1.2 STATEMENT OF THE PROBLEM

The problems addressed by this project, focuses on the efficacy of the SABS ISO 9000 standards as they are applied by two different kinds of organizations. The first case is that of a sophisticated company with a history of total quality management (TQM): Will the SABS ISO 9000 standards be compatible with the existing quality culture or will adherence to the requirements of SABS ISO 9001, SABS ISO 9002 or SABS ISO 9003 be disruptive? The second case is that of an unsophisticated company using the requirements of SABS ISO 9000 as the first major attempt to install a quality system. For that company, the problem to be investigated is whether the template laid out in SABS ISO 9000 is sufficient to develop an effective quality culture. In either case, the key question is whether the rapid gain in popularity of ISO 9000 registration will be a regressive move to TQM, using the philosophies of Deming as guide.

Seventy-four countries (Schröder 1994a), use at present the ISO 9000 quality assurance series. These countries who have obtained ISO certification are grouped into four major groups.(see table 1.1). A detailed analysis per group is shown in an appendix A to this report.

It is expected that certification, based on these international quality standards, will eventually become mandatory for most manufactures seeking global markets (Ivancevick *et al* 1994:8). A growing world-wide acceptance of ISO 9000, and the feeling that registration will be required to do business in Europe and elsewhere are expected to increase the number of companies that adopt the standards.

One definition of a quality system is described by the philosophies of W. Edwards Deming whose views are reviewed and summarized in this project. Deming's teachings span more than fifty years. Combined, these teachings offer a philosophical basis to build a quality management system instead of a prescriptive sequential approach, which is the hallmark of other quality proponents, most notably Philip Crosby (1979).

Deming is noted for his evolving 14 points, but they are far from being a checklist to follow, but represent instead a codification of his principles. This does not mean that Deming opposes any kind of prescriptive standard. He has been involved in the development of international agreements for cross-border railway gauges and the sharing of census methodology since 1939 (Neave 1990).

Many questions concerning the purpose or the objectives of 'ISO implementation' have been raised.

> Some would proselytize that ISO series of standards can only be implemented within the framework of a Total Quality Philosophy. In effect, that faction sees the ISO series as providing a structure to the very tenets of total quality. To others, the ISO series is nothing more than a baseline model/foundation upon which one can build a total quality superstructure. Others, would argue that ISO series has little to do with quality and indeed a step backwards. Extremists in that latter group believe that ISO series might in fact represent the antithesis to total quality. (Lamprecht 1993:23)

This project then endeavours to answer the question: 'Is SABS ISO 9000 a step backwards for the philosophies of W. Edwards Deming?'

Chapter 1

BACKGROUND INFORMATION FOR THE PROJECT

1.1 INRODUCTION

Rarely has an international standard receive such interest as the ISO 9000 (ISO International Standards Organisation) series for quality systems registration. Many factors are causing this, but three seem the most prominent:

1. The accelerating globalization of the world market-place.
2. The development of the European Community in 1992 which requires simplified standards to allow free trade across borders (Ivancevick, Lorenzi, & Skinner 1994:119-120).
3. The economic success of the Japanese is widely perceived to be based upon quality leadership.

Yet a foremost leader in the quality revolution, W. Edwards Deming, teaches a philosophy and methodology that appear at odds with several aspects of ISO 9000. This study seeks to critically analyse the SABS ISO 9000 (SABS - South African Bureau of Standards) quality system standards on the basis of Deming's management philosophy and methodology.

The ISO 9000 series of quality standards is rapidly growing, both in interest and international acceptance. "There are in excess of 1 000 companies listed in this scheme in South Africa..."(Luyt 1994:160). These standards have become popular because they are the first to be widely accepted as a minimal listing required for a functional quality system. Lofgren (1991:35-37) believes that successful implementation and acceptance of these standards have not been simple, partially because of differing views regarding the definition of a quality system.

LIST OF TABLES

1.1 ISO 9000 certificates-October 1993 4

2.1 Plan-Do-Study-Act 28

2.2 The Seven Deadly Diseases 35

4.1 ISO 9001 in Relation to the Deming Cycle 45

4.2 ISO 9001/Deming 14 Points Relationship Matrix 71

4.3 Contrast of ISO 9001 to the System of Profound Knowledge 74

4.4 ISO 9001/Demings's 14 Points Relationship Matrix Compared to Interview Results 82

6 1 First-level categories of the Deming Prize 97

6.2 Malcolm Baldrige Quality Award point allocation 1992 104

APPENDICES

A ISO 9000 CERTIFICATES-OCTOBER 1993 116

B INTERVIEW AGENDA 117

C INTERVIEWEES 119

D COMPANY'S VISITED (SABS 9001) 122

E STANDARDS MENTIONED IN REPORT 126

REFERENCES 127

6.4.4 Conclusion ... 97
6.5 MALCOLM BALDRIGE NATIONAL QUALITY AWARD ... 97
6.5.1 Origin ... 97
6.5.2 Total quality management revisited ... 98
6.5.3 Features of total quality management ... 99
6.5.4 The Baldrige Award criteria framework ... 102
6.5.5 Examination items ... 104
6.5.6 Linkage of the Award criteria to quality related issues ... 105
6.5.7 Developing a strategy to win the Malcolm Baldrige National Quality Award ... 106
6.6 ISO 9000, DEMING PRIZE AND THE BALDRIGE AWARD GUIDELINES COMPARED 107
6.6.1 Requirements of the three systems ... 107
6.6.2 Comparing ISO 9000 with the Deming Prize ... 108
6.6.3 Comparing ISO 9000 with MBNQA ... 110
6.6.4 Comparing the Deming Prize with MBNQA ... 110
6.7 SUGGESTED MODEL TO ACHIEVE TQM ... 112
6.8 A FINAL COMPARISON ISO, DEMING PRIZE AND MBNQA ... 113
6.9 CONCLUSION ... 114

LIST OF FIGURES

2.1 Deming View of a Manufacturing System ... 21
2.2 The Shewhart Circle ... 27
4.1 ISO 9000 Standards: Levels of Application ... 42
4.2 ISO 9000 and the Deming System View ... 44
5.1 Holding the Gains ... 86
6.1 TQM trilogy ... 93
6.2 The Baldrige Award criteria framework ... 103
6.3 A trilogy approach to TQM ... 113

4.4 ISO 9001 COMPARED PARAGRAPHS BY PARAGRAPH WITH DEMING'S 14 POINTS 45
4.5 ISO 9001 COMPARED TO THE ELEMENTS OF PROFOUND KNOWLEDGE 72
4.6 ANALYSIS 75
4.6.1 Dr Deming's opinion of ISO 9000 75
4.6.2 Summary of ISO 9001/Deming comparison matrix 76
4.6.3 Summary of the positive aspects of ISO 9001 77
4.6.4 Summary of the negative aspects of ISO 9001 78
4.7 COMPARISON OF THE ISO 9001/DEMING'S 14 POINTS RELATIONSHIP MATRIX AND INTERVIEW RESULTS 81
4.8 SUMMARY 83

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION 84
5.2 REVIEW OF RESEARCH QUESTIONS 84
5.3 RESEARCH CONCLUSIONS 86
5.4 RECOMMENDATIONS FOR FURTHER RESEARCH 90
5.5 SUMMARY 90

Chapter 6

THOUGHTS ON ISO 9000, DEMING PRIZE AND BALDRIGE AWARD

6.1 INTRODUCTION 92
6.2 ISO 9000 93
6.3 GROUPING OF QUALITY AWARDS 94
6.4 THE DEMING PRIZE 95
6.4.1 Origin 95
6.4.2 Framework 96
6.4.3 Evaluation criteria 96

Chapter 2

REVIEW OF THE RELEVANT LITERATURE

2.1 INTRODUCTION 13

2.2 QUALITY EXPERT W. EDWARD DEMING 13

2.2.1 Deming's history 13

2.3 DEMING AND TOTAL QUALITY MANAGEMENT 16

2.4 PROFOUND KNOWLEDGE 19

2.4.1 Appreciation of a system 20

2.4.2 Some knowledge about variation 22

2.4.3 Some theory of knowledge 23

2.4.4 Some psychology 24

2.5 FOURTEEN POINTS 26

2.6 THE SEVEN DEADLY DISEASES AND OBSTACLES 34

2.7 SUMMARY 36

Chapter 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION 37

3.2 RESEARCH QUESTIONS 37

3.3 RESEARCH DESIGN 38

3.4 DATA RESOURCES 40

3.5 ANALYSIS OF THREATS OF VALIDITY 40

3.6 SUMMARY 41

Chapter 4

THE RELATIONSHIP BETWEEN DEMING AND ISO 9001

4.1 INTRODUCTION 42

4.2 TQM LACKS A UNIVERSAL DEFINITION 43

4.3 ISO 9000 AND THE DEMING PROCESS FLOW DIAGRAM 43

CONTENTS

TITLE PAGE i
DECLARATION ii
ACKNOWLEDGEMENTS iii
ABSTRACT iv
CONTENTS v

Chapter 1

BACKGROUND INFORMATION FOR THE PROJECT

1.1 INTRODUCTION 1
1.2 STATEMENT OF THE PROBLEM 3
1.3 LIMITATIONS OF THE RESEARCH PROJECT 5
1.4 DELIMINATION OF THE RESEARCH PROJECT 6
1.5 DEFINITION OF TERMS 6
1.5.1 Corporate culture 6
1.5.2 Deadly diseases 7
1.5.3 Deming's 14 points 7
1.5.4 Hoshin planning 7
1.5.5 SABS ISO 9000 standards 8
1.5.6 The Deming (PDCA) cycle 9
1.5.7 Profound knowledge 9
1.5.8 Quality audit 9
1.5.9 Quality function deployment (QFD) 10
1.5.10 System 10
1.5.11 Sophisticated 10
1.5.12 Third party registration 11
1.5.13 Transformation 11
1.5.14 Total quality management (TQM) 11
1.6 OUTLINE OF THE RESEARCH PROJECT 12

ABSTRACT

This project compares the ISO 9000 series with the Deming-based total quality management philosophy. The series are also equated with the Deming prize and the Malcolm Baldrige National Quality Award as a trilogy in achieving total quality management.

Many companies which have implemented total quality management are requiring their suppliers to meet quality standards to assure a consistent product or service. The SABS ISO 9000 series is presently a prevalent method of assessment of suppliers.

Concerns that ISO registration would be the only way to ensure sales to the European Community have partially diminished, while pressure from domestic firms have increased, especially for companies facing competitive bidding from supplier contracts. This driving force may result in companies not reaping the advantages of total quality management, as their quality systems are simply designed to meet ISO 9000 requirements.

Analysis, primary and secondary research identified weaknesses and strengths of the ISO standards and Awards. Suggestions are made to those companies in the process of ISO registration in moving to a total quality environment.

ACKNOWLEDGEMENTS

Projects requir . combination of intense independence and space coupled with predictable and . ''ng support. I was fortunate to have the right mix of individuals surrounding me to provide me with the right combination of space and support to complete this major project in my life. I express my gratitude to the many individuals who have helped make this project possible.

Dr Deming would end his seminars and workshops with the words *"I have tried my best"* (Voehl 1995)

DECLARATION

I declare that this research project is my own, unaided work. It is being submitted for the Degree of Master of Science in Engineering at the University of the Witwatersrand, Johannesburg. It has not been submitted for any degree or examination in any other University.

21st day of August 19 95

ISO 9000 IMPLEMENTATION GUIDELINES

Vincent Blignaut

A research project submitted to the Faculty of Engineering, University of the Witwatersrand, Johannesburg in fulfilment of the requirements for the degree of Master of Science in Engineering.

Johannesburg, 1995.

After graduate school, Deming spent several years with the United States Department of Agriculture. His expanding fame as a statistician led to his work with the 1940 census and an invitation to work in Japan after World War II. In 1950 he gave the first in a series of lectures on statistics to Japanese engineers. Many advances gained by Shewhart in statistical application and improvement had been transitory due to management's focus on short-term profits and an inability to grasp the significance of these teachings. Much of the work done in the 1930s with statistical process control fell into disuse in the 1950s and Deming decided it was critical to avoid a repeat of his United States (US) failure.

> Quality in these postwar years took a getting the numbers out. Quality control came to mean end-of-the-line inspection. If there were defects and rework, there would be profit enough to cover them. Although a few control charts lingered here and there for a time, particularly in defence industries, for the most part the techniques taught by Dr Deming and his colloquies were now regarded as time-consuming and unnecessary, and they faded from use. (Walton 1986:9)

Deming concluded that he would have to work at the management level in Japan. After his lectures to engineers in Japan during July of 1950, he met with Ichiro Ishikawa, the President of Japanese Union and Scientists and Engineers (JUSE), (Walton 1986.37). He was highly successful with his approach and was honoured in 1951 by JUSE with the establishment of the coveted Deming prize. It is awarded to an individual or company for accomplishment in the application of statistical theory (Walton 1986: 54).

Deming's work in Japan would continue for another forty years, but did not gain recognition in the United States, not until the 1980s. He first came to the attention of the American public in the summer of 1980 through a television documentary 'If Japan Can, Why Can't We?' (Dobyns & Crawford-Mason 1991). This sparked an interest in his work that has obtained almost cult like proportions. "In the 1980's pursuit of greed, glamour and instant gratification, it has been intriguing to watch a

Central to his development, was exposure to Dr Walter Shewhart, beginning in 1927 Deming has always recognized the importance of Shewhart's work and its influence on him: "In fact I could claim that I had the privilege to work closer with Dr Shewhart than any head in Bell Laboratories. He kindly spent much time with me, as I tried to understand his thoughts" (Kilian 1988:56). He continued to study with Shewhart for several years (Walton 1986:84). Shewart developed statistical process control and control charts which greatly influenced Deming's approach to quality management.

Much of what today is attributed to Deming comes from the ideas of Shewhart, a fact which Deming acknowledges. His emphasis on processes and systems is rooted in Shewhart's concepts. Deming believes Shewhart's special contribution was to know when to act on a process and when to leave it alone, sometimes referred to as distinguishing between special and assignable cases (Walton 1986:104). Other contributions are the stability of a process and cost savings through quality control (Rosander 1991:61). The Deming method's special contribution is a broad view that encompasses the responsibility of management and the intrinsic motivation of the worker. It promotes a way of life as opposed to simple management fix-it schemes.

During the summers of 1925 and 1926, Deming learned much at the Bell Laboratories Hawthorne plant that would influence his work in future years. The growing complexity of telephone equipment was dictating consistency and interchangeability and significant improvements in reliability (Kilian 1988:130-140). Shewhart's work control charts helped in achieving these aims. These years were also important in the development of a management philosophy due to experiments conducted by Elton Mayo at the plant, perhaps best known for the 'Hawthorne effect.' These studies pointed to the element in work situations and that management must acknowledge worker motivation. Labourers were no longer thought of as brainless hands of the scientific management theories espoused by Taylor (George 1972:37). The human element forms a major part of Deming's theories of profound knowledge, but he does not seem to have had any direct contact with Mayo's studies at that time.

Chapter 2

REVIEW OF THE RELEVANT LITERATURE

2.1 INTRODUCTION

A company cannot achieve TQM in simple straight forward steps. Achieving TQM requires a fundamental review of the principles that guide strategic planning and day to day activities. The works of W. Edward Deming represents one model for TQM. This report uses the Deming's principles as a framework to study SABS ISO 9000. These standards are evaluated for effectiveness in moving a company towards TQM if it currently lacks quality as a management emphasis.

2.2 QUALITY EXPERT W. EDWARD DEMING

To understand the Deming way, one must know something about the person (Fendt & Vavrek 1992:153). The following section will provide a short overview of the history of Deming.

2.2.1 Deming's history

Deming was born in 1900 in Sioux City, Iowa. He earned a BSc in engineering from the University of Wyoming in 1921, an MSc in mathematics and physics from the University of Colorado in 1921 and a PhD in physics at Yale University in 1928. The Japanese Deming prize for quality was named after him in 1951 and in 1960 he received the elite Japanese order of sacred Treasure, Second Class (Laszlo 1994:14).

He spent most of his live as private consultant. His career began with summer work at Bell Laboratories where much of the foundation for his work was established.

1.6 OUTLINE OF THE RESEARCH PROJECT

The next chapter reviews the current literature pertaining to the teachings of W. Edward Deming.

Chapter three describes the research methodology, with specific reference to the research questions. The use of primary and secondary sources are discussed and threats of validity.

Chapter four provides a comparison between Deming's teachings and SABS ISO 9001.

Chapter five is the penultimate chapter. A summary of the findings and conclusions of the main report is provided in this chapter. Some ideas for possible future research in this or similar areas are also presented.

Chapter six is the final chapter. Thoughts on ISO 9000, The Deming Prize and Baldrige Award are presented as alternative strategies for companies in their quest for quality excellence.

****

1.The total-customer-satisfaction-oriented concept of quality, together with reasonable costs of quality, must be established as one of the primary business and product planning and implementation of goals and performance measures of the marketing, engineering, production, industrial relations and service functions of the company.

2.Assuring the customer-satisfaction quality and cost result must be established as a primary business goal of the quality program of the company and of the quality-control function itself - not some narrower technical goal restricted to a limited technical or production-oriented quality result.

1.5.12 Third party registration

Third party refers to the independent agent hired by an organization to evaluate a supplier. Registration by a third party is a formal process in which the third party is accredited by an independent body which is sometimes a government agency. This then provides independent registration of suppliers through a formal quality audit and these registrations are then recognized by other potential customers. The supplier initiates and funds the independent third party registration process.

1.5.13 Transformation

Deming (1986:ix) speaks of a transformation of management. He uses this word to emphasize that change is not enough, but that an entirely new paradigm or foundation is required in management thinking.

1.5.14 Total quality management (TQM)

The Institute of Management Services defines TQM as: "a strategy for improving business performance through the commitment and involvement of all employees too fully satisfying agreed customer requirements at the optimum overall cost through the continuous improvement of the products and services, business processes and the people involved" (Jones 1992:18).

1.5.9 Quality function deployment (QFD)

The QFD is an analytical tool used to translate "customer requirements into appropriate technical requirements for each state of product development and production" (Eureka & Ryar. 1988:13). A QFD relationship matrix is used in this project to graphically analyse the intersection of the SABS ISO 9001 paragraphs and Deming's 14 points.

1.5.10 System

Dr W. Edward defines a system as: "...a series of functions or activities(subprocesses, stages-hereafter components) within an organization that work together for the aim of an organization"(Latzko & Saunders 1995:34). A quality system comprises of the processes in an organisation intended to yield consistency or improvement to the enterprise of the corporation.

1.5.11 Sophisticated

In the context of quality systems, a sophisticated company is one that has adopted a conscious quality focus as a strategic element of management. An unsophisticated company has not recognized the strategic importance of quality. Feigenbaum (1983:18) defines two management steps required to establish quality as a strong business strategy:

1.5.6 The Deming (PDCA) cycle

This is the circle of continuous process improvement taught by Deming, based upon original ideas of Walter Shewhart (Neave 1990:139). Deming revised it in 1990 to PDSA,with the signifying 'study' to place more emphasis on the analytical nature of the checking stage (Dobyns & Crowford-Mason 1991).

1.5.7 Profound knowledge[1]

Deming's philosophy is based upon his system of profound knowledge. It comprises the four elements of appreciation of systems, the knowledge of variation (statistical theory), the theory of knowledge and psychology (British Deming Association 192:3)

1.5.8 Quality audit

Mills (1989:7) defines the quality audit as "...a management tool for determining the effectiveness of the quality system... The results of the audit provide an assessment of the adequacy of the existing program. They also provide a bench mark against which system improvements can be developed and evaluated". The quality audit is the primary tool used by registrars to confirm compliance to the requirements of quality system standards.

[1]Dictionaries interpret the word in such terms as: thoroughgoing, far-reaching, penetrating beyond what is superficial or obvious, unqualified, absolute, coming from great depth.

with daily activity, good vertical communication, cross-functional communication, and everyone planning or himself or herself, and the buy-in that results. (King 1989:3).

1.5.5 SABS ISO 9000 standards

For the purpose of this project, SABS ISO 9000 standards refer to the collection of ISO 9000 quality systems registration standards maintained by the International Organization of Standardization (ISO) based in Geneva, Switzerland. Waples (1994:2) state that "...to my knowledge, every nation that has adopted ISO 9000 as its national standard has adopted it, without any change of wording or substance." Labuschagne (1994) asserts that the SABS ISO 9000 series are equivalent to ISO 9000. The only difference is that the SABS has assigned to it local standard numbers, SABS. Other countries have adopted a similar approach such as the following: United States, ANSI/ASQC Q90; Sweden, SS-ISO 9000; Australia, AS 3900; New Zealand, NZS 9000; United Kingdom, BS 5750; European Community, EN 2900, and more than 69 others. The SABS ISO standards are:

SABS ISO 9000-1987: "Quality management and quality assurance standards- Guidelines for selection and use." [Equivalent to ISO 9000]

SABS ISO 9001-1987: "Quality systems - Model for quality assurance in design'development, production, installation and servicing." [Equivalent to ISO 9001]

SABS ISO 9002-1987: "Quality systems - Model for quality assurance in production and installation." [Equivalent to ISO 9002]

SABS ISO 9003-1987: "Quality systems - Model for quality assurance in final inspection and test." [Equivalent to ISO 9003]

SABS ISO 9004-1987: "Quality systems - Quality management and quality systems-Guidelines." [Equivalent to ISO 9004]

> new members as the correct way to perceive, think, and feel in relation to these problems. (Schein 1987:262)

A culture is considered robust if it is insensitive to uncontrollable outside sources. Any modification of the core procedures in a company, intended to meet only the requirements of an auditor, would be affected whenever the auditing requirements changed. "By 'robust,' we mean that the product or process performs consistently on target and is relatively insensitive to factors that are difficult to control" (Montgomery 1991:414).

