QUALITY MANAGEMENT IN THE SMALL BUSINESS ENVIRONMENT OF SOUTH AFRICA

by

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Dissertation submitted in fulfillment of the requirements for the degree

Master Technologiae: Quality

in the Faculty of Engineering

at the Cape Peninsula University of Technology

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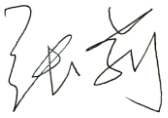
November 2010

DECLARATION

By

Li Zhang

"I hereby declare that this research report submitted for the degree (Master Technologiae: Quality) at the Cape Peninsula University of Technology, is my own original unaided work and has not previously been submitted for any other institution of higher education. I further declare that al sources cited or quoted indicated or acknowledge by means of a comprehensive list of references"

Signature: 

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November 2010

ACKNOWLEDGEMENTS

I wish to express my appreciation to the following persons who contributed to the compilation of this dissertation:

- My supervisor Prof. Dr. J. Andr é Watkins, for his knowledge, and patience.
- My co-supervisor, Mr Bingwen Yan, for his encouragement, guidance and time.
- The Head of Department Mr Patrick McLaren, Mr Andre Bester, for their motivating me to do this dissertation.
- All my classmates and friends, especially Caron Sherae Viljoen.
- Ms Ronel van der Merwe.
- My family especially my husband Mr Andy Han, for his support and love.

Thank you all

ABSTRACT

Beginning in the United States in December 2007, and with much greater intensity since September 2008, much of the industrialised world is being subjected to an economic downturn, which manifests in unemployment, small-business lending, and in particular, the closing of small business enterprises, etc. Customer satisfaction, quality and retention are global issues that affect all organisations, no matter whether they are large or small, profit or non-profit, global or local.

In a globally changing landscape characterised by continuous structural changes and enhanced competitive pressures, the role of small business in society has become even more important as providers of employment opportunities and key players for the well-being of local and regional communities. Under the current global worldwide economic crisis, small business is considered to be a major force behind the South Africa's economy. Regarding the implementation of quality, probably the most serious constraints a small firm has is that the manager is almost constantly under time pressure, usually dealing with the urgent staff and operational matters.

Especially in very small companies, the manager usually has to cope with to all issues irrespective of their nature, in addition to day to day duties such as record keeper, inventory management and scheduling. Ironically, it is this type of small business that needs quality solutions because quality strategies do not from the basis of the traditional small business enterprises, thus impacting on the successful management of the business environment.

Key words: small business, quality management, quality strategy, quality solution

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CHAPTER ONE
SCOPE OF THE RESEARCH

1.1 INTRODUCTION AND MOTIVATION

Since 1980's, Japanese companies adopted quality as a competitive advantage in most industries. It has become one of the most frequently discussed topics in current business literature. Within the Japanese business context, no matter how large or small the enterprises, quality management became more and more important in pursing greater profits and higher competitiveness in today's competitive economic world. Many quality concepts exist from which enterprises can learn eminating from quality gurus in the likes of W. Edwards Deming, Joseph Juran, and others.

Currently, the numbers of people running their own business, despite the world economic downturn is rising exponentially. Small business contributes to the economy, particularly in the creation of new jobs and innovation. To launch a small business or expand an existing one successfully, is not a simple task. According to Barrow (1998:33), the quality of products or services are a very important measure of small business success. Improved quality does not come just from necessity, customers are demanding more quality and cost-efficiency from their suppliers. However, quality strategies do not form the basis of small business enterprises, thus impacting on the management, of the business environments. Furthermore, small companies focus on short term profits as apposed to improving the quality of management, thus impacting on long term sustainability. This research will provide insight into small business enterprises and ascertain whether quality solutions implemented by small business can improve the management and overall sustainability of the enterprises.

1.2 BACKGROUND OF PROBLEM

Beginning in the United States in December 2007, and with much greater intensity since September 2008, much of the industrialised world is being subjected to an economic downturn, which manifests in unemployment, small-business lending, and in particular, the closing of small business enterprises, etc. According to Fen (2005:**Online**), customer satisfaction, quality and retention are global issues that affect all organisations, no matter whether they are large or small, profit or non-profit, global or local. In a globally changing landscape characterised by continuous structural changes and enhanced competitive pressures, the role of small business in society has become even more important as providers of employment opportunities and key players for the well-being of local and regional communities. Under the current global worldwide economic crisis, small business is considered to be a major force behind the South Africa's economy.

Regarding the implementation of quality, probably the most serious constraints a small firm has is that the manager is almost constantly under time pressure, usually dealing with the urgent staff and operational matters, and does not have enough time to concern himself/herself with quality issues. Especially in very small companies, the manager usually has to cope with to all issues irrespective of their nature, in addition to day to day duties such as record keeper, inventory management and scheduling (Haksever, 1996:4-5). Ironically, it is this type of small business that needs quality solutions because quality strategies do not from the basis of the traditional small business enterprises, thus impacting on the successful management of the business environment.

1.2.1 Statement of the research problem

Against the above background to the research problem, the research problem statement read as follows: “Quality strategies do not form the basis of small business enterprises, thus impacting on their sustainability as business enterprises”.

1.3 RESEARCH QUESTION

Forming the crux of this dissertation, the following research question will be researched: “What quality solutions should be implemented by small business to improve the sustainability of the enterprise?”

1.3.1 Investigative questions

The investigative questions to be researched in support of the research question, read as follows:

- What are the existing quality strategies that small enterprises follow?
- What are the main barriers that impact on quality management in small enterprises?
- What are the possible strategies that can be implemented to improve quality management in a small enterprise?
- How should quality improvement strategies be applied for optimum small business results?

1.4 RESEARCH OBJECTIVES

The objectives of this dissertation are:

- To investigate the quality strategies that exists within small enterprises in South Africa.

- To identify the barriers that impact on quality management in small enterprises.
- To determine the possible strategies that can assist small enterprises to improve quality management processes.
- To develop a suitable quality management strategy for a small enterprise to ensure sustainability.

1.5 THE RESEARCH PROCESS

The research process provides insight into the process of 'how' the research will be conducted from formulating the research proposal to final submission of the thesis or dissertation. Fundamental stages in the research process common to all scientific based in investigations are listed below.

According to Collis and Hussey (2003:16), there are six fundamental stages in the research process, namely:

- The identification of the research topic.
- Definition of the research problem.
- Determining how the research is going to be conducted.
- Collection of the research data.
- Analysis and interpretation of the research data.
- Writing up of the dissertation or thesis.

The above research process will be used in the execution of this research study.

1.6 THE RESEARCH DESIGN AND METHODOLOGY

Selecting the right research design depends upon the research question. According to Yin (1994:20-27), the case study strategy is most likely to be appropriate for 'how' and 'why' questions, which calls for the initial task being to clarify precisely the nature of the study questions. Therefore, case study will serve as research method in this dissertation.

According to Yin (1994:1), case study research can be used in many situations, including:

- Policy, political science, and public administration research.
- Community psychology and sociology research.
- Organisational and management studies.
- City and regional planning research, such as studies of plans, neighborhoods or public agencies.
- Research into the social sciences, the academic disciplines as well as professional fields such as business administration, management sciences, and social work.

A further strength of the case study approach is that it allows for the carrying out of a detailed in-depth study, in a descriptive process-orientated manner, while limiting a multitude of factors. The aim of this research paper is to determine the possible solutions that should be implemented by small business to improve management of the enterprises.

1.7 DATA COLLECTION DESIGN AND METHODOLOGY

Methodology refers to the overall approach of the research process, from the theoretical underpinning to the collection and analysis of data" (Collis and Hussey, 2003:54). The selection of the most appropriate design and methodology for a

research study cannot be overemphasised.

The data collection methodology to be applied in this research study, will be based on the quantitative research paradigm. In this respect, questionnaires will be used to gather data with the sample frame being employees in small business enterprises, randomly selected.

1.8 DATA VALIDITY AND RELIABILITY

According to Collis and Hussey (2003:186), 'validity' is concerned with the extent to which the research findings accurately represents what is happening. More specific, whether the data is a true picture of what is being studied. According to Cooper and Schindler (2006:318-320), three major forms of validity can be identified, namely 'content validity', 'criterion related validity' and 'construct validity', which is expanded upon below to provide a holistic perspective of each of the concepts:

- **Content validity**: Content of the measuring instrument is the extent to which it provides adequate coverage of the investigative (sub-) questions guiding the study. If the instrument contains a representative sample of the universe of subject matter of interest, then content validity is good.
- **Criterion-related validity:** Reflects the success of measures used for prediction or estimation. Any criterion measure must be judged in terms of the following four qualities:
    - Criterion is relevant: If the criterion is define and scored in the terms we judge the proper measures of success.
    - Freedom from bias: When the criterion gives each respondent the opportunity to score well.
    - Reliability: A reliable criterion is stable and reproducible.
    - Availability: The information specified by the criterion must be available.

- **Construct validity:** In attempting to evaluate construct validity, both the theory and the measuring instrument being used should be considered. According to Collis and Hussey (2003:59), construct validity relates to the problem that there are a number of phenomena, which are not directly observable, such as motivation, satisfaction, ambition and anxiety. These are known as hypothetical constructs, which are assumed to exist as factors which explain observable phenomena. For example, you may observe someone shaking or sweating before an interview. However, you are not actually observing anxiety, but a manifestation of anxiety.

Both 'content validity' and 'criterion related validity', will be used in this dissertation.

Reliability (also referred to as 'trustworthiness'), is concerned with the findings of the research (Collis & Hussey, 2003:186). The findings can be said be reliable if you or anyone else repeat the research and obtained the same results. There are three common ways of estimating the reliability of the responses to questions in questionnaires or interviews, namely 'test re-test method', 'split-halves method' and the 'internal consistency method':

- **Test re-test method**: The questions are asked of the same people, but on two separate occasions. Responses of the two occasions are correlated and the correlation coefficient of the two sets of data computed, thus providing an index of reliability.
- **Split-halves method**: The questionnaires or interview record sheets are divided into two equal halves. The two piles are correlated and the correlation coefficient of the two sets of data computed, thus providing an index of reliability.
- **Internal consistency method**: Every item is correlated with every other item across the entire sample and the average inter-item correlation is taken as the index of reliability.

In this dissertation, the 'Internal consistency method' will be used to estimate the reliability of the responses to questions in questionnaires.

1.9 ETHICS

In the context of research, according to Saunders, Lewis and Thornhill, (2000:130), "…ethics refers to the appropriateness of your behavior in relation to the rights of those who become the subject of your work, or are affected by it".

The following ethics will be observed in the research study:

- **Informed consent**: Participants should in advance be told about the nature of the study to be conducted, and be give the choice of either participating or not.
- **Honesty**: Strive for honesty in whole research process. Honestly report data, results, methods and procedures, and publication status.
- **Right to privacy**: The nature and quality of participants' performance must be kept strictly confidential.
- **Non-Discrimination**: Avoid discrimination against colleagues or students on the basis of sex, race, ethnicity, or other factors that are not related to their scientific competence and integrity.

1.10 RESEARCH ASSUMPTIONS

An assumption represents a condition that is taken for granted, without which the research study would be pointless. The requirement to state assumptions on which the research is undertaken is based on the fact that it is essential that others know what one assumes with respect to a research study (Leedy & Ormrod, 2001:62-63).

The following assumptions pertain to this research study:

- Staff and the managers from small business enterprises would be willing to participate in the study and give the honest responses.
- Questionnaire information from random small business enterprises in Western Cape would be representative of the entire small business enterprises of South Africa.

1.11 RESEARCH CONSTRAINTS

According to Collis and Hussey (2003:128-129), 'limitations' identify weakness in the research, while 'de-limitations' explain how the scope of the study was focused on only one particular area or entity, as opposed to say a wider or holistic approach.

The following constraints pertain to this dissertation:

- According to definitions of small business in South Africa, there are sixteen different categories identifiable. However, during the process of research, the respondents are limited to divide all the categories into two main elements, namely that of products and services.
- The research will be limited to the small business environment in the Western Cape in South Africa.
- The research will be focus on quality issues although there are many other elements influencing the success of small business. For instance: financial performance; recruiting people; law environment; HIV/ AIDS; Crime etc.

1.12 SIGNIFICANCE OF THE PROPOSED RESEARCH

Quality management is very important for a companies' survival be it a small or large organisation. The small business seems to be forgotten. Small business enterprises provide opportunity for the creation of employment and they play a significant role in South Africa's economy, which should not be ignored. The significance of this study lies in that it provides quality solutions to small business management to prepare themselves for long term sustainability.

1.13 CHAPTER AND CONTENT ANALYSIS

The following chapter and content analysis will apply to this research study:

Chapter 1 – Scope of the research: In this chapter, a holistic perspective will be provided in respect of the proposed research to be conducted within the ambit of this dissertation.

Chapter 2 – Implementing quality solutions for small business in South Africa literature review: In this chapter a literature review will be conducted on the small business environment, and the concepts of quality, quality management tools and quality solutions used in small business, will be elaborated upon in detail.

Chapter 3 – Survey design and methodology: In this chapter, the survey design and methodology to be used within the ambit of this dissertation will be elaborated upon in detail.

Chapter 4 – Analysis and interpretation of data: In this chapter, data collected from the research survey conducted within the ambit of Chapter 4 will be analised and interpreted.

Chapter 5 – Conclusions and recommendations: In this chapter, the research will be concluded and recommendations made to mitigate the research problem.

CHAPTER TWO

IMPLEMENTING QUALITY SOLUTIONS FOR SMALL BUSINESS IN SOUTH AFRICA LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter a literature review will be conducted on the following critical issues pertaining to the quality solutions of small business enterprises in South Africa. The aspects which will be addressed include: the concept of 'small business', background of small business in South Africa, and the definitions of small business in different countries. Also the concept of quality in different perspective and dimensions will be covered. The leading contributors to the quality paradigm including: W. Edwards Deming, Joseph M, Juran, Kaoru Ishikawa and Philip Crosby. The quality management tools will be introduced as well. Thereafter the quality solutions will be stated, which concluding: barriers that influence quality management in small business, implementing quality solutions in small business, long term quality for small business in South Africa. The research problem to be researched within the ambit of this dissertation reads as follows: "Quality strategies do not form the basis of small business enterprises, thus impacting on their sustainability as business enterprises." The research question to be researched within the ambit of this dissertation, reads as follows: "What quality solutions should be implemented by small business to improve the sustainability of the enterprise?"

2.2 THE CONCEPT 'SMALL BUSINESS'

McGibbon and Moutray (2009:1) describe that small businesses create most of the nation's new jobs, employ about half of the nation's private sector work force, and provide half of the nation's nonfarm, private real gross domestic product (GDP), as well as a significant share of innovations. According to Barrow (1993:1), recent

years have seen a major resurgence of small business throughout the developed world which even the recessions of the 1980's and 1990's have done little to abate.

In most developed economics anything from 6% to 15% of the working population are small business men and women. This, for example, translates into about 3.4 million people in the United Kingdom, out of a working population of around 27 million. Over half of all the people in commercial and industrial employment in the United Kingdom work in a small business (Barrow, 1993:1).

According to Manzullo (2010:1), over the last decade, small businesses have been an economic juggernaut for America economy. In those years, small businesses created 75 percent of all new jobs, developed over 50 percent of new technologies and innovations, generated over half of private GDP, and provided the stable economic and social base essential to our towns and communities. It is no exaggeration that small firms are the lifeblood of the American economy (Velazquez, 2007:2).

In Italy 90% of all industrial firms are small businesses and absorb 84% of total employment. In Denmark 92% of all manufacturing firms are small businesses employing 43% of the workforce (Barrow, 1993:1). In Taiwan, in 1993, Small and Medium Enterprises (SMEs) have been at the heart of this impressive success. In 1993, SMEs accounted for 96 per cent of the total number of companies, 69 per cent of total employment and 55 per cent of Taiwan's manufacturing exports. Most of Taiwan's current 400 electronic companies started as small businesses (Barakat, 2001:1).

Few historians have bothered to record its contributors to society, even though the first known piece of writing appeared more than 4,000 years ago. It described how bankers loaned money at interest (Bursk, 1963:2). Since then, small business

people have been the innovative backbone of most economies, providing products and services to benefit the consumer (Barrow, 1993:1).

Despite many successes, small-business history, until recent years, has never excited the public at large. Greek and Roman historians virtually ignored small business. In their view, ideas and military deeds were the stuff of history. Yet it was largely through small business that civilisation was spread throughout the known world. Small businesses transported such things as Babylonian astronomy and Greek philosophy, the Jewish calendar and Roman law (Barrow, 1993:1).

Currently, the numbers of people running their own business, however, small businesses struggled to weather the downturn. According to Bemowski (1992:23-27), a 1992 Gallup survey of 634 small businesses, the recessionary environment is the biggest survival challenge these companies face. The surveyed businesses indicated that they have attempted to meet this challenge by one of four different strategies: improving quality, improving productivity, adding new products/services, or purchasing new equipment. Of the four options, the new initiative most often taken by responding companies was quality improvement (Bemowski, 1992:23-27). Customers have become increasingly discerning and are demanding high quality in products, services, and in life (Sureshchandar, Rajendran & Anantharaman. 2001:343).

Quality in small businesses is as important as large organisations. For instance, the International Standards Organisation (ISO) has publications addressing the implementation of ISO 9001-based quality management systems for small organisations. This is even reflected in the Malcolm Baldridge National Quality Awards – out of the 49 organisations applying for the 2002 awards, only 8 were large manufacturers. The rest were: 3 service, 10 educational, 17 health care, and 11 small business firms (Chaudhry & Chaudhry, 2002:34).

