for Quality Manual scale items

Scale item	Corrected Item-Total Correlation	Alpha if item is deleted
Extent quality manual is considered by the members as important for the ultimate performance of the organization.	.8544	.9399
Quality manual is available at the point of work of everybody in the organization.	.8608	.9374
Quality manual describes interactions between the different procedures in the organization.	.8967	.9266
Quality manual clarifies the aims of the organization.	.8941	.9271
Scale alpha	.9487	

Item-Total statistics for Document Control scale items

Scale item	Corrected Item-Total Correlation	Alpha if item is deleted
Extent control of documents is considered by the members as important for the ultimate performance of the organization.	.6445	.7147
Extent control of records is considered by the members as important for the ultimate performance of the organization.	.6272	.7213
In my organization, I can easily tell when the document I need to use is current and not superseded by a revised one.	.4879	.7561
In my organization, information contained in records of work is analyzed to help prevent problems.	.4992	.7514
In my organization, information contained in records is used to plan performance improvement.	.5002	.7510
In my organization, information from records is used to review how the work has been performed.	.5366	.7453
Scale alpha	.7757	

Item-Total statistics for Management Review scale items

Scale item	Corrected Item-Total Correlation	Alpha if item is deleted
Feedback from customers is used as input to each unit's management review.	.5141	.7074
Results of quality system audits are used as input to each unit's management review.	.4624	.7232
Information from performance records is used as inputs to the units' management reviews.	.5538	.6904
Changes in any process are used as input to a unit's management review.	.5532	.6903
Changes from external environment are used as inputs to the units' management reviews.	.5008	.7134
Scale alpha	.7495	

Item-Total statistics for Customer Focus scale items

Scale item	Corrected Item-Total Correlation	Alpha if item is deleted
In my organization, there are systems for identifying who the customer to every activity is.	.6390	.9054
In my organization, there are systems for identifying the processes which are used to create value that is passed to the customer.	.6412	.9053
In my organization, there is customer needs measurement system.	.6390	.9058
In my organization, there are systems for translating customer needs to products and services.	.7077	.9014
In my organization, there are systems and processes for regular measurement of customer satisfaction	.7022	.9017
In my organization, information from customer satisfaction measurement is used to evaluate and improve internal processes.	.7383	.8996

Item-Total statistics for Customer Focus scale items (continues)

Scale item	Corrected Item-Total Correlation	Alpha if item is deleted
In my organization, there are systems to evaluate every activity to determine its contribution to meeting customer requirements.	.7176	.9007
In my organization, there are systems and processes for listening and learning from customers.	.6859	.9027
In my organization, there are systems and processes for clearly defining key customer groups.	.6489	.9048
In my organization, there are processes through which customers can easily comment, complain and receive prompt resolution of their concerns.	.6670	.9038
Scale alpha	.9120	

Item-Total statistics for Process Approach scale items

Scale item	Corrected Item-Total Correlation	Alpha if item is deleted
In my organization, more efforts are made to reduce complexity than to deal with complexity.	.6242	.8553
In my organization, control is achieved by statistically studying variation to understand the causes of poor performance.	.6365	.8536
In my organization, process and system factors are considered more important than social factors in task performance goal achievement.	.6314	.8542
In my organization, process stability and capability are emphasized in assuring quality of work.	.6498	.8517
In my organization, quality of work is assured by the way everyone works rather than inspection before work output goes to the customer.	.6447	.8524
In my organization, managing interactions between activities is considered more important than perfection in an activity.	.6966	.8452
In my organization, improvement activities target underlying work processes and not work roles.	.6452	.8525
Scale alpha	.8706	

Item-Total statistics for self-report Operational Performance scale items

Scale item	Corrected Item-Total Correlation	Alpha if item is deleted
Perceived performance relative to other organizations in similar situations and with service obligation In the area of cost efficiency.	.7215	.9170
Perceived performance relative to other organizations in similar situations and with service obligation In the area of timeliness.	.7757	.9094
Perceived performance relative to other organizations in similar situations and with service obligation In the area of quality of service.	.7872	.9078
Perceived performance relative to other organizations in similar situations and with service obligation In the area of service relevance.	.7837	.9083
Perceived performance relative to other organizations in similar situations and with service obligation In terms of satisfied customers.	.8028	.9059
Perceived performance relative to other organizations in similar situations and with service obligation In terms of service reputation.	.8045	.9056
Scale alpha	.9230	