1.5.2 Deadly diseases

According to Walton(1992:36) there are seven characteristics of an organization which Deming considered a continuation of ruinous management procedures. (See table2.2)

1.5.3 Deming's 14 points

These are statements which Deming used to summarize the key points of his philosophy. Deming's 14 point philosophy underlines many of the present quality systems now being implemented (Elshennawy, Maytubby & Aly 1991:75-78). (See section 2.5)

1.5.4 Hoshin planning

Hoshin in Japanese means 'shining metal' or 'pointing direction' (King 1989:2). Hoshin planning is:

> A system that has integrated PDCA (plan do check act) language and activity based on clear, long-term thinking, a realistic measurement system with a focus on process and results, identification of what's important, alignment of groups, decisions by people who have the necessary information, planning integrated

changing as he continues to apply his own principles of continuous improvement. For example, the 14 points came about only in the early 1980's and he is still working on the concepts of profound knowledge (Neave 1990).

1.4 DELIMITATION OF THE RESEARCH PROJECT

This study cannot completely review the concepts of total quality management nor the structure of quality systems registration, due to the complexity of both topics. Only a representative summary of either subject can be adequately addressed, but this project attempts to do so in as complete a manner as necessary to provide a foundation for analysis of the research questions. Many people hold widely divergent opinions on these topics and the structure of this study does not allow statistical sampling of large numbers. Critical opinions were derived from interviews with the authors of the quality standards, selected proponents of quality management principles and users of the standards. Thus, careful selection of sources and interviews with experienced people helped, to assure a balanced and thorough perspective.

1.5 DEFINITION OF TERMS

Leontiades (1982:45) said that there was no shared language of business policy and therefore definitions are necessary. Within the context of this project, the following definitions will apply:

1.5.1 Corporate culture

"There are many interpretations and definitions of culture. One definition can be adopted to define the quality culture of a group" (Saraph and Sebastian 1993:73).

> The pattern of basic assumptions that a group has invented, discovered or developed in learning to cope with its problems of external adaption and internal integration, and that has worked well enough to be considered valid, and, therefore, to be taught to

ISO 9001, ISO 9002 and ISO 9003 registration as the pinnacle of their TQM achievements, and they have no plans to build on this registration (Dale 1994)."

This study compares the requirements of SABS ISO 9000 to the philosophies of W. Edwards Deming to learn if compliance can be achieved within the comprehensive framework of his methods. This broader understanding is necessary for quality unsophisticated companies because, as Kanter (1983:75) wrote, older tradition bound companies are "used to setting policy at the top, they cannot easily free the levels below to contribute new ideas". This freeing of entrepreneurial spirit will be required for success in the increasingly competitive global market-place.

1.3 LIMITATIONS OF THE RESEARCH PROJECT

The method of study was an extensive literature search and interviews with practitioners of TQM, registrants to SABS ISO 9000, and developers of the standards. "The revision process [ISO 9000 standards] is due to start in 1996. It is envisaged that the next revision will only be published in 2000. ISO is using the phrase 'Vision 2000' and it is expected that substantial changes to the series will be made" (Schröder 1994b). The current release of the standards dated 1987 may have critical omissions which are investigated. There are many conflicting views and interpretations of both the usefulness and application of quality systems registration as embodied in these standards. "ISO 9000 falls far short of the quality that world-class corporations demand of themselves and their suppliers" (Henkhof 1993:68). Thorough review of available literature is required to avoid overlooking significant trends and information.

Interviews were used to support and expand the results of the literature search. These interviews could have been limited by the availability of people who are knowledgable about either Deming's philosophies or ISO 9000. The researcher was optimistic that people with in-depth understanding of both topics would be available. Precise conclusions are made even more difficult because the Deming philosophy is constantly

Table 1.1 ISO 9000 Certificates, October 1993

Group	ISO 9000 certificates
Europe	37 779
PAC Rim	4 767
Americas	2 270
Other	1 209

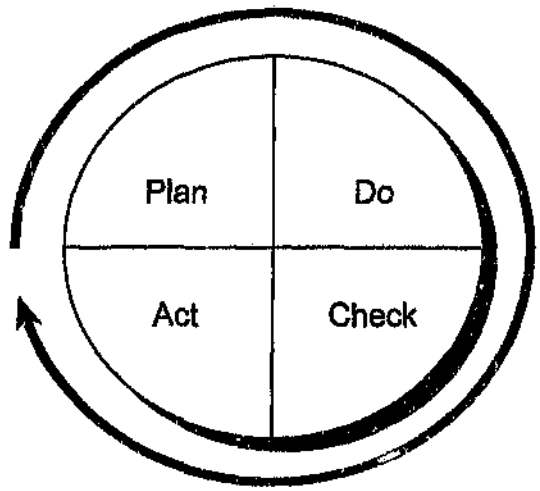
Source: Scröder, G. 1994a. A brief overview of the ISO series. Paper presented at the SAQI Quality Conference, Mi. .994. [Adapted]

> ISO is a label for a series of international standards for quality systems that were published by the International Organization for Standardization. The standards are voluntary; they are not a legal prerequisites to selling products in Europe. They have been cleverly marketed, however, that whoever hopes to sell products in Europe must become registered as meeting the criteria of ISO 9000. Registration to ISO has become a *de facto* license to market in Europe. (Juran 1994:36)

South African Quality Institute chief patron and chairman, Dr Marius de Waal (1994), believes quality will be the key that opens the door to export markets to South Africa. However, for companies who wish to export, specifically to Europe, it would be, necessary to register as an SABS ISO 9000 company (Gerber 1993:9-10).

Acc· ·ing to Michel (1993:50) the 'rush to registration' has taken place at different rates in different industries in different countries. This rush to become registered with the SABS ISO 9000 standards may result in a simple prescriptive, form of TQM. Prescriptive means forcing a checklist or in sequence approach to TQM by literal adherence to the paragraphs of the SABS ISO 9000 standards. This approach is not sufficient to achieve a lasting management shift to a quality focus that may be required to remain competitive "....some organisations, particularly small companies, see

Figure 2.2 The Shewhart Circle[1]



Source: Ivancevick *et al* (1994:189)

Based upon ideas he learned from Shewhart in the 1930s, PDCA is at the heart of his ideas of continual process improvement. He revised the acronym to PDSA, Plan-Do-Study-Act, in 1990 to emphasize the analysis that takes place at the review stage (Dobyns & Crawford-Mason 1991:65-70). Scherkenbach (1991:63) describes PDSA in the steps listed in table 2.1.

[1]In Japan it is called the Deming Cycle because it was Dr Deming who introduced it. (Walton 1994:84)

The emphasis on psychology is also related to the understanding of variation. Psychology helps understand the variation that is present in people and their reactions to circumstances. The role of a leader is to optimize people's performance by understanding how their particular abilities can best be augmented through the design of their jobs (Neave 1990:80).

> People are different from one another. A leader must be aware of these differences, and use them for optimization of everybody's abilities and inclinations. Management of industry, education and government operate today under the supposition that all people are alike. (British Deming Association:1992:17)(BDA)

2.5 FOURTEEN POINTS

The system of profound knowledge was discussed firstly to provide a theoretical framework to understand the 14 points. Profound knowledge is the foundation of these statements which form much more than a prescriptive implementation list. Profound knowledge is also described in the 14 points but they do not provide a simple bridge from theory to application.

Many of these items discuss the nature of processes and warn against the futility of management exhortations to 'do better' when the process itself limits results.

> This is the most seductive fallacy. All we need, supposedly, is for everyone to give a little more, and all our problems will be solved. The corollary is that our problems arise because people aren't doing their best. They're careless, or they're purposely making mistakes. Deming claims that in his more than sixty years of experience he has yet to find the person who isn't trying his or her hardest. Some people, though, are constrained by the system from doing what they know is best and right. (Aguayo 1990:31)

Another foundation theory for Deming's 14 points is the Deming/Shewhart circle called PDCA for Plan-Do-Check-Act figure 2.2.

(Figure 2.2...)

same modest Washington home he and his wife bought during the depression of the 1930s (Gabor 1990:80). Understanding the role that psychology and values play in his system of profound knowledge explains the radical change he requires in society's traditional emphasis on grading, rewards, and competition.

Deming speaks of intrinsic as contrasted with extrinsic motivation. Intrinsic motivation emphasizes a person's innate self-esteem and dignity as the basis of the idea of joy in work. Extrinsic motivation is at the heart of the scientific management theory and modern American management by objectives. Like his emphasis on understanding variation, derived from Shewhart's influence, this concept is not new. Herzberg (1959:114) studied worker motivation and identified factors he described as 'self-actualization' and 'self-realization.' Deming believes emphasis of extrinsic motivation is counterproductive and is destructive of intrinsic motivation.

> Extrinsic motivation is submission to external forces that neutralize intrinsic motivation. Pay is not a motivator. Under extrinsic motivation, learning and joy in learning in school are submerged in order to capture top grades. On the job, innovation and joy in work become secondary to a good rating. Under extrinsic motivation, one is ruled by external forces. He tries to protect what he has. He strives for a high rating, or for a high grade in school. He tries to avoid punishment. He knows no joy in work. He knows no joy in learning. He tries to avoid punishment. Extrinsic motivation is a zero-defect mentality. (Deming, 1990:36)

This reference emphasizes both understanding the motivation of people and his rejection of simpler prescriptive approaches such as Crosby's zero defect campaigns. The management transformation or metamorphosis of which Deming writes is intimately connected with this study of psychology. He advocates fundamental changes in society and the way motivation and values are viewed. He advocates the elimination of employee ranking and pay for performance. He advocates an understanding of intrinsic motivation and the evolution of society and corporations to an era in which 'everyone will win, no loser' (British Deming Association:1992:18).

Japan's Competitive Success' emphasized this point: "Where management has failed to establish such a system and has instead directed its efforts randomly and in bits and pieces to such areas as suggestions and QC circles, success has often been short-lived"

Neave (1990:267) discusses the theory of knowledge and lists several attributes. The job of management is essentially prediction and strategic efforts as opposed to tactical actions. Profound knowledge teaches that 'there is no knowledge without prediction' (Neave 1990:269). This is followed by an understanding that there is no knowledge without a theoretical basis, and finally that "no number of examples establishes a theory" (Neave 1990:269). Managers seeking to apply Deming's principles will find a discussion of the theory of knowledge of little value to them by itself. One way of applying this principle is by operational definitions. The purpose of an operational definition is to put into words the definition of the system and the management interpretation of all the elements of information that form the predictive knowledge about the process. These words are not effective unless they are acted upon consistently by everyone in the organization who impacts the process (Neave 1990:270). The concept of operation definitions provides a theoretical basis for the ISO 9000 standards' emphasis on documentation. Writing something down removes ambiguity about processes and specifically what is to be done to achieve the desired fitness of purpose required by the customer. Operational definitions are widely used by the Japanese to translate Deming's process flow chart into action.

> The Japanese paid great attention to the development of operational definitions in the early 1950s, and ... the benefits they gained from this bore comparison with those obtained by their use of concepts and tools of the statistical control of processes. (Neave 1990:109)

2.4.4 Some psychology

Deming's early years, growing up in poverty in Wyoming, instilled in him values that form the humanistic element of his teachings. He is disdainful of waste and extravagance and, although he demands great fees in his consulting work, lives in the

> A master statistician, in Deming's view, is someone who grasps the entire picture of statistics, someone who sees the forest of statistics rather than merely the trees of formulae. Specifically, a master statistician has formed a holistic view from a set of individual observations. (Yoshida 1989:13)

Theoretical statisticians not grounded in practicality will fall short of this description of a master statistician. Deming emphasizes that a statistical view of anything is far from being precise: "There is no such thing as a fact concerning an empirical observation. Any two people may have different ideas about what is important to know about any event" (Deming 1990:35).

An understanding of variation does not necessarily require complicated mathematics. Deming showed the example of a ten-year-old boy who charted the arrival time of his school bus. The child used a simple control chart to better predict the school bus schedule and identified special causes of delay, such as a 'new driver,' on the graph. Scherkenbach (1991:22) used the phrase, 'voice of the process' to characterize the central tendency, shape, dispersion, and other parameters that enumerate the stable performance of a system.

2.4.3 Some theory of knowledge

The significance of the simple flow chart of figure 2.1 cannot be understated. What Deming found in his initial trips to Japan was that the Japanese were very knowledgeable in specific areas but had failed to grasp the significance of the interactions. They did not understand systems. This is the third element of the system of profound knowledge, the theory of knowledge. It is the ability to understand how individual pieces of information are formed into a more sophisticated realization of some fundamental truth. Working only with isolated pieces of knowledge or with the latest fad in quality management has been a major failing of American companies attempting to develop TQM. Masaaki Imai, (1986:94) in 'Kaizen: The Key to

organization chart, of all the departments striving for individual goals (sales profit, productivity). It is a network of people, materials, methods, equipment, all working in support of each other for the common aim" (Deming 1991:15).

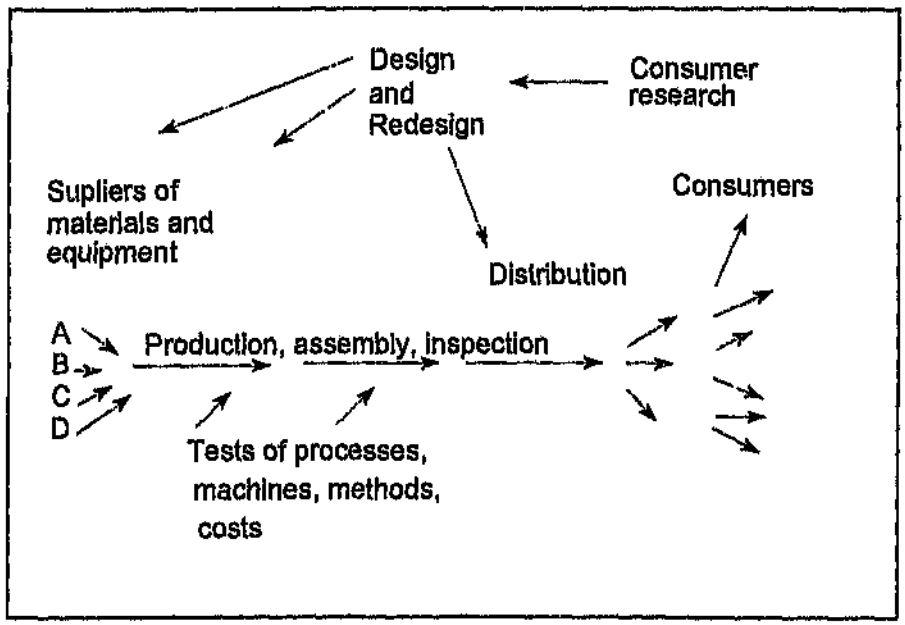
2.4.2 Some knowledge about variation

Deming's primary career throughout his life has been statistical consulting. "Statistical theory is the leitmotif of Deming's Fourteen Points of Management. And to understand Deming's philosophy, one must first understand its statistical underpinnings" (Gabor 1994:31). His emphasis on the importance of statistical theory is grounded in his belief that variation is ubiquitous and affects every process from manufacturing to human systems. Traditional scientific management is based upon a deterministic view of the world that expects exact outcomes in similar situations. A view of the world based upon knowledge of variation recognizes that there is always random irregularity involved in any process and the method for optimization must concentrate on reducing variation.

Theory is just a theory until some action is taken. The purpose of a statistical study is to understand a process better and to predict its future behaviour. Statistical studies can be divided into two primary categories. Enumerative studies are those that seek to understand outcomes and to base action on a mathematical description of the outputs. Analytic studies probe more deeply to understand how to modify the inputs to a process to affect the output (Scherkenbach 1991:105-111). Action is the emphasis in Deming's teaching. Knowledge of variation is not enough unless this information is used continually to improve the process. Rosander (1991:80) indicated that Deming utilized about 45 statistical examples to reinforce his message in 'Quality Productivity and Competitive Position.' Rosander (1991:80) emphasized that although "the analysis shows that statistics have a lot to do with the 14 points, statistics are necessary but not sufficient".

It is a mistake to think that Deming's teachings are simply about statistics.

Figure 2.1 Deming View of a Manufacturing System



Source: Deming (1986:4)

The importance of this contribution was to educate the Japanese managers that the little of expertise they possessed needed to be formed into a synergetic system. This simple flow diagram is the basis for systems thinking. Systems thinking means that each element of a process, such as production and receipt of test materials, is not important by itself. The elements are important in their relationship to the output of the system. Efforts to concentrate on only one part of the process and optimize the performance of that area can lead to suboptimization and to the detriment of the system. "Management of the system therefore requires knowledge of the inter-relationship between all the sub-processes within the system and of everybody that works in it [Deming]" (Neave 1990:129). The other key idea taught by this flow chart is the feedback loop between the consumer, to the consumer research department, design and research and finally back into the production process. This is the basis of continual process improvement. "A business is not merely an

Besides these four elements, he [Deming] emphasized that no segment is sufficient by itself. All four must be considered as a whole and the interrelation between each forms the system of profound knowledge (Neave 1990:80).

Whereas the 14 steps of Philip Crosby can be easily summarized in a poster displayed on the shop floor, the system of profound knowledge is less accessible to the average worker. Emphasis is on management which, in Deming's mind, is responsible for most of the performance of any system. Management makes the decisions about how a process will be designed, what materials will be purchased, how employees will be treated, and so forth. They are the ones who must understand and enable this comprehensive philosophical system (Aguayo 1990:87-96).

2.4.1 Appreciation of a system

Understanding systems is important in understanding everything else in the teachings of Deming. His earliest contribution was a simple flow diagram that he used with management in his first Japanese lectures of 1950 (see figure 2.1). Deming said:

> What is a system? It is a series of functions or activities (sub-processes, stages— here-inafter components) within an that work together for the aim of the organization. The mechanical and electrical parts that work together to make an automobile or a vacuum-cleaner form a system. The schools of a city, including private schools, parochial schools, and universities, provide an example of components that ought to work together as a system for education.(British Deming Association 1992:6)

He believes this approach is ruinous and causes fixation on short-term solutions. He [Deming] quotes Dr Yoshi Tsurumi:

> Most American executives think they are in business to make money, rather than products or services... The Japanese corporate credo, on the other hand, is that a company should become the world's efficient provider of whatever product and service it offers. Once it becomes the world leader and continuous to offer good products, profits follow. (Deming 1986:99)

To drive this point home, Deming quotes Dr Lloyd Nelson who said, "The most important figures needed for the management of any organization are unknown and unknowable" (Deming, 1986:20). Some unknowable figures are the unknown sales lost because of a dissastified customer or decreased productivity from unmotivated employees. Awareness of the importance of unknown figures places a responsibility on management in TQM mature company that is much more broad than can be reflected in the balance sheet.

2.4 PROFOUND KNOWLEDGE

Although Deming is best known for his 14 points, his system of quality management is rooted in what he calls the system of profound knowledge. This is a recent development appearing in his lectures in the late 1980s and encompasses more than just statistical tools, the understanding of processes or variation (Neave 1990:84). The system of profound knowledge defines a philosophical system more comprehensive than a simple quick fix manual for installing quality.

The systems of profound knowledge consist of four elements (British Deming Association:1992:3).

1. Appreciation for a system
2. Some knowledge of the theory of variation (statistical theory)
3. Theory of knowledge
4. Knowledge of psychology

further effort towards improvement when once everything is within specification and seems logical. "Shouldn't everything pay for itself including quality? ... It seems logical but it's wrong" (Aguayo 1990:41). Manufacturing of tangible products is easier to understand than the intangible of services. Quality of services is elusive as Rosander (1991:48) says, namely 'customers buy a sample of one.' The customer's judgement of the quality is based upon the single transaction of the service.

To understand the Deming method, it is best to understand his insistence, not only change in management style, but on transformation.

> Transformation of American style of management is not a job of reconstruction nor is it revision. It requires a whole structure, from foundation upward. Mutation might be the world, except mutation implies unordered spontaneity. Transformation must make way for direct effort. (Deming 1986:ix)

His insistence upon the "total transformation of Western style management" (Neave 1990:80) is central to understanding his method. He was fond of saying that "best efforts will not be enough" (Neave 1990:30) and talked of restoring pride in workmanship, dignity and self-esteem of the worker. This is why his approach stands out from other quality proponents. An organization must make a complete paradigm shift in its thinking. A company cannot adopt only parts of his philosophy and be successful.