The intersection of ‘service’ and ‘small’ is indeed important as evidenced by frequent coverage in both the popular press and practitioner periodicals of instances of poor service (Godfrey, 2002:16). Complaints about poor quality and customer service seem to be universal. Paton (2002:6) refers to this as “aggressively bad customer service”. Poor quality is very expensive for small firms (Fitzsimmons, 2000:20). This penalises the ‘offending’ service firm on multiple fronts – loss of repeat business, unfavorable word of mouth, and a costly legal battle on its hands.

According to Golden, Toombs, Anderson & White (2009:3), small organisations have been less likely to utilise strategic management models and strategic planning concepts than large organisations for many reasons:

- Small organisations are often family-owned;
- Small business leaders are often more focused on day-to-day operations as opposed to management models and strategic management systems;
- Small businesses have less money to spend on training; and
- Their competitors generally operate the way they do – without using management models and implementing improvement systems.

Entrepreneurs who develop small businesses usually have little desire to establish routine processes and procedures. On the other hand, large organisations often have strategic planning departments, more people who encountered management models and strategic concepts when they completed their management or other college degrees, more money to spend on training, and large competitors which are strategically-focused and competitively-driven (Golden *et al*., 2009:4).

2.3 BACKGROUND OF SMALL BUSINESS IN SOUTH AFRICA

According to Arendse, Karlinsky, Kilian and Payne (2006:1), small businesses are universally recognised as an important driver of economic success. They are a key ingredient in the economic machine that drives many countries' economies, as job creators, sales generators and a source of tax/fiscal revenue.

Sunter (2000:23) also mentioned that Small and Medium Enterprises SMEs sector is widely regarded as the driving force in economic growth and job creation in both developed and developing countries. The important contribution that SMEs can make to employment and income generation is recognised around the world, and in particular in South Africa (Brink & Cant, 2003:2).

In South Africa the importance of small business as a creator of jobs, particularly for those with a low skills level, is widely recognised. Small, medium and micro-enterprises (SMMEs) contribute 36.1% of the country's GDP and employ 68.2% of the workforce in the private sector (Smulders, 2006:2). In the agriculture, construction and retail sectors, SMMEs employ more than 80% of the total workforce. Over the last few years, the growth in employment by SMMEs has exceeded the growth in their contribution to GDP, highlighting the job creation potential of this sector of the economy (Arendse *et al.*, 2006:1)

According to Reinecke and White (2004:30), as the Figure 2.1 showed, the employment share of small enterprises in non-agricultural in South Africa of 2000 has the largest amount compared with other countries.

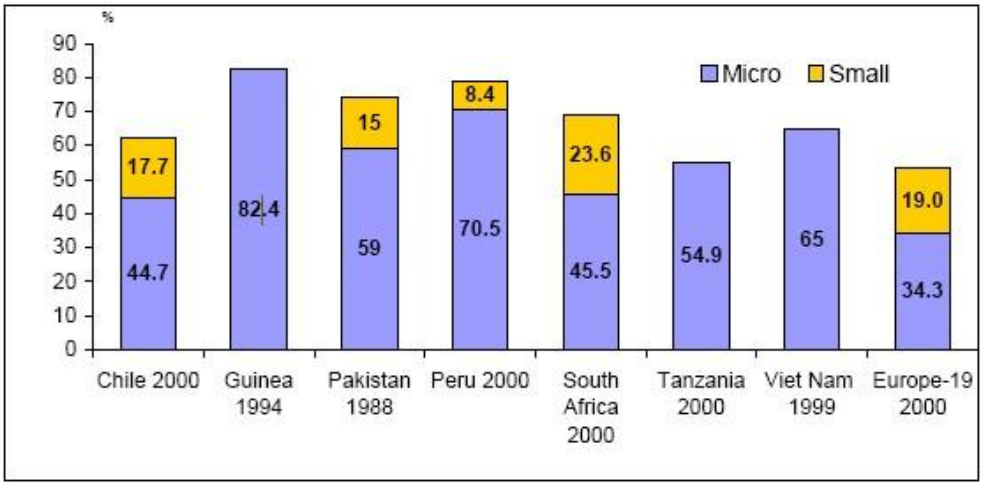

Figure 2.1: Employment share of micro- and small enterprises in non-agricultural employment. (**Source**: Reinecke and White, 2004:30)

Since the political change of 1994 South Africa's small business sector has struggled to overcome obstacles rooted in apartheid. Uprooted and confined to economically dismal homeland areas, the majority of the population lacked property rights to secure business financing, were prohibited from partnering with non-black companies, and were forced to incur the cost and risks of living far from designated commercial areas. The increased competitiveness as South Africa reintegrated into the global economy after 1994 exacerbated these disadvantages (Branam, 2008:1).

The South African government has focused efforts on enabling small businesses to participate in external markets. It has done this by promoting private-public partnerships and by targeting sub-sectors that clearly redistribute wealth. These sectors include tourism, small-scale mining, manufacturing, agro-processing, and arts and crafts. These initiatives target small to medium-sized enterprises which serve as economic intermediaries between big business and micro-business and survivalist enterprises (Branam, 2008:2).

The small businesses play an important role in economy, however, survival rate of Small and Medium Enterprises (SMEs) is relatively low. In the South African economy, more than one million jobs have been shed since 1990, bringing the unemployment rate, by February 2002, at 28 per cent (Lighthelm & Cant, 2002:1). Less than half of newly established businesses survive beyond five years. This is not only true for South Africa, but also a common phenomenon in the rest of the world.

Brink and Cant (2003:4), stated that the following operational aspects may impact on the success of SMEs: lack of proper quality control in the production process; lack of capacity planning, problems with suppliers of resources and limited attention to developing suitable products or services.

It is of much greater importance to support more mature and viable SMEs in South Africa to upgrade their products, processes, and levels of quality, productivity and innovation to enable them to integrate into local, national, and international value chains – to become profitable, productive and performance-driven enterprises (Rankin, 2008:8).

Regarding the implementation of quality, probably the most serious constraints a small firm has is that the manager is almost constantly under time pressure, usually dealing with the urgent staff and operational matters, and does not have enough time to concern with quality issues. Especially in very small companies, the manager usually has to cope with to all issues irrespective of their nature, in addition to day to day duties such as record keeper, inventory management and scheduling (Haksever, 1996:4-5). Ironically, it is this type of small business that needs quality solutions because quality strategies do not from the basis of the traditional small business enterprises, thus impacting on the successful management of the business environment.

2.4 THE CONCEPT 'SMALL BUSINESS' DEFINED

There are no uniformly acceptable definitions of a small business enterprise. Most of the attempts at defining small business have to rely on some quantifiable characteristics, such as the number of employees, sales volume, or net asset worth. One classification scheme defines a small business as a firm with fewer than 500 employees. A more detailed classification divides this range further into subcategories: Very small (1-19); small (20-99); and medium (100-499). Any company with more than 500 employees is considered to be a 'big business' (Haksever, 1996:2).

A qualitative definition that embodies this distinction would particularly reflect issues of ownership and inter dependence. Being a small entrepreneur fundamentally means coping with high levels of autonomy: standing alone and having total responsibility for the full range of business activities. Within the firm, personal relationships and individual qualities are more important than formal hierarchies and promotion systems. Because the firm's own resources are limited, there is at the same time a high dependence on suppliers, banks, accountants, etc., and on appropriate, supportive legislation. Owner-managers have to be close to their customers. Business networks become social networks, and the entrepreneur's standing in the community is highly dependent on success or failure (Effective Policies For Small Business, 2004:20).

The legal definition of 'small' varies by country and by industry. The definitions of the American, United Kingdom, France, South Africa and other countries will be listed in the following text.

2.4.1 Small Business: An American perspective

The Small Business Administration (SBA), founded by the US government in 1953 for the purpose of providing intermediate to long-term financing for small businesses that could not obtain money on reasonable terms elsewhere, has a definition of a small business which embraces almost 99% of full-time businesses as Table 2.1 showing.

Table 2.1: Small US business as defined by the SBA. (**Source**: Small Business Administration, 1978:3)

Category	Sales ($ million)	Employment
Retail	2-8	
Wholesale	9.5-22	
Construction	1.0-9.5	
Manufacturing		0-1,500
Agriculture	1.0	

The SBA goes to great lengths by even defining smallness differently by industry sector, within each main business category as Table 2.2 showing (Small Business Administration, 1978:2). Many of the SBA's definitions really cover medium-sized businesses. For example, a manufacturer employing 1,000 people probably has sales revenue in excess of $ 50 million a year. Few people would really view such a business as small (Haksever, 1996:7).

Table 2.2: SBA standards of smallness for selected industries. (**Source**: Small Business Administration, 1978:3)

Manufactures	**Employing fewer than**
Aircraft	1,500 persons
Calculating machines	1,000
Household vacuum cleaners	750
Men's and boys' clothes	500
Macaroni and spaghetti	250
Retailers	**Earning sales of less than**
Mail order houses	$ 7.5 million a year
Grocery stores	7.5
Automobile agencies	6.5

Variety stores	3.0
Radio and television stores	2.5
Wholesalers	**Earning sales of less than**
Paints and varnishes	$ 22.0 million a year
Tyres and tubes	22.0
Groceries	14.5
Sporting goods	14.5

2.4.2 Small Business: A United Kingdom perspective

Back in 1971, what is usually held to be a definitive report on the state of small business in Britain at the time, the Bolton Report (Bolton, 1971:20), made heavy weather of providing a statistical definition. The 1985 UK Companies Act (1985:49), which has special less stringent reporting requirements for small and medium-sized firms, uses the following definitions as Table 2.3 showing:

Table 2.3: Requirements of UK Companies Act for small and medium-sized firm. (**Source**: UK Companies Act, 1985:50)

Criterion	Small business	Medium business
Maximum annual turnover	£ 2.8 million	£ 11.2 million
Maximum annual balance sheet total	£ 1.4 million	£ 5.6 million
Maximum number of employees	50	250

2.4.3 Small Business: A perspective from France

If France, as in most countries, there is no single official definition of 'small business'. However, numerous quantitative definitions are used in taxation, industrial relations and government incentives. The most widely used (and widely criticised) definition is based on employment (Amboise & Gasse, 1984:3):

- **Less than 10 employees**: Artisanat and very small enterprises.
- **10 to 40 employees**: Small enterprises.
- **50 to 500 employees**: Medium-sized enterprises.
- **Over 500 employees**: Large enterprises.

2.4.4 Small Business: A South Africa perspective

In South Africa, in terms of the White Paper (South Africa, 1995:20), on national strategy for the development and promotion of small business, the definitions of small business according to industry sector are elaborated upon in Annexure B for ease of reference.

The most widely used framework in South Africa is the definition of the National Small Business Act 102 of 1996 (Abor and Quartey, 2010:4), who defines five categories of businesses in South Africa. The definition uses the number of employees (the most common mode of definition) per enterprise size category combined with the annual turnover categories, the gross assets excluding fixed property. The definitions for the various enterprise categories are given as follows (Abor & Quartey, 2010:5):

- **Survivalist enterprise**: The income generated is less than the minimum income standard or the poverty line. This category is considered pre-entrepreneurial, and includes hawkers, vendors and subsistence farmers. (In practice, survivalist enterprises are often categorised as part of the micro-enterprise sector).
- **Micro enterprise**: The turnover is less than the VAT registration limit (that is, R150 000 per year). These enterprises usually lack formality in terms of registration. They include, for example, *spaza* shops, minibus taxis and household industries. They employ no more than 5 people.
- **Very small enterprise**: These are enterprises employing fewer than 10 paid employees, except mining, electricity, manufacturing and construction sectors, in which the figure is 20 employees. These enterprises operate in the formal market and have access to technology.
- **Small enterprise**: The upper limit is 50 employees. Small enterprises are generally more established than very small enterprises and exhibit more complex business practices.

- **Medium enterprise**: The maximum number of employees is 100, or 200 for the mining, electricity, manufacturing and construction sectors. These enterprises are often characterised by the decentralisation of power to an additional management layer.

2.4.5 Small Business: A perspective from other countries

Other countries such as Denmark and Eire have definitions that more appropriately narrow their size. In Demark, for example, a small business is one with under 49 employees, a medium one has 50-199 employees and large business employees over 200 people. Denmark only has 400 firms that meet the large business (LB) definition; if it adopted the American definition it would have virtually no large businesses. Inevitably the EU has its own definition, the latest version of which emerged in 1996. To be small a firm must employ between 10 and 49 people or turnover more that £4 million in the balance sheet. Anything smaller is micro and greater is medium. With over 500 employees, a firm is considered large (Barrow, 1998:5).

The European Commission has coined the term 'small and medium enterprise' (SME) and in 1996 defined them as organisations employing fewer than 250 people. This is disaggregated into three parts and, to qualify as a SME, both the employee and the independence criteria must be satisfied plus either the turnover or balance sheet criteria as reflected in Table 3.4 below (2010:**Online**):

Table 2.4: Criterion as a SME in Europe. (**Source**: 2010:**Online**)

Criterion	Micro business	Small business	Medium business
Maximum number of employees	9	49	249
Maximum annual turnover	-	7 million Euros	40 million Euros
Maximum annual balance sheet total	-	5 million Euros	27 million Euros
Maximum % owned by one, or	-	25%	25%

According to Burns (2001:9), despite the independence criteria, SMEs could still include organisations managed by non-owner-managers. Even so, some of them may be entrepreneurs. However, it is likely to be true that the smaller the firm, particularly the owner-managed firm, the more important the personality and influence of the manager, be they entrepreneurial or not.

2.5 THE CONCEPT OF QUALITY

Definitions of quality are personal and idiosyncratic. According to Golden, Toombs, Anderson & White (2009:3), in order to understand quality initiatives, one must first understand what quality is. The below concise, clear, and meaningful definitions are arranged by category of focus, namely: manufacturing-based, customer-based, product-based, value-based, transcendent. Besides that, Gavin also mentioned that eight dimensions of quality are: performance, features, reliability, conformance, durability, serviceability, aesthetics, perceived quality.

2.5.1 Manufacturing-based definitions of quality

Quality means conformance to requirements (Crosby, 1984:82). Quality is the degree to which a specific product conforms to a design or specification Engineering specifies the product characteristics, and the more closely manufacturing can conform to those requirements, the better the quality of the product. According to Rao, Carr, Dambolena and Kopp (1996:27-28), this definition has the advantages of providing objectively measurable quality standards and of reducing the cost of quality. The disadvantage of this measure is its lack of concern for the customer's preferences. Its implicit assumption is that customer satisfaction is directly related to the precision of meeting the target specifications of a product or service (Rao *et al.,* 1996:27-28).

2.5.2 Customer-based definitions of quality

Quality is fitness for use (Juran, 1995:40). Quality is meeting customer expectations. The Quality Improvement Process is a set of principles, policies, support structures, and practices designed to continually improve the efficiency and effectiveness of our way of life. According to Marcu (2010:**Online**), achieving customer satisfaction when selling merchandise that does not come back and a customer who does.

The user-based definition equates customer satisfaction with quality. Customer satisfaction reflects the attitudes of the consumer. An organisation adopting this view of quality needs to accurately identify the target market, ferret out its needs, and then design, construct, and deliver the appropriate product. For success all of the functions contributing to the value of the product have to be involved. The benefits expected are increased market share. However, customer satisfaction may not be achieved for reasons that have nothing to do with the quality of the product (Rao *et al.,* 1996:27).

2.5.3 Product-based definitions of quality

The product-based approach identifies specific feature or attributes that can be measured to indicate higher quality. Leather upholstery for car seats is considered higher quality that vinyl, the lack of blemishes in gems viewed using a 10X magnifying glass indicates a higher quality. This approach provides objective measures of quality. Its disadvantage is that it assumes that the absence or presence of an attribute implies higher quality. Since leather is more highly regarded than vinyl, the presence of leather upholstery in a car with on regard to the color or finish of the leather would imply higher quality (Rao *et al.,* 1996:27).

This approach provides objective measures of quality. Its disadvantage is that it assumes that the absence or presence of an attribute implies higher quality (Rao *et al.*, 1996:27).

2.5.4 Valued-based definitions of quality

Quality is the degree of excellence at an acceptable price and the control of variability of an acceptable cost. In this definition one attribute of value is quality. The purchase decision involves trading off the quality against the price. Because many of the attributes of quality are subjective assessments, the approach is not effective in introducing objective criteria. Unfortunately, most of these definitions are subjective. Although the manufacturing and product-based approaches are the most objective, both fail to account sufficiently for customer preferences. The user-based approach relies solely on the consumer's input, but methods for obtaining this input are unreliable and unable to predict changes in preference (Rao *et al.*, 1996:28).

2.5.5 Transcendent definitions of quality

Quality is achieving or reaching the highest standard as against being satisfied with the sloppy or fraudulent. However, according to Rao *et al.* (1996:26), these items may not represent quality to everyone, and this lack of objectivity creates a problem for the worker in a business environment who is striving for quality. When a factory worker produces an item, this definition does not allow that person to state definitively that the item is of high quality. The other four approaches to defining quality are based more on objective measures.

2.6 DIMENSIONS OF QUALITY

At the level of strategic operations, many researchers have developed different quality frameworks. For example, Garvin (1987:104) developed a quality framework considering an eight dimension product quality, and Parasuraman, Berry and Zeithaml (1991:420) derived a five dimension model of service quality, SERVQUAL (see below Table 2.5).