Appendix 4: Normality tests

Appendix 4-1: Normality tests for the output performance variables

	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
2007/2008 Performance score in operations criteria	.284	44	.000	.802	44	.000
Customer satisfaction survey score	.097	46	.200(*)	.979	46	.579
Overall perceived performance	.117	47	.116	.957	47	.083
Cost	.103	47	.200(*)	.960	47	.110
Timeliness	.142	47	.018	.964	47	.154
Service quality	.153	47	.007	.963	47	.142
Relevance	.106	47	.200(*)	.963	47	.145
Reputation	.102	47	.200(*)	.966	47	.183

* This is a lower bound of the true significance.

a Lilliefors Significance Correction

Appendix 4-2: Normality tests for the ISO 9001 implementation factor variables

	ISO 9001 status	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Quality policy	Not Certified	.413	9	.000	.649	9	.000
	ISO 9001 certified	.097	33	.200(*)	.960	33	.260
Quality objective	Not Certified	.383	9	.000	.656	9	.000
	ISO 9001 certified	.120	33	.200(*)	.964	33	.329
Quality manual	Not Certified	.384	9	.000	.649	9	.000
	ISO 9001 certified	.074	33	.200(*)	.987	33	.960
Document control	Not Certified	.207	14	.106	.900	14	.112
	ISO 9001 certified	.086	33	.200(*)	.968	33	.439
Management review	Not Certified	.092	14	.200(*)	.985	14	.994
	ISO 9001 certified	.110	33	.200(*)	.969	33	.462

* This is a lower bound of the true significance.

a Lilliefors Significance Correction

Appendix 4-3: Normality tests for the ISO 9001 implementation factor variables

	ISO 9001 status	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Process approach	Not Certified	.162	14	.200(*)	.955	14	.637
	ISO 9001 certified	.152	33	.051	.920	33	.018
Customer focus	Not Certified	.173	14	.200(*)	.958	14	.693
	ISO 9001 certified	.089	33	.200(*)	.979	33	.756

* This is a lower bound of the true significance.

a Lilliefors Significance Correction

Appendix 5: Tests of homogeneity of variances for grouped data

Appendix 5-1: Output performance variables grouped by ISO 9001 certification status

		Levene Statistic	df1	df2	Sig.
Customer satisfaction survey score	Based on Mean	.222	1	44	.640
	Based on Median	.225	1	44	.638
	Based on Median and with adjusted df	.225	1	43.997	.638
	Based on trimmed mean	.226	1	44	.637
Cost efficiency	Based on Mean	.162	1	45	.689
	Based on Median	.175	1	45	.678
	Based on Median and with adjusted df	.175	1	45.000	.678
	Based on trimmed mean	.163	1	45	.689
Timeliness	Based on Mean	.682	1	45	.413
	Based on Median	.169	1	45	.683
	Based on Median and with adjusted df	.169	1	41.645	.683
	Based on trimmed mean	.559	1	45	.459
Relevance	Based on Mean	.038	1	45	.846
	Based on Median	.047	1	45	.830
	Based on Median and with adjusted df	.047	1	42.665	.830
	Based on trimmed mean	.057	1	45	.813
Reputation	Based on Mean	.720	1	45	.401
	Based on Median	.746	1	45	.392
	Based on Median and with adjusted df	.746	1	44.866	.392
	Based on trimmed mean	.721	1	45	.400
Service quality	Based on Mean	.012	1	45	.913
	Based on Median	.002	1	45	.963
	Based on Median and with adjusted df	.002	1	40.798	.963
	Based on trimmed mean	.000	1	45	.997
Overall perceived performance	Based on Mean	.866	1	45	.357
	Based on Median	.144	1	45	.706
	Based on Median and with adjusted df	.144	1	37.240	.706
	Based on trimmed mean	.709	1	45	.404