> The change required is transformation, change of state, metamorphosis. The transformation will restore the individual; will abolish grades in school on up through the university; will abolish the annual appraisal of people on the job, MBO [Management by Objectives], quotas for production, specified requirements that people work 57 minutes out of every hour, incentive pay, monthly or quarterly reports on business targets, competition between people, competition between divisions, and other forms of suboptimisation. Leadership will replace these bad practices, and will restore the individual [Deming]. (Neave 1990:9)

Another element distinguishes Deming's methods from that of others to achieve TQM, and that is in, his opinion of traditional American management focus on profits.

Deming, emphasized by his decision to concentrate on management commitment early in his Japanese work.

> The importance Deming attaches to controlling and reducing variation has led him to a holistic view of leadership that casts management in a different role from the one prevailing in American companies since the end of World War II. Deming rejects the model of the modern American manager who can 'manage anything' based on a company's balance sheet. Instead, he advocates a process-obsessed management culture that is capable of harnessing the know-how and natural initiative of its employees and fine-tuning the entire organization to higher standards of excellence and innovation. (Gabor 1990:117)

This holistic approach meshes well with the orientation of traditional Japanese culture (Yoshida 1989:10-17). Western society's approach is not as inclusive and follows the scientific tradition of breaking down a problem into its individual parts. This approach is known as 'atomism' and is in contrast to the Japanese holistic approach, called 'vitalism' (Boznak 1991:22-23). These differing world views may account for the delay Deming's approach has experienced in being accepted by Western Management.

A discussion of TQM requires a definition of quality. Quality is sometimes incorrectly confused with expensive products. Modern TQM programmes have shown just the opposite. Quality products are less costly to manufacture because of the reduced waste and effort. Deming uses the analogy of an orchestra to explain the meaning of quality. A world- class orchestra or a local school orchestra may play from the same score. Both performances may be technically flawless and without error. Yet, the result from one is much different from the other, demonstrating that the whole is greater than the parts. (Weekley 1993:175-176)

This sophisticated view of quality exceeds Phillip Crosby's definitions of 'conformance to specifications' or 'quality means conformance to requirements' (Crosby 1988a:35). If quality was meeting requirements, it would be reasonable to assume that once the specifications or requirements were met, there would be no

grass-roots movement thrive on the ideas of quality, learning and self-improvement" (Gabor 1990:135).

The review is concluded with the words of Laszlo (1994:14) paying tribute to Deming. "On December 20, 1993, quality's foremost preacher, W. Edwards D[illegible] died at the age of 93, leaving behind an endless list of honours and achievem[illegible] a congregation of followers that continues to grow."

2.3 DEMING AND TOTAL QUALITY MANAGEMENT

Total Quality Management is a phrase used to describe a comprehensive management method with an accent on quality. Chapter 1 includes a definition by The Institute of Management services. Another good definition is by Feigenbaum (1983:13) who defines total quality control but whose definition encompasses TQM:

> Total quality control's organization wide impact involves the managerial technical implementation of customer-oriented quality activities as a prime responsibility of general management and of machine-line operations of marketing, engineering, production, industrial relations, finance, and service as well as the quality-control function itself.

Saylor (1992:6) goes on and describes TQM as:

> ... a philosophy and a set of guiding principles that are the foundation of a continuously improving organization. TQM is the application of quantitative methods and human resources to improve the material services supplied to the organization, all the processes in the organization within the organization, and the degree to which the needs of the customer are met, now and in the future.

This comparison emphasizes a holistic approach that includes a humanistic element as 'people are assets.' This means that the efforts of a corporation or organization is more than the sum of the individual parts. This is a major theme in the work of

These two represent the general principles and the most stringent of the three registration guide lines. Additional related standards were reviewed. They are:

- Draft International Standard (DIS) ISO 9001.2: 1994. " Quality systems - Model for quality assurance in design/development, production, installation and servicing".
- Draft International Standard (DIS) 9002.2: 1994. Quality systems - Model for quality assurance in production, installation and servicing".

SABS ISO 9001 1987 was reviewed into sections for consistency with the principles of Deming. The literature search of chapter two provides the research, regarding the Deming approach to quality systems. Additional references to the ISO 9000 standards were used to learn their applicability and relationship to TQM principles. Studies of published commentaries regarding the standards were used in comparison with the principles of Deming.

Three methods were used to compile the results of this study. The first is a written commentary comparing each section of ISO 9001 with the Deming ideology. The second uses a matrix diagram to position the major elements of a quality system, defined by ISO 9001, within the framework of the four elements of profound knowledge described by Deming. The third uses a QFD 'house of quality' to show interrelationships and conflicts among the twenty sections of ISO 9001 and Deming's 14 points. Additional material was researched in technical and quality related symposiums' proceedings. Periodical literature published in the United States and Europe was obtained whenever possible.

Conformation or modification of the results of the literature search was done through interviews. These interviews were held in person or through correspondence. A copy of the interview script is reproduced in appendix A. Communications were with managers in companies registered for ISO 9001 certification or with consultants in the quality field. Additional interviews were conducted with experts in the field familiar with the principles of W. Edwards Deming.(See appendix B and C)

2. The standards conflict with or neglect several important elements of TQM as described by Dr W. Edwards Demming.

3. Rapid acceptance of these standards, without additional management changes may be detrimental to the broad success of TQM principles.

This project attempts to confirm these statements in two ways. Firstly, support of the research questions was sought through an extensive review of literature concerning the philosophies of Deming and the ISO 9000 standards. Secondly, interviews with key and influential people were conducted to test the research questions.

3.3 RESEARCH DESIGN

This project is nonexperimental in design. The approach consists of a main study based upon a thorough review of literature and study of the ISO 9000 standards. Results of this main study were confirmed or modified by interviews with proponents of the Deming philosophy, with managers in companies that have achieved ISO 9001 registration, and with members of committees who have written the ISO 9000 standards. Interviews were conducted to confirm conclusions drawn from the literature search.

The main study consists of a review of the SABS ISO 9000 1987 standards. Primary, emphasis was placed on two standards:

1. SABS ISO 9001-1987: "Quality systems - Model for quality assurance in design/development, production, installation and servicing".

2. SABS ISO 9004-1987: "Quality systems - Quality management and quality systems - guidelines".

Chapter 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This study compares the ISO 9000 standards with the teachings of W. Edwards Deming to determine if the two are compatible. His approach is chosen as a model for developing TQM within an organization, but his methods are not the only way to achieve TQM. Deming's theories are unique in that they represent a comprehensive consideration of all aspects of managing a company, from tools and methods to psychology and learning, and this approach emphasizes the total in TQM.

His ideology is controversial because it promotes a much different method than traditionally taken by Western style management which emphasizes profit and management by numbers. It is beliefed that a company can be primarily managed by the review of numerical reports and information gathered through financial measurements. Interest in quality systems registration, using the ISO 9000 standards, is growing but rapid acceptance and expanding customer demand for registration may not be effective in promoting mature quality systems.

3.2 RESEARCH QUESTIONS

For this study, the following research questions have been constructed which assert that rapid acceptance of the ISO 9000 standards will be counterproductive to establishing TQM:

1. The ISO 9000 quality system standards are not a complete guide to use for achieving TQM.

Deming points out that attention to short-term profits is self destructive because of the slight contribution it makes towards continuous improvement. Any manager can meet short-term financial objectives by destructive steps such as lack of maintenance, use of cheap parts and reduction of training.

2.7 SUMMARY

This project seeks to evaluate the ISO 9000 quality systems registration standards as an element or step towards TQM. There is no single accepted definition of total quality management and there are several experts who offer complete systems intended to achieve the results of TQM. This review of literature has investigated the teachings of W. Edwards Deming. Deming has neither the most complete nor only method to approach TQM. His teachings provide a substantial and thorough system of management thought within which to review the requirements and effect of the ISO 9000 standards. Thus it is appropriate to ask if prescriptive application of these standards would be counter-productive to Deming's teaching and, by inference, inadequate in application to achieve TQM.

****

Table 2.2 The Seven Deadly Diseases

1.	Lack of constancy of purpose
2.	Emphasis on short-term profits
3.	Evaluation of performance, merit rating, or annual review performance
4.	Mobility of management
5.	Running a company on visible figures alone
	Deceases 6 and 7 are pertinent to the United States
6.	Excessive medical costs
7.	Excessive costs of warranty, fuelled by lawyers who work on continency fees

Source: Walton (1992:36) [Adapted]

Elsewhere in Deming's work, he describes obstacles to the management transformation he preaches. For example, the cavalier attitude once quality control is installed and the job is done. Another is reliance on automation and computers to solve process problems when the processes are neither stable nor understood. A third is the belief that it is only necessary to meet specifications, nothing more. Many of these are summed up in his phrase 'hope for instant pudding' to emphasize Western management's passion for short, quick, easy solutions (Deming 1986:126). Deming's humanistic approach is evident when he says, 'Barriers against the realization of pride in workmanship may in fact be one of the most important obstacles to reduction of cost and improvement of quality in the United States (Deming 1986: 83). One of the main reasons this dehumanization happens is American management's fixation with short-term profits.

> In Deming's view, the traditional financial mentality is the greatest impediment to quality management in the United States, because it deflects attention from the long-term interests of a company's operations and because traditional financial and accounting measures offer managers few of the insights they need to plan for the future. (Gabor 1990:78)

Point 14 Put everyone in the company to work to accomplish the transformation

Earlier versions of this point highlighted the role of top management and its responsibility to provide leadership to the transformation (Neave 1990:134). This point is a recapitulation of the previous thirteen, building upon the understanding of systems and establishing that everyone in an organization must be involved in the transformation. Chief executives who believe they can appoint a quality director and then feel they've done their part have missed the essence of Deming's teachings. Deming refused to consult with any company unless the top management has agreed to accept his philosophies and there is commitment throughout the organization to work toward transformation (Gabor 1990:54-60).

2.6 THE SEVEN DEADLY DISEASES AND OBSTACLES

This review of Deming's philosophies started with the system of profound knowledge and then proceeded to the 14 points. The final views of his teachings are the seven deadly diseases and other obstacles that inhibit the development of a quality system using his methods. Table 2.3 summarizes the seven deadly diseases that Deming considers symptoms of a ruinous Western management practice. Many of these are simple corollaries to one of the 14 points. For example, disease four, management mobility, conflicts with point one, constancy of purpose.

A woman in my class at the Graduate School of business Administration of New York University described her job with an airline, which was to answer the telephone, to make reservations and to give information. She must make 25 calls per hour. She must be courteous, don't rush callers. She is continually plagued by obstacles:
(a) the computer is slow in delivery of information that she asks for;
(b) it sometimes reports no information, whereupon she is forced to use directories and guides. Christine, what is your job: Is it:

To make 25 calls per hour?

or

To give callers courteous satisfaction; no brush-off?

It cannot be both.

Point 12 Remove barriers that rob workers, engineers, and managers of their right to pride of workmanship

There are many barriers to pride in workmanship that face hourly workers and management. Some examples of these are inadequate training, poorly designed processes, poor environment and bad materials. Although workers are paid for doing reworks, most will say they take no pride nor are they happy in this work. Given the opportunity, most people want to do well. This is another element of psychology which management needs to consider.

Point 13 Institute a vigorous program of education and self-improvement

This point is closely related to Deming's efforts at promoting continual improvement. He sees education as a basic ingredient to life and especially to everyone's ability to continue to grow and contribute to an enterprise. Companies must encourage and support lifelong learning. Education is more broad in scope than training since what is learned through education may have no immediate use. Training is the bits and pieces and education is integration into knowledge.

the goals of a single department at the expense of the total success of the enterprise. Each department must understand the parts of the process that precede and follow their own to optimize the result that the customer receives.

Point 10: Eliminate slogans, exhortations, and numerical targets

An earlier version of this point added the phrase 'without providing methods' (Neave 1990:358). Informative posters and morale building slogans in themselves are not wrong. What Deming considers wrong are slogans that exhort the worker to produce zero defects, or to take pride in quality without management addressing the effect of their decisions on the worker's ability to produce a quality product. Slogans and exhortations are a simple way for management to shirk the responsibility of the hard work of leadership in improving work environments and processes.

Point 11 Eliminate work standards (quotas) and management by objective

Deming does not imply that businesses should manage without numbers or objective measures, but he advocates the elimination of arbitrary quotas or objectives. For example, a sales organization that improved sales last year by 8 percent is exhorted by management to improve to twelve this year. Management gives no thought to how this will be achieved or what new products will be available to reach this goal. Quotas and numbers may also lead to wrong behaviour and ultimately customer dissatisfaction. Deming (1986:73) gives an excellent example of conflicting objectives in *Out of the Crisis*.

the propagation of errors and divergence from the skills that were taught to the first person in the OJT chain.

Point 7 Institute leadership

As Scherkenbach (1991:29) stated: "The quality of decisions made by the top leaders of a company has a far greater impact on the prosperity of the enterprise than the efforts exerted by the willing workers" Leadership is more than supervision. Leadership means to create an environment in which people can do a better job and enjoy the pride of workmanship. A leader understands all the elements of the system of profound knowledge including knowledge of variation as applied to people and their performance. Ranking and evaluation of people is counterproductive. It is more important to understand who is outside the normal system and requires special help, such as finding a job that matches ability and inclination.

Point 8 Drive out fear

'Drive out fear' is another example of Deming's humanistic approach to quality improvement rooted in the system of profound knowledge and the need to understand psychology. Unlike Taylor's scientific management theory that had little consideration for the human element, Deming emphasizes that people must work without fear. This fears can be tangible threats or more subtle ones such as pressure caused by unrealistic quotas and capricious ranking. Fear of not meeting quotas may lead to falsification of data and the inability of management to lead by the numbers since the figures that are submitted are incorrect.

Point 9 Break down barriers between departments

Point nine is related to the understanding of systems in profound knowledge. Breaking down barriers reduces the possibility of suboptimizing a process to achieve

Point 4 End the practice of awarding business on price tag alone. Instead, minimize total cost, which is often accomplished by working with a single supplier.

When purchasing an item, cost must not be the only concern. Indeed, a low price supplier may cost more in the long run because the product either does not meet the customer's requirements, or is shoddily manufactured and not reliable. Deming recommends developing a relationship of trust with single suppliers. A single supplier is preferable since it is difficult to characterize and control variation from a single source let alone two. Multiple suppliers complicate the statistical distribution of parts considerably.

Point 5 Improve constantly the system of production and service

Constant improvement is the result of the application of the PDSA Deming circle. Continual improvement implies that traditional management fire-fighting is not enough. Solving problems as individual isolated events, constant tampering with a system, and short-term focused corrective action reports, ignores the essence of systems knowledge. Lasting results are obtained through improving the process as far up stream as possible, not reacting after the fact as management by objectives promotes.

Point 6 Institute training on the job

The use of training in this phrase is different from education. Education is a broad term that means integration of individual items of knowledge into something new. Training refers to specific skills required to accomplish a job. Deming emphasizes two aspects of training: 1. People learn in different ways.... 2. Once a worker has brought his work into statistical control, further lessons will not help him' (Neave 1990:326). On the job training (OJB) is one employee teaching the next and this practice leads to

'Elements of Political Economy' in 1835 used the phrase 'constancy of purpose' to describe the perseverance a manager must have in carrying out plans (George 1972:96). Hoshin planning, also known as policy deployment, is a good technique to formalize an emphasis on long-range, breakthrough planning. It establishes a corporate culture that places value on consistency of purpose (King 1989:132).

Point 2 Adopt the new philosophy

This point details the transformation that is required in society and management. Deming's teachings describe this new philosophy. The shared societal view of what is the acceptable norm for a reward system or business enterprise constitute a paradigm. Thomas Kuhn (1970:11) describes paradigms used by the scientific community as a common sharing of 'rules and standards for scientific practice' that acts as a filter to colour what people see and how they interpret new information. Deming's point two is a challenge to adopt a new paradigm for management success.

Point 3 Cease dependence on mass inspection to achieve quality

Point three is a criticism of traditional American manufacturing techniques that developed to maturity in the 1950s. After World War II, consumer demand was so great that industry could scarcely keep up with sales. Inspection was used at the end of the assembly line to sort out the products that were bad. The system of profound knowledge emphasizes the interrelatedness of all elements of the manufacturing process. Needless waste that is generated through rejection of inspected items is eliminated early in the manufacturing stream by careful design and process control. A stable process, well understood by management, needs little or no inspection.

Table 2.1 Plan-Do-Study-Act

I.	**PLAN:**	**Develop a plan to improve**
	1.	Identify the opportunity for improvement
	2.	Document the present process
	3.	Create a vision of the improvement process
	4.	Define the scope of the improvement effort
II.	**DO:**	**Carry out plan**
	5.	Pilot the proposed changes on a small scale, with customers and over again
III.	**STUDY:**	**Study the results**
	6.	Observe what you learned about the improvement of the process
IV.	**ACT:**	**Adjust the process, based on your knowledge**
	7.	Operationalize the new mix of resources
	8.	Repeat the steps (cycle) on the next opportunity

Source: Scherkenbach (1991:63) [Adapted]

The following titles for the 14 points are taken from a listing provided by Adams & Arora (1994:10-16).

Point 1 **Create constancy of purpose (means steady enduring, a never-ending goal.**

'Constancy of purpose' is a concise phrase that accentuates the long-term over short-term business practice. Like much of Deming's work, the ideas are not new but his integration of them into a coherent system is his contribution. Samuel P. Newman in

This clause is rated +3 weak positive in relation to point 9. Several interview subjects mentioned improvement in communication within their corporations as a positive side effect of the registration process and documentation development. A rating of +3 weak positive also marks point 14. The awareness and participation of everyone is required to effectively sustain the quality system as required by clause 4.2.

> **Contract review (4.3)**
>
> The supplier shall establish and maintain procedures for contract review and for the coordination of these activities (ISO 1987:2).

This short clause states that the supplier is responsible for assuring that the organization can provide the product or service that the buyer orders. This condition is in concert with the standard's definition of quality as conformance to customer requirements.

Positive aspects of clause 4.3

It is good business practice to completely understand the requirements of a contract and to assure they can be met. Efforts invested at the contract review stage can avoid misunderstandings and mistakes further downstream in the service performance or product production operation.

Negative aspects of clause 4.3

Crawford (1988:3) believes the contract review stage is already too late for improvement or innovation in understanding customer requirements: "The weakness of this clause is that it apparently contemplates that these necessary checks will be done when the contract already exists. We should encourage people to get them done at a much earlier stage". Deming advances further:

> Success depends on how well a company evaluates the processes, products and markets of today to figure out what the customer will want tomorrow, and whether a company has the management conviction to change accordingly (Gaster 1990:19).

Conformity to requirements as the primary definition of quality is not in accordance with the Deming philosophy, and clause 4.2 refers to "ensuring that product conforms to specified requirements" (ISO 1987:2).

> The meaning of nonconformity however is defined as 'the nonfulfilment [*sic*] specified requirements'. BS5750 is thus capable of being interpreted as sustaining the short-sighted and dangerous view that quality improvement efforts can stop as soon as products or services have 'met the spec' (BDA 1989: 8).

Simply meeting specifications contradicts Deming's view that the obligation of management is to innovate, exceed customer expectations, and offer new and unique products or services. The quality system standards that preceded ISO 9000, such as BS 5750-1979, emphasized specifications as the definition of quality. John Betti of the Fort Motor Company is quoted by Deming:

> We in America have worried about specifications: meet the specifications. In contrast, the Japanese have worried about uniformity, working for less and less variation about the nominal value - e.g., diameter 1cm (Deming 1986:49).

Deming also says, "Specifications are not wrong. They are just not sufficient" (Neave 1990:164). The accent of specifications and conformance to customer requirements is found throughout ISO 9001.

ISO 9001/Deming's relationship assessment of clause 4.2

A -3 weak negative is applied to Deming's point 2 because of the ISO 9001 description of quality, primarily as conformance to requirements. This definition has been a consistent one in industry and does not support adopting a new philosophy as Deming's proselytizes. A -3 weak negative is also assigned to point 5, since conformance to specifications encourages a proclivity to inaction and inflexibility.

Quality system (4.2)

> The supplier shall establish and maintain a documented quality system as a means of ensuring that product conforms to specified requirements. (ISO1987:2).

A written quality manual is the primary manifestation of a quality system that an auditor of this clause expects to review. In this clause, the term quality system is not meant in the broad terms Deming describes in profound systems knowledge. As far as the ISO 9001 standard is concerned, the term quality system pertains only to those factors that are likely to affect conformance to customer expectations.