Table 2.5: Dimensions of Quality. (**Source**: Ma, Pearson & Tadisina, 2005:106)

Framework	Dimension	Definition
Product quality (Gavin (1987))	1. Performance	Primary operating characteristics
	2. Feature	Supplements to basic functioning characteristics
	3. Reliability	Does not malfunction during specified period
	4. Conformance	Meets established standards
	5. Durability	A measure of product life
	6. Serviceability	The speed and ease of repair
	7. Aesthetics	How a product looks, feels, tastes and smells
	8. Perceived quality	As seen by a customer
Service Quality (Parasuraman et al. (1991))	1. Tangibility	Physical facilitates, equipment and appearance of personal
	2. Reliability	Ability to perform the promised service dependably and
	3. Responsiveness	Willingness to help customers and provide prompt service
	4. Assurance	Knowledge and courtesy of employees and their ability to inquire Trust and confidence
	5. Empathy	Caring, indvidualised attention the firm provider gives its

2.7 LEADING CONTRIBUTORS TO THE PARADIGM

According to Golden *et al.* (2009:3)，managers who wish to implement quality initiatives should study quality models, concepts, and tools developed and popularised by W. Edwards Deming (1986:30), Juran (1995:49), Philip Crosby (1984:82), Kaoru Ishikawa (1982:39), and others quality gurus.

Quality gurus have made a significant impact on the world through their contributions to improving not only businesses, but all organisations including state and national governments, military organisations, educational institutions, healthcare organisations, and many other establishments and organisations (Encyclopedia of Business, 2010:**Online**).

2.7.1 W. Edwards Deming's Fourteen Points for Quality Management

W. Edwards Deming was widely accepted as the world's preeminent authority on quality management prior to his death on December 24, 1993. Deming gained credibility because of his influence pertaining to quality on Japanese and American industries. He placed great importance and responsibility on management, at both the individual and company level, believing management to be responsible for 94% of quality problems (Foster, 2004:92). Deming's contributions included:

- Fourteen points for management,
- the seven deadly diseases, and
- continual never-ending improvement.

Deming's fourteen points (Deming, 1986:17):

- **Point 1 – Create constancy of purpose:** Create constancy of purpose for continual improvement of products and services, allocating resources to provide for long-range needs rather than only short-term profitability, with a plan to become competitive, to stay in business, and to provide jobs.
- **Point 2 – Adopt a new philosophy:** We are in a new economic age. We can no longer live with commonly accepted levels of delays, mistakes, defective materials, and defective workmanship. Transformation of Western management style is necessary to halt the continued decline of industry.
- **Point 3 – Cease mass inspection:** Cease dependence on mass inspection to improve quality. Eliminate the need for inspection on a mass basis by

building quality into the product in the first place. Require statistical evidence of built-in quality in both manufacturing and purchasing functions.

- **Point 4 – End awarding business on the basis of price tag:** Instead, minimize total cost. Move toward a single supplier for any one item, based on a long-term relationship of loyalty and trust.
- **Point 5 – Constantly improve the system:** Improve constantly and forever the system of production and services, to improve quality and productivity, and thus constantly decrease cost. Institute innovation of product, service, and process. It is management's job to work continually on the system (design, incoming supplies, maintenance, improvement of equipment, supervision, training, retraining, and so on).
- **Point 6 – Institute training on the job:** People must have the necessary training and knowledge to do their job. New skills are required to keep up with changes in materials, methods, product design, machinery, techniques, and service.
- **Point 7 – Improve leadership:** The aim of supervision should be to help people, machines, and gadgets to do a better job. Supervision of management is in need of overhaul as well as supervision of production workers.
- **Point 8 – Drive out fear:** Encourage effective two-way communication and other means to drive out fear throughout the organization so that everybody may work effectively and more productively for the company.
- **Point 9 – Break down barriers between departments:** People in different areas, such as research, design, sales, administration, and production, must work in teams to tackle problems that maybe encountered with product and service.
- **Point 10 – Eliminate slogans:** Eliminate the use of slogans, posters, and exhortations of the workforce, demanding zero defects and new levels of productivity, without providing methods. Such exhortations only create adversarial relationships; the bulk of causes of low quality and low productivity belong to the system, and thus lie beyond the power of the

workforce.

- **Point 11 –Eliminate work standards:** Eliminate work standards on the factory floor. Eliminate management by objectives. Eliminate management by numbers and numeric goals. Substitute leadership.
- **Point 12 – Remove barriers to pride:** Remove barriers to rob workers of their right to pride in the quality of their work. The responsibility of supervisors must be changed from sheer numbers to quality.
- **Point 13 – Institute education and self-improvement:** This is more generalized education than training on the job. Organizational learning requires a structure that reinforces and rewards learning.
- **Point 14 – Put everybody to work:** Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job.

2.7.2 W. Edwards Deming's Seven Deadly Diseases for Quality Management

Deming's 14 points for management apply anywhere, to small organisations as well as to large ones, to the service industry as well as to manufacturing. They apply to a division within a company (Institute for Manufacturing, 2010:**Online**):

Deming's 7 Deadly Diseases (Walton, 1990:98)

- Lack of constancy of purpose.
- Emphasis on short-term profits.
- Evaluation of performance, merit rating, or annual review.
- Mobility of management.
- Running a company on visible figures alone.
- Excessive medical costs for employee health care.
- Excessive costs of warrantees.

2.7.3 W. Edwards Deming's continual improvement method for quality management

As Figure 2.2 showing, a proposed theory of quality management underlying the Deming Method. Deming believed that adoption of, and action on, the fourteen points was a signal that management intended to stay in business (Foster, 2004:93).

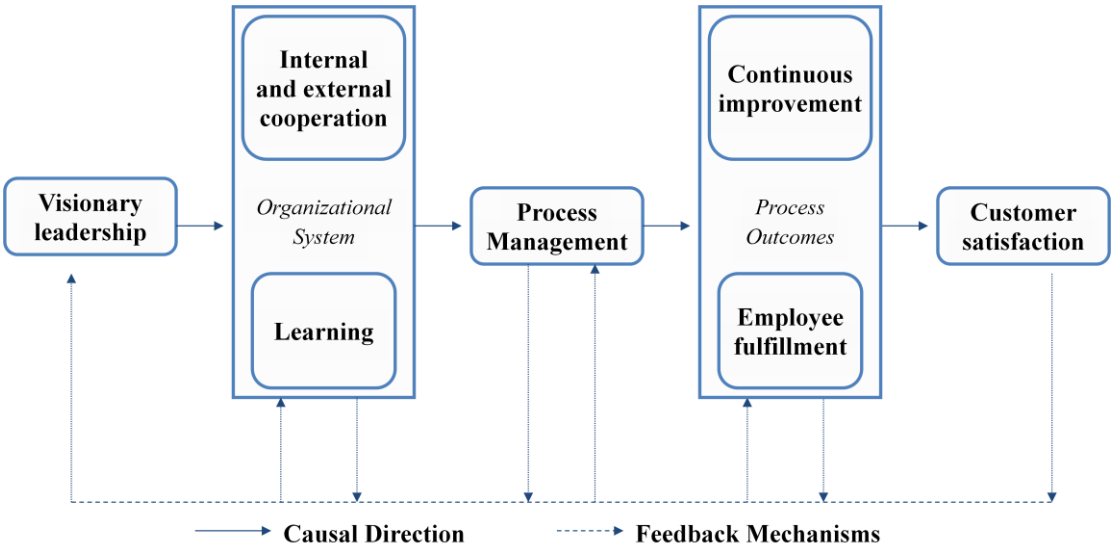

Figure 2.2: Theoretical Model Underlying the Deming Method. (**Source**: Foster, 2004:93)

2.7.4 Juran Trilogy for Quality Management

Joseph M Juran tends to take a more strategic and planning-based approach to improvement than does Deming. Juran promotes the view that organisational quality problems are largely the result of insufficient and ineffective planning for quality (Debbie, 2004:25). Juran Trilogy demonstrates three basic processes are essential for managing to improve quality as Figure 2.3 shows.

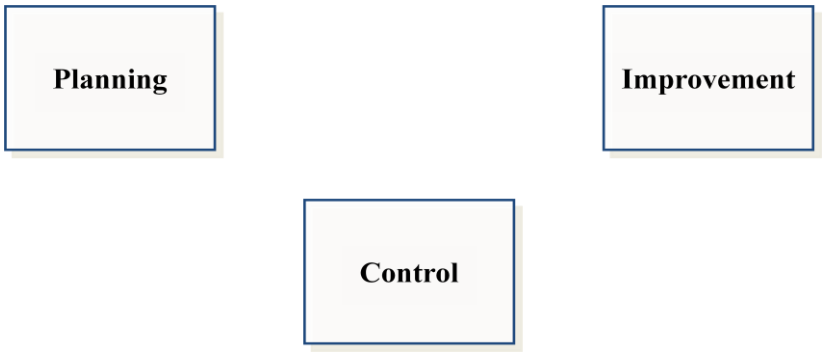

Figure 2.3: Juran Trilogy. (**Source**: Foster, 2004:104)

- **Quality planning**: First identifying the customer, who is defined as anyone impacted by the process; this included external and internal customers. After determining the customer's needs, it was necessary to develop the goods and services to meet those needs and establish quality goals that included the minimum possible cost. Then came the process design, which should be proven capable of making the product under actual operating conditions. Finally, the process should be transferred to the operators by including all those involved with the plan and training them appropriately.
- **Quality control**: It is directly at the critical elements that needed to be controlled. These elements had to be identified, and measures and the methods of measurements had to be defined. Standards of performance had to be established. As actual performance was measured and compared to the standard, action would be taken on the difference. Juran advocated quality control be delegated to the lowest possible level, and that if possible, it should be done by the workers responsible for performing the task. This meant widespread training in data collection and problem-solving techniques.
- **Quality Improvement:** It followed by proving the need for improvement and establishing specific improvement projects. The appropriate team had to be organised to guide the project, discover the causes, and provide remedies that work under operating conditions. Finally, mechanisms to control the new process and hold the gains had to be developed.

2.7.5 Philip Crosby's Fourteen Steps to Quality Improvement

Crosby became very well known for his authorship of the book 'Quality is Free'. The primary premise of the book was that quality, as a managed process, can be a source of profit for an organisation (Foster, 2004:104). Crosby specifies a quality improvement program consisting of fourteen steps. These steps underline the 'Crosby zero defects' approach to quality improvement. His approach emphasises the behavioral and motivational aspects of quality improvement, rather than statistical approaches (Hutchens, 1996:2). Crosby's 14 steps to Quality Improvement include:

- Make it clear that the management is committed to quality.
- Form quality improvement teams with representatives from all departments.
- Assess and evaluate the quality awareness/concern of employees.
- Raise the quality awareness/concern of employees.
- Take actions to correct problems.
- Establish a committee for a zero defects program.
- Train supervisors.
- Hold a 'zero defect day'.
- Encourage people to establish improvement goals for themselves and their teams.
- Encourage employees to communicate to management the obstacles to attaining improvement goals.
- Recognise those who participate.
- Establish Quality Councils.
- Do it all over again: The quality improvement program never ends.

2.8 QUALITY MANAGEMENT TOOLS

In the never-ending quest for improvement in the ways processes are operated, numbers and information will form the basis for understanding, decisions and actions, and a thorough data gathering, recording and presentation system is essential. Deming's quality philosophy is Continual Process Improvement (CPI) of the process and its output. It means that all processes should monitored regularly, and, when the opportunity arises to eliminate unwanted variation or lessen the variation adversely affecting a process, the PDSA cycle should be proceed through to improve that process (Small Business Guidebook to Quality Management, 2010:49).

2.8.1 The Plan-Do-Study-Act Cycle

According to Polito, Watson and Berry (2000:1), Deming describes a simple four step process for continuous improvement of quality that he learned from Dr. Walter A. Shewhart during the 1930's when he worked with and mentored under Shewhart at the Hawthorne Works Western Electric plant in Chicago. Deming refers to it as the PDSA Cycle (Plan-Do-Study-Act) or the Shewhart Cycle. The Japanese call it the Deming Cycle. Others call it the PDCA Cycle (Plan-Do-Check-Act) or the Deming Wheel. The PDSA Cycle contains five steps:

- **Plan phase**: Develop a plan for improving quality at a process.
- **Do phase**: Execute the plan, first on a small scale.
- **Study phase**: Evaluate feed back to confirm or to adjust the plan.
- **Act phase**: Make the plan permanent or study the adjustments.

The fifth step of the PDSA Cycle is the cyclical aspect of the technique. After all 'action' is completed, this continuous cycle continues with another 'plan' (Polito *et. al.*, 2001:1).

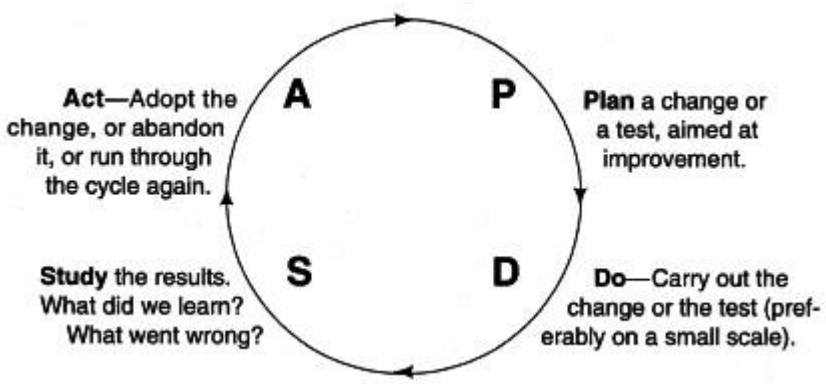

Figure 2.4: PDCA cycle. (**Source**: Deming, 1994:132**)**

Figure 2.4 shows how the cycle can be used to fairly quickly test a new idea for improving a product or process. Taken in a larger sense, the cycle can be considered a way to think about how to relate products and processes to customer needs: the Plan step would be doing customer research to determine their needs, the Do step would be making a product that company believe meets those needs, the Study step would be to see how the customer liked the product, and the Act step would be making appropriate modifications, based on customer feedback, to make the product even better. These four steps are to be repeated over and over to continuously improve the product or a process in small business enterprises (Austenfeld, 2001:59).

Deming realised that innovation, improvements to systems, and reducing variation require problem-solving techniques. A key element in this effort is the use of the plan-do-study-act cycle. The PDSA cycle is a vehicle for constant, continual improvement and innovation, enabling employees to solve problems and be more creative (Foster, 2004:120).

2.8.2 Basic Seven Tools of Quality

Ishikawa's basic seven tools of quality**,** are available for use in the CPI cycle, which provide a framework for recording and in addition to the basic elements of a quality system (Small Business Guidebook to Quality Management, 2010:40). The Logical order for the seven tools is shown as Figure 2.5 as following:

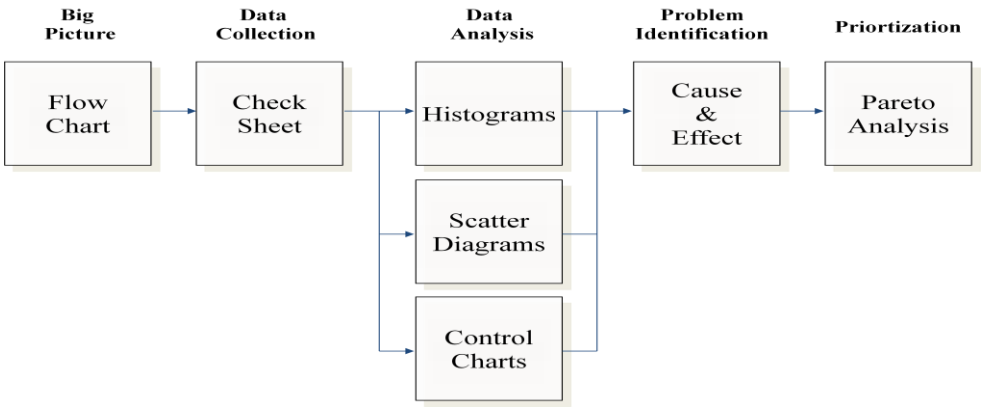

Figure 2.5: Logical Order for Basic Seven Tools. (**Source**: Foster, 2004:189)

- **Flowchart** – Is a graphic representation of the flow of a process. It is a useful way to examine how the various steps in a process relate to each other, to define the boundaries of the process, to verify and identify customer-supplier relationships in a process, to create common understanding of the process flow, to determine the current 'best method' of performing the process, and identify redundancy and unnecessary complexity (Bauer, Duffy & Westcott, 2002:99).
- **Check Sheets** – Are data gathering tools that can be used in forming histograms, they can be either tabular or schematic. It is particularly useful for recording direct observations and helping to gather in facts rather than opinions about the process. In the recording process it is essential to understand the difference between data and numbers (Tague, 2004:15).

- **Histograms** – Is in a very clear pictorial way, the frequency with which a certain value or group of values occurs. They can be used to display both attribute and variable data, and are an effective means of letting the people who operate the process know the results of their efforts (Rao, *et. al*., 1996:69).
- **Scatter diagrams or scatter plot** – Is used to examine the relationship between variables. Depending on the technology, it is frequently useful to establish the association, if any, between two parameters or factors (Rao *et al*., 1996:70).
- **A control chart** – Is used to measure sequential or time-related process performance and variability. It is a sophisticated tool of quality improvement (Bauer, Duffy & Westcott, 2002:94).
- **The cause and effect diagram** – According to Bauer, Duffy and Westcott (2002:91), it graphically illustrates the relationship between a given outcome and all the factors that influence the outcome. It is sometimes called the "Ishikawa diagram" (after its creator, Kaoru Ishikawa) or the "fishbone diagram" (due to its shape). This type of diagram displays the factors that are thought to affect a particular output or outcome in system. It is more effectively used with a group of people.
- **The Pareto chart** – Is based on the premise that 80% of the adverse effects in a process come from 20% of the causes. The Pareto chart is a form of the histogram.