Appendix 5-2: Customer focus and process approach grouped by certification status

		Levene Statistic	df1	df2	Sig.
Customer focus	Based on Mean	.211	1	45	.648
	Based on Median	.255	1	45	.616
	Based on Median and with adjusted df	.255	1	42.466	.616
	Based on trimmed mean	.258	1	45	.614
Process approach	Based on Mean	.101	1	45	.752
	Based on Median	.000	1	45	.993
	Based on Median and with adjusted df	.000	1	37.478	.993
	Based on trimmed mean	.017	1	45	.898

Appendix 6: Curve estimations with ISO Implementation factors

Appendix 6-1: Curve estimations with ISO hard elements factors

Independent: ISO hard elements (IF_{ISOR}); Dependent variable: overall performance (PERFt)

Dependent	Mathematical function	Rsq	d.f.	F	Sigf	b0	b1
PERFt	Power	0.183	30	6.73	.015	1.6168	.6386
PERFt	S function	0.184	30	6.77	.014	1.9356	-2.2889
PERFt	Exponential	0.182	30	6.68	.015	1.9312	.1775

Independent: ISO hard elements (IF_{ISOR}); Dependent variable: Cost

Dependent	Mathematical function	Rsq	d.f.	F	Sigf	b0	b1	b2
COST	Linear	0.473	30	26.93	.000	-.5693	1.1333	
COST	Logarithmic	0.472	30	26.84	.000	-1.6843	4.0622	
COST	Inverse function	0.471	30	26.68	.000	7.5547	-14.497	
COST	Quadratic	0.473	29	13.03	.000	.8554	.3383	.1104
COST	Cubic function	0.473	29	13.03	.000	.8554	.3383	.1104
COST	Power function	0.477	30	27.39	.000	.7692	1.1823	
COST	S function	0.477	30	27.42	.000	2.4288	-4.2270	
COST	Exponential function	0.476	30	27.30	.000	1.0664	.3293	

Independent: ISO hard elements (IF_{ISOR}); Dependent variable: Reputation

Dependent	Mathematical function	Rsq	d.f.	F	Sigf	b0	b1	b2
REPUTATION	Linear	0.269	30	11.04	.002	.5583	.9035	
REPUTATION	Logarithmic	0.272	30	11.18	.002	-.3540	3.2567	
REPUTATION	Inverse function	0.274	30	11.31	.002	7.0712	-11.688	
REPUTATION	Power function	0.293	30	12.41	.001	1.1998	.8991	
REPUTATION	S function	0.295	30	12.56	.001	2.2323	-3.2278	
REPUTATION	Exponential function	0.290	30	12.23	.001	1.5439	.2493	

Appendix 6-2: Curve estimations with the implementation factor of management review

Independent: Management review (MR); Depedent: Customer satisfaction (CSSURV)								
Dependent	**Mathematical function**	**Rsq**	**d.f.**	**F**	**Sigf**	**b0**	**b1**	**b2**
CSSURV	Linear	0.138	44	7.04	.011	1.1655	.7216	
CSSURV	Quadratic	0.148	43	3.73	.032	5.3048	-2.0098	.4456
CSSURV	Cubic function	0.147	43	3.72	.032	3.9511	-.6569	.0484
CSSURV	Exponential function	0.138	44	7.03	.011	1.6961	.2193	

Independent: Management review (MR); Dependent: Overall performance (PERFt)								
Dependent	**Mathematical function**	**Rsq**	**d.f.**	**F**	**Sigf**	**b0**	**b1**	**b2**
PERFt	Linear	0.386	44	27.67	.000	-.1732	1.1322	
PERFt	Quadratic	0.410	43	14.93	.000	-6.2090	5.1151	-.6498
PERFt	S function	0.456	44	36.84	.000	2.3072	-3.4300	