Positive aspects of clause 4.2

This clause requires "the preparation of quality plans and a quality manual in accordance with the specified requirements" (ISO 1987:2). A cross-functional effort is required to assemble the pertinent plans and to write the quality manual. This activity requires the review of existing processes and the assessment of their effectiveness. This review can provide the opportunity to analyse departmental interfaces and help identify inefficiencies in the process flow. Willey writes that the benefits of this cross-functional review is a result of ISO 9 000 registration efforts but not necessarily a specific objective. "Industrial experience from introducing BS5750 certainly helps to break down barriers between departments and improve understanding. However, this is a fortunate result form BS5750 not a central aim"(Wiley 1990:8).

Negative aspects of clause 4.2

Precise description of a quality system as procedures and processes may overlook the human organization and the essential characteristics that make a group successful.

> [There is an] 'informal organization', or the way the work gets done. There could be any and every combination of vertical, horizontal, and diagonal customer and supplier transactions. Real organizations cannot, and should not, be described by the neat and orderly columns and rows, as graphically described by many of the organization charts that are seen in companies everywhere (Scherkenbach 1991:11).

leadership:

> There is no recognition of the need for management to provide leadership, nor of the purpose of leadership in the context of quality, i.e. to help people and their equipment to do a better job. (Crawford 1988:2).

This is reinforced by Phillip Willey (1990:6):

> The word 'leadership' does not appear anywhere in BS5750. There is plenty about 'management responsibility' ... but it is obvious that this is management and documentation of the system.

ISO 9001/Deming relationship assessment of clause 4.1

A +9, strong positive, is assigned to the intersection between clause 4.1 and Deming's point 1, because the standard clearly states management's responsibility for the success of the system. Discussions with employees of registered companies reinforce the effect the standard has of requiring managers to manage, plan carefully, follow the plan, and avoid frequent, disruptive changes of direction to the organisation. Although some Deming's supporters criticise the lack of emphasis on leadership, the practical effect in registered companies is to bolster management obligation and provide leadership for the long term. A score of +3 week positive is applied to point 7, to recognise this link, but it is considered weak due to management focus of tactical system operation and not long term innovative leadership. This clause does not go as far as Deming's concept of an aim for the system nor an integration of the elements of profound knowledge.

A +9 strong positive is assigned to point 14. Managers interviewed in registered companies, frequently cited the positive aspect of the registration effort in enlisting all departments and employees in the effort to define, stabilise, and optimise the quality system.

> A system must have an aim. Without an aim there is no system. The aim of the system must be clear to everyone in the system. The aim is a plan for the future. The aim is a value judgment.

He also addresses the necessity to transform management and its attitudes toward quality improvement. Part of this transformation is to provide leadership and "create an environment in which people can take joy in their work" (British Deming Association 1989:11). Most of these thoughts are contained to some degree within the intention of ISO 9001 clause 4.1, because of the link drawn between management responsibility and the overall success of the quality system.

Positive aspects of clause 4.1

This clause begins the requirements part of ISO 9001 with a clear statement of management responsibility, Crawford (1988:2) writes:

> The whole of this paragraph makes excellent sense, provided that the responsibility and authority are delegated to the right level. If fully understood and implemented, this requirement should also ensure that everyone will know what his job is.

The determination of proper delegation is made by an auditor during the registration evaluation. Management must demonstrate that employees at appropriate levels, have been given the necessary authority to carry out assigned responsibilities. Clear management responsibility for the system, is a constant theme throughout ISO 9001.

Negative aspects of clause 4.1.

Deming's system of profound knowledge lists an understanding of variation as an important responsibility of management. A criticism that Deming advocates importance of ISO 9000, is that the importance of variation is sparinlgly referred to.

> The Standard fails to draw management's attention to the essential variability of processes, and hence of products. Consequently it conveys no idea of the benefits of reducing variation. (Crawford 1988:2).

A far greater omission as viewed by Deming advocates is the lack of a discussion of

Each of the following twenty paragraphs is composed of five parts. The first is a quotation of the initial text of the paragraph that describes the clause. The numbers listed are the clause numbers used within ISO 9001 for identification. Section 4 of the standard defines the quality system requirements, thus all of the following segments are from that section. Next follows a brief interpretation or comments for further clarification. The third is a grouping of positive factors that were identified during research. The fourth are negative factors similarly determined. The fifth is the researcher's evaluation of the correlation between the ISO 9000 clause and the relevant Deming point. This assessment is supported by specific observations and given a relative comparison rating of +9, strong positive, +3, weak positive, -3, weak negative, or -9 strong negative. Those relationships that are judged to be highly complementary are assigned +9 and those that firmly contradict are given a -9. Sections and points that support or oppose each other to a lesser degree are given +3 or -3 ratings. Figure 4.3 provides a graphic identification of the alignment of ISO 9001 with Deming-based TQM. The conclusions represented by this matrix are summarised in the section analysis.

Management responsibility (4.1)

Quality policy (4.1.1)

The supplier's management shall define and document its policy and objectives for, and commitment to, quality. The supplier shall ensure that his policy is understood, implemented and maintained at all levels in the organisation. (ISO 1987:2)

"Where is quality made? The answer is, by the top management. the quality of the output of a company can not be better than the quality determined at the top" (Deming 1992:13). Deming underscores the responsibility of management for the overall success of the system, and this obligation is the first quality system requirement stressed in ISO 9001. Deming (1992:35) also discusses the responsibility of management to provide a clear aim for the organisation:

Table 4.1 ISO 9001 in Relation to the Deming Cycle

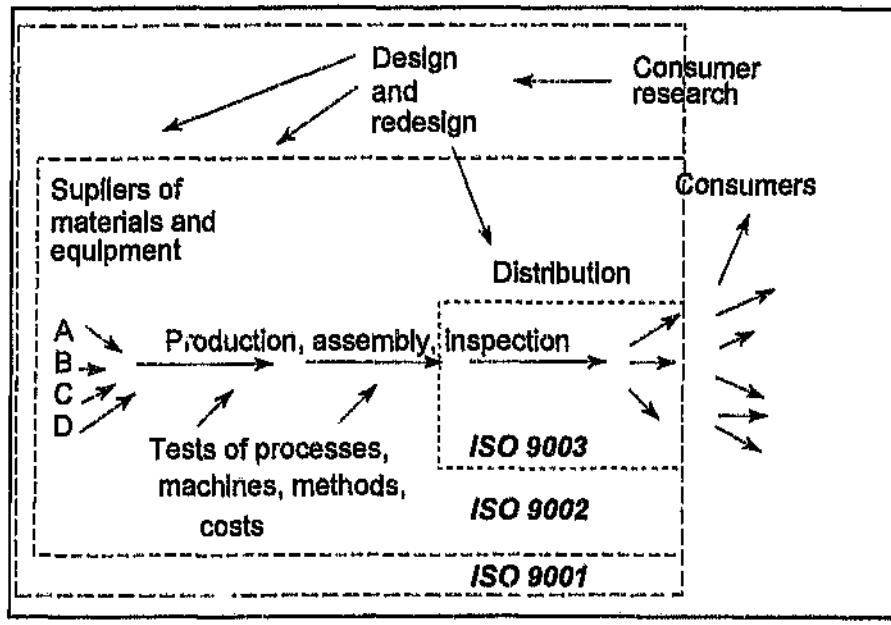
PLAN	**Say what you will do** - plan - define - establish - document
DO	**Do what you say** implement maintain
CHECK	**Check results versus expectations** - management review - internal audits - external audits
ACT	**Act on any deficiencies** - quality system revision - preventative action - corrective action

4.4 ISO 9001 COMPARED PARAGRAPHS BY PARAGRAPH WITH DEMING'S 14 POINTS

In the following section, ISO 9001, which is the most demanding of the contractual requirements, will be compared with each of Deming's 14 points. ISO 9001 is chosen since it is the document against which an auditor reviews a company applying for registration.

Deming teaches the importance of the understanding of systems in the concept of profound knowledge. Figure 4.2 shows the researcher's interpretation of the way in which the ISO 9000 standards intersect Deming's drawing of a manufacturing system. The three increasing levels of complexity, from ISO 9001 to ISO 9003, are indicated by larger portions of the system that is assessed. This figure demonstrates that inputs from consumer research and innovation are missing and also shows that the standards reinforce the idea of quality as conformable to customer requirements.

Figure 4.2 ISO 9000 and the Deming System View



Another relationship between ISO 9000 and the Deming view of a system is shown in table 4.1. This table lists the view of ISO 9000 as a Deming PDSA cycle. Both of these devices highlight the systems nature of the ISO 9000 standards and the potential for continual improvement that is inherent in that structure.

(Table 4.1...)

The following sections of this chapter discuss the relationship between Deming, ISO 9001 and TQM.

4.2 TQM LACKS A UNIVERSAL DEFINITION

The interviews revealed wide variation in interpretation of the concept of Total Quality Management. Deming does not subscribe to any definition of TQM. During a seminar given by him, a participant referred to a definition of TQM by Dr Deming. He immediately stopped the student and questioned him. When the student repeated that he thought Deming taught a definition of TQM, Deming emphatically said, "I do not! What is Total Quality Management? There isn't any definition" (Weekley 1993:128). Disagreement about a definition of TQM is not limited solely to followers of Deming. Saylor (1992:6) underscores this point "No one definition of TQM is accepted by everyone. The definition of TQM varies from organization to organization and individual to individual."

4.3 ISO 9000 AND THE DEMING PROCESS FLOW DIAGRAM

Many people interviewed during the research phase of his project, accentuated the importance of a systems view of an organisation in TQM and ISO 9000 registration. Peach (1991:71) discusses this and said that the quality system of an organisation is the sum of its current practice:

> The quality system is the philosophy and procedures by which an organisation conducts itself to satisfy customers and to comply with all other necessary requirements of the operations. A quality system represents the level of standards an organisation actually employs to guide and regulate all its activities.

The international standard ISO 8402 defines a quality system as, "the organisational structure, responsibilities, procedures, processes and resources for implementing quality management".

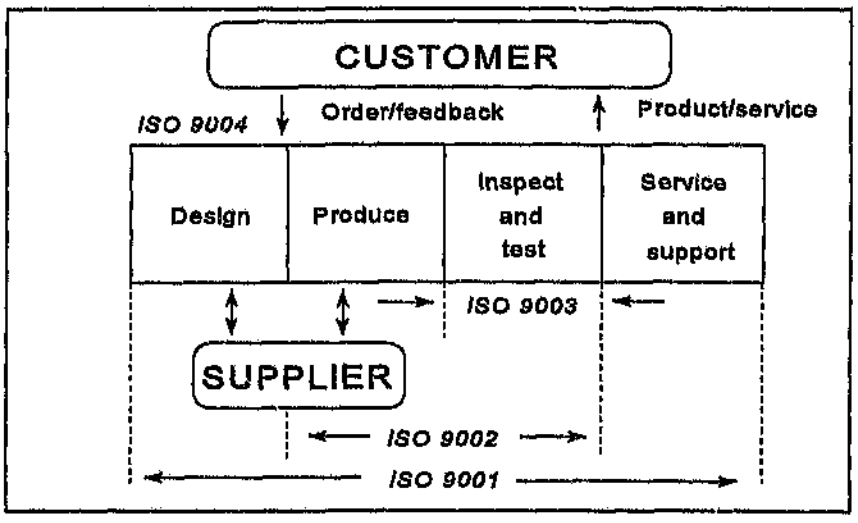
Chapter 4

THE RELATIONSHIP BETWEEN DEMING AND ISO 9001

4.1 INTRODUCTION

The core of ISO 9000 is a set of five international quality management and assurance standards, ISO 9000 through to 9004. The top-level document, ISO 9000, is an overall guide for the use of four supporting standards. ISO 9001 contains the requirements for quality systems that cover product design and development, production, installation and servicing. ISO 9002 focuses on quality assurance in production and installation. ISO 9003 deals with quality assurance in the final inspection and test stages of the life cycle, while quality management and quality system elements are covered in the ISO 9004 iteration. The relation of these models is depicted in figure 4.1

Figure 4.1 ISO 9000 Standards: Levels of Application



Another difficulty is the availability of current information. Quality system registration and the ISO 9000 standards are in a state of change, and the standards are being reviewed for a major update in 1996. Many companies in South Africa are planning for their first quality system, audit to the standards. Current literature on the subject is limited primarily, to frequently published books, periodicals and papers presented at technical symposia. The final threat to validity is limited accessibility to experts' knowledgable about Deming or ISO 9000 standards.

3.6 SUMMARY

The research questions chosen for this project do not lend themselves to precise, easily measurable answers. The importance of the questions, however, justifies the initial ambiguity of the research. The ISO 9000 standards are achieving a popularity unlike any other quality system standards that have preceded them. The value of this study is to aid organizations seeking registration to sort through an overwhelming maze of frequently conflicting information regarding these standards and the implied requirements. This project can help companies understand how to evolve towards TQM and remain competitive in world markets requiring ISO 9000 standards' registration..

****

3.4 DATA RESOURCES

A comprehensive search of available literature was the key to the success of the main study. Timely information was sought through quality and manufacturing periodicals on pertinent subjects such as Deming and quality principles available in South Africa. Additional material was researched in technical and quality related symposiums' proceedings. Periodical literature not published in South Africa was obtained whenever possible.

Interviews were sought with knowledgable people regarding both the ISO 9000 standards and the theories of Deming. These people were identified through the literature search and the former by the SABS.

The nature and quality of the interview subjects dictate the appraisal of the interview information. Open-ended questions were used to affirm or modify the research questions. The objective of the interviews was to gain insight from highly experienced people and, since the population sample was too small, the measurement uncertainty was too great for statistical analysis. Other techniques were used to summarize the interview results. These methods include tabular presentation, affinity diagrams, and matrix diagrams.

3.5 ANALYSIS OF THREATS TO VALIDITY

One threat to the validity of this study, is researcher bias. The study of the ideas of W. Edwards Demming does not yield a simple prescriptive method to achieve TQM, and experts in the field of quality systems say that TQM cannot be easily achieved in a few simple steps. Researcher interpretation of broad areas of importance to quality systems evolving his [Deming] ideas could yield bias.

Control of nonconforming product (4.13)

> The supplier shall establish and maintain procedures to ensure that a product that does not conform to specified requirements is prevented from inadvertent use or installation. Control shall provide for identification, documentation, evaluation, segregation (when pratical), disposition of nonconforming product and for notification to the functions concerned (ISO 1987:6).

The text describes nonconformity review and disposition requirements. "This again is an unfortunately logical and necessary part of the Standard. Every activity described represents waste and loss of productivity. Every activity carries a risk of leakage of nonconforming product to internal or external customers" (Crawford 1988:5).

ISO 9001/Deming's relationship assessment of clause 4.13

This clause is consistent with inspection methods of quality control. The requirements are operational tactics and are judged to have no correlation to the 14 points.

Corrective action (4.14)

> The supplier shall establish, document and maintain procedures for investigating the cause of nonconforming product and the corrective action needed to prevent recurrence (ISO 1987:6).

Subparagraphs describe analysis, quality records, and the use of customer complaint information. Preventative action is determined by analysis of the discrepancy and then followed by the application of controls to ensure effective maintenance.

Positive aspects of clause 4.14

The clause encourages "initiating preventative actions to deal with problems to a level corresponding to the risks encountered" (ISO 1987:6) thus suggesting a balance between tampering and fixing significant problems. Because this clause promotes process improvement, it is "readily interpretable in accordance with the Deming approach" (Crawford 1988:5).

Negative aspects of clause 4.11

The list of ten requirements are more tactical and specific than most other clauses of the standard. Practice among registered companies indicates that because of this specificity, auditors expect to see only these procedures used and used. This detailed, prescriptive clause inhibits innovation or development of alternative methods.

ISO 9001/Deming's relationship assessment of clause 4.11

The amplification to a separate standard, underscores the importance of measurement in specification and inspection. Measurement integrity is also important in understanding process capability and striving to reduce variation, but this is not described explicitly in ISO 9001. Some interviewees described the environment that is promoted by the prescriptive nature of this clause, as a mind set of minimal steps to be taken. Once these steps are accomplished, nothing more need be done. A rank of -3 weak negative is applied to point 3. An understanding of measurement integrity can help to determine process capability the achievement of statistical stability, and narrowed dispersion, thus the rank of +3 weak positive with point 5.

Inspection and test status (4.12)

> The inspection and test status of product shall be identified by using markings, authorized stamps, tags, labels, routing cards, inspection records, test software, physical location or other suitable means, which indicate the conformance or nonconformance of product with regard to inspection and tests performed (ISO 1987: 3).

This very short clause describes contractual requirements and operational tactics.

ISO 9001/Deming's relationship assessment of clause 4.12

No correlation is assessed. This instruction is coherent with the meaning of quality as conformance to specifications.

ISO 9001/Deming's relationship assessment of clause 4.10

This clause directly contradicts the lessons of point 3, and is thus ranked as -9 strong negative. There is no acknowledgement of control and improvement of processes through statistical techniques. Modern manufacturing procedures such as just-in-time manufacturing (JIT) appear at odds with the intention of this clause. Use of these methods may require education and justification efforts with the registering auditor. For example, a JIT process will not require inspection of incoming materials.

Inspection, measuring and test equipment (4.11)

> The supplier shall control, calibrate and maintain inspection, measuring and test equipment, whether owned by the supplier, on loan, or provided by the purchaser, to demonstrate the conformance of product to the specified requirements (ISO 1987:5).

Good measurements require calibrated instruments of quantified accuracy traceable to a national reference device or intrinsic parameter. This clause lists ten specific steps to be taken to assure accurate and repeatable measurements. The standard also requires the characterization of the measurement uncertainty and thereby the capability of equipment.

Positive aspects of clause 4.11

Most of the steps listed are based on other measurement standards and enumerate traditional good practice. The effect of this clause in the standard is to encourage a more thorough application of statistical methods, to understand the process capability of the measuring equipment. "Statistical control of the measuring process itself is vital if the measurements are to be of use in improving the manufacturing processes" (BDA 1992:12).

Reliable measurements of product specifications and processes is deemed so important that a separate standard addresses the subject. That standard is titled ISO 10012.1, "Quality Assurance Requirements for Measuring Equipment - Part 1: Metrological Confirmation System for Measuring Equipment".

workmanship which shall be stipulated, to the greatest practicable extent, in written standards or by means of representative samples" (ISO 1987:4). Clause 4.9a delineates management's responsibility to provide suitable equipment and working conditions (ISO 1987:3).

Inspection and testing (4.10)

Inspection and test records (4.10.4)

> The supplier shall establish and maintain records which give evidence that the product has passed inspection and/or test with defined acceptance criteria (ISO 1987:5).

Inspection and testing is required for receiving of material, in-process goods, final inspection and testing, and collection of records.

Positive aspects of clause 4.10

A system that defines quality in terms of specifications and conformance to requirements must rely on frequent inspections to assure compliance. In this context, this clause is compatible with the rest of the standard.

Negative aspects of clause 4.10

An entire clause of the standard devoted to inspection and testing gives the impression that quality can be inspected into a product. Deming has spent fifty years demonstrating that this is not so. This clause also ignores the theory of process capability and perpetuates a view that ignores the knowledge of systems and PDSA (Crawford 1988). To a company unsophisticated in the knowledge of variation, the procedures required in this paragraph could be detrimental.

> Deming has a more enlightened approach to inspection than does BS5750. He urges everyone to improve their processes, products and services to the extent that it will cease to be necessary to depend on mass inspection to filter out defectives. Instead, inspections should be moved upstream into appropriate stages of the process and, when a state of statistical control or stability has been achieved, greatly reduced in frequency (BDA 1989:11).

BDA (1992:8) research committee suggests that rigidly documented work instruction are not sufficient:

> Progress beyond that point requires further steps of getting more people personally involved in developing a deeper understanding of the processes and of what is meant by "process control". But many organisations lose out by failing to use the creativity and experience of their employees.

Negative aspects of clause 4.9

The basis of this paragraph is heavily influenced by the scientific management ideas of Taylor. The human element of pride in workmanship is lacking, and little is left to the creativity and flexibility of the worker.

ISO 9001/Deming relationship assessment of clause 4.9

Clause 4.9 requires documented and defined processes but falls short of invoking continual improvement methods. Improvement will be a byproduct, not the objective of process control, thus Clause 4.9 is rated +3 weak positive when compared to point 5.

A level of +9 strong positive is allotted for comparison to point 12. The standard places strong import on management's role in defining processes and providing necessary materials and working environment. These factors are influential in removing "barriers that rob workers, engineers, and managers of their right to pride of workmanship" (Deming 1990:6). A process concentration will lessen the tendency to exhort workers to do better and blame them when they cannot because of the system.

This clause also warrants a high ranking with point 12, because of the requirement for workmanship standards. Deming writes, "How can anyone on the factory floor take pride in his work when he is not sure what is acceptable workmanship, and what is not, and cannot find out?" (Deming 1986:77). Clause 4.9d requires "criteria for

Positive aspects of clause 4.8

Although the intention of this clause is primarily remedial, the information collected can be used to study and understand the variation between suppliers and reduce the effect that this variation has on the finished product. This aids in improving supplier quality.