The basic seven tools can help the small business owners to analysis and find out the quality problems which existing in the organisation. Comparing with implementing a system, using seven basic tools to do statistical analysis is suitable at the begin stage of small business in terms of very low lost. However, one of the main barriers that influence quality management in small business is that if the staff can perform sophisticated statistical analysis of quality problems.

2.9 QUALITY SOLUTIONS TO IMPROVE THE SUSTAINABILITY OF SMALL BUSINESS ENTERPRISES

According to The Small Business Act of 1996 (Abor and Quartey, 2010:4), a small business is independently owned and operated and not dominant in its field of operation. Almost all small business starts small and stays that way. Usually they are started by an entrepreneur who has a bright idea about services or has developed a new product that fills a niche. A majority of small firms are privately owned; only about 40,000 of them are publicly traded. In most cases the business is owned by the entrepreneur, or jointly by close family members. The management is independent; usually the owner is the manager and reports to no one or to other members of the family if they are also owners.

Small Businesses are now major contributors to employment and wealth in the economy. Through awareness of the contributor of small enterprises is now widespread, their importance is still often underestimated. Quality Management plays very important role in the big companies, however, what quality solutions should be implemented by small business to improve management are the essential content (McGibbon & Moutray, 2009:19).

2.9.1 Barriers that influence quality management in small business

According to Gallear (1995:90), the disadvantages of implementing quality management within Small and Medium Enterprises (SMEs) are highlighted below:

- In very small companies, the personality of the owner or chief executive may dominate the organisations' culture. Many owners have little formal management training, which may result in inflexibility and rigidity of outlook.

- The limited size of the management team means that individuals are often responsible for a number of different functions with little backup.
- A small number of de-motivated or uncommitted staff can disproportionately affect the quality of outcomes.
- Retraining employees when jobs become superfluous rather than laying them off, is difficult to justify.
- SMEs are often under pressure to gain registration to a standard quality management system. Meeting the requirements of these standards can be a formidable obstacle for a small company.
- Resource paucity is arguably the most serious disadvantage faced by SMEs.
- Time and staffing constraints often preclude the administration of complicated incentive and reward programmes.
- Finally, SMEs are usually sceptical of outside help. Moreover, there is generally less interaction and sharing of information among SMEs.

Because of the nature of ownership, typically, small business firms often suffer from a shortage of capital. As a rule, capital is supplied by the owner or the owner's family. Additional capital for growth, or short-term credit for weathering bad times, is very difficult to raise (Haksever, 1996:2).

Many small businesses are established as a means of self-employment. As long as the owner receives a satisfactory income, there may be no desire to expand the business. Some may become small business owners because they prefer a more relaxed and less competitive environment. Some have the objective of maintaining ownership and control of the business. As a result, growth is not an objective for many owners (Haksever, 1996:3).

A major reason for conformance quality problems is the lack of proper training. Some employees simply do not have the basic skills to perform the specific tasks they are assigned. Beyond such basic skills as reading, writing, and performing

simple mathematics, being able to read and understand instructions for a machine or a blueprint for a product to be manufactured are usually the minimum requirements in most manufacturing jobs. Furthermore, employees who do have these basic skills need to be trained in the technical requirements of the jobs they are performing. These basic skills are not enough for defect prevention and conformance to quality, as most employees also need to be trained in the basics of statistical process control (Haksever, 1996:3).

Small companies cannot be expected to engage in data collection and processing with the same depth and breadth as large ones, because they usually do not have the staff infrastructure to perform sophisticated statistical analysis. Moreover, they cannot afford to spend their limited funds for collecting data through consumer surveys or focus groups. It may seem then that small businesses have a serious disadvantage in this area (Haksever, 1996:3).

2.9.2 Long term quality solutions for small business

There are many quality methodologies and formulas for success available. Most of these will show some positive results in application. However, it is important to understand that the transition to a real quality culture is usually a long-term commitment. It will not succeed if there is theory without action or action with theory (Small Business Guidebook to Quality Management, 2010:18).

There is great deal of contradictory information about how small firms should improve quality. There are many differences between the approaches to small business quality management as reflected by the various experts in the field. However, rather than focusing on differences, it is more appropriate to identify and focus on common themes and messages when quality within an organisation is key. Figure 2.6 reflects the ‘core’ and ‘inner’ and ‘outer’ ring variables applicable to an organisation.

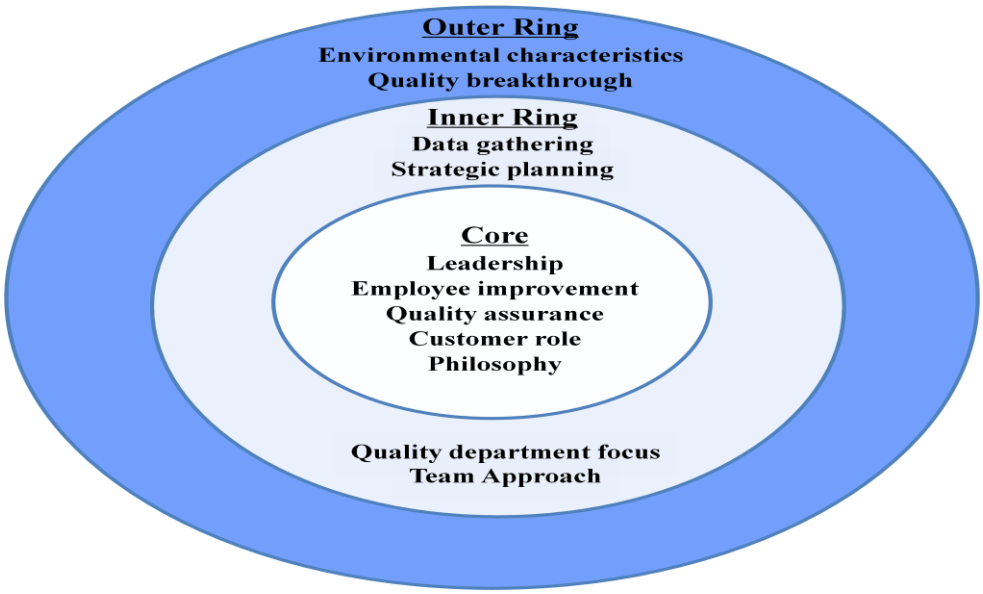

Figure 2.6: A categorisation of quality management content variables. (**Source**: Foster, 2004:8)

As Figure 2.6 showing, the core ring variables include: leadership, employee improvement and involvement, quality assurance, customer role and philosophy. The Inner and outer ring variables include: information analysis, strategic planning, environment or infrastructure, team approach, role of the quality department, breakthrough. Those important variables are explained in the following text.

2.9.2.1 Leadership

According to Juran and Gryna (1993:116), one of the basic elements that emerged as specific approaches to strategic quality management is that leadership by upper management to develop quality goals and strategies. The role of the leaders in being the champion and major force behind quality improvement is critical (Foster, 2004:8).

Oakland and Porter (1995:24), found that effective leadership and total quality management results in the company or organisation 'doing things right the first time'. The five requirements of effective leadership according to the authors are the following:

- Developing and communicating clear documented corporate beliefs and objectives.
- Developing clear and effective strategies and supporting plans for achieving the mission and objectives.
- Identifying the critical success factors and critical processes.
- Reviewing the management structure.
- Encouraging effective employee participation.

George and Weimerskirch (2006:29-33), are of the opinion that quality begins at the top. Leadership holds the key to the door of continuous improvement. If there is no commitment from top management towards continuous improvement, the organisation has no chance of becoming a quality leader. There are four steps to quality leadership, namely:

- Commitment to quality.
- Know the company's systems and values.
- Participate in the quality process.
- Integrate quality into the management model.

Small firms have a distinctive advantages in this respect because normally without much effort the CEO of an small business enjoys a high degree of visibility and can readily emphasise the importance of quality. In a larger organisaiton this may not be readily possible (Gallear, 1995:89). In a small firm, there is usually no doubt as to where the power rests – in most cases, the owner and the manager are the same person, with the ultimate power of decision making. This gives the manager an advantage in asserting a desire for a change in the organisational culture (Haksever, 1996:7).

2.9.2.2 Employee improvement and involvement

Once the leader is enlightened and motivated to go forward in the quality effort, employees must be trained and developed (Foster, 2004:8). According to Rao *et al.*, managers and academicians believed that by involving employees in problem-solving, decision-making, and business operations, performance and productivity would increase. Many organisations, larger or small, began to involve employees in participatory management programs. However, to be effective, employee involvement must be the overall approach to management in each organisation in which it occurs. Essentially, employees should be encouraged, through culture, systems, and practice, to control their destiny and participate in the daily life and processes of the organisation. In order to participate effectively, employees need powder, information, knowledge and rewards that are relevant to business performance. Only then will employees be able to make decisions that will affect productivity.

2.9.2.3 Quality assurance

Quality experts agree that quality can be assured only during the design phase. Therefore, effort must be invested in designing products, services, and processes so that they are consistently of high quality (Foster, 2004:8). Juran and Gryna (1993:565) stated that many quality assurance activities provide protection against quality problems through early warnings of trouble ahead. The assurance comes from evidence – a set of facts. For simple products, the evidence is usually some form of inspection or testing of the product. For complex products, the evidence is not only inspection and test data but also reviews of plans and audits of the execution of plans.

2.9.2.4 Customer focus

An understanding of the customer is the key to quality management efforts. A focus on customer needs is another basic element of strategic quality management in terms of Juran and Gryna (1993:116), this focus covers strengths, weaknesses, opportunities, and threats. It leads to a unique competitive advantage. The operations of a small firm are typically concentrated in one community. For many, their markets are also local, so there is usually no geographic barrier, or distance, between the small firm and its customers. Many employees live in the same community in which the company is located. Depending on the size and nature of the business, the owner and employees of the small firm may be in frequent contact with the customers and may even know them socially. As the size of the company grows, these links weaken and contacts become less frequent or nonexistent (Haksever, 1996:7).

2.9.2.5 Quality philosophy

A quality philosophy should reflect how an organisation acts in its day-to-day business operations. It should reflect the organisation's ideas, values, principles, attitudes, and beliefs. The organisation's quality philosophy sets the cultural background in which the organisation operates. The philosophy should focus on improving the organisation and helping it grow to meet its full potential (Bauer, Duffy & Westcott, 2002:19). Adoption a philosophy toward quality improvement is also important. Establishing a clear message provides a company with a map to follow during their quest for improvement.

2.9.2.6 Information analysis

Fact-based improvement refers to an approach that favors information gathering and analysis. According to Sower, Savoie and Renick (1999:196), the purposes of information analysis are:

- Determine requirements for a new or enhanced information system.
- Structure requirements for clarity and consistency.
- Select among competing systems features those that best meet user requirements within development constraints.

2.9.2.7 Strategic planning

This provides a framework for a rational quality strategy that will provide alignment with key business factors. According to Juran and Gryna (1993:115), the following elements provide a widely accepted framework:

- Define the mission of the organisation.
- Analyse the opportunities and threats.
- Analyse the strengths and weaknesses.
- Identify and evaluate alternative strategies.
- Select a strategy.
- Develop goals.
- Prepare detailed short range plans..
- Translate plans into budgets.
- Monitor performance.

According to Small Business Guidebook to Quality Management (2001:19), the one major use of the PDSA cycle is with strategic planning. A carefully prepared 5-year or 10-year strategic plan is the most typical. This plan should be centered around an aim, or vision, statement. The plan includes the values, or guiding principles, of the organization; the mission, or reason for existence, of the vision,

company; and the objectives, or short-term steps, needed to begin the realisation of the aim. Nothing will be more important than the clarification of the aim, or vision, of small business organisation.

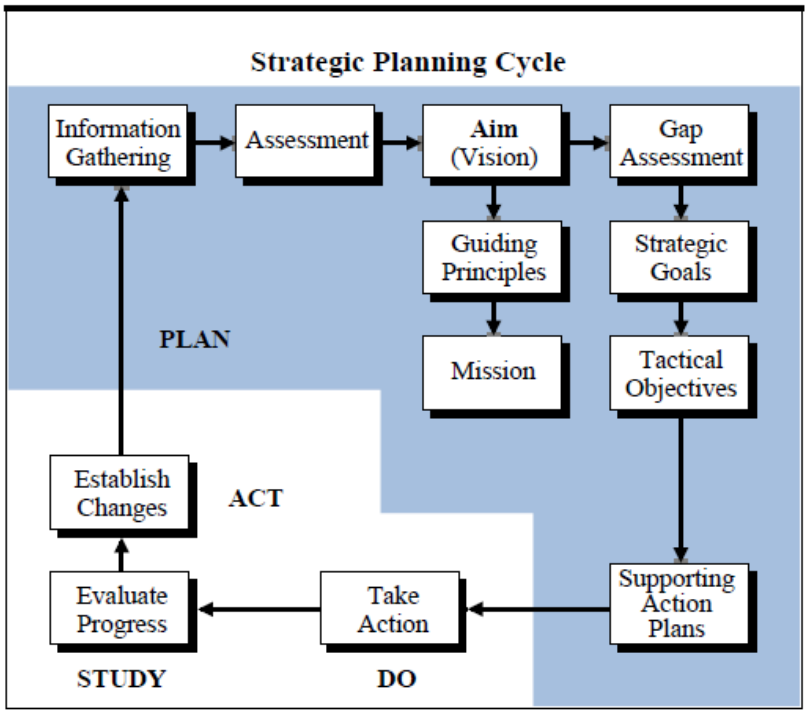

Figure 2.7: PDSA Strategic Planning Cycle (**Source**: Small Business Guidebook to Quality Management, 2010:19-20)

2.9.2.8 Environment or infrastructure

Quality environment or infrastructure must be created that supports quality management efforts (Foster, 2004:8). According to Juran and Gryna, the forces identified in quality becoming a cardinal priority for most organisations. This reality has evolved through a number of changing business conditions. These include:

- **Competition** – In the past, higher quality usually meant the need to pay a higher price. Today, customers can obtain high quality and low prices simultaneously.

- **Changing Customer** – Some companies are now entering industrial or consumer markets for the first time.
- **Product Complexity** – As systems have become more complex, the reliability requirements for suppliers of components have become more stringent.
- **Higher Level of Customer Expectation** – Higher expectations, spawned by competition, take many forms.

2.9.2.9 Team approach

According to Bauer, Duffy & Westcott (2002:99), a team cares about achieving common goals. Teams are formed with the understanding that improved quality can be achieved using the skills, talents, and knowledge of appropriate individuals. Team approach is one of the contemporary approaches to quality management learned from the Japanese is teamwork.

There are normally fewer internal cliques in small companies, and therefore there is less fighting and bickering between work units. The potential for effective teamwork is better in a small organisation. There are fewer layers of management in most small businesses, so that the potential exists for good communications and dynamic work habits. The normally overworked small business owner and manager can often benefit the most by relying more on the skills, knowledge and attitudes of the employees who operate the processes (Haksever, 1996:5).

2.9.2.10 Role of the quality department

As a result of the dispersion of responsibility for quality, the role of the quality department has changed significantly. Rather than performing the policing function, these departments are filling more of a coaching role (Foster, 2004:8). Organisation structure in a small firm is usually very simple, with few layers.

Sometimes management positions are filled by family members, making it a truly family business. Employees usually perform a variety of tasks, often giving the business greater flexibility than larger businesses have. Because of the nature of ownership, typical small business firms often suffer from a shortage of capital. Therefore, normally, small business enterprises do not have enough work force and capital to establish the quality department (Haksever, 1996:3).

2.9.2.11 Breakthrough improvement

Taken to its extreme, breakthrough improvement may encompass totally reengineering an entire organisation. This usually means literally ignoring how the organisation is structured and how it currently produces and delivers its products and services. It's a 'start from a clean sheet of paper' approach. The subject of much criticism and a number of notable failures, this approach has gained an unsavory reputation (Bauer, Duffy & Westcott, 2002:19). Breakthrough improvement is the need to make large improvement is not precluded by continuous improvement. Firms must find ways to achieve radical improvement.

2.9.2.12 Continuous improvement

Whatever success a company may achieve in the implementation of quality management, it will never reach its 'destination.' The needs and expectations of customers are constantly changing, and competition is pushing standards to higher levels. Customer satisfaction is a moving target. New products are being introduced at a faster pace with technological advances that quickly render some products obsolete. This brings new challenges in quality and customer satisfaction. Thus, continuous improvement is a natural requirement for sustained customer satisfaction (Haksever, 1996:3).

2.10 CONCLUSION

The path to quality management is a long one and needs to be negotiated with care and patience. These are just a few of the steps to begin the transition to a quality culture. It is important that training and education becomes a focus point in the plan for the future of the small firms (Small Business Guidebook to Quality Management, 2010:30).

There are a multitude of things small firms can do to get started on the path of transformation to quality management (Storey, 2000:20). However, according to the Small Business Guidebook to Quality Management (2010:55), there are a number of important factors necessary in any successful quality management effort, namely:

- Start with top management support, nurture and maintain top management consistency of purpose.
- Ensure that all personnel understand the organisation's aims and guiding principles.
- Ensure that all personnel have at least introductory training in the quality management philosophy. Then, encourage and assist all personnel in further education and training.
- Ensure that process improvement teams receive timely training and proper facilitation.
- Delegate authority to the lowest appropriate level.
- Focus on meeting or exceeding the customers' requirements.
- Make continual process improvement the common practice throughout the company.
- Integrate the PDSA cycle into all company activities.