Appendix 7: Performance Measures

			2007/2008 Performance score in operations criteria	Customer satisfaction survey score	Cost	Timeliness	Reputation
Not Certified	1		3.540	6.0	2.22	2.67	3.00
	2		.	4.5	2.78	2.67	2.56
	3		3.570	7.4	3.00	3.75	3.25
	4		2.500	5.5	3.00	3.00	3.13
	5		2.500	5.0	2.36	2.45	3.00
	6		2.540	5.3	2.89	2.67	3.33
	7		3.540	7.2	2.38	3.00	2.63
	8		3.510	7.2	2.44	2.44	2.78
	9		2.530	5.3	3.62	3.62	3.92
	10		3.540	7.6	2.67	2.67	2.56
	11		3.560	4.3	2.38	2.15	2.46
	12		2.510	5.5	2.33	2.56	2.56
	13		2.510	6.5	2.14	2.21	2.21
	14		3.569	6.0	3.00	3.18	3.45
	Total	N	13	14	14	14	14
		Mean	3.07069	5.950	2.6582	2.7883	2.9165
		Median	3.51000	5.750	2.5556	2.6667	2.8889
		Std. Deviation	.535793	1.0826	.40978	.47462	.46742
ISO 9001 certified	1		4.370	6.0	4.50	3.93	4.21
	2		4.100	8.3	4.07	4.50	4.93
	3		3.970	7.3	3.71	3.29	3.43
	4		3.510	7.3	3.43	3.29	3.71
	5		3.580	6.3	3.56	3.67	3.78
	6		.	6.2	3.86	4.00	4.07
	7		3.550	6.7	3.40	3.70	3.40
	8		3.410	8.2	3.13	3.50	3.50
	9		3.330	7.8	3.33	3.78	3.67
	10		3.540	8.8	3.78	3.78	4.00
	11		3.530	6.0	3.82	3.73	4.18
	12		3.510	8.5	3.20	3.60	3.60
	13		3.510	6.9	3.75	3.63	4.00
	14		4.500	6.5	3.70	4.00	4.00
	15		3.510	8.0	3.33	2.89	3.89
	16		3.600	9.2	3.07	3.07	3.36
	17		3.500	8.8	3.75	3.50	4.13
	18		2.550	5.2	3.29	3.71	3.57
	19		3.640	6.6	3.67	3.20	3.67

	20		3.500	7.8	4.00	4.00	4.11
	21		3.450	7.1	3.77	4.38	4.38
ISO 9001 certified			2007/2008 Performance score in operations criteria	Customer satisfaction survey score	Cost	Timeliness	Reputation
	22		3.400	6.4	3.29	3.57	3.71
	23		3.540	7.5	3.43	3.71	3.86
	24		.	8.0	3.50	3.67	3.92
	25		3.510	7.0	3.63	3.38	3.88
	26		2.510	5.5	2.90	3.00	3.00
	27		3.510	8.8	3.86	3.71	4.29
	28		3.540	7.8	3.60	3.50	3.90
	29		3.524	7.5	3.88	3.88	4.25
	30		2.540	7.5	2.75	2.88	2.88
	31		3.030	7.5	2.69	3.00	3.31
	32		3.580	7.4	3.22	4.11	3.78
	33		3.600	.	3.75	3.92	4.17
	Total	N	31	32	33	33	33
		Mean	3.49819	7.323	3.5331	3.6198	3.8338
		Median	3.51000	7.445	3.6000	3.6667	3.8750
		Std. Deviation	.427164	1.0054	.38531	.39708	.40966
Total	N		44	46	47	47	47
	Mean		3.37189	6.905	3.2725	3.3721	3.5605
	Median		3.51000	7.130	3.3333	3.5000	3.6667
	Std. Deviation		.496332	1.2013	.56064	.56664	.59856

Note: Customer Satisfaction Feedback Score. Scale is 1-10

a Limited to first 500 cases.

Appendix 8: Participating Organizations

The following government agencies were selected from a sample frame made up of 124 qualifying organizations, using systematic sampling method.