Negative aspects of clause 4.8

There is no apparent negative relationship to the Deming 14 points. This paragraph is similar to 4.7 in that it is a tactical contractual requirement.

ISO 9001/Deming's relationship assessment of clause 4.8

The procedures required in this clause can be helpful, if the data obtained is used to understand the capabilities of vendors and to achieve continual improvement. Thus, a +3 weak positive is appropriate for point 4 and point 5.

Process control (4.9)

General (4.9.1)

> The supplier shall identify and plan the production and, where applicable, installation processes which directly affect quality and shall ensure that these processes are carried out under controlled conditions (ISO 1987:4).

Processes are defined through work instructions, monitored, controlled, approved by proper authority, and measured against workmanship standards. This short clause also refers to special processes that may be difficult to verify.

Positive aspects of clause 4.9

Documented work instructions provide clear direction to workers concerning procedures. Deming mentions that "a job description must do more than prescribe motions, do this, do that, this way, that way. It must tell what the work will be used for, how this work contributes to the aim of the system" (Deming 1992:42). The

A -3 weak negative is also assigned to point 4. Deming expressly encourages the use of single suppliers, because of reduced variation and the benefits accrued through stable work and good relationships. This concept is neither addressed nor discouraged by this clause, but the tone of the clause is legalistic in defining the relationship between supplier and purchaser. Without a single supplier philosophy, it is more difficult to achieve continual improvement and "reduce the number of sources, concentrating on the good ones, to lower the cost of variation" (BDA 1992:8).

Purchaser supplied product (4.7)

> The supplier shall establish and maintain procedures for verification, storage and maintenance of purchaser supplied product provided for incorporation into the supplies (ISO 1987:3).

Clause 4.7 applies if the buyer provides the material that is used in the product and returned to the buyer.

ISO 9001/Deming's relationship assessment of clause 4.7

This clause is a contractual statement of good business practice. It is judged to have no direct positive or negative correlation to the 14 points.

Product identification and traceability (4.8)

> Where appropriate, the supplier shall establish and maintain procedures for identifying the product from applicable drawings, specifications or other documents, during all stages of production, delivery and installation. (ISO 1987:3).

The purpose of this clause is to identify components in the finished product. This may be necessary to remove a product from final assembly or to recall a product once it has been delivered. Product identification may be important during servicing as governed by clause 4.19.

A purchased product is material which the supplier obtains to use in the manufacture of the product to the buyer's specifications. This clause pertains only to material that is used in the product or directly affects the quality of the manufacturing or delivery operation. Evidence of compliance to this clause is accomplished through formal documentation which controls the choice and authorization of suppliers and subcontractors. Proof is necessary that the goods purchased meet the requirements of the requisition, is verified as such, and can be traced at any location in the manufacturing or delivery process.

Positive aspects of clause 4.6

This segment highlights the importance subcontracted or supplied components have in the quality of the finished product. Deming advocates in point 4 a close partnership with suppliers.

Negative aspects of clause 4.6

Crawford (1988:3) says:

> This is a statement of conventional practice. As such, it relies on the common supposition that it is only necessary for the purchased product to meet specifications and fails to recognise that a product drawn from several suppliers is likely to be more variable than product drawn from a single supplier.

Willey (1990:4) adds, "Choosing a supplier who can merely supply to specification, bars the way to continual improvement". Both of these statements affirm the limited scope of this clause and the deficiency when compared to point 3.

ISO 9001/Deming's relationship assessment of clause 4.6

A -3 weak negative is assigned to point 3, because clause 4.6.4, 'Verification of purchased product,' supports traditional source inspection. There is no mention of more sophisticated techniques to achieve consistent results, such as statistical process control and sharing of process capability information.

Taylor's assumption that an optimum system can be defined, and that there is enough information to define it, is directly contradictory to Deming's approach. Instead of trying to design an optimum system, Deming emphasizes the need to have a resilient system which can be improved in course of time (Gluckman & Roome 1990:251). If the assumption is made that a system can be in detail described completely, then the emphasis of documentation logically follows.

ISO 9001/Deming's relationship assessment of clause 4.5

Documentation control is thoroughly investigated by registrars. A common auditing technique is to sample documents and verify actual practice of the procedures. If anomalies are found, further probing is done to determine the root cause of the discrepancy. A -3 weak negative is assigned to point 3, since the Deming approach stresses the need to understand and constantly improve the process, not concentrate on mistakes made in documentation control. The interview subjects' opinions are bolstered by a report in the March/April 1992 'Journal of European Business'.

This report lists the results of 1,040 nonconformatists from ISO 9001 evaluations. Of these, the largest number namely 18% are registered against Clause 4.5 (Timbers 1992:23). Many people interviewed said that the emphasis on rigid documentation seriously inhibited flexibility and responsiveness. Correspondingly, this clause is judged -9 strong negative when compared to Deming's point 5.

A score of -3 weak negative is given to point 12. Rigid documentation and procedures are intended to eliminate the human element in a process, as much as possible, but in so doing reduces the opportunity for workers to exhibit creativity, innovation, and pride in their work.

Purchasing (4.6)

General (4.6.1)

The supplier shall ensure that purchased product conforms to specified requirements (ISO 1987:3).

Organizational and technical interfaces (4.4.2.2)

Organizational and technical interfaces between different groups shall be identified and the necessary information documented, transmitted and regularly reviewed.(ISO 1987:3)

Document control (4.5)

Document approval and issue (4.5.1)

The supplier shall establish and maintain procedures to control all documents and data that relate to the requirements of this International Standard (ISO 1987:3).

Clause 4.5 describes the requirement to control appropriate quality system documents and records. Proper authorization procedures are required to place documents into service, and methods to remove obsolete documents from use must be defined. Formal change control procedures are needed for modification of existing documentation.

Positive aspects of clause 4.5

A thorough review and control of quality system definitions and documents, forces an evaluation of existing processes and procedures. These may never have been reviewed since they were written. Gaining control of documentation is good discipline for organizations without an established history of quality systems focus.

Negative aspects of clause 4.5.

Interviewees frequently mentioned that the ISO 9000 standards stress of control of documentation was restrictive and excessive. Deming writes, "Unnecessary paperwork is a serious loss. A lot of it originates in management's supposition that the cure for repetition of a mistake or fraud is more audit, more inspection" (Deming 1992:15). Dr Joyce Orsini (Weekley 1993:146) who lectures at Dr. Deming's seminars, adds: "We create paperwork to cover ourselves. We did exactly what we were supposed to do and then look to blame [when something goes wrong]". The practice of excessive documentation originates in the theories of Frederick Taylor, the author of scientific management:

Positive aspects of clause 4.4

Because of the specific nature of the discussion regarding the design stages, Crawford (1988:3) writes that the standard provides more guidance than Deming:

> Design is a subject on which the Standard offers (in the writer's view) much more advice, and more specific advice, than does Dr Deming. Although the latter emphasises that quality must be built in at the design stage (Out of the Crisis:49), specific advice on methods and procedures is scattered.

The standard detail steps for activity assignment, organizational interfaces, design input, design output, verification and change control (ISO 1987:3). This advice reinforces the importance of the plan stage of the PDSA cycle.

Negative aspects of clause 4.4

ISO 9001 primarily discusses the design of the finished commodity and does not address the planning of the production processes, which in turn heavily influence the final outcome (Crawford 1988). The British Deming Association (1992:7) committee which wrote 'Beyond ISO 9000' suggests that there are at least three things which will improve the standard in this clause. They suggest:

> First, it means designing goods and services which will exceed expectations rather than just aiming to meet specified requirements. Second, it means understanding that the product is at the mercy of the design and production processes. Third, it means recognising that innovation is and inseparable part of quality.

ISO 9001/Deming's relationship assessment of clause 4.4

A +3 weak positive is assigned to point 5, because this clause supports the use of the PDSA cycle. A +3 weak positive is also assigned to point 9, because the clause discusses organizational boundaries as a potential problem:

The definition of a customer extends to those who may not normally be considered as such by an organization. These are potential customers, previous customers or experts in the field, who may have valuable insight for innovation (Scherkenbach 1991).

ISO 9001/Deming's relationship assessment of clause 4.3

This clause is a simple statement, expressing the need for a good relationship between supplier and customer. It is ranked -3 weak negative regarding to point 2, because it reinforces limited thinking of quality as conformance to specifications. It does not allude to the need of the organization to innovate and provide products not conceived by the customer. Deming writes that the customer does not contribute to innovation:

> Where today are the makers of carburettors? There was a time when every automobile had a carburettor. How could it run without one? The makers of carburettors improved their product year by year. Customers were happy, loyal. What happened? Innovation. Came the fuel injector. The moral is, that it is necessary to innovate, to predict needs of the customer, give him more (Deming 1992:6).

Design control (4.4)

General (4.4.1)

> The supplier shall establish and maintain procedures to control and verify the design of the product in order to ensure that the specified requirements are met (ISO 1987:3).

Clause 4.4 expands the description of product characteristics, to be based on negotiation between the buyer and seller. More elaboration is given as to specific activities expected during the design stage.

4.6 ANALYSIS

4.6.1 Dr Deming's opinion of ISO 9000

In correspondence with the researcher Neave (1995) wrote the following about Deming and ISO 9000.

> Dr Deming first heard of ISO 9000 (as BS5750) at our first study-weekend with him in 1988. That weekend was devoted to the work of eight BDA Research Groups which had commenced work at that stage. One of these was the group which eventually published the BDA Booklet *Beyond ISO 9000*. We asked Dr Deming whether he had heard of BS5750, and he said he had not. Suspecting that this would be the case, I had arranged for one of the Group to have ready a 20-to-30 minute introduction. Dr Deming listened intently. At the end, when asked for his reaction, he thought for a few seconds, and then said "It sound to me as if it *could* be a useful start"

Crawford (1988:1) writes about the conflicting philosophies of the ISO 9000 standards and Deming:

> The underlying philosophy of the Standard is indicated by two passages from Clause 1 [of ISO 9001] - "Scope and Field of Application".
> a."The requirements ..... are aimed primarily at preventing nonconformity" (Para 1.1).
> b."Confidence in product conformance can be attained by adequate demonstration of certain suppliers' capabilities" (Para 1 2) (p. 1)

The "Objective of 'conformance' limits the horizons of the Standard" (Crawford 1988:1) and Crawford contrasts this limited scope with two ideas of Deming's teaching. The first is continuous improvement and the second is that quality can be considered separately from innovation (Crawford 1988). The draft version of DIS 9004-4.2 does detail quality losses in terms of customer satisfaction and the "loss

Table 4.3 Contrast ISO 9001 with the System of Profound Knowledge

SYSTEMS		VARIATION	
4.2	Quality system	4.20	Statistical techniques
4.3	Contract review		
4.4	Design control		
4.5	Document control		
4.6	Purchasing		
4.7	Purchaser supplied product		
4.8	Product identification and traceability		
4.9	Process control		
4.10	Inspection and testing		
4.11	Inspection, measuring and equipment		
4.12	Inspection and test status		
4.13	Control of nonconforming product		
4.14	Corrective action		
4.15	Handling, storage, packaging and delivery		
4.16	Quality records		
4.17	Internal quality reviews		
4.19	Servicing		
THEORY OF KNOWLEDGE		**PSYCHOLOGY**	
4.1	Management responsibility		
4.18	Training		

effort in the companies represented by the managers interviewed. "People get cynical about programs that come and go" (Ranney 1992:5). Because constancy of purpose is frequently missing in quality programs, employees can feel the same cynicism about ISO 9000 registration. They may think it is just the latest management fad, a thought that is echoed throughout the interviews.

The idea of trust is mentioned in DIS 9004-4.2, 'Guidelines for Quality Improvement: Addendum to ISO 9004', which is in draft stage and not yet published. "Trust is essential if everyone is to be involved in identifying and following up on opportunities for improvement" (ISO 1991:7). Trust is mentioned in the context of communication and teamwork. Willey (1990:7) writes, "The passing reference to motivation of personnel [in ISO 9004] hardly scratches the surface and, contains a reinforcement of the very fear that Deming is talking about".

> Employees should be made aware of the advantages of proper job performance at all levels, and of the effects of poor job performance on other employees, customer satisfaction, operating costs and the economic well-being of the company. (ISO 1992:161).

The twenty clauses of ISO 9001 are categorized in table 4.2 according to the element of profound knowledge to which they refer.

(Table 4.3...)

4.5 ISO 9001 COMPARED TO THE ELEMENTS OF PROFOUND KNOWLEDGE

One method of summarizing Deming's philosophy is by use of the 14 points. The previous section provides an evaluation of the relationship between ISO 9001 and those points. A different perspective is gained by comparing the twenty clauses of the standard to the four elements of Deming's system of profound knowledge.

The standard is a list of requirements addressing the expectations of the buyer about the supplier's quality system, whereas the system of profound knowledge is a high level summary of philosophy. Although meant for different purposes, a comparison between the two demonstrates the extent to which the standard attains the more comprehensive Deming philosophy of quality.

Almost all of the elements of the standard apply to the heading of systems. Only a few deal with knowledge or variation and none with psychology. This is not unexpected, considering that the intent of the standard is to provide the minimum basis for a quality system and not a comprehensive definition of TQM.

The two clauses 4.1 and 4.18 reference the theory of knowledge in an oblique manner. The role of management, in the Deming philosophy, is to provide leadership, gained by an appreciation and application of the principles of the theory of knowledge. Other than a clear indication of management's responsibility for the fulfilment of customer obligations, leadership is not discussed by the standard. The standard refers to training in clause 4.18, but does not address the broader notion of the integration of knowledge through education.

Discussion about the psychology of human organisations is not included in the standard, because the standard is meant to be a contractual requirement. The implementation and maintenance of ISO 9000 registration is a very high visibility

Table 4.2 ISO 9001/Deming 14 Points Relationship Matrix

Strong positive	●	9
Weak positive	△	3
Weak negative	▽	-3
Strong negative	■	-9

SABS ISO 9001		DEMING PRINCIPLES 1. Constancy of purpose	2. Adopt the philosophy ...	3. Cease dependence on inspection ...	4. End awarding business on basis of price tag alone ...	5. Flowing continual improvement ...	6. Institute training ...	7. Institute leadership ...	8. Drive out fear ...	9. Break down barriers between departments ...	10. Eliminate slogans, exhortatic ...	11. Eliminate management by objectives/numerical quotas ...	12. Remove barriers that rob people of pride of workmanship ...	13. Institute a vigorous programme of education ...	14. Put every body to work to accomplish transformation ...	ISO 9001 to Deming
4.1	Management responsibility	●						△							●	21
4.2	Quality system		▽			▽				△					△	
4.3	Contract review		▽													-3
4.4	Design control					△				△						6
4.5	Document control			▽		■						▽				-15
4.6	Purchasing			▽	▽											-6
4.7	Purchaser supplied product															
4.8	Product identification and traceability				△	△										6
4.9	Process control					△						●				12
4.10	Inspection and testing			■												-9
4.11	Inspection, measuring and test equipment			▽		△										
4.12	Inspection and test status															
4.13	Control of nonconforming product															
4.14	Corrective action			△												3
4.15	Handling, storage, packaging and delivery															
4.16	Quality records					△										3
4.17	Internal quality audits	●				△			▽							9
4.18	Training					●							△			12
4.19	Servicing															
4.20	Statistical techniques			△		△						△	△			12
Deming to ISO 9001		18	-6	-12		9	9	3	-3	6	3	3	9		12	

A +3 weak positive is assessed for point 5, because statistical tools may be used for continual improvement. The standard does not go as far as requiring the use of statistical tools. The relationship to point 10 is by inference. Statistical knowledge will help management understand the futility of setting numerical targets to objectives for which processes are not capable. For this reason, a rank of +3 weak positive is placed with point 10.

Similarly, the same rank is placed in intersection with point 11, since a greater understanding of variation and process capability will lead to a more enlightened use of process metrics.

(Table 4.2...)

Statistical techniques (4.20)

> Where appropriate, the supplier shall establish procedures for identifying adequate statistical techniques required for verifying the acceptability of process capability and product characteristics. (ISO 1987:7).

Positive aspects of Clause 4.20.

This clause acknowledges that statistical tools may be useful in determining capability and product characteristics.

Negative aspects of clause 4.20.

The negative aspects of this paragraph are in what it does not expressly say:

> This is an inadequate and opaque statement. It shows no understanding of concepts and methods which have been used effectively for half a century. Nor does it recognise any need for stable and predictable processes as the basis for maintaining and improving quality. But at least the subject is mentioned. (Crawford 1988:6).

Tools applied without proper knowledge in order to meat the standard, can be quite useless. In writing 'as appropriate', the interpretation of appropriateness is left to negotiation between the auditor and supplier and does not imply a strong requirement. "Statistical techniques, on their own, are of very limited use. What is needed is statistical understanding (part of what Deming calls Profound Knowledge)" (BDA 1992:13).

ISO 9001/Deming's relationship assessment of Clause 4.20.

A +3 weak positive is ranked with point 3, because proper application of statistical methods can lessen the necessity of mass inspection. The standard gives no guidance to this effect, however.

Negative aspects of Clause 4.18

The implication in this paragraph is that training applies only to work procedures and activities that directly affect production. Other dimensions such as the education of management concerning the significance of variation can only be inferred. Train.. .; is mentioned in BS5750 but not education, except in the rather woolly statements that properly "qualified people should be employed" (Willey 1990:10). The intention of this clause is good and recognizes management's responsibility to train employees, but falls far short of Deming's theory of training and education. "As is common, the Standard blurs the distinction between training, that is. skills and vocational aspects, and education" (BDA 1992:12).

ISO 9001/Deming's relationship assessment of clause 4.18

Because this clause specifically requires management to provide training for the job, i' is ranked +9 strong positive with point 6. Management's responsibility is made clear' to provide training for roles that affect the quality of the product. A rank of +3 weak positive, is assayed against point 12 since poor training is a barrier to pride in workmanship. No relationship is assessed against point 13, because the scope of this clause is not extensive enough to include the concept of "a vigorous program of education and self-improvement" (Deming 1990:6).

> ### Servicing (4.19)
>
> When servicing is specified in the contract, the supplier shall establish and maintain procedures for performing and verifying that servicing meets the specified requirements. (ISO 1987:7).

ISO 9001/Deming's relationship assessment of Clause 4.19

This is a statement of the contractual requirement regarding customer needs after installation or delivery. No ranking is assigned to the 14 points.

This clause also requires "timely corrective action on the deficiencies found by the audit team" (ISO1987:7) which, if taken every time a mistake or nonconformity is identified results in tampering. This leads to the mistake of assuming a special cause was the source of the error, when the deviation was due to common causes.

ISO 9001/Deming's relationship assessment of Clause 4.17

The practice of scheduled audits is an effective means of reaffirming management commitment in registered companies. This clause is ranked +9 strong positive with respect to point 1, for the consistency of management practice that is engendered. A +3 weak positive grade is assessed against point 5, because the results of an audit may effectively be used for improvement of the system, but is not explicitly required.

Audits can be used against people, and as an instrument of fear either intentionally or as a result of poor implementation. For this reason, this clause is classified -3 weak negative in intersection with point 8. The potential for creating an environment in which information is falsified or held from management is quite likely when audits are considered punitive.

Training (4.18)

> The supplier shall establish and maintain procedures for identifying the training needs and provide for the training of all personnel performing activities affecting quality. Personnel performing specific assigned tasks shall be qualified on the basis of appropriate education, training and/or experience, as required. Appropriate records of training shall be maintained. (ISO 1987:7).

Positive aspects of Clause 4.18.

Training and education are critical elements in the success of a quality system. Education as cited in this clause is, however, not meant in an extensive way as Deming uses the term in the system of profound knowledge.

Internal quality audits (4.17)

> The supplier shall carry out a comprehensive system of planned and documented internal quality audits to verify whether quality activities comply with planned arrangements and to determine the effectiveness of the quality system (ISO1987:7).

The importance of the activity determines the frequency of audits and the result reported to the responsible management. Corrective action should be taken on the deficiencies that are discovered.

Positive aspects of clause 4.17

One positive aspect of audits is the visible commitment by management to the continued effectiveness of the quality system. An objective and impartial review by an independent person can disclose problems that are not obvious to those who are close to the daily operation (Crawford 1988).

Negative aspects of clause 4.17

An audit against the existing quality system description promotes the status quo rather than encouraging modification and improvement (Crawford 1988). Audits can be a stressful and unpleasant event and may encourage people to be less open if they fear punishment for mistakes that are discovered.

Auditing can be a powerful tool for determining the health of the management system. But it is too often carried out as a policing activity which induces fear in the people being audited, who then erect barriers to protect themselves (BDA 1992:11).

An in-depth review can help to determine the effectiveness of stable systems. "Audits should be regarded as part of a continuous learning process, contributing to the 'Study' stage in the 'Shewhart Cycle' of Plan-Do-Study-Act" (BDA 1992:11).

Quality records (4.16)

> The supplier shall establish and maintain procedures for identification, collection, indexing, filing, storage, maintenance and disposition of quality records.
> Quality records shall be maintained to demonstrate achievement of the required quality and the effective operation of the quality system (ISO 1987:6).