This chapter provided a literature background to the definitions of small business. Furthermore, many quality concepts exist from enterprises can learn eminating from quality gurus in the likes of W. Edwards Deming, Joseph Juran, and others. According to Barrow (1998:33), the quality of products or services is a very important measure of small business success. Improved quality does not come just from necessity, customers are demanding more quality and cost-efficiency from their suppliers. However, quality strategies do not form the basis of small business enterprises, thus impacting on the management, of the business environments. Furthermore, small companies focus on short term profits as apposed to improving the quality of management, thus impacting on long term sustainability. The barriers, such as the limited size of management and time and staffing constrain etc., influence quality management in small business. Thus, according to those characters of quality management in small business enterprises, a number of important factors were provided, which could assist entrepreneur to develop a suitable quality management strategy for a small enterprise to ensure sustainability.

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

In this chapter, the case study as the research method, survey design as the data collection method to be used within the ambit of this dissertation will be elaborated upon in detail. The data collection methodology will be based on quantitative research paradigms. Questionnaires were used in the collection of data along side the Likert scale.

The purpose of this chapter is to determine the quality solutions for small business to improve the sustainability of the enterprise. This object maps to the research problem set for this dissertation, which reads as follows: "Quality strategies do not form the basis of small business enterprises, thus impacting on their sustainability as business enterprises".

3.2 CASE STUDY

A case study method will be utilised in this research. According to Yin (1994:1), a case study research can be used in many situations, such as organisational and management studies, a case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, aims of case study research is not only to explore certain phenomena, but also to understand them in a particular context. Some of the more salient aspects of case study research described by Yin (1994:1), are listed below for ease of reference:

- A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.
- Case study research aims not only to explore certain phenomena, but also to

understand them in a particular context.

- ‘How’ and ‘why’ questions are explanatory, and likely to be used in case study research.
- A case study illuminates a decision or set of decisions – why they were taken, how they were implemented, and with what result.
- The case study as a research strategy comprises an all-encompassing method – with the logic of design incorporating specific approaches to data collection and data analysis. In this sense, the case study is not either a data collection tactic or merely a design feature alone, but ‘a comprehensive research strategy’.
- Case study research uses multiple methods for collecting data, which may be both qualitative and quantitative.
- A case study is typically used when contextual conditions are the subject of research.

3.3 CHOICE OF SAMPLING METHOD

According to Collis and Hussey (2003:155-160), a ‘sample’ is made up of some of the numbers of a ‘population’ (the target population), the latter referring to a body of people or other collection of items under consideration for the purpose of the research. Two main categories of sampling can be identified namely ‘probability sampling’ where the research can in advance determine that each segment of the population will be represented in the sample, and ‘non-probability sample’ where the researcher has no way of forecasting or guaranteeing that each element of the population will be represented in the sample. In this research, the sample frame with employees/managers in small business enterprises, randomly selected will be used.

3.4 THE TARGET POPULATION

A population is any precisely defined set of people or collection of items which is under consideration (Collis and Hussey, 2003:56). With any survey, according to Watkin (2008:109), it is necessary to clearly define the target population which can be defined as, "that group which constitutes the defined population from a statistical viewpoint". The target population must be specifically chosen in order to validate the practicality of the concepts to be presented. The risk of bias, which cannot be statistically eliminated, should be recognised based on the very definition of the target population as well as the number of respondents selected. A too small number of respondents will not provide for quantifiable data.

The 'sampling frame' defined by Collis and Hussey (2003:155-160), as 'a list or record of the population from which all the sampling units are drawn. The sample size 50 small business employees or owners will be chose from small business enterprises in Western Cape.

3.5 DATA COLLECTION

According to Emory and Cooper (1995:278), dominated of three main methodologies for data collection, namely:

- Personal interviewing
- Telephone interviewing
- Self-administered questionnaires

In this dissertation, the self-administered questionnaires the most appropriate method to gather information to arrive at an educated conclusion for this particular research. The data collected and analysed, serves as factual platform for this research project.

The data collection method used fall within the ambit of both definitions attribute to the concepts ‘survey’ or ‘descriptive survey’. For clarity Remenyi, Williams, Money and Swartz (2002:290), define the concept of ‘survey’ as: “ … the collection of a large quantity of evidence usually numeric, or evidence that will be converted to numbers, normally by means of a questionnaire”.

According to Gay and Diebl (1992:238), a ‘survey’ is an attempts to collect data from members of a population in order to determine the current status of that population with respect to one or more variables. Kerlinger (1986:372), defines ‘field study’ as non-experimental scientific inquiries aimed at discovering the relations and interactions among … variables in real … structures. As with the case of most academic research, the collection of data forms an important part of the overall dissertation content.

3.6 MEASUREMENT SCALES

Measurement scales is applied in this dissertation. While a plethora of measurement scales are available for academic research, the well-known Lickert scale whereby respondents are asked to respond to each of the statements, by choosing one of five agreement choices (Emory and Cooper, 1995:180) is commonly used by business research students. Typical agreement choices used in the Lickert scale are depicted below:

Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

The advantages in using the popular Lickert scale according to Emory and Cooper (1995:180-181), are:

- Easy and quick to construct.
- Each item meets an empirical test for discriminating ability.
- The Lickert scale is probably more reliable than the Thurston scale, and it provides a greater volume of data than the Thurston differential scale.
- The Lickert scale is also treated as an interval scale.

3.7 THE DEMAND FOR A QUALITATIVE RESEARCH STRATEGY

While this author acknowledges that a number of strategies can be applied in similar research projects, the well-known concepts of objectivity, reliability etcetera, inherited from the empirical analytical paradigm, is suggested for business research in more or less the traditional way. Quoting Thorndike and Hagen, these concepts are defined by Emory and Cooper (1995:156), as follows:

- **Practicality:** Practicality is concerned with a wide range of factors of economy, convenience, and interpretability.
- **Validity:** Validity refers to the extent to which a test measures what we actually wish to measure. Cooper and Schindler (2006:318-320), identifies 3 subsets to the concept validity, namely: Construct validity, internal validity and external validity.
- **Reliability:** Reliability has to do with the accuracy and precision of a measurement procedure. Collis and Hussey (2003:186), also stated that there are three common ways of estimating the reliability of the responses to questions in questionnaires, namely: test re-test method, split-halves method and the internal consistency method.

3.8 SURVEY SENSITIVITY

Research conducted in areas of a sensitive nature as in the case of this survey, pose particular challenges to the researcher. The following guidelines from various academics serve to illustrate the mitigation process, which can be deployed in an instance where research is conducted in areas of a sensitive nature:

- A qualitative investigation of a particularly sensitive nature conducted by Oskowitz & Meulenberg-Buskens (1997:83), qualified the importance of handling mission critical issues as identified above when the authors stated: "Thus any type of qualitative investigation could benefit from the researchers being skilled and prepared, and the sensitive nature of an investigation into a stigmatizing condition made the need for such an undertaking even more imperative in the current study".
- The sensitivity of certain issues and issues identified as impacting the research negatively in the environments being evaluated, not only demand intimate personal involvement, but also demand the 'personal and practical experience' of the researcher. This view was upheld by Meulenberg-Buskens (1997:83), as being imperative to assure quality in qualitative research being undertaken. Checkland (1989:152), supports this view however extends the concept with the opinion that: "The researcher becomes a participant in the action, and the process of change itself becomes the subject of research".

3.9 SURVEY DESIGN

According to Mouton (2001:152), surveys are studies that are usually quantitative in nature and which aim to provide a broad overview of a representative sample of a large population. Collis and Hussey (2003:60), are of the opinion that, "if research is to be conducted in an efficient manner and make the best of opportunities and resources available, it must be organised". Furthermore, if it is to provide a coherent and logical route to a reliable outcome, it must be conducted

systematically using appropriate methods to collect and analyse data. A survey should be designed in accordance with the following stages:

- **Stage one**: Identify the topic and set some objectives.
- **Stage two**: Pilot a questionnaire to find out what people know and what they see as the important issues.
- **Stage three**: List the areas of information needed and refine the objectives.
- **Stage four**: Review the responses to the pilot.
- **Stage five**: Finalise the objectives.
- **Stage six**: Write the questionnaire.
- **Stage seven**: Re-pilot the questionnaire.
- **Stage eight**: Finalise the questionnaire.
- **Stage nine**: Code the questionnaire.

Questionnaires can be completed by the respondent without any direct personal contact with the interviewer. The statements or questions within the survey should according to Watkins (2008:143), be designed with the following principles in mind:

- Avoidance of double – barreled questions or statements.
- Avoidance of double – negative questions or statements.
- Avoidance of prestige bias.
- Avoidance of leading questions or statements.
- Avoidance of the assumption of prior knowledge.

3.10 SURVEY VALIDITY AND RELIABILITY

According to Collis and Hussey (2003:186), ‘validity’ is concerned with the extent to which the research findings accurately represents what is happening. More specific, whether the data is a true picture of what is being studied. According to Cooper and Schindler (2006:318-320), three major forms of validity can be identified, namely ‘content validity’, ‘criterion – related validity’ and

'construct validity'.

Reliability (also referred to as trustworthiness), is concerned with the finds of the research (Collis and Hussey, 2003:186). The findings can be said to be reliable if the researcher and anyone else repeated the research and obtained the same results. There are three common ways of estimating the reliability of the responses to questions in questionnaires or interviews, namely the 'test re-test method', 'split – halves method' and the 'internal consistency method' (Watkins, 2008:68). According to Babbie (2005:285), survey research is generally weak on validity and strong on reliability.

3.11 QUESTIONNAIRE FORMULATION

In this study, the questionnaire is designed to achieve the objectives of this research which are list as following:

- To investigate the quality strategies that exists within small enterprises in South Africa.
- To identify the barriers that impact on quality management in small enterprises.
- To determine the possible strategies that can assist small enterprises to improve quality management processes.
- To develop a suitable quality management strategy for a small enterprise to ensure sustainability.

According to Watkins (2008:118), the most important aspect of designing a questionnaire is that the respondent should understand the questions. This will ensure that answers will not be based on vague assumptions, an aspect that will provide incorrect or unreliable data. The following guidelines should be adhered to when designing a questionnaire:

- Questions should be simple, understandable and not too long.

- The correct information should be elicited from the respondent.
- Omit leading or loading questions. Be especially aware of questions starting off with factual information.
- Ensure that the participants selected have the necessary information at his or her disposal to be able to answer the questions.
- Questions, which can be embarrassing to the respondents, should be avoided.
- Avoid questions, which will not be answered honestly by respondents.
- 'Pre – test' the questionnaire for clarity of questions and ease of use before distributing to respondents.
- If the questionnaire is distributed electronically, ensure that hyperlinks (if applicable) work and that answers can be submitted electronically.

3.12 LIST OF QUESTIONS/STATEMENTS

The following list of questions/statements as Part A was posed to respondents in the survey:

- **Question 1**: Management created clear quality values, policies and strategies in the organisation.
- **Question 2**: Management has experience and knowledge of quality management in the organisation.
- **Question 3**: Management delegates authority and responsibility clearly in the organisation.
- **Question 4**: There is enough capital to establish a quality system in the organisation.
- **Question 5**: There is a quality management department in the organisation.
- **Question 6**: Staff can perform sophisticated statistical analysis of quality problems in the organisation.
- **Question 7**: Not all personnel have been trained in the quality management philosophy.
- **Question 8**: All employees have opportunities to address quality problems of

the product/service nature.

- **Question 9**: Management and employees of the organisation are in frequent contact with the customers.
- **Question 10**: Management and employees in the organisation have full insight into information flow from the customers.
- **Question 11**: The communication between management and employees are frequent and open in organisation.
- **Question 12**: It is easy for employees to work together to achieve organisational goals.
- **Question 13**: Management encourages activities that improve customer satisfaction.
- **Question 14**: Customer comments on product/service are used to improve quality.
- **Question 15**: There are processes in place for designing new products/services to ensure quality in the organisation.
- **Question 16**: The process used in the organisation includes in-process measurement of quality.
- **Question 17**: Continual Process Improvement is a common practice throughout the organisation.

The following list of questions/statements as Part B was posed to respondents in the survey:

- **Question 1**: The organisations primary function.
- **Question 2**: If the organisation currently has a quality strategy in operation.
- **Question 3**: Number of people employed by the organisation.
- **Question 4**: Annual turnover of the organisation.
- **Question 5**: The period of respondent worked or owned the organisation.
- **Question 6**: The job title of respondent.

3.13 CONCLUSION

The objective of this chapter was to describe the survey methodology and case study adopted in this research study. The research survey design and methodology was discussed under the following headings:

- Introduction
- Aim of chapter
- Case study
- Choice of sampling method
- The target population
- Measurement scales
- The demand for a qualitative research strategy
- Data collection
- Survey sensitivity
- Survey design
- Survey validity and reliability
- Questionnaires formulation
- List of questions/statements

In the next Chapter, a data analysis results from the survey will be conducted in detail and conclusions drawn.

CHAPTER 4

ANALYSIS AND INTERPRETATION OF SURVEY RESULTS

4.1 INTRODUCTION

Data analysis is “the process of bringing order, structure and meaning to the mass of collected data” (de Vos, 2002:339). This chapter discusses the statistical analysis of the questionnaires. The aim of this study is to determine whether the fact that small business that do not have quality strategies as their basis have an influence on their sustainability. The data of this chapter obtained from the completed questionnaires will be presented and analysed.

In most social research the analysis entails three major steps done in the following order:

- Cleaning and organising the information that was collected which is called the data preparation step,
- Describe the information that was collected (Descriptive Statistics); and
- Testing the assumptions made through hypothesis and modeling (Inferential Statistics).

The responses to the questionnaire developed by the researcher for the purpose of obtaining information regarding the existing quality strategies that small enterprises are implementing at present, the barriers of quality management in small business enterprises, the quality solutions that should be implemented by small businesses to improve management of the enterprises and a suitable quality management strategy for small enterprises have been analysed by using SAS software.

4.2 METHOD OF ANALYSIS

The method of analysis in this chapter will be introduced in detail in the following text.

4.2.1 Validation of survey results

A descriptive analysis of the survey results returned by the research questionnaire respondents are reflected below. The responses to the questions obtained through the questionnaires are indicated in table format for ease of reference. Data validation is the process of ensuring that a program operates on clean, correct and useful data. The construct validation however can only be taken to the point where the questionnaire measure what it is suppose to measure. Construct validation should be addressed in the planning phases of the survey and when the questionnaire is developed. This questionnaire is supposed to measure quality strategy information of small enterprises in the Western Cape.

4.2.2 Date format

The data was received in questionnaires, which were coded and captures on a database that was developed on Microsoft Access for this purpose. These questionnaires are captured twice and then the two datasets are compared to make sure that the information captures was correctly. When the database was developed use is made of rules with respect to the questionnaire that set boundaries for the different variables (questions). For instance if the Likert scale is used as follows:

- Strongly disagree is coded as 1
- Disagree is coded as 2
- Undecided is coded as 3

- Agree is coded as 4
- Strongly agree is coded as 5.

A boundary is set on Microsoft Access as less than 6. This means if the number 6 or more than 6 is captured an error will show until a number less than 6 is captured. It was then imported into SAS-format through the SAS ACCESS module. This information which was double checked for correctness is then analysed by the custodian of this document.

4.2.3 Preliminary analysis

The reliability of the statements in the questionnaire posed to the respondents from small businesses in Western Cape; South Africa are measured by using the Cronbach Alpha tests. (See paragraph 4.3.1). An Uni-variate descriptive analysis was performed on all the original variables; displaying frequencies, percentages, cumulative frequencies, cumulative percentages, means, standard deviations, range, median, mode etc. These descriptive statistics are discussed in paragraphs 4.3.2 and 4.3.3 (See also computer printouts in Annexure C & D).

4.2.4 Inferential statistics

Inferential statistics that will be used are:

- Cronbach Alpha test. Cronbach's Alpha is an index of reliability associated with the variation accounted for by the true score of the "underlying construct". Construct is the hypothetical variables that are being measured (Cooper & Schindler, 2001:216-217). Another way to put it would be that Cronbach's alpha measures how well a set of items (or variables) measures a single uni-dimensional latent construct. When data has a multidimensional structure, Cronbach's Alpha will usually be low.

- Chi-square tests for nominal data. The Chi-square (two-sample) tests are probably the most widely used nonparametric test of significance that is useful for tests involving nominal data, but it can be used for higher scales as well like cases where persons, events or objects are grouped in two or more nominal categories such as 'yes-no' or cases A, B, C or D. The technique is used to test for significant differences between the observed distribution of data among categories and the expected distribution based on the null hypothesis. It has to be calculated with actual counts rather than percentages (Cooper & Schindler, 2001:499).
- Kruskal-Wallis test for interval data with more than 2 independent samples. The *Kruskal-Wallis one-way analysis of variance* by ranks is a non-parametric method for testing equality of population medians among groups. Intuitively, it is identical to a one-way analysis of variance with the data replaced by their ranks. It is an extension of the *Mann-Whitney U test* (Wilcoxon Two-Sample Test) which compares two groups to 3 or more groups. Since it is a non-parametric method, the Kruskal-Wallis test does not assume a normal population, unlike the analogous one-way analysis of variance. However, the test does assume an identically-shaped and scaled distribution for each group, except for any difference in medians.
- Mann-Whitney *U* test or Wilcoxon rank-sum test for ordinal data with two independent samples. The Mann-Whitney *U* test (also called the Mann-Whitney-Wilcoxon (MWW), Wilcoxon rank-sum test, or Wilcoxon-Mann-Whitney test) is a non-parametric test for assessing whether two samples of observations come from the same distribution. The null hypothesis is that the two samples are drawn from a single population, and therefore that their probability distributions are equal. It requires the two samples to be independent, and the observations to be ordinal or continuous measurements, i.e. one can at least say, of any two observations, which is the greater. In a less general formulation, the Wilcoxon-Mann-Whitney two-sample test may be thought of as testing the null hypothesis that the

probability of an observation from one population exceeding an observation from the second population is 0.05.