1 Athi Water Services Board
2 Catering & Tourism Training Development Levy Trustees
3 Chemelil Sugar Company
4 Communications Commission of Kenya
5 Export Promotion Council
6 Jomo Kenyatta Foundation
7 Kenya Airports Authority
8 Kenya Bureau of Standards
9 Kenya Electricity Generating Company
10 Kenya Institute of Administration
11 Kenya Literature Bureau
12 Kenya Medical Training College
13 Kenya National Examinations Council
14 Kenya Ordinance Factories Corporation
15 Kenya Post Office Savings Bank
16 Kenya Power and Lighting Company Ltd
17 Kenya Revenue Authority
18 Kenya Sugar Board
19 Kenya Wine Agencies Ltd
20 Kenyatta International Conference Centre
21 Kenyatta University
22 Moi Teaching & Referral Hospital
23 NGO Coordination Board
24 Retirement Benefits Authority
25 Tea Board of Kenya
26 Telkom Kenya Ltd

27 University of Nairobi

28 Water Services Regulatory Board

29 Agricultural Development Corporation

30 Bomas of Kenya

31 Coast Water Services Board

32 Commission for Higher Education

33 Council for Legal Education

34 Electricity Regulatory Commission

35 Export Processing Zones Authority

36 Industrial & Commercial Development Corporation

37 Kenya Accountants and Secretaries National Examinations Board

38 Kenya Civil Aviation Authority

39 Kenya Ferry Services

40 Kenya Industrial Property Institute

41 Kenya Investment Authority

42 Kenya Meat Commission

43 Kenya National Assurance Company (2001) Limited

44 Kenya Plant Health Inspectorate Services

45 Kenya Reinsurance Corporation Ltd

46 Kenya Seed Company

47 Kenya Tourist Board

48 Kenya Water Institute

49 Kerio Valley Development Authority

50 Lake Victoria South Water Services Board

51 Masinde Muliro University of Science and Technology

52 National Cereals & Produce Board

53 National Council for Persons with Disabilities

54 National Housing Corporation

55 National Oil Corporation of Kenya

56 New Kenya Cooperative Creameries Ltd

57 Nzoia Sugar Company

58 Rift Valley Water Services Board

59 Tana & Athi Rivers Development Authority

60 Teachers Service Commission

Appendix 9: Participant Communication

Dear Sir,

Relationship Between ISO 9001 Certification Status and Performance within Government Agencies in Kenya.

I am currently carrying out a doctoral research on the above topic in order to determine and share insights on this topical and important area of management. I am attached to University of Nairobi Business School.

You have experience that would be of value to this research and I very much wish to know your views on the practices currently in use in your organization. I hope you will take a few minutes and fill out the questionnaire I have attached.

I am aware of the need to treat the responses with utmost confidentiality. No source, individual or organization will be identified in the report. The output will be in the form of summarized ratings from all participants.

Sincerely,

Owino Okwiri,

SURVEY QUESTIONNAIRE

This survey is aimed at finding out your views on the practices that are in place in your organization and how they relate to the consumers of your service output. This questionnaire contains questions requiring you to select from given list or choices a response that most reflects your perception of the issues as they are. There are no answers representing the bad or the good. Any response will be of value in determining the very important issues being researched on. No participating organization or individuals within these organizations will be identified.

Survey questions

Section A

1(a). Please indicate your organization's current status as regards ISO 9001.

☐ Our organization is an ISO 9001 certified organization

☐ Our organization is NOT an ISO 9001 certified organization. If ticked go to section B.

☐ I do not know. If ticked, go to section B.

1(b). If ISO certified, please indicate approximately how many years have passed since achievement of ISO certification.

☐ More than 2 years

☐ 2 years or less

2(a). The following aspects of ISO 9001 quality management system have been emphasized. To what extent do you consider each to be important for the ultimate performance of your organization? Please indicate by ticking in the appropriate column.

	Not important at all	Not very important	Important	Very important	Extremely important	Don't know
Quality policy statement						
Quality objectives						
Quality Manual						
Document control						
Control of records						
Management review						

2(b). Please indicate the extent each of the following is true of your organization's quality policy statement by ticking as appropriate.

	Extremely not true	Somewhat Not true	True	Very true	Extremely true	Don't know
Conveys to me the desired degree of customer satisfaction.						
Conveys to me the type of future improvement needed.						
It clearly specifies contribution of suppliers.						
It includes how the organization intends to develop its employees.						