Positive aspects of clause 4.16

The collection of records is effective if the records are analyzed and used for continual improvement in the PDSA cycle. Crawford (1988:6) observes that the tone of ISO 9001 implies that records are predominately of deviations, corrective actions,and nonconformities. He said records should consist "more and more of notes of the actions taken to bring processes into statistical control (detection and elimination of special causes)".

Negative aspects of clause 4.16

'It is easy to become swamped with useless data, especially when data collection is done without a clear purpose' (Scholtes, Joiner, Braswell, Finn, Hacquebord, Little, Reynard, Streibel, & Weiss 1988:38). Besides asking why data is collected, what data is to be collected, and how it will be used, they suggest:

> Imagine you have the data in hand: What could these data tell you? What will you do with the data? What will you do after that? Would another kind of data be more helpful? (Scholtes *et al* 1988:38).

ISO 9001/Deming's relationship assessment of clause 4.16

Data collected for the continual improvement of processes is a sound practice. If data is collected solely to meet the audit requirements of this clause, that effort is a needless and burdensome exercise. This clause is assessed +3 weak, positive with point 5.

Negative aspects of clause 4.14

Identifying and recording nonconformance and then reacting is not as effective as the Deming philosophy of problem prevention through good process design (Willey, 1990). Willey (1990:2) also suggests that this clause encourages "how to use the existing management system to deal with mistakes made; it does not offer advice as to how to prevent them". Deming writes strongly against this approach to quality control and calls it tampering: "P R.R. - problem, report, and resolution. Actually, this system of management by results is tampering - making things worse" (Deming 1990:26)

ISO 9001/Deming relationship assessment of clause 4.14

In a less direct manner, Clause 4.14 supports the idea of continual improvement and can be the basis for a more vigorous and proactive program. The temptation to tamper with a system must be avoided in the effort to demonstrate to an auditor that corrective action is taken. This clause is judged +3 weak positive corresponding to point 3 because it recognizes that nonconformities may be statistical special causes and that inspection is not a permanent solution to ensure product quality.

Handling, storage, packaging, and delivery (4.15)

> The supplier shall establish, document and maintain procedures for handling, storage, packaging and delivery of product (ISO 1987:6).

Clause 4.15 defines handling, storage, packaging and delivery in separate paragraphs.

ISO 9001/Deming's relationship assessment of clause 4.15

This clause defines contractual requirements and operational tactics. No correlation is assessed to the 14 points.

Companies are motivated to secure ISO certification for the following reasons:

- avoid trade barriers in the European Community
- satisfy demands/requirements from customers
- establish market discriminators against competitors
- improve internal quality systems and improve productivity

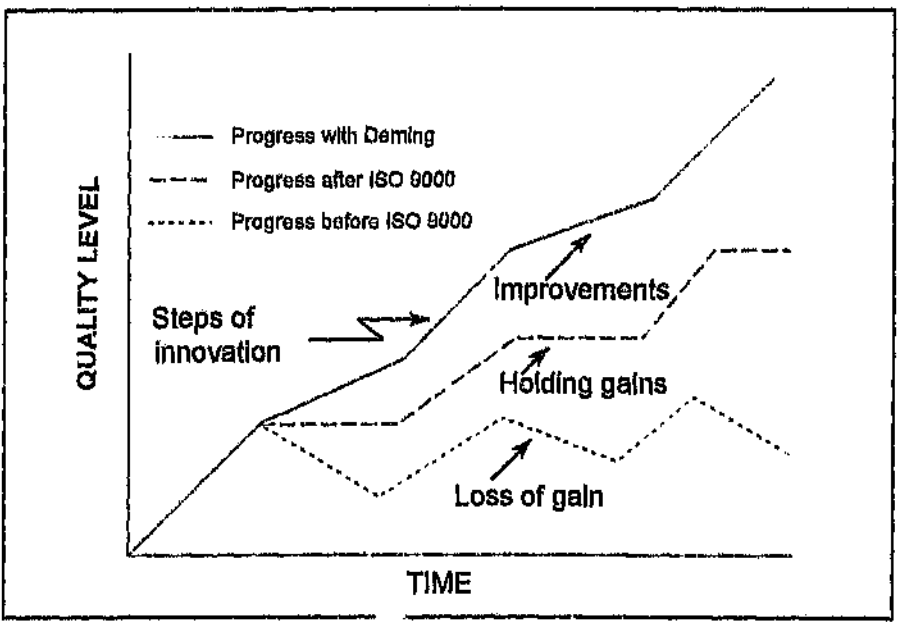
ISO is not solely a quality assurance system and does not provide specifics on implementing a quality system. At the most basic level, ISO 9000 requires companies to define a system of documenting procedures and ensure that these procedures are maintained, controlled, available and followed.

Compliance to the ISO 9000 standards is agreeable with the teachings of Dr Deming. Clear benefits accrue as a result of the disciplined afford to meet each of the sections of the standards. These benefits derive primarily from clearly and easily described objective for the organization along with a summary of good practices. These practices are a collection of tools that hold the gains of improvement that result from a complete and thorough review of all processes and procedures.

The difficulty with the standards occurs if registration and compliance are the only objective of management. Given the growing popularity of the standards, this is a likely possibility as registration to the ISO 9000 standards becomes a requirement to conduct business. The standards used alone without other comprehensive quality system guidance will yield three key deficiencies

- An inflexible system, due to emphasis in the standard on rigid documentation and control.
- The lack of continual improvement, especially if the competition is guided by such concepts and benefit from improved productivity and lower costs.

Figure 5.1 Holding the Gains



Source: BDA 1989:19

There seem to be few negative consequences from appropriate application of the standards, although they are judged by this research to be not comprehensive enough for a Deming combatable quality system.

5.3 RESEARCH CONCLUSIONS

The European ISO 9000 series of standards fail to include some of the essentials needed to attain world-class quality such as:

- quality goals in the business plan
- quality improvement at revolutionary rate
- training in managing for quality
- participation by the work workforce

> BS5750 [ISO 9000] concentrates on establishing an adequate system of quality management in order to achieve conformance of a product or service to a given or implied specification. The Deming approach aims at transforming management so as to achieve 'consistency of purpose for continuos improvement. (BDA 1989:1)

> The Deming philosophy, since it reaches much further than the Standard, is more difficult to apply. The standard provides a conveniently structured package of measures and handy checklists. Deming offers mainly theory and concepts, and asks the manager first to understand them then to work out how they should be applied to his particular business. (BDA 1989:12)

The third research question states that rapid acceptance of these standards, without additional management changes may be detrimental to the broad success of TQM principles. This proposition is most difficult to support because wide variation in application of the standards, but research and interview results lead to a qualified support of the statement. Rapid acceptance of ISO 9000 standards may have several positive effects. As Avery (1994:49) writes:

> In my judgement, the ISO series is having more beneficial influence on quality, nationally and internationally, than any of the other individual thrusts. Not perfect, not fully comprehensive, but a practical no-nonsense approach that is getting good results and is showing the way to further benefit.

A major benefit of the standards is to provide a strong foundation for a more comprehensive quality system, and in so doing set the stage for future transformation to the more idealized vision of Dr Deming. Th idea of holding the gains is depicted in figure 5.1 from 'BS5750: The End or the Beginning' by the British Deming Association. Alternatively, it has been shown that poor implementation of the standard can lead to an inflexible, rigid system that does not encourage continual improvement.

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The research questions are repeated here for the convenience of the reader:

1. The ISO 9000 quality system standards are not a complete guide to use for achieving TQM.
2. The standards conflict with or neglect several important elements of TQM as described by Dr W. Edwards Demming.
3. Rapid acceptance of these standards without additional management changes may be detrimental to the broad success of TQM principles.

5.2 REVIEW OF RESEARCH QUESTIONS

The results described in chapter 4 demonstrate that the collected teachings of Dr Deming exceed in scope and intention those of the ISO 9000 standards. The first research question states that standards are not a complete guide to use for achieving total quality management and this statement is supported by these results. The research conducted confirms this statement of the research question.

Confirmed in chapter 4, is the fact that the standards conflict or neglect completely several elements of TQM as described by Dr Deming. The research also discovered that Deming objects to the simple label of TQM for such a complex subject. The second research question is still valid, because TQM is a management movement recognized by several authors and supported by the cited definitions. The research questions should be changed from a comparison of TQM to a transformation to the new philosophy of quality management to be consistent with Dr Deming's ideology.

4.8 SUMMARY

The history of the development and intent of the ISO 9000 standards is reviewed in this chapter. Interview methodology is described was used to gain further insight into the structure of the standards and their relationship to the teachings of Deming. The ideas of total quality management and the relationship to the Deming's ideology is discussed. A detailed description of the ISO 9001 standard reviews each clause against the 14 points of Deming and the system of profound knowledge. An analysis details Deming's comments on the standard and the positive and negative aspects discovered in the course of the research. Finally, the importance of auditor and registrar consistency is expressed. These findings are summarized with conclusions in the following chapter.

****

standards about the disposition of nonconformities, but this passing reference is far from being a central focus of the quality system.

Table 4.4 ISO 9001/Deming's 14 Points Relationship Matrix Compared to Inteview Results

ISO 9001/Deming 14 Points	Interview Affinity Categories
POSITIVE:	**POSITIVE:**
4.1 Management responsibility	
Point 1: Constancy of purpose	Clear organizational goal
Point 14: Every one	
4.9 Process control	Codification of good practice
4.18 Training	
4.29 Statistical techniques	
NEGATIVE:	**NEGATIVE:**
4.5 Document control	Over-emhasis of documentation
4.10 Inspect and test	Continual improvement lacking
Point 3 Cease.... inspection	
	Lack of customer satisfaction focus
	Registration.... sole objective
	Link to business metrics lacking
	Registration does not ensure a good product

ISO 9000 standards is, as a result, dependent upon the crucial role of auditors.

Auditor consistency is crucial to the success of the ISO 9000 standards in improving quality systems. Reviews that placed significance only on what is documented and clearly observable neglect the human element and the unknowable figures.

4.7 A COMPARISON OF THE ISO 9001/DEMING'S 14 POINTS RELATIONSHIP MATRIX AND INTERVIEW RESULTS

The first column of table 4.4 lists the highest and lowest ranking items from the ISO 9001/Deming's 14 points relationship matrix. The affinity categories, resulting from interviews and literature research, are entered in column two. This synopsis shows there are at least two positive and two negative sets of topics in common.

The positive factors can be grouped into two categories. The first category combines clause 4.1 and points 1 and 14 with the statement that "ISO 9000 provides a clear organisational goal".

Management commitment and the involvement of everyone in the organisation is a factor that encouranges a well defined and managed quality system. This effect agrees well with the teachings of Deming. The second grouping is clause 4.9 and the belief among interview subjects that the standards represent an index of best practices. Clause 4.9 discusses process control and definition, a major element in understanding systems, which is a factor of Deming's system of profound knowledge.

Two categories discuss factors not conducive to the teachings of Deming. Clause 4.5 matches interview results expressing concern among users that the standards unduly emphasize documentation. The second combines clause 4.10 and point 3 with the interview subject's criticism that continual improvement is not a factor in the evaluation. Continual improvement must be inferred from the discussion in the

Registration becomes the singular objective.

Some companies will become registered because of customer demand and market pressure. The registration status by itself becomes a singular motivation, and an interviewee said that this is a poor reason to implement a quality system. (Uys 1995).

One of the biggest traps is for companies to become too orientated towards the ISO standards and the accreditation process and myopically see this process as a means to an end ..... This so called ISO standard myopia can manifest itself in many ways ..... If a lot of marketing pressure is applied by top management with lip-service commitment, and business contracts are at stake, a cosmetic system may be implemented that is so superficial that it is unlikely to be followed in the months following registration. (Uys 1995).

Relationship to business metrics is not apparent

Neither Deming's methods nor the ISO 9000 standards can easily be linked to traditional business metrics of profit, shipments, or growth. There seems no demonstrable correlation between countries that have had mature registration systems for a period of time and financial metrics in their economies.

Registration does not assure good products

Managers who were interviewed expressed a concern that registered suppliers to ISO 9000 brought no assurance of improvement in the quality of the purchased product. This is asserted by Avery (1994:49-53), that certification to one of ISO 9000 standards does not necessarily quarantee a quality product, per se, only a consistent level of output.

The Importance of Auditor Consistency

The requirement documents of ISO 9001, ISO 9002 and ISO 9003 are written in short and cryptic language. The translation of that language into practice is the task of the auditor who reviews an applicant's quality system. The success of the

Exceeding customer expectations is accomplished through continuous innovation, an idea not overtly promoted in the ISO 9000 standards.

Over-emphasis of documentation

An auditor will determine that what an organisation says is its methods to meet the requirements of the standard and then verify that these methods are practised. Documentation in the form of written procedures is the most common evidence sought by auditors to evaluate the practice of an organisation. Deming also encourages the use of operational definitions to precisely describe processes However, to counter-balance an excessive emphasis on fixed and rigid procedures, Deming notes: "Sub-processes need not be clearly defined and documented: people may merely do what needs to be done" (Neave 1990: 126). A concern about excessive documentation requirements was expressed by several interview subjects.

Continual improvement is not promoted

A frequent criticism of the standards by people interviewed, is the lack of discussion a-bout continual improvement as a necessary component in a quality system. Similar to the criticism regarding lack of customer satisfaction focus, continous improvement has been intentionally left out of the standard:

Scherkenbach (1991:62) writes that continual improvement is based on many of the control elements required by ISO 9000: "I do not want to be misinterpreted here, so I will emphasize that the Method of Continual Improvement builds on the good characteristics of both Detection and Prevention". Willey (1990:5) writes, "it is difficult not to conclude that the commitment to constant improvement is central to Deming while peripheral and incidental to the BS5750 [ISO 9000] approach". Quality improvement is discussed in the draft document DIS 9004-4.2: "The responsibility and leadership for creating the environment for continuous quality improvement belong to the highest level of management."

can provide much needed discipline in management commitment, total oragnizational participation, and training , and help implement a truly effective quality system. (Gazy 1993:33-54).

4.6.4 Summary of the negative aspects of ISO 9000

Lack of customer satisfaction focus.

Customer satisfaction is not stressed, although the ISO 9000 standards define quality in terms of specifications and conformance to requirements. Fitness for purpose is used in the ISO 9004 guideline as a definition of quality in customer requirements. "It will not suffice to have customers that are merely satisfied. An unhappy customer will switch [Deming]" (Neave 1990:30).

Customer satisfaction and the need to exceed expectations is central to most definitions of a quality centered TQM organisation. One way to stress this aspect is by saying that quality management's goal is to delight the customer.

Certainly, there is nothing in BS5750 [ISO 9000] to lead the user to anything approaching the interpretation of Deming by Joiner Associates: "A company should strive to delight their customers, giving them more than they imagined possible. Your bosses may be ecstatic, the Board of Directors blissful and your company may be considered a legend on Wall Street. But, if your customers are not delighted, you have not begun to achieve quality". (Willey 1990:2).

The DIS 9004-4.2 document stresses customer satisfaction as an aspect of measuring quality costs:

> It is important to estimate even difficult to measure quality losses such as the loss of customer goodwill and the failure to fully realize human potential. (ISO 1991:8).

most negative score is assessed for point 3, which warns against reliance on inspection to achieve quality.

4.6.3 Summary of the positive aspects of ISO 9000

Affinity diagram methods were used to summarise the positive aspects of the standards that were determined through both research and the interview of experts. This method groups ideas from many sources and looks for common categories, or affinities, between the ideas. The following topics resulted from this affinity diagram analysis.

ISO 9000 provides a clear organisational goal

Most subjects interviewed agreed that the efforts required to achieve ISO 9000 registration provided a clear, easily identifiable, objective and rallying point for an organisation. Management responsibility in providing tangible objectives is reinforced by the high score of +21, assigned to clause 4.1 in figure 4.3.

The standards are a codification of good practice

A recurrent theme among experts interviewed, is that the standards represent a 'codification of good practice'. Continued use of good practices is assured by internal and third party surveillance audits. These audits effectively reinforce the good practices laid out in the standards. Inlay (1995) describes this aspect of reinforcement by comparing ISO with knowledge to keep you from slipping back, not a means of taking you forward.

The standards lead to further growth

These standards can be a simple beginning of a sophisticated transformation to a mature quality system. Market pressure and competitive forces that require registration can introduce quality systems thinking to a company. The market value of compliance is important, but suppliers should realize that proper use of ISO 9000

of opportunity to add more value for the customer" (ISO 1991: 4). Deming teaches a change in management philosophy, and 'BS5750 [ISO 9000] is specifying a system of statements, written policies, processing instructions, assessment procedures and traceable records' (Willey1990:9).

4.6.2 Summary of the ISO 9001/Deming's comparison matrix

Analysis of the rows

The graphic representation of figure 4.3 shows overlaps and voids between the ISO 9001 standard and the 14 points of Dr.Deming. Some rows have no symbols marking a relationship, and these are clauses specifying contractual requirements and tactics. The clauses are: 4.7, 4.12, 4.13, 4.15 and 4.19. They deal with purchaser supplied product, inspection and test status, control of nonconforming product, handling and storage instructions, and after sales servicing. These subjects do not represent core factors of a quality system, but are consistent with a buyer's expectations in a requirement specific document.

Each symbol represents a numeric relationship of +9, +3, -3 or -9. The sum of the scores in each row is listed in the last column of figure 4.3. The highest score of +21 is given to 4.1, which describes management's responsibility. Equal ratings of +12 are assigned to 4.9, which addresses process control, 4.18 listing training requirements, and 4.20 which encourages the use of statistical techniques. The most negative score of -15 is assessed against clause 4.5, which details document control procedures. The next most negative score of -9, is against clause 4.10 on inspection and testing.

Analysis of the columns

The only column with no relationship symbol is point 13 which discusses education and self-improvement. The maximum positive score of +18 is given to point 1, which describes constancy of purpose. The next positive score of +12 is assigned to point 14, which requires everyone to be active in achieving the needed transformation. The

The application of TQM is unique to each organization that adopts such an approach. However, based on a review of current management literature on companies that have adopted TQM, it appears that a consensus has formed around the characteristics that are common to all TQM organizations. This consensus is also reflected in the criteria used in the Malcolm Baldrige National Quality Award.

6.5.3 Features of total quality management

Companies participating in the Baldrige Award process submit applications for examination that document their total quality management systems. The application cites several core values and concepts that are deemed essential to instituting successful TQM systems. These core values and concepts are:

- customer-driven quality
- leadership
- continuous improvement
- full participation
- fast response
- design quality and prevention
- long-range outlook
- management by fact
- partnership development
- corporate responsibility and citizenship

The above core values and concepts are described briefly below.

Customer-Driven Quality

An essential attribute of TQM is the general understanding that the customer is the final arbiter of quality. TQM is based on the premise that quality is driven by and

Malcolm Baldrige National Quality Improvement Act. This law established the Malcolm Baldrige National Quality Award, named after the former Secretary of Commerce, the late Malcolm Baldrige. The award is designed to recognize companies that have successfully implemented total quality management systems.

The Baldrige Award is managed by the US Department of Commerce's National Institute of Standards and Technology and is administered by a consortium that includes the American Society for Quality Control and the American Productivity and Quality Center.

The award is presented annually to up to six companies (two each in three categories: manufacturing, service and small business) that pass a rigorous examination process. Applicants are evaluated by teams comprised of leading quality experts from companies, government, and academia. The exact criteria used to evaluate companies have been upgraded slightly each year, with the trend toward requiring more detailed information in fewer, but more important areas.

Increasingly, companies view the criteria outlined in the Baldrige Award application as a useful diagnostic tool for evaluating the effectiveness of their management practices. One indicator of the interest in TQM practices is that in 1990 over 180,000 applications were requested. Corporate executives also see the process of applying for the award as a way of improving their corporate knowledge of quality management principles and practices.

6.5 2 Total qaulity management revisted

Total quality management is a relatively new approach to the art of management. It seeks to improve product quality and increase customer satisfaction by restructuring traditional management practices.

Table 6.1 First-level categories of The Deming Prize

1.	Company policy and objectives
2.	Organisation and its operation
3.	Quality control education and dissemination
4.	Collection, transmission and utilization of information on quality
5.	Analysis
6.	Standardisation
7.	Control
8.	Quality assurance
9.	Effects
10.	Future plans

Source: Conti, T. 1993:281

6.4.4. Conclusion

Unlike the The Malcolm Baldrige National Quality Award, no maximum possible scores are assigned to any of the categories, which the assessors are free to improve and interpret on a case-by-case basis. It is for these reasons the Deming Prize Criteria are extremely limited as a means of self-assessment.

6.5 MALCOLM BALDRIGE NATIONAL QAULITY AWARD

6.5.1 Origin

On August 20, 1987, the President Ronald Reagan signed Public Law 100-107, the

6.4.2 Framework

The framework of the Deming prize is focused on the implementation of a set of principles and techniques. The the most notable are the following:

- process analysis
- statistical methods
- quality circles

The logic behind the Deming Prize is that if a company's processes are improved, then its results (profitability and productivity) will consequently improve.