- The SAS software computes a *p*-value (Probability value) that measure statistical significance when comparing variables with each other, determining relationship between variables or determining association between variables. Results will be regarded as significant if the *p*-values are smaller than 0.05, because this value presents an acceptable level on a 95% confidence interval ($p \leq 0.05$). The *p*-value is the probability of observing a sample value as extreme as, or more extreme than, the value actually observed, given that the null hypothesis is true. This area represents the probability of a Type 1 error that must be assumed if the null hypothesis is rejected (Cooper & Schindler, 2001:509).
- The *p*-value is compared to the significance level (α) and on this basis the null hypothesis is either rejected or not rejected. If the p value is less than the significance level, the null hypothesis is rejected (if *p* value $<\alpha$, reject null). If the *p* value is greater than or equal to the significance level, the null hypothesis is not rejected (if *p* value $\geq\alpha$, don't reject null). Thus with α=0.05, if the *p* value is less than 0.05, the null hypothesis will be rejected. The *p* value is determined by using the standard normal distribution. The small *p* value represents the risk of rejecting the null hypothesis.
- A difference has statistical significance if there is good reason to believe the difference does not represent random sampling fluctuations only. Results will be regarded as significant if the *p*-values are smaller than 0.05, because this value is used as cut-off point in most behavioural science research.

4.2.5 Assistance to research

The conclusions made by the researcher, is validated by the statistical report. Help was given to interpret the outcome of the data. The final report written by the researcher is was validated and checked by the statistician to exclude any

misleading interpretations.

All inferential statistics are discussed in paragraphs 4.3.4, 4.3.5 and 4.3.6.

4.2.6 Sample

The target population is employees or owners of small business enterprises in the Western Cape; South Africa. A random sample was drawn in the target population and the sample realisation was 35.

4.3 ANALYSIS

In total 35 respondents from the Western Cape completed the questionnaire. Descriptive statistics will be given for each variable and only the respondents who completed the entire questionnaire will be utilized in the inferential statistics.

4.3.1 Reliability testing

Reliability tests (Cronbach's Alpha Coefficient) are done on the questions/statements (which is the measuring instrument in this case) posed to these small business respondents. According to Nunnally (1978**:**245), the the acceptable level of Cronbach's Alpha Coefficients for each item are more than 0.70, and thus these items (statements) in the questionnaire, prove to be reliable and consistent for all the items in the scale.

The results of the Cronbach Alpha tests for the raw variables are shown in Table 4.1 and Annexure A. It shows the correlation between the respective item and the total sum score (without the respective item) and the internal consistency of the scale (coefficient alpha) if the respective item would be deleted. By deleting the items (statements) one by one each time with the statement with the highest

Cronbach Alpha value, the Alpha value will increase. In the right-most column of Table 4.1, it can be seen that the reliability of the scale would be higher if any of these statements is deleted.

For instance if statement A07 is deleted from this measuring scale then the Cronbach Alpha Coefficient will increase to 0.8415. This however is not needed as the alpha for each item is greater than 0.70.

Table 4.5: Cronbach's Alpha Coefficient for all the items forming the measuring instrument in this survey.

Statements (Test all statements without current one's input)	**Variable nr.**	**Correlation with total**	**Cronbach's α Coefficient**
Section A: Measuring instrument.			
1. Management created clear quality values, policies and strategies in the organisation.	A01	0.3716	0.8025
2. Management has experience and knowledge of quality management in the organisation.	A02	0.5840	0.7882
3. Management delegates authority and responsibility clearly in the organisation.	A03	0.6166	0.7846
4. There is enough capital to establish a quality system in the organisation.	A04	0.3027	0.8093
5. There is a quality management department in my organisation.	A05	-0.0244	0.8334
6. Staff can perform sophisticated statistical analysis of quality problems in the organisation.	A06	0.3690	0.8036
7. Not all personnel have been trained in the quality management philosophy.	A07	-0.3345	0.8415
8. All employees have opportunities to address quality problems of the product/service nature.	A08	0.5479	0.7898
9. Management and employees of the organisation are in frequent contact with the customers.	A09	0.5782	0.7894
10. Management and employees in the organisation have full insight into information flow from the customers.	A10	0.0206	0.8228
11. The communication between management and employees are frequent and open in the organisation.	A11	0.6179	0.7854
12. It is easy for employees to work together to achieve organisational goals.	A12	0.5709	0.7916
13. Management encourages activities that improve customer satisfaction.	A13	0.6905	0.7872

Statements (Test all statements without current one's input)	Variable nr.	Correlation with total	Cronbach's α Coefficient
14. Customer comments on products/service are used to improve quality.	A14	0.6992	0.7851
15. There are processes in place for designing new products/services to ensure quality in the organisation.	A15	0.6725	0.7839
16. The process used in the organisation includes in-process measurement of quality.	A16	0.4191	0.8000
17. Continual Process Improvement is a common practice throughout the organisation.	A17	0.6106	07873
Cronbach's Coefficient Alpha for standardized variables			**0.8290**
Cronbach's Coefficient Alpha for raw variables			**0.8098**

4.3.2 Descriptive statistics

Table 4.2 shows the descriptive statistics for all the categorical demographic variables as well as the variables measuring the quality of small businesses with the frequencies in each category and the percentage out of total number of questionnaires. Take note that the descriptive statistics are based on the total sample. These descriptive statistics are also shown in Annexure B & C.

Table 4.6: Descriptive statistics for all the variables

Variables	Categories	*f*	% out of total
Section A: Measuring instrument.			
1. Management created clear quality values, policies and strategies in the organisation.	Strongly disagree	0	0.0%
	Disagree	2	5.7%
	Undecided	10	28.6%
	Agree	20	57.1%
	Strongly agree	3	8.6%
2. Management has experience and knowledge of quality management in the organisation.	Strongly disagree	0	0.0%
	Disagree	5	14.3%
	Undecided	9	25.7%
	Agree	14	40.0%
	Strongly agree	7	20.0%
3. Management delegates authority and responsibility clearly in the	Strongly disagree	0	0.0%

Variables		Categories	*f*	% out of total
	organisation.	Disagree	9	25.7%
		Undecided	6	17.1%
		Agree	14	40.0%
		Strongly agree	6	17.1%
4.	There is enough capital to establish a quality system in the organisation.	Strongly disagree	6	17.1%
		Disagree	12	34.3%
		Undecided	8	22.9%
		Agree	6	17.1%
		Strongly agree	3	8.6%
5.	There is a quality management department in my organisation.	Strongly disagree	10	28.6%
		Disagree	10	28.6%
		Undecided	5	14.3%
		Agree	10	28.6%
		Strongly agree	0	0.0%
6.	Staff can perform sophisticated statistical analysis of quality problems in the organisation.	Strongly disagree	4	11.4%
		Disagree	10	28.6%
		Undecided	7	20.0%
		Agree	12	34.3%
		Strongly agree	2	5.7%
7.	Not all personnel have been trained in the quality management philosophy.	Strongly disagree	0	0.0%
		Disagree	2	5.7%
		Undecided	9	25.7%
		Agree	13	37.1%
		Strongly agree	11	31.4%
8.	All employees have opportunities to address quality problems of the product/service nature.	Strongly disagree	1	2.9%
		Disagree	6	17.1%
		Undecided	7	20.0%
		Agree	15	42.9%
		Strongly agree	6	17.1%
9.	Management and employees of the organisation are in frequent contact with the customers.	Strongly disagree	0	0.0%
		Disagree	3	8.6%
		Undecided	3	8.6%
		Agree	16	45.7%
		Strongly agree	13	37.1%
10.	Management and employees in the organisation have full insight	Strongly disagree	1	2.9%

Variables	Categories	*f*	% out of total
into information flow from the customers.	Disagree	4	11.4%
	Undecided	8	22.9%
	Agree	19	54.3%
	Strongly agree	3	5.6%
11. The communication between management and employees are frequent and open in the organisation.	Strongly disagree	1	2.9%
	Disagree	3	8.6%
	Undecided	2	5.7%
	Agree	18	51.4%
	Strongly agree	11	31.4%
12. It is easy for employees to work together to achieve organisational goals.	Strongly disagree	0	0.0%
	Disagree	2	5.7%
	Undecided	5	14.3%
	Agree	20	57.1%
	Strongly agree	8	22.9%
13. Management encourages activities that improve customer satisfaction.	Strongly disagree	0	0.0%
	Disagree	1	2.9%
	Undecided	3	8.6%
	Agree	20	57.1%
	Strongly agree	11	31.4%
14. Customer comments on products/service are used to improve quality.	Strongly disagree	0	0.0%
	Disagree	1	2.9%
	Undecided	6	17.1%
	Agree	18	51.4%
	Strongly agree	10	28.6%
15. There are processes in place for designing new products/services to ensure quality in the organisation.	Strongly disagree	0	0.0%
	Disagree	3	8.9%
	Undecided	7	20.0%
	Agree	17	48.6%
	Strongly agree	8	22.9%
16. The process used in the organisation includes in-process measurement of quality.	Strongly disagree	0	0.0%
	Disagree	2	5.7%
	Undecided	10	28.6%
	Agree	19	54.3%
	Strongly agree	4	11.4%

Variables		Categories	*f*	% out of total
17.	Continual Process Improvement is a common practice throughout the organisation.	Strongly disagree	0	0.0%
		Disagree	4	11.4%
		Undecided	6	17.1%
		Agree	21	60.0%
		Strongly agree	4	11.4%
Section B: Organisation and Respondent Demographics				
1.	Classify your organisations primary function.	Manufacturing	13	37.1%
		Service	21	60.0%
		Other	1	2.9%
2.	Does your organisation currently have a quality strategy in operation?	Yes	23	65.7%
		No	12	34.3%
3.	Number of people employed by your organisation.	<10	23	65.7%
		10-50	10	28.6%
		>50-120	1	2.9%
		>120-200	0	0.0%
		>200	1	2.9%
4.	Annual turnover (in million Rand).	<5	31	88.6%
		5-15	1	2.9%
		>15-25	2	5.7%
		>25-50	1	2.9%
		>50	0	0.0%

Table 4.7: Descriptive statistics – Mean, Median, Standard Deviation and Range

Variable	N	Mean	Std Dev	Median	Range
Section A: Measuring Instrument					
1. Management created clear quality values, policies and strategies in the organisation.	35	3.69	0.7183	4.0	3.0
2. Management has experience and knowledge of quality management in the organisation.	35	3.66	0.9684	4.0	3.0
3. Management delegates authority and responsibility clearly in the organisation.	35	3.49	1.0675	4.0	3.0
4. There is enough capital to establish a quality system in the organisation.	35	2.66	1.2113	2.0	4.0
5. There is a quality management department in my organisation.	35	2.43	1.1952	2.0	3.0

Variable	N	Mean	Std Dev	Median	Range
6. Staff can perform sophisticated statistical analysis of quality problems in the organisation.	35	2.94	1.1617	3.0	4.0
7. Not all personnel have been trained in the quality management philosophy.	35	3.94	0.9056	4.0	3.0
8. All employees have opportunities to address quality problems of the product/service nature.	35	3.54	1.0667	4.0	4.0
9. Management and employees of the organisation are in frequent contact with the customers.	35	4.11	0.9000	4.0	3.0
10. Management and employees in the organisation have full insight into information flow from the customers.	35	3.54	0.9185	4.0	4.0
11. The communication between management and employees are frequent and open in the organisation.	35	4.00	1.0000	4.0	4.0
12. It is easy for employees to work together to achieve organisational goals.	35	3.97	0.7854	4.0	3.0
13. Management encourages activities that improve customer satisfaction.	35	4.17	0.7065	4.0	3.0
14. Customer comments on products/service are used to improve quality.	35	4.06	0.7648	4.0	3.0
15. There are processes in place for designing new products/services to ensure quality in the organisation.	35	3.86	0.8793	4.0	3.0
16. The process used in the organisation includes in-process measurement of quality.	35	3.71	0.7504	4.0	3.0
17. Continual Process Improvement is a common practice throughout the organisation.	35	3.71	0.8250	4.0	3.0
Section B: Organisation and Respondent Demographics					
5.1 How long have you worked at organisation? Months as a fraction of the year.	35	3.68	3.2401	2.5	14.5

4.3.3 Uni-variate graphs

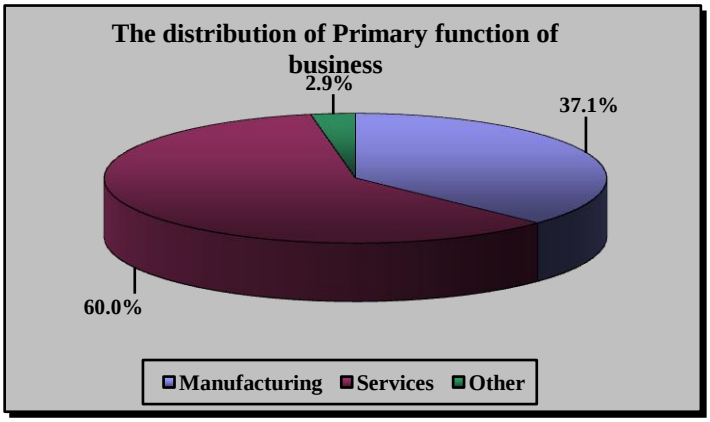

Figure 4.11: Primary function of small business

Nearly two thirds of the respondents' primary function was "Services" and just more than a third of the respondents' primary function was manufacturing.

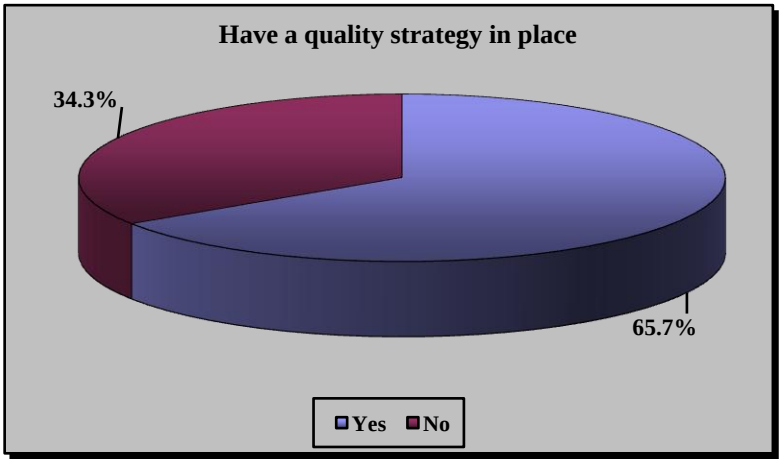

Figure 4.12: Quality strategy in place

Just less than two thirds of the small businesses in the survey have a quality structure in place and just less than a third of the small businesses in the survey do not have a quality structure in place.

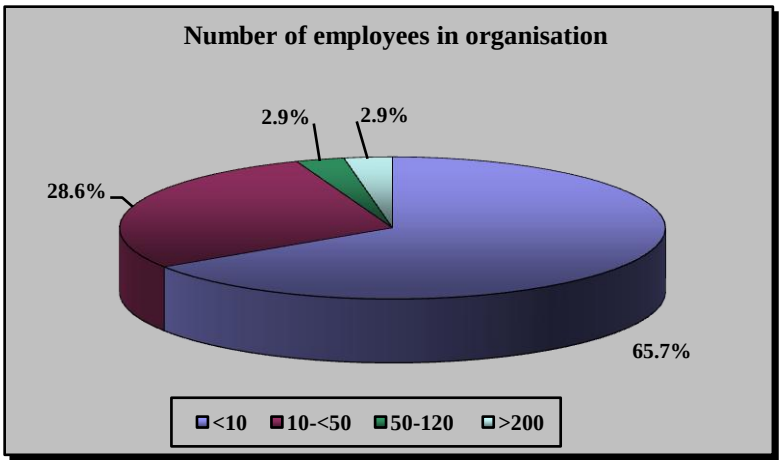

Figure 4.13: Number of employees in small business

Nearly two thirds of the organisations have less than 10 people employed and nearly 30% of the organisations have between 10 and 50 people employed. Only one (2.9%) of the companies has 50 to 120 people employed and only one (2.9%) of the companies has more than 200 people employed.

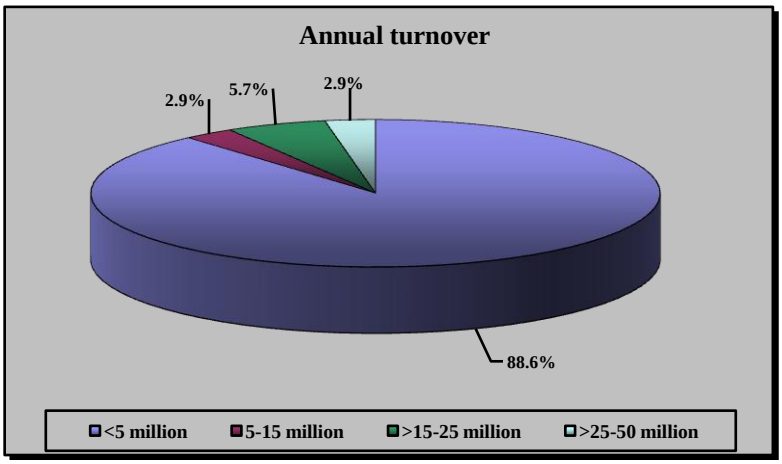

Figure 4.14: Annual turnover

Most of the organisations (88.6%) in this survey have less than 5 million rand turnover.

The responses on the statements will be represented in two graphs by splitting the statements into:

- Those that were least agreed with (the percentage who agree to strongly agree is less than 50 % of total responses), and
- Those that were agreed mostly with (the percentage who agree to strongly agree is more than 50% of total responses).