2(c). Please indicate the extents the following are true of your organization's stated quality objectives by placing a tick in the appropriate column.

	Extremely not true	Somewhat Not true	True	Very true	Extremely true	Don't know
They include the needs of customer and interested parties						
They include organizational learning needs						
They include requirement for analysis of improvement opportunities						

2(d). Please indicate the extents the following are true of your organization's Quality Manual by placing a tick in the appropriate column.

	Extremely not true	Somewhat Not true	True	Very true	Extremely true	Don't know
It is available at the point of work of everybody.						
It describes interactions between the different procedures in the organization.						
It clarifies the aims of the organization						

Section B

3(a). Please indicate the extents the following are true of your organization, by ticking as appropriate.

	Extremely not true	Somewhat Not true	True	Very true	Extremely true	Don't know
I can easily tell when the document I need to use for my work is current and not superseded by a revised one.						
Information contained in records of work is analyzed to help prevent problems.						
Information contained in records is used to plan performance improvement.						
Information from records is used to review how the work has been performed.						

3(b). Please tick the word or words that reflect the extents the following information are used as input to your unit/section's management review.

	Never	Rarely	Usually	always	Don't know
Feedback from customers					
Results of quality system audit					
Information from performance records					
Changes in any process					
Changes from external environment					

3(c). The purpose of this sub-section of the questionnaire is to gauge the extent your organization's systems and processes are focused on the customer. Please indicate your view by ticking as appropriate the extent to which each of the following is true of your organization:

	Extremely Not True	Some-what Not True	True	Very True	Extremely True	Don't' know
In my organization, there are systems for identifying who the customer to every activity is.						

	Extremely Not True	Some-what Not True	True	Very True	Extremely True	Don't' know
In my organization, there are systems for identifying the processes which are used to create value that is passed to the customer.						
In my organization there is customer needs measurement system						
In my organization there are systems for translating customer needs to products and services.						
In my organization, there are systems and processes for regular measurement of customer satisfaction.						
In my organization, information from customer satisfaction measures is used to evaluate and improve internal processes.						
In my organization, there are systems in place to evaluate every activity in the business process to determine its contribution to meeting customer requirements.						
In my organization, there are systems and processes for listening and learning from customers.						
In my organization, there are systems and processes for clearly defining key customer groups						
In my organization, there are processes through which customers can easily comment, complain and receive prompt resolution of their concerns.						

3(d). The purpose of this section of the questionnaire is to gauge the extent your organization's activities are based on the process approach. Please indicate your view by ticking as appropriate the extent to which the following is true of your organization:

	Extremely Not True	Some-what Not True	True	Very True	Extremely True	Don't know
In my organization, more efforts are made to reduce complexity than to deal with complexity.						
In my organization, control is achieved by statistically studying variation to understand the causes of poor performance						
In my organization, process and system factors are considered more important than social factors in task performance goal achievement.						
In my organization, process stability and capability are emphasized in assuring quality of work.						
In my organization, quality of work is assured by the way every one works rather than inspection.						
In my organization managing interactions between activities is considered more important than perfection in an activity.						
In my organization, improvement activities target underlying work processes and not work roles.						
In my organization, complexity in work processes is handled through automation and computerization.*						

	Extremely Not True	Some-what Not True	True	Very True	Extremely True	Don't know
In my organization, improvement is achieved by setting performance targets.*						
In my organization, managers achieve improved performance by holding every employee to account for results and talking to them about the need to perform.*						
In my organization, customers are those from outside the organization to whom our services are targeted at. *						

3(e). Please indicate by ticking the scale that, in your opinion, best represents your organization's performance relative to the organizations in similar situations and with similar service obligations, in each of the listed areas.

	Much worse than others	Slightly worse than others	Just about the same as others	Slightly better than others	Much better than others
Cost efficiency					
Timeliness					
Quality of service					
Relevance					
Satisfied customers					
Service reputation					

Appreciation:

The researcher wishes to express his appreciation and sincere thanks to you for taking the time to fill the questionnaire. You can be assured of the confidentiality of both your participation and the responses.

Many thanks.