6.4.3 Evaluation criteria

Although the Deming Prize is the world's oldest and most prestigious of awards, it does not serve well in demonstrating the role of self assessment. This is largely due to the vagueness of much of the assessment process. This is conducted on the basis of a concise two-page list of criteria which serve as guidelines when Japanese assessors examine the company (Ishikwa 1985). These guidelines are reproduced in table 6.1.

(Table 6.1...)

Category two: This category includes awards for which the organisers publish full details of award criteria and scoring systems and provide sufficient information to enable any organisation, regardless of whether or not it intends competing for the award, to use these guidelines for self-assessment as an aid to quality improvement. The Malcolm Baldrige National Quality Award resorts under this category.

6.4 THE DEMING PRIZE

6.4.1 Origin

In contrast to the specialized approach traditionally used in the United States, a number of Japanese companies, rebuilding from post-war devastation, adopted an innovative, integrated approach to achieving quality. Several leading statisticians and quality experts-most notably Drs. W. Edwards Deming and Joseph M Juran-introduced quality management principles to Japanese industry.

The Union of Japanese Scientists and Engineers, a private organisation formed by engineers and scholars, provided a forum for the widespread dissemination of statistical quality control techniques. In 1951 the group established the Deming Prize, with the intention of raising the quality levels of Japanese industry.

In fact the Deming Prize has been credit for guiding Japanese industry beyond it former second-class products to current position of excellence (Nakha & Neves 1994 :33). Many of the management techniques developed since then form the foundation of the TQM principles that are gaining popularity in the United States and elsewhere.

Unlike The Deming Prize and The Malcolm Baldrige National Quality Award, the ISO 9000 series, are not award programs. They do not require the use of any state-of-the-art system, nor do they require any prescribed method of process control. They are generic and apply to all industries (Marquardt 1992:51). Leaving the determination of quality levels to the customer-supplier interaction, the series fill the need for customer's guarantee that a supplier will, within defined limits, be able to deliver products and services as promised (Raynor 1993:44).

This flexibility and lack of constraining requirements mean that there is no one right way to ISO 9000. Industries are free in their own way and perceive this as an opportunity rather than an additional constraint.

6.3 GROUPING OF QUALITY AWARDS

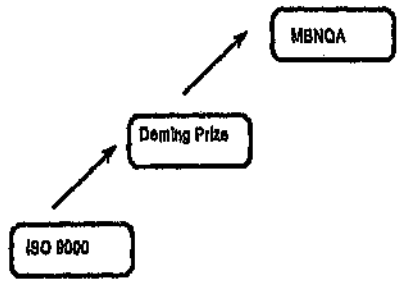
The national awards already mentioned are two of the many which have been established to recognize excellence in the quality of manufacturing and services at the national, regional and organisational level. The Presidential Award for Quality European Quality Award, Shingo Prize and NASA Award have not been researched for this project.

The awards to be discussed fall into two categories.

Category one: This category accommodates awards for which the organisers are quite deliberately non-prescriptive, do not elaborate on the criteria, reveal their scoring system, or give examples of the features found in potential award winning organisations The Deming Prize falls into this category.

The main feature of this category of awards is that they do not provide a basis for organisational self-assessment.

Figure 6.1 TQM trilogy



This chapter examines, ISO 9000 and the two national awards (The Deming Prize and The Malcolm Baldrige National Quality Award) which has been established to recognize excellence in the quality of manufacturing and services at the regional, and organisational level. The criteria by which submission for these awards are judged, and the scoring system used, provide an authoritative basis for assessing the potential for employing quality improving strategies.

It should be noted that this is not an exhaustive survey of the mentioned quality awards and ISO 9000.This chapter only includes a compendium of these awards and ISO 9000. In addition, each model discussed below is complex in its own right and this project cannot justify a full and detailed description of each.

6.2 ISO 9000

This section of the report is extremely limited as the reader is referred to chapters 2 and 4 of this report.

Chapter 6

THOUGHTS ON ISO 9000, DEMING PRIZE AND BALDRIGE AWARD

6.1 INTRODUCTION

The review of the major quality systems indicates that while there are similarities amongst quality systems, there is significant disagreement amongst various experts (Crosby, Deming, Feigenbuam, Ishikawa and Juran) concerning the best approach for any single company to adopt. It is clear that a company cannot simply implement any single system in a "turnkey" fashion (Weitz 1994:33). Any approach must be designed and taylored to the specific needs of the company.

Today there exists an inconceivable opportunity to improve management systems. We have three broadly accepted models designed to promote quality:

- The ISO 9000 standards (ISO 9000)
- The Deming Prize (TDP)
- The Malcolm Baldrige National Quality Award (MBNQA)

Each model has general management dimensions that when pulled together provide an eclectic tool for those who want to establish TQM. Combined these three models comprise the TQM trilogy as shown in figure 6.1.

(Figure 6.1...)

systems registration standards is unprecedented. The 1987 introduction of the standards by the International Organization for Standardization may become a significant milestone in management history.

It remains to be seen if the old habits of legalistic application of standards, a 'tell me what to do' attitude on the part of registrants, a widely varying auditor sophistication will damage the credibility of these standards in the next few years. It is this researcher's opinion that the ISO 9000 standards will suffer many of these afflictions at first, but will ultimately survive, as users of the standards become more aware of the philosophy behind them.

It may take one or two more generations of these standards to achieve this level of understanding, but the financial and productivity advantages of management quality techniques, along with an ever increasing expectation in the market-place, are too strongly established to be cast easily aside.

****

Practical experience has demonstrated that ISO 9000 by itself will not be sufficient to bring about of quality management,. but needs to be coupled to an operating system such as Good Manufacturing Practice and/or Statistical Process Control before any benefits can be demonstrated.

It is concluded that ISO 9000 lays down mechanistically *what* must be done, but not *how* it must be done....

It is further concluded that ISO 9000 expects a company with no or limited experience in quality management to design its own quality system (within the laid-down framework). It then checks the system against itself. At no stage, however, does any body check whether it is a good or bad system and whether it is producing the desired results.

5.4 RECOMMENDATIONS FOR FURTHER RESEARCH

The following areas are suggested for further research:

- Correlation between business success and ISO registration
- Auditor and registrar accreditation systems
- The nature of ISO 9000 standards as fad or passing subject of interest
- The cost of ISO 9000 certification
- Utilising ISO 9000 to assess suppliers and contractors

5.5 SUMMARY

The subject of this project is a factor that may have a significant impact on the way business is conducted world-wide. Quality systems and techniques for quality control and assurance are not new subjects, but the high visibility enjoyed by ISO 9000 quality

manufacture, distribution and support function. These requirements were strictly adhered to and found present by the researcher at the companies visited.

While ISO does not explicitly require continuos improvement–a frequently heard criticism of the program–the management review, internal audit, and corrective action clauses of which merge into a cycle of improvement, where according to most quality managers interviewed, periodically carried out..

The ISO standards do not provide sufficient guidance for a company that whishes to evolve to Total Quality Management.

The standards fall short of the mangement transformation described by Dr Deming which exceed the intention ans scope of the standards.

ISO can be used as a stand alone system. In this case it will not support a total quality initiative.

The efficacy of any system can only be judged by the results. In the case of quality management, success criteria should at least include measurable benefits such as:

- A reduction in costs of internal failure such as waste, overtime, rework, retesting, discounted sub-standard material, incidents and accidents.
- A reduction in the cost of external failure such as customer complaints, cost of replacement, repair or making good damage caused by defective product, cost of handling and servicing complaints and loss of goodwill..
- Improvement in positive parameters such as the amount of first-grade quality produced, working capital and worker morale.

- The lack of innovation which can lead to business loss, as competitors provide new products and services that do not emerge from rigid adherence to the limiting principles of customer satisfaction and conformance to specification.

The most significant variable in the success or failure of these standards is found in registrar consistency. If auditors are not consistent, and customers realize that a registration from one agency is not as meaningful as one from another, the credibility of the ISO 9000 standards will be undermined. If auditors do not adopt a new management philosophy similar to that taught by Deming, past experience would indicate a implementation of that the quality system will gravitate to fixed, rigid, and legalistic frameworks in order to satisfy their needs.. ISO 9000 will be a step backward for the philosophies of W. Edward's Deming if implementation and interpretation of the standards is done poorly by the registering bodies.

Profound knowledge, as espoused by W. Edwards Deming, is a much-needed and sought-after element in the workings of continual improvement within business organisations.

The 14 points that comprise W. Edwards Deming's philosophy, can provide an effective means of determining a company's quality position and monitoring improvements.

The standard ISO, is concise but extremely demanding. It first requires organized, responsible authorized, and competent people. ISO 9000 then insist that the organisation have a formal quality system. Consistency and complete product verifiable processes for quality defect prevention detection and correction in design,

DEMING PRIZE	MBNQA
Purpose	
Award prizes to those companies recognized as having applied CWQC (Company-Wide Quality Control based on Quality Control." Emphasize "world-class" accomplishment	Promote quality awareness, recognize quality achievement of US companies, and publicize successful quality strategies
Emphasis	
Statistical methods, prevention of quality problems	Customer satisfaction, prevention of quality problems
Eligibility	
Individual factories and companies	Companies only-limited to US
Award recipients	
Any number of companies that meet the standard established by JUSE	Maximum of two manufacturing companies (plus their divisions), two small companies (less than 500 employees), and two service companies.
Evaluation criteria	
One page of guidelines ("Particulars")--very succinct, with some subjective interpretation	Twenty-five pages of guidelines ("Areas to address, scoring system, business factors considered")

Time frame	
Registration takes six to twelve months depending on starting point and urgency	Two to five years (preparation with JUSE, application when "ready").
Common emphases	
Administration, procedures, controls, training.	Administration, procedures, controls, training

6.6.3 Comparing ISO 9000 with MBNQA

MBNQA is larger overall system than ISO 9000 series. Several MBNQA requirements are either not covered or receive only bare mention in the ISO 9000 series. Spreading knowledge about quality to other organisations is not an ISO 9000 requirement, but its is a clear requirement for quality leadership bench marking. It makes little provision for employee recognition and performance, employee morale, quality results bench marking, customer relationship management, and customer satisfaction.

While the ISO is a smaller system, there are several requirements of ISO 9000 which are given limited attention in MBNQA guidelines. Document control is at the heart of ISO 9000, but only touched upon in passing in MBNQA requirements. Product identification and traceability is much larger part of ISO 9000 requirements than in the MBNQA guidelines. For the most part, however, the systems cover much of same material.

6.6.4 Comparing the DemingFrize with MBNQA

The following sections equate the Deming Prize with the MBNQA (Mahoney & Thor 1993: 73)

Evaluation criteria

Standards at three levels of depth and breath	One page of guidelines ("Particulars")--very succinct, with some subjective interpretation (JUSE personnel judgements

Orientation

Process (80%) at 9001 level, heavy on quality assurance initiatives; management and administration (20%)	Process (60%) plus (40%), heavy on statistical control

Mechanics

Select registration agency; pre-assessment choice of standards, submission of quality Master Manual, site assistance, on-site assessment of three to five days	Qualification based on review off-/on-site by JUSE

Examiners

Select staff of registration agency	Select panel of senior members of JUSE

Cost

Low to moderate monetary value with sound quality assurance program in place; some consulting on system may be useful	High monetary value and effort; consulting from fees from JUSE are major component (training has major impact in case)

6.6.2 Comparing ISO 9000 with the Deming Prize

The following sections compare ISO 9000 and the Deming Prize (Mahoney &Thor 1994:53-54). The following criteria are applied:

ISO 9000	DEMING PRIZE
Purpose	
"Effectively document the quality system elements to be implemented or in place needed to ensure an ability to perform, voluntary registration by an accredited third party"	Award prizes to those companies recognized as having applied CWQC (Company-Wide Quality Control based on Quality Control." Emphasize "world-class" accomplishment
Emphasis	
Valdation of ability to perform according to contract	Statistical process control
Eligibility	
Comapnies, divisions locations in countries signatory to the ISO protocol	Individuals, factories, and companies--global since 1984; only non-Japanese winner has been Florida Power and Light
Participants	
Typically, organisations involved in international trade that wish to be acceptable to as vendors, especially those wishing to trade with the European Community	Any number of companies that meet the standard established by the Union of Japanese Scientist and Engineers

6.6 ISO 9000, DEMING PRIZE AND THE BALDRIGE AWARD GUIDELINES COMPARED

6.6.1 Requirements of the three systems

ISO requirements are clearly defined, but how the requirements are met is left largely to the organisation.

Clear documentation of all work processes affecting quality is required, but documentation, basic training for employees, attached as rider on a particular manufactured item or service, or even displayed as process flow chart in a work area.

ISO 9000 concentrates almost exclusively on results criteria, although process criteria may meet some ISO 9000 requirements, depending on the lead assessor. ISO 9000 probably offers the least change in organizational involvement. A traditional, mass-inspection-oriented organisation could readily be registered.

MBNQA guidelines are demarcated and methods for meeting the guidelines are fairly well defined. MBNQA guidelines are document dependet. An organisation committed to basing its quality initiative model upon the MBNQA guidelines must expect a high level of documentation in many areas.

MBNQA guidelines are somewhat more results-oriented than process-oriented, but the organisation is required to follow both results and process criteria. MBNQA requires specific organisational involvement and change.

The Deming Prize has much vagueness regarding the assessment process.

Financial achievement

The Award Criteria address financial achievement by means of three areas:

1 Emphasis on quality factors and management action that lead to better market performance, market share gain and customer retention.
2 Emphasis on improved productivity, asset utilization, and lower overall operating costs.
3 Support for business strategy development and business decisions.

6.5.7 Developing a strategy to win the Malcolm Baldrige National Quality Award

If the companies that have won either the Deming Prize or the Malcolm Baldrige National Quality Award were studied, it would be found that each winner developed detailed plans for implementing TQM that enabled them to win the awards. The Baldrige criteria are simply a set of indexes by which implementation of TQM can be assessed.

A strategy used by many organisations that have won the Baldrige Award is to actually apply for the award an use the feedback received as data to prepare plans that enable them to eventually win an award. A plan should spell out the overall goals for company with respect to Baldrige Award; an example might be to win the Baldrige Award in 1997.

The approach and method plan should explain how the company intends to go about implementing systems and procedures to meet or exceed the Baldrige criteria. Once the macro Baldrige Award strategic plan has been developed and approved, the next task is to develop separate plans for the seven categories in the Baldrige criteria. (Brown 1991:16-23).

6.5.6 Linkage of the Award criteria to quality related corporate issues

Award Criteria can be linked to quality related corporate issues in three areas (1) increment and breakthrough improvement, (2) invention, innovation, and creativity and (3) financial achievement.

Increment and breakthrough improvement

Use of nonprescriptive, results-oriented criteria and key indicators are intended to focus on what needs to be improved. This approach helps to ensure that improvements throughout the organisation contribute to the organisations overall purposes.

In addition to supporting creativity in approach and organisation, results-oriented criteria and key indicators encourage 'breakthrough thinking'—openness to the possibility for major improvements as well as incremental ones. Bench marking may serve a useful purpose in stimulating breakthrough thinking.

Invention, innovation, and creativity

Invention, innovation, and creativity-discovery, novel changes to existing practices or products, and imaginative approaches are important aspects of delivering ever-improving value to customers and maximizing productivity While the state of the technology may play a key role in corporate involvement in research leading to discovery, innovation and creativity are crucial features in company competitiveness and can be applied to products, processes, services, human resource development, and the overall quality system. The Award Criteria encourage invention, innovation, and creativity in all aspects of company decisions and in all work areas.

(4) *Goal*. The basic aim of the quality is the delivery of ever improving value to customers

The rationale for the seven criteria is based on senior executive leadership—**the driver**—being the foundation on which a quality organisation is built and the quality results are obtained. According to this framework, information and analysis, quality management— **the system**—are company wide efforts that lead to measurable quality control results— **the measures of progress**—which in turn affect customer satisfaction relative to competitors, customer retention, and market share gain namely—**the goals**.

6.5.5 Examination items

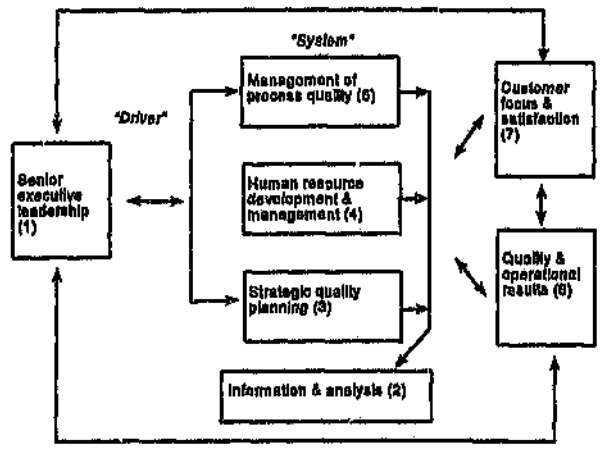
The major components of total quality management system are contained in the Award's seven criteria and these are allocated points based on their relative imporatnce as shown in table 6.2

Table 6.1 Malcolm Baldrige Quality Award point allocation-1992

Category	Points
Senior executive leadership	90
Information and analysis	80
Strategic quality planning	60
Human resource development and management	150
Management of process qaulity	140
Quality and operational results	180
Customer focus and satifaction	300

Source: Steeples 1992:22 [Adapted]

Figure 6.2 The Baldrige Award criteria framework



Goal	*Measures of progress*
• Customer satisfaction	• Product and service quality
• Customer satisfaction relative to competitors	•Productivity improvement
• Customer retention	• Waste reduction/elimination
• Market share gain	• Supplier quality

Source: Ivanchevic *et al* 1994:36 [Adapted]

The frame work has four basic elements:

(1) ***Driver***. Senior executive leadership creates the values, goals and systems which then guide the sustained pursuit of quality and performance objectives.

(2) ***System***. The system comprises the set of well-defined and well-designed processes for meeting the company's quality and performance requirements.

(3) ***Measures of progress***. Measures of progress provide results-oriented basis for channelling actions to delivering ever-improving customer value and company performance.

Corporate responsibility and citizenship

Objectives of the company's quality system should address corporate responsibility and citizenship. Corporate responsibility refers to basic expectations of the company, whileCorporate citizenship refers to leadership and support within limits of company's resources.

6.5.4 The Bladrige Award criteria framework

The core values and concepts of the Malcolm Baldrige award criteria are manifested in seven categories. These categories are:

1. senior executive leadership
2. Information and analysis
3. strategic quality pl ming
4. human resource development and management
5. management process quality
6. quality and operational results
7. customer focus and satisfaction

The framework uniting and blending these categories is given in figure 6.2

(Figure 6.2...)

Design quality and prevention

Design quality emphasizes building quality into products and services and into the process through which they are produced. Excellent design quality may lead to major reductions in 'down stream' waste, problems and associated cost. Design quality represents an 'upstream' approach which results in prevention of problems "downstream". Such a system helps to minimize inspection costs, internal failure costs (cost of scrap, re-work and repair.) External failure costs (cost of servicing rejected material and warranty replacement.).This leads to higher levels of productivity and customer satisfaction.

Long-range outlook

A company's plans for any product or service makes provisions for consideration of changes resulting from customers' expectations, technological developments, customer segments, evolving regulatory requirements and community/social expectations.

Management by fact

Another important attribute is a willingness to measure quality constantly and to identify and correct conditions causing poor quality. TQM is predicted on decision-making that uses reliable information and analysis. A number of statistical techniques have been adopted to support this process.

Partnership development

Companies should create partnerships with customers, employees, labour unions, suppliers and educational organisations. Often partners seek to develop long-term objectives and approaches for regular communication to evaluate progress in achieving those objectives.

defined by the customer. Product and service attributes that create a perception of quality on the part of the customer will increase customer satisfaction and ultimately, increase customer demand.

Leadership

Strong quality leadership is a key attribute of TQM. Many of the management practices and principles that are required in a TQM environment may be contrary to long-standing practice. Only a strong leadership team focused on quality improvement can overcome the inevitable inertia and resistance to change by creating clear quality goals and developing the systems and methods for achieving these goals.

Continuous improvement

Continuous improvement, a fundamental attribute of TQM, arises from a philosophy that all business operations and work activities can be done more efficiently. It requires the development of a management approach that encourages identifying and seizing on-going opportunities to improve.

Full participation

TQM environments allow all employees to participate in helping achieve organizational quality goals. All employees are held accountable for quality and are given means and training to fulfill this responsibility. TQM is based on the assumption that the employees closest to a particular organization's daily operating procedures are in the best position to understand and improve the quality of those procedures.

Fast response

Companies must consider quality, productivity and fast response together. A system made up of fast, responsive, flexible processes is the key to meeting the challenges of competitive markets.