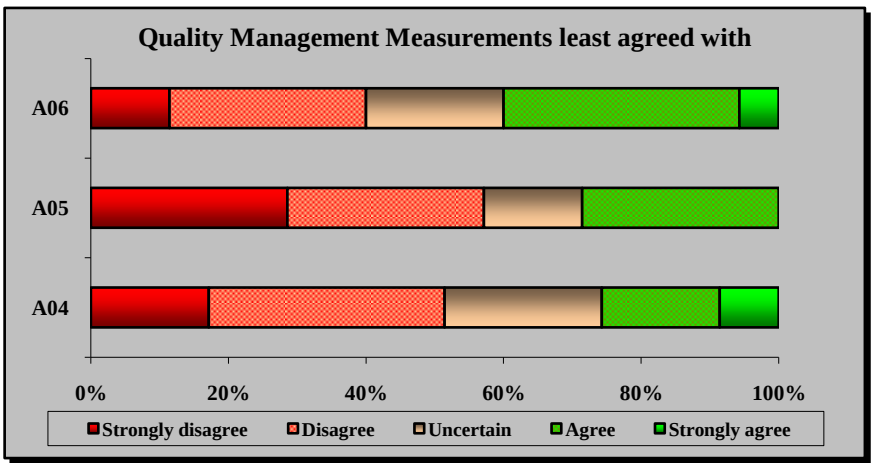

Figure 4.15: Quality Management Measurements least agreed with

The statements are sorted from the statement where the respondents mostly agree with to the statement that they least agree with. The respondents least agreed with the following statements:

- There is enough capital to establish a quality system in the organisation. (25.7% agree to strongly agree)
- There is a quality management department in the organisation. (28.6% agree to strongly agree)
- Staff can perform sophisticated statistical analysis of quality problems in the organisation. (40.0% agree to strongly agree)

This seems to be the aspects that have to be addressed in the small businesses.

Figure 4.6 shows that the respondents mostly agreed with the following statements:

- Management encourages activities that improve customer satisfaction. (88.6% agree to strongly agree)
- Management and employees of the organisation are in frequent contact with the customers (82.8% agree to strongly agree)
- Customer comments on product/service are used to improve quality. (80.0% agree to strongly agree)
- The communication between management and employees are frequent and open in organisation. (82.9% agree to strongly agree)
- It is easy for employees to work together to achieve organisational goals. (80.0% agree to strongly agree)

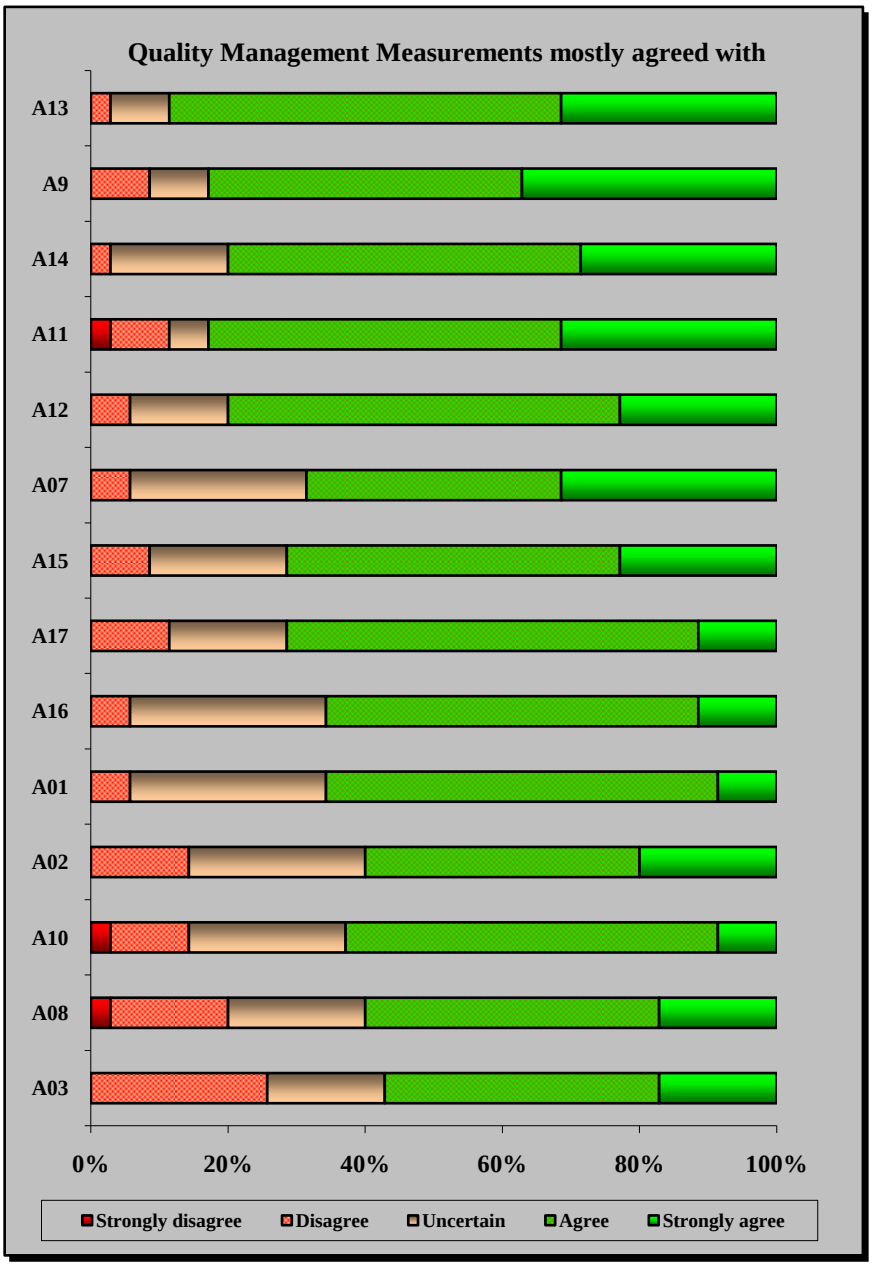

Figure 4.16: Quality Management Measurements mostly agreed with

4.3.4 Inferential statistics

According to above mentioned demographic information it becomes apparent that the businesses in this survey are businesses with less than 50 employees and less than 5 million rand turnover. Nearly two thirds of these businesses do have a quality strategy in operation and the lack of having a quality strategy in operation are only represented by a third of the respondents (small businesses).

This distinction will be used as the independent variable in determining whether the lack of having a quality strategy in operation influence the sustainability of these small businesses. Thus compare having a quality strategy in operation with not having a quality strategy in operation with respect to the responses on the different statements. Comparative statistics for abovementioned comparisons of having or not having a quality strategy in operation using the Wilcoxon Rank-Sum (Mann-Whitney U) tests for two independent samples are discussed in paragraph 4.3.4.1 and the computer printouts are shown in Annexure E. The reason for using above mentioned statistics is because doubt existed whether the data was normally distributed and thus non-parametric statistics is used.

The hypothesis being tested will be as follows:

- H_0 = There is no difference between the responses of the businesses who have a quality strategy in operation and the responses of businesses who do not have a quality strategy in operation with regard to the measuring instrument.
- H_1 = There is a difference between the responses of the businesses who have a quality strategy in operation and the responses of businesses who do not have a quality strategy in operation with regard to the measuring instrument.

With regard to organisation and respondent demographics the organisation's primary function is grouped in 3 categories i.e. manufacturing, services and others. A distinction is also made between the organisations who currently have a quality strategy in operations and those that do not. In order to determine whether having a quality strategy as an organisations basis has an influence on their sustainability, this distinction variable is compared with regard to the responses on the statements regarding quality in the organisation.

4.3.4.1 Comparisons with regard to having a quality strategy in place

The comparisons between the two groups were done for each statement in the survey and the *p*-value for each was more than 0.05, which means that the H_0 hypothesis is not rejected. As there were no statistically significant differences between the businesses who currently have a quality strategy in operations and those that do not with regard to all of the statement responses the statistics are attached in Annexure E.

4.3.4.2 Exploratory factor analysis

Exploratory factor analysis is used to investigate the factor structure underlying the set of original observed (17) variables that represent the measurement items regarding quality strategies in the organisation to determine the latent variables which it describes. Per definition, factor analysis identifies the nature and number of latent factors responsible for covariation in data analysis. Results, including the rotated factor pattern and communality estimates of the exploratory factor analysis are shown in Table 4.4. The SAS printout can be found in Annexure F. The communality refers to the percent of variance in an observed variable that is accounted for by the retained factors (Hatcher, 1994:13).

Table 4.8: Original variables and corresponding factor loadings from the rotated factor pattern.

Factor Pattern				**Final Communality Estimates**	**Questionnaire Statements**
1	**2**	**3**	**4**		
91	3	4	5	0.8292	A11
82	13	-8	3	0.6971	A09
80	5	32	-18	0.7818	A14
78	11	23	-17	0.6991	A13
72	19	14	31	0.6756	A12

Factor Pattern				Final Communality Estimates	Questionnaire Statements
1	2	3	4		
68	17	37	-1	0.6297	A15
65	7	29	-20	0.5546	A08
53	-36	-37	-1	0.5461	A10
5	83	0	12	0.7017	A01
-23	65	37	-36	0.7392	A04
39	62	7	-26	0.6111	A03
30	59	32	-8	0.5463	A02
36	18	75	-13	0.7411	A17
16	8	75	-11	0.5998	A16
-15	1	-12	72	0.5573	A07
-36	18	22	-47	0.4257	A05
11	55	-2	-59	0.6645	A06

- *Take note that all the loadings are multiplied by a 100 and rounded to the nearest integer.*

Measurements on quality strategies are subjected to an exploratory factor analysis using squared multiple correlations (SMC) as prior communality estimates. The principal factor method was used to extract the factors, and this was followed by a varimax (orthogonal) rotation. A scree test as well as an eigenvalue of more than 1 suggested six meaningful factors, so only these factors were retained for rotation.

In interpreting the rotated factor pattern, an item was said to load on a given factor if the factor loading was 0.40 or greater for that factor, and was less than 0.40 for the other. Using these criteria, eight items were found to load on the first factor, which was subsequently labelled the "Communication*"* factor. Four items loaded on the second factor, which was labelled the "Management*"* factor. Two items loaded on the third factor, which was labelled the "Process*"* factor and three items loaded on the fourth factor which was labelled the "Quality" factor. Note should be taken that item A06 loaded on the 4 factor as well as the second factor and

subsequently should be left out of the comparisons.

The followings graphs (Figure 4.7 – Figure 4.10) show the item distribution in each factor.

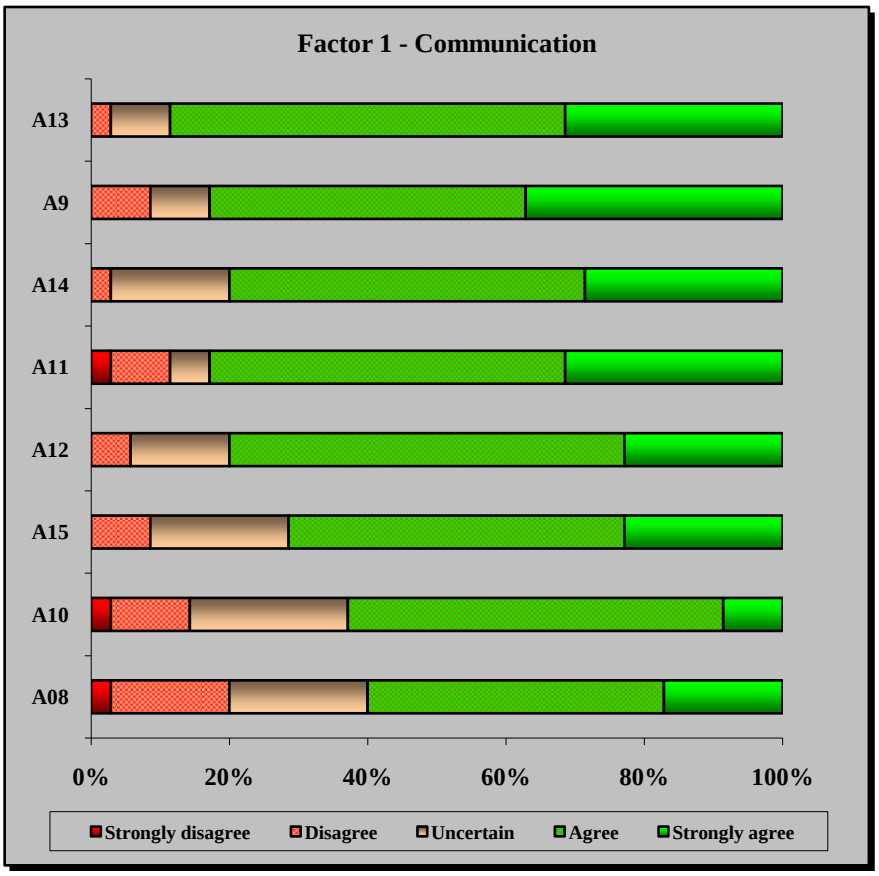

Figure 4.17: Communication

It seems that the respondents were mostly positive (Agree to strongly agree) with regard to the businesses communication structure.

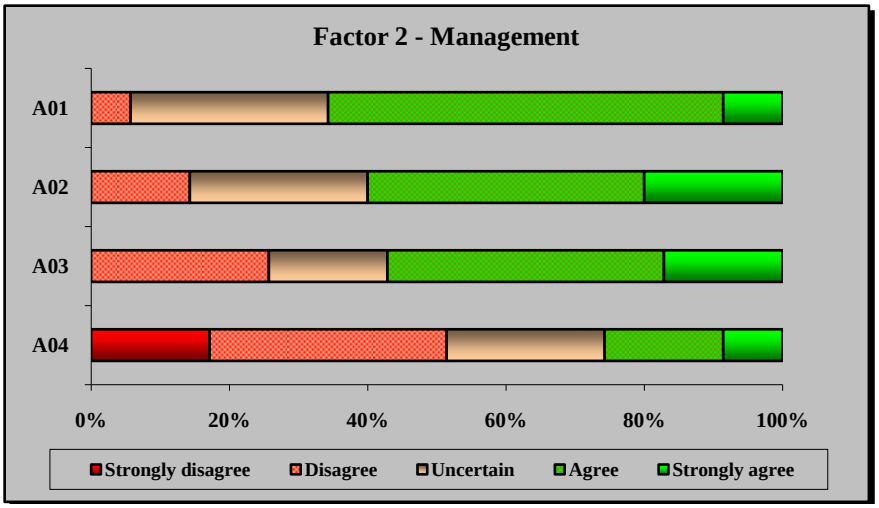

Figure 4.18: Management

Except for statement "There is enough capital to establish a quality system in the organisation" the respondents were positive with regard to the management factor.

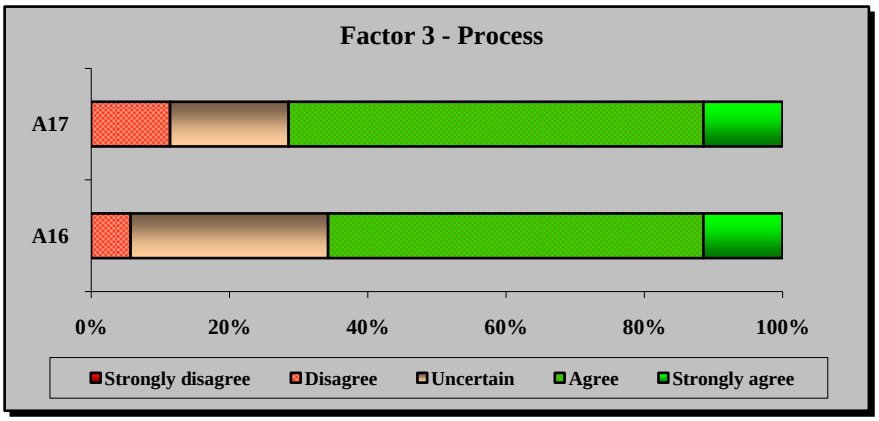

Figure 4.19: Process

It seems that the processes used in the organisations include in-process measurement of quality and that continual process improvement is common practice for these small businesses in the survey.

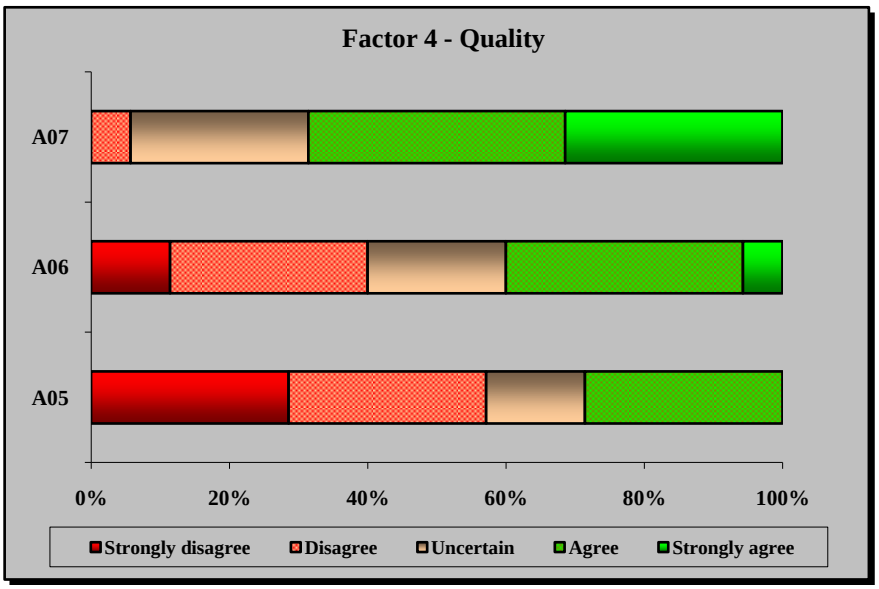

Figure 4.20: Quality Management Measurements

As statement A07 "Not all personnel have been trained in the quality management philosophy" is put in the negative form the positive response actually means negative responses. Thus although two thirds of the organisations indicated that they do have a quality strategy in place currently, the quality aspect is still not well addressed.