COMPANY	LISTED	COMMODITY OR SERVICE
De Beers Industrial Diamond Division (Pty) Ltd Booysens Reserve Booysens	91-11-20	The research and development of synthetic diamonds and other ultrahard materials for industrial application, which constitutes the following major activities: a) Design and development and documentation of high pressure systems for use in diamond synthesis b) Research, development and documentation of diamond synthesis processes c) Development of diamond test procedures d) Development of diamond recovery techniques e) Development of diamond inspection and sorting techniques f) Development of application procedures
Engineering Management Services (Tvl) (Pty) Ltd Douglas Roberts Centre Skeen Boulevard Bedfordview	91-09-10	The provision of multi-disciplanry engineering and project management services for all types of industrial plants and projects
Gray Security Services (Tvl) (Pty) Ltd (Johannesburg Region) SBDC Building 5 Wellington Road Parktown	94-0520	The design and provision of security and loss control systems

COMPANY'S VISITED (SABS ISO 9001)
SOURCE:SABS

COMPANY	LISTED	COMMODITY OR SERVICE
Alprom (Pty) Ltd Douglas Roberts Centre Skeen Boulevard Bedfordview	94-12-01	The provision of multi-disciplinary engineering and project management services for all types of metallurgical and allied industries, plants and projects.
Badger Africa (Pty) Ltd Douglas Roberts Centre Skeen Boulevard Bedfordview	94-09-27	The provision of multidisciplinary engineering and project management services for all types of petrochemical and refinery plants and projects
Circuit Breaker Industries Ltd Tripswitch Drive Elandsfontein	89-09-21	a) The design and manufacture of FUCHS and HEINEMAN brands: Low-voltage air-break switches and air-break disconnectors Minature moulded-case circuitbreakers b) A range of matching time switches, bell transformers, energy control units and load control relays: Surge arresters Earth leakage protection units Moulded case circuit-breakers Integral industrial/mining earth leakage protection units c) The manufacture of gully boxes

V.D. WALT, Wikus. Manager (in person)	Seattech Stitching Division of Hanni Leathers 40 Fabriek Crecent, Vorsterskroon Nigel 1490 Tel 0118442668
VILJOEN, H. Manager Information Services and Quality (in person)	Honeywell Southern Africa (Pty) Ltd 34 Harry Street Robertsham Johannesburg Tel (011) 6803440

MAY, M.A. Director (in person)	Systems Specialists (Pty) Ltd. P.O. Box 60100 Langlaagte 2102 Tel (011)8376537
MEIRING, Anthony Q.A. Foreman (in person)	Circuit Breaker Industries Ltd. Tripswitch Drive Elandsfontein Tel (011) 392 2372
NEAVE,Dr, Henry. R. Director of Research (telephone & correspondence)	British Deming Association University Park, Nottingham NG7 2RD Tel(0602)423256
STEWARD, Neil S. Quality Manager (in person)	Engineering Management Services (Tvl) (Pty) Ltd Douglas Roberts Centre P.O. Box 585 Bedfordview 2008 Tel (011) 4561000
THEUENISSEN, Terry Department Head Quality Systems (in person)	Circuit Breaker Industries Ltd. Tripswitch Drive Elandsfontein Tel (011) 392 2372
TREDOUX, K. Quality Manager (in person)	Gray Security Services (TVL) (Pty) (Johanneburg Region) SBDC Building 5 Wellington Road Parktown Tel (011)4844090
UYS, P.J.R Consultant (in person)	Piet Uys Consulting International Expertise in Good Manufacturing Practice 21 Aftonwold Way Aston Manor 1619 Tel (011) 9723132

APPENDIX C

INTERVIEWEES

BARNARD, A. Project Manager (in person)	Hendler and Hart Brakpan Road Boksburg Tel (011)9141600
BECK, Peter Quality Systems Consultant (telephone)	I Q Development PO Box 675 Somerset West 7129 Tel: (024) 516669
FLACK, Kevin Corporate Q.A. Manager (in person)	Circuit Breaker Industries Ltd. Tripswitch Drive Elandsfontein Tel (011) 392 2372
GIBSON, Nolan Q.M.E Manager (in person)	Automotive Products Elandsfontein Works Barabara Road Elandsfontein Tel (011 8280620
KILLIAN, N. J. QUALITY MANAGER (in person)	De Beers Industrial Diamond Division (Pty) Ltd Booysens Reserve Booysens Tel(011)4906012
LOCHNER, Lochi New Products and Quality Director (In person)	Howden Group South Africa Ltd P.O. Box 2239 Johannesburg Tel (011)4934623
MAGILL, G. Managing Director (in person)	Howden Power 151 Kimberley Road Booysens Johannesburg Tel (011)4933850

No.	Questions
1	Your company is certified as an ISO 9000 company since (DATE). In your capacity as (TITLE) are you fimilair with ISO 9000?
2	Are you familiar with the Deming philosophy on TQM?
3	In your opion what are the main advantages of ISO to your company?(strong or positive points)
4	What aspects are missing in ISO that should be there in your opinion?
5	Does ISO have any advantages for a company without an established TQM program?
6	Does ISO present conflict for a company practising TQM based on the philosophy and principals of Deming?
7	What function and/or role do you believe auditors and registars should play in future regarding ISO?

1. The Interview with Mr N.J. Kilian, De Beers Industrial Diamond Division, was not premitted to be recorded due stric security measures adopted by the company. Permission was however granted to incorporate the results into my project.

INTERVIEW AGENDA

STRUCTURING

- Interview dates were arranged telephonically with interviewees in advance.

- Reasons for requesting the interview were provided telephonically and a brief overview of the proposed agenda.

- Appointments were confirmed prior to the interview date.

- Permission was requested to tape the conference and to incorporate the material into the research report.[1]

- All questions asked were openended questions and worded so that the questions could be easily read out by the interviewer without distorting the response of the interviewee.

INTERVIEW

Prior to the commencement of the interview I introduced myself and gave reasons for this project being undertaken and under who's supervision. A written copy of the agenda of the questions was provided to interviewees prior to the interview where requested. Confirmation was again sought to record the interview and to incorporate the material into my project.

(Interview questions...)

ISO 9000 CERTIFICATES -OCTOBER 1993

Source: Schröder G 1994a

EUROPE		PAC-RIM		AMERICAS		OTHERS	
Austria	200	Australia	2 695	Argentina	9	India	73
Belgium	464	Brunei	2	Brazil	113	Israel	14
Cyprus	1	China	35	Canada	460	Saudi Arabia	10
Czech	18	Hong Kong	161	Columbia	6	South Africa	1 100
Denmark	608	Indonesia	8	Costa Rica	1	Sri Lanka	1
Finland	324	Japan	434	Mexico	24	Tunisia	1
France	1 534	Malaysia	224	Puerto Rico	2	U.A.E.	9
Greece	46	New Zealand	489	USA	1 634	Zambia	1
Hungary	23	Phillipines	4	Venezuela	1		
Iceland	893	Singapore	523			TOTAL 'OTHERS'	1 209
Italy	864	South Korea	87	TOTAL 'AMERICA'	2 270		
Luxemborg	10	Taiwan	96				
Malta	1	Thailand	9				
Monaco	1						
Netherlands	1 502	TOTAL 'PAC-RIM'	4 767			WORLD TOTAL	46 025
Norway	172						
Poland	1						
Portugal	85						
Russia	5						
Slovakia	5						
Slovenia	16						
Spain	320						
Sweden	365						
Switzerland	569						
Turkey	65						
UK	26 096						
Ukarine	1						
Yogaslavia	1						
TOTAL 'EUROPE'	37 779						

Dr Joseph M.Juran and his error-free performance philosophy; and his "fitness for use" as a central theme for quality improvement in which the customer defines/dictates what is "fit for using."

Phillip Crosby With his "art of corporate wellness"; zero-free defects and his positive approach—the employee knows threre is a right way and will do the right thing.

Dr Kaoru Ishikawa and his "cause and effect" diagram.

Dr Walter Sheward—quality control chart based on the principles of statitistical techniques: and model of linked quarter circles: Plan, Do, Check, Act (Meisenheimer 1992:518)

Companies adopting the criteria of the Deming Prize and The Malcolm Baldrige National Quality Award, will **benefit** from the philosophies, experiences and recommendations developed by quality improvement "Gurus" in their quest for designing, refining, and popularizing TQM,as embedded in the philosophies of the Awards.

South African companies who wish to achieve TQM should adopt the criteria of the Deming Prize and Malcolm Baldrige Award as a **template** for internal quality processes independent of the award itself.

The ISO series 9000, The Deming Prize and the Malcolm Bladrige National Quality Award are playing a key role in the **quality revolution** in the US, Japan and Western Europe and will effectively raise quality performance standards and expectations throughout the world.

****

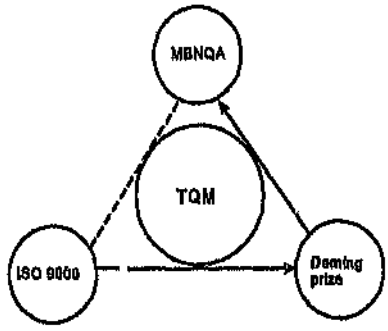
ISO 9000 SERIES	DEMING PRIZE	BNQA
Year created		
1987	1951	1987
Basic form		
Certification	Long-term prize	Annual contest
Winners		
Many	Few	Few
Emphasis		
Organisation policy documentation	Statistics; problem solving	Basic form customer Leadership, Support Organisation; Measurement; Bench marking
Absent		
Customer results	Customer objectives	
Cost		
Low-medium	High	Medium-low

6.9. CONCLUSION

Many of the quality management techniques developed by quality experts most notability

Dr W.Edwards Deming and his obligations to management (14 principals).

Figure 6.3 A trilogy approach to TQM



As illustrated in figure 6.1, the components of the model include

- ISO 9000
- The Deming Prize
- The Malcolm Baldrige National Quality Award
- TQM

The rationale of the proposed model is that companies should build from the ISO 9000 series, move on trough the Deming Prize and end with the Malcolm Baldrige National Quality Award. This model does not provide for smooth progression and may take several years to accomplish.

6.8 A FINAL COMPARISON ISO, DEMING PRIZE AND MBNQA

The three approaches namely ISO 9000, The Deming Prize and The Malcolm Baldrige National Quality Award are compared on a macro basis in the following section (Mahoney & Thor 1994:212).

Orientation

Process (60%) plus results (40%); heavy statistical process control	Results (60%) plus process (40%); heavy quality results, customer satisfaction, human resource orientation

Process

Qualification based on review with JUSE	Qualification for site visit; competition

Examiners

Select panel	Open examiner system; annual application; selection, assignment avoids conflict of interest

Cost

High monitory value effort, consulting fees a major component (training has a major impact in any case)	Low to high monitory value; high effort if excellent quality system(s) not in place (training has a major impact in any case)

Time frame

Two to five years	One-year cycles; renew after five years

6.7 SUGGESTED MODEL TO ACHIEVE TQM

Figure 6.3 pre[illegible]s an elementary model resulting from the review of literature in this chapter as well as literature review for the main report.

Y

Yoshida K. 1989. Deming management philosphy: Does it work in the U.S. as well as Japan? **Columbia Journal of World Business**, Fall:10-17

****

Schröder, G.1994a. A brief overview of the ISO 9000 series: Which relate to quality management systems. (In South African Society for Quality. Gallagher Esate, Midrand.)

Schröder, G 1994b. Manager: Services Sector Certification SABS. Pretoria, 1994. Correspondence. 11 November. Kempton Park.

Steeples, M.S. 1992. **The corporate guide to the Malcom Baldrige National Quality Award: Proven strategies for building quality into your organization.** ASQC Press: Wisconsin.

U

Uys, P.R. 1995. Consultant. Personnel interview. 18 April 1995.

V

Voehl, F. 1995. **Deming: The way we knew him.** Florida: St Lucie Press.

W

Walton, M. 1992. **The Deming management method.** 3rd edition. London: Gold Arrow Publications.

Waples. I.V. 1994. IS0-the foundation for good business relationships. **Journal of AOAC International,**. 77(1):2-4.

Weekley, T.L. Total quality management from a joint labor perspective. Ph.D thesis, The Union Institute.

Weitz, K. W. 1994The evolving scope and impact of total qaulity management in leading South African Companies. Masters of Commerce Thesis, University of South Africa.

Willey, P. 1990. Compelementary or contradictory: The relationship between **Deming and ISO9000/BS5750.** (BDA research committee working paper). Unpublished manuscript.

Mills, C.A. 1989. **The quality audit: A management evaluation tool.** New York: McGraw-Hill.

Montgomery, D.C. 1991. **Design and analysis of experiments.** 3rd edition. New York: Wiley.

N

Neave, H.R. 1990. **The Deming dimesion.** Knoxville: SPC Press.

Neave, H.R. 1995. Director of Research: British Deming Association. Nottingham 1995. Correspondence, 17 January.

Neves, J. & Nakhai B. 1994 The evolution of the Baldrige Award. **Quality Progress.**

R

Rosander, A.C. 1991. **Deming's 14 points applied to services.** Milwaukee: ASQC Press.

S

Saraph, J.V. & Sebastian, R.J. 1993. Developing a desired organizational quality culture. **Quality Progress,** 26(9), September:73-78.

Saylor, J. H. 1992. **TQM field manual.**[S.I. : s.n.].

Schein, E.S. 1985. **Managing organizational culture.** 2nd edition. New York: Prentice Hall.

Scherkenbach, W.W. 1991. **Deming's road to continual improvement.** Knoxville: SPC. Press.

Scholtes, P.R., Joiner, B.L., Braswell, B., Finn, L., Hacquebord, H., Little, K., Reynard, S., Streibel, B., & Weiss, L. 1988. **The team handbook: How to use teams to improve quality.** Madison: Joiner Associates.

L

Labuschagne, L.E. 1994. Head: Standards Information, SABS. Personnel interview 7 November.

Lamprecht, J.L. 1993. **Implementing the ISO 9000 series.** New York: Marcel Dekker.

Lancelles, D.M. & Dale, B.G. **The road to quality.** Information Press: Oxford.

Laszlo, M. 1994. Quality expert W. Edwards Deming dies at 93. **Industrial Engineering,** 26(2), February:14-1.

Latzko, W.J. & Saunders, D.M. 1995. **Four days with Dr. Deming: A strategy for modern methods of management.** Massachusetts: Addison and Wesley.

Leontiades, M. 1982. The confusing words of business policy. **Academy of Management Review,** 7(1):45-48.

Lofgren, G.O. 1991. Quality system registration. **Quality Progress,** May, 24(5):35- 73.

Luyt, D.C. 1994. Nation wide quality. Ph.D thesis. University of Pretoria, Pretoria.

M

Mahoney, F.F. & Thor, C.G. 1994. **The TQM trilogy.** New York: American Management Association.

Marquardt, D.W., Chovè, J., Jensen, K.E., Petrick, K., Pyle, J., & Strahle, D. 1991. Vision 2000: The strategy for the ISO 9000 series satndards in the '90s. **Quality Progress,** May:25-31.

Meisehiemer, C.G. 1992. **Improving quality: A guide to effective programs.**Maryland:Aspen Publication.

Michel, B.J. 1993. Realities and misconceptions regarding ISO 9000. **American Ceramic Society,** 72(8), August:50-52.

H

Henkhoff. R. 1993. The hot new seal. **Fortune**, June:28.

Hertzberg, F. 1959. **The motivation to work.** 2nd edition. New York: John Wiley.

I

Imai. M. 1986. **Kaizen: The key to Japan's competitive success.** New York: McGraw-Hill.

Ishikwa, K. 1985. **What is total quality? The Japanese way.** Prentice-Hall: London

Ivancevick, J.M., Lorenz, P. & Skinner, S.J. 1994. **Management quality and competitiveness.** Boston: Irwin.

J

Jones, C. 1991. Total quality, quality management and the role of management services. **Management Services**, 36(11), November:18-24.

Juran, J.M. 1994. The upcoming century of quality. **Quality Progress**, 27(8), August:29-37.

Juran, J. & Gryna, F. 1980. **Quality planning and anlysis.** 2nd edition. San Francisco: McGraw-Hill.

K

Kanter, R.M. 1983. **The change masters: Innovation for productivity in American Corporation.** New York: Simon and Schuster.

Kilian, C.S. 1988. **The world of W. Edward's Deming.** Rockville: Mercury Press.

King. B. 1989. **Hoshin planning: The development approach.** Massachusetts: Goal/QPC.

Kuhn, T.S. 1970. **The structure of scientific revolutions.** 2nd edition. Chicago: University Press.

Dobyns, L. & Crawford-Mason, C. 1991. **Quality or else: The revolution in world quality**. Boston: Houghton Mifflin.

Dzus, G. 1991. Planning a successful ISO 9000 assessment. **Quality Progress** November:43-46.

E

Eureka, W.E. & ryan, N.E. 1988. **The customer driven company: Managerial perspectives on QFD**. Massachusettes: ASI Press.

F

Feigenbaum, A.V. 1993. **Total quality control**. 3rd edition.San Francisco:McGraw Hill.

Fendt, P. F. & Vavrek, G.M. 1986. **Quality improvement in continuing higher education and service organizations**. New York: Edwin Miller.

Finlay, J.S. 1992. ISO 9000, Malcolm Baldrige award guidelines and Deming.**Quality Systems Update**, August:1-16.

G

Gabor, A. 1990. **The man who discoverd quality: How W. Edwards Deming brought the quality revolution to America-The stories of Ford, Xerox, and GM**. New York: Times Books.

Gazy, S.E. 1993. A common sense approach to quality. **Appliance Manufacturer**, 41(9), September:33-34.

George, C.S. 1972. **The history of management thought**. Englewood Cliffs:Prentice Hall.

Gerber, G.R.S. Die bestuur en opleiding van SABS 9000 reeks. M.Com-skripsie, Randse Afrikaanse Universiteit.

REFERENCES

A

Adams, H.G. & Arora, S. 1995. **Total quality in radiology: A guide to implementation.** Florida: St. Lucie Press.

Aquayo, R. 1990. **Dr. Deming: The American who taught the Japanese about quality.** New York: Simon & Schuster.

Avery, S. 1994. What's wrong with ISO 9000?. **Purchasing,** March:49-53.

B

Boznak, R.G. Product development: Atomism vs. vitalism. **Industrial Engineering,** July:29-32.

British Deming Association. 1992. **Beyond ISO 9000.** Tennessee: SPC Press.

British Deming Association. 1992. **A system of profound knowledge.** Tennessee: SPC Press.

C

Crawford, J. 1989. **An appraisal of BS5750 in the light of the Deming philosophy.**(BDA research committee working paper). Unpublished manuscript.

Crosby, P.B. 1979. **Quality is free.** New York: McGraw-Hill

D

Dale, B. Director UMIST: Quality Centre, University of Manchester. Personal inteview 9 November, Gallagher Estate, Midrand.

De Waal, M. Chief Paton SAQI. Personal interview 10 November, Gallagher Estate.

Deming, W.E. 1986. **Out of the crisis.** Cambridge: MIT Press.

APPENDIX E

STANDARDS MENTIONED IN REPORT

SABS ISO 9000-1987: "Quality management and quality assurance standards- Guidelines for selection and use."

SABS ISO 9001-1987: "Quality systems - Model for quality assurance in design/development, production, installation and servicing."

SABS ISO 9002-1987: "Quality systems - Model for quality assurance in production and installation."

SABS ISO 9003-1987: "Quality systems - Model for quality assurance in final inspection and test."

SABS ISO 9004-1987: "Quality systems - Quality management and quality systems-Guidelines."

SABS ISO 9001: 1987 and ISO/DIS 9001.2: 1994

SABS ISO 9002: 1987 and ISO/DIS 9002.2: 1994

SABS ISO 10012.1 "Quality Assurance Requirements for Measuring Equipment - Part 1: Metrological Confirmation System for Measuring Equipment".

ISO 9004-4 : "Quality management and quality system elements- Part 4: Guidelines for quality improvement". (first edition 1993-06-1950)

COMPANY	LISTED	COMMODITY OR SERVICE
Systems Specialits (Pty) Ltd Shield House 63 Marist Road Homestead Park Johannesburg	94-09-23	The design of security systems, specific to individual clients

COMPANY	LISTED	COMMODITY OR SERVICE
Honeywell Southern Africa (Pty) Ltd 34 Harry Street Robertsham Johannesburg	94-08-01	Software design, hardware configuration, manufacture and installation of industrial automation and process control systems
Howden Energy Systems 9 Trump Street Selby Johannesburg	91-03-14	Project management specializing in combustion systems, industrial furnaces and air-pollution equipment
Howden Safanco 51 Kimberley Road Booysens Johannesburg	86-11-06	The design, manufature and repair of: a) Axial fans, including glass-rein-forced polyester (GRP) bladed-axial fans b) Centrifugual fans SABS MARK-BEARING COMMODITY (DIAMOND-MARK) Glass-reinforced polyester (GRP) laminated products (SABS 141)
Howden Power 51 Kimberley Road Booysens Johannesburg	92-07-01	The design, manufacture and installation of fan equalpment and heaters in power generating plants