4.3.4.3 Kruskal Wallis tests

The variables that loaded on these 4 factors with a factor loading of more than 0.40 will be used in further analysis by adding there scores together and for each factor (latent variable) by using the Non-parametric Kruskal Wallis test to compare the groups (Distinction between having a quality strategy in place, primary function, Number of people employed in organisation groups and Annual turnover groups).

There were no statistically significant differences between the groups for any of the factors. All the tests however will be shown in Annexure G.

4.4 DISCUSSIONS AND CONCLUSSIONS

As for the results obtained through this survey on whether the lack of quality strategies in small businesses influences their sustainability the following analogies can be drawn from this research:

- The majority of the management of small enterprises encourages activities that improve customer satisfaction.
- Management and employees of the small enterprises are in frequent contact with the customers.
- Customer comments on products/service are used to improve quality.
- The communication between management and employees are frequent and open in the organisation.
- It is easy for employees to work together to achieve organizational goals.

Although the responses were mostly positive regarding communication, management and processes there definitely is an issue to be addressed regarding the fact that small enterprises do not have enough capital to establish a quality system in their organisation and subsequently:

- There is not a quality department in these small businesses,
- Sophisticated statistical analysis of quality problems cannot be performed by staff, and
- Personnel are not trained in the quality management philosophy.

CHAPTER FIVE

CONCLUSIONS AND FINAL RECOMMENDATIONS

5.1 THE RESEARCH THUS FAR

In the research thus far, the scope of the research was provided in Chapter one which indicated that research problem, research question and research objectives. A holistic perspective was provided in respect of the proposed research to be conducted within the ambit of this dissertation. In Chapter two, a literature review was conducted on the small business environment, and the concepts of quality, quality management tools and quality solutions used in small business. In addition, a holistic perspective of small business environment in South Africa also elaborated upon in detail. The survey design and methodology were covered in detail to ultimately in Chapter three. In Chapter four the survey data was analysed and interpreted. In this final Chapter five, the research will be concluded and final analogies drawn.

5.2 ANALOGIES DRAW FROM THE DATA ANALYSIS

As for the results obtained through the survey from previous chapter on whether the lack of quality strategies in small businesses influences their sustainability the following analogies can be drawn from this research:

- The majority of the management of small enterprises encourages activities that improve customer satisfaction.
- Management and employees of the small enterprises are in frequent contact with the customers.
- Customer comments on products/service are used to improve quality.
- The communication between management and employees are frequent and open in the organisation.
- It is easy for employees to work together to achieve organisational goals.

Although the responses were mostly positive regarding communication, management and processes there definitely is an issue to be addressed regarding the fact that small enterprises do not have enough capital to establish a quality system in their organisation and subsequently:

- There is not a quality department in these small businesses,
- Sophisticated statistical analysis of quality problems cannot be performed by staff, and
- Personnel are not trained in the quality management philosophy.

5.3 ANALOGIES DRAW FROM LITERATURE REVIEW

The main content of literature review include: background and definitions of small business in South Africa. Also the concept of quality in different perspective and dimensions and brief introduction of quality management tools. The leading contributors to the quality paradigm including: W. Edwards Deming, Joseph M, Juran, Kaoru Ishikawa and Philip Crosby. The quality solutions for small business which indicated in the following subject: leadership, employee improvement and involvement, quality assurance, customer focus, information analysis, strategic planning, environment or infrastructure, team approach, role of the quality department, breakthrough improvement.

5.4 THE RESEARCH PROBLEM REVISITED

The research problem which was formulated in Chapter one paragraph 1.2.1 read as follows: “Quality strategies do not form the basis of small business enterprises, thus impacting on their sustainability as business enterprises”. Recommendations to mitigate the research problems as a result of the literature review and data analysis showing as the following Figure 5.1. It is the main part of this research conclusion, and it summarised the conclusion which based on the research results.

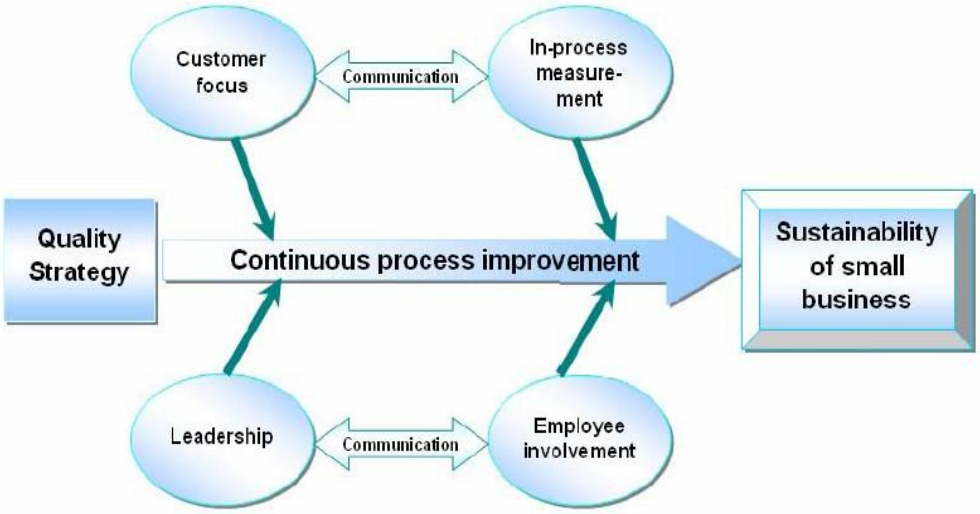

Figure 5.1: Quality strategy in small business enterprises

The above flowchart concluded that the quality strategy plays an important role to impacting on the sustainability of small business enterprises. There are several elements enhance the continuous process improvement in small business. Such as leadership and employee involvement, customer focus and in-process measurement, etc.

Leadership according to Juran and Gryna (1993:116), is one of the basic elements as specific approaches to strategic quality management to develop quality goals and strategies. The role of the leaders in small business is significant and in being major force behind quality improvement is critical. Based on the research result, in most small business enterprise, leadership define the mission of the organisation (Refer to 2.9.2.1 & 2.9.2.7). And the management of small business enterprises created clear quality value, policy and strategies, the management has experience and knowledge of quality management in the organisation, and they delegates authority and responsibility clearly in the organisation. The leadership plays an important role especially there is not enough capital to establish a quality management system in the organisation.

Implementing quality strategy not only the documents but from the people who works in the small business, therefore, the employee involvement is essential. As the report of the statistical analysis, the management of small business delegates the authority and responsibility to the employees, and the communication between the management and employees are frequent and open. Thus the employees have opportunities to address the quality problems. Most respondents also agree with that it is easy for employees to work together to achieve organizational goals. However, there are some aspects of employee involvement in small business enterprises need to be improved for the continuous process improvement. In terms of the responses not all personnel have trained in the quality management philosophy, and they cannot perform sophisticated statistical analysis of quality problems in the organisation.

Customer focus leads to a unique competitive advantage in small business. Based on the result of the research, the management and employees of small business are in frequent contact with the customer, and they have full insight in to information flow from the customers, and comments from customer on product/service are used to improve quality. A company that is customer driven is fundamentally different from a company that is not. Therefore, the customer focus are vital for the continuous process improvement in small business enterprise.

The customer satisfaction as a criterion for the in-process measurement. Continual process improvement is a common practice throughout the organisation, and the in-process measurement of quality are very important part of quality strategy for small business enterprises.

The quality strategies influence the development and sustainability of enterprises from long term view. Many small business lack of the awareness of quality management or do not realise that it is the primary element for the enterprises sustainability.

5.4.1 The recommendation related to quality strategy

As the statement of research problem indicated that quality strategy is the most important part for the quality management in small business enterprises. There are a number of quality management strategies can be applied to Small Business Enterprises (SBEs), such as total quality management (TQM), continuous improvement, etc. Deming's PDSA model (refer to Paragraph 2.8.1) is one of the popular and classical approaches that adopted by many medium and large companies in world-wide. It has contributed to the success of quality management process significantly during the last decades. It is therefore this study recommended that Small Business Enterprises (SBEs) should try to implement PDSA model to improve their quality management strategy showing as the following Figure 5.2 PDSA strategy planning cycle.

Figure 5.2: PDSA Strategy planning cycle for small business

The above PDSA Strategy cycle for quality management in small business are explained in the following phase:

- **Plan phase** – According to the statistical results, in the small business enterprises, the plan part including the leadership create the clear quality values, policies and strategies base on the information flow from the customers. The main point of this step is to develop a plan for improving quality at a process in small business enterprises.
- **Do phase** – The small business management delegates authority and responsibility clearly and execute the plan, and take action.
- **Study phase** – Evaluate feedback from the customer by the communication to confirm or to adjust the plan, and establish processes in place for new products and services to ensure quality in small business firms.
- **Act phase** – Summarise from previous three step and establish the changes and processes in place for new products/services to ensure quality in the small business enterprises.

5.5 THE RESEARCH QUESTIONS REVISITED

The research question which was formulated in Chapter one paragraph 1.3 read as follows: "What quality solutions should be implemented by small business to improve the sustainability of the enterprise?"

As in the instance of the research problem, should the recommendations made in Paragraph 5.4 be implemented, this researcher is of the opinion that a viable situation can be provided to the research question.

5.6 KEY RESEARCH OBJECTIVES REVISITED

The research objectives which was formulated in Chapter one Paragraph 1.4 read as follows:

- To investigate the quality strategies that exists within small enterprises in South Africa. According to the result of analysis, which indicated just less than two thirds of the small businesses in the survey have a quality structure in place and just less than a third of the small businesses in the survey do not have a quality strategies in place.
- To identify the barriers that impact on quality management in small enterprises. As the report of survey analysis showed, the small enterprises do not have enough capital to establish a quality system in their organisation and there is not a quality department in these small businesses and staff lack of sophisticated statistical analysis skills, personnel are not trained in the quality management philosophy. Those barriers also support by the literature review, refer to Paragraph 2.9.1.
- To determine the possible strategies that can assist small enterprises to improve quality management processes. The recommendation related to quality strategies provide the detail, which refer to Paragraph 5.4.1. The support theory from the literature review refers to Paragraph 2.9.2.7.
- To develop a suitable quality management strategy for a small enterprise to ensure sustainability. The Paragraph 5.4 summarised the advantages and disadvantages of quality management of small business enterpirses. The recommendations based on the result of the statistical analysis of survey and literature review (refer to Paragraph 2.9) are the suitable quality management strategy for a small enterprise to ensure sustainability.

5.7 FINAL CONCLUSION

Summarising the main findings from this study, it can be concluded that main elements of quality strategy to enhance the continuous process improvement in small business, thus impacting on their sustainability, which including leadership, employee involvement, customer focus and in-process measurement showed as Figure 5.1. In addition, the communication flow in the small business are also very important.

5.7.1 Conclusion relating to the role of leadership in small business

Although owners/entrepreneurs in small business are generally experts in the product or service they produce, they usually have neither the education nor the skills required to manage a business (Haksever, 1996:3). According to the data of analysis one of the barriers is that they do not know how to delegate authority and responsibility. Therefore, the role of leadership in small business enterprises are significant. In addition, it is one of the basic elements that emerged as specific approaches to strategic quality management to develop quality goals and strategies (Juran & Gryna, 1993:116).

5.7.2 Conclusion relating to the employee involvement in small business

Based on the data of analysis, the communication between the management and employees are frequent and open and employees are easy to work together to achieve goals of quality improvement, which are the advantages of small business enterprises. However, there is not a quality department in these small businesses because of lacking capital, and the employees are not well trained in the quality philosophy, which are the barriers of small business respecting implementing quality solutions. Because once the leader is enlightened and motivated to go

forward in the quality strategy, employees must be trained and developed (Foster, 2004:8).

5.7.3 Conclusion relating to the customer focus in small business

A focus on customer needs is one of basic elements of strategic quality management (Juran & Gryna, 1993:116), this focus covers strengths, weaknesses, opportunities, and threats. The result of statistical analysis of this research proof that depending on the size and nature of the business, the owner and employees of the small business in frequent contact with the customers. The customer comments on product/service are used to improve quality.

5.7.4 Conclusion relating to the in-process measurement in small business

In-process measurement of quality based on the customer comments are the performance of quality assurance in small business. In small firms, the communication between the owns/employees and customer are effectively. It is criterion for in-process measurement. Therefore, effort must be invested to audit designing products, services are consistently of high quality. And based on the data of analysis the employees should enhance the ability of performing sophisticated statistical analysis of quality problem during the measurement. They should also familiar with the data analysis tools, such as Seven Basic Tools. As the above mentioned elements, the in-process measurement is vital for the continuous process improvement in small business enterprise.

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Annexure A

Definitions of small business of South Africa. (**Source**: South Africa, 1995:20)

Sector or subsectors in accordance with the Standard Industrial Classification	**Size or class**	**Total full-time equivalent of paid employees Less than**	**Total annual turnover Less than**	**Total gross asset value (fixed property excluded) Less than**
Agriculture	Medium Small Very small Micro	120 50 10 5	R 4.00 m R 2.00 m R 0.40 m R 0.15 m	R 4.00 m R 2.00 m R 0.40 m R 0.10 m
Mining and Quarrying	Medium Small Very small Micro	200 50 20 5	R30.00 m R 7.50 m R 3.00 m R 0.15 m	R18.00 m R 4.50 m R 1.80 m R 0.10 m
Manufacturing	Medium Small Very small Micro	200 50 20 5	R40.00 m R10.00 m R 4.00 m R 0.15 m	R15.00 m R 3.75 m R 1.50 m R 0.10 m
Electricity, Gas and Water	Medium Small Very small Micro	200 50 20 5	R40.00 m R10.00 m R 4.00 m R 0.15 m	R15.00 m R 3.75 m R 1.50 m R 0.10 m
Construction	Medium Small Very small Micro	200 50 20 5	R20.00 m R 5.00 m R 2.00 m R 0.15 m	R 4.00 m R 1.00 m R 0.40 m R 0.10 m
Retail and Motor Trade and Repair Services	Medium Small Very small Micro	120 50 10 5	R30.00 m R15.00 m R 3.00 m R 0.15 m	R 5.00 m R 2.50 m R 0.50 m R 0.10 m
Wholesale Trade	Medium Small Very small Micro	120 50 10 5	R50.00 m R25.00 m R 5.00 m R 0.15 m	R 8.00 m R 4.00 m R 0.50 m R 0.10 m
Commercial Agents and Allied Services	Medium Small Very small Micro	120 50 10 5	R50.00 m R25.00 m R 5.00 m R 0.15 m	R 8.00 m R 4.00 m R 0.50 m R 0.10 m
Catering	Medium Small Very small Micro	120 50 10 5	R10.00 m R 5.00 m R 1.00 m R 0.15 m	R 2.00 m R 1.00 m R 0.20 m R 0.10 m
Transport	Medium Small Very small Micro	120 50 10 5	R20.00 m R10.00 m R 2.00 m R 0.15 m	R 5.00 m R 2.50 m R 0.50 m R 0.10 m

Storage	Medium Small Very small Micro	120 50 10 5	R20.00 m R10.00 m R 2.00 m R 0.15 m	R 5.00 m R 2.50 m R 0.50 m R 0.10 m
Communications	Medium Small Very small Micro	120 50 10 5	R20.00 m R10.00 m R 2.00 m R 0.15 m	R 5.00 m R 2.50 m R 0.50 m R 0.10 m
Finance	Medium Small Very small Micro	120 50 10 5	R20.00 m R10.00 m R 2.00 m R 0.15 m	R 4.00 m R 2.00 m R 0.40 m R 0.10 m
Business Services	Medium Small Very small Micro	120 50 10 5	R20.00 m R10.00 m R 2.00 m R 0.15 m	R 4.00 m R 2.00 m R 0.40 m R 0.10 m
Community	Medium Small Very small Micro	120 50 10 5	R10.00 m R 5.00 m R 1.00 m R 0.15 m	R 5.00 m R 2.50 m R 0.50 m R 0.10 m
Social and Personal Services	Medium Small Very small Micro	120 50 10 5	R10.00 m R 5.00 m R 1.00 m R 0.15 m	R 5.00 m R 2.50 m R 0.50 m R 0.10 m

Annexure B

Cronbach Alpha Coefficients

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
A01	35	3.68571	0.71831	129.00000	2.00000	5.00000	A01
A02	35	3.65714	0.96841	128.00000	2.00000	5.00000	A02
A03	35	3.48571	1.06747	122.00000	2.00000	5.00000	A03
A04	35	2.65714	1.21129	93.00000	1.00000	5.00000	A04
A05	35	2.42857	1.19523	85.00000	1.00000	4.00000	A05
A06	35	2.94286	1.16171	103.00000	1.00000	5.00000	A06
A07	35	3.94286	0.90563	138.00000	2.00000	5.00000	A07
A08	35	3.54286	1.06668	124.00000	1.00000	5.00000	A08
A09	35	4.11429	0.90005	144.00000	2.00000	5.00000	A09
A10	35	3.54286	0.91853	124.00000	1.00000	5.00000	A10
A11	35	4.00000	1.00000	140.00000	1.00000	5.00000	A11
A12	35	3.97143	0.78537	139.00000	2.00000	5.00000	A12
A13	35	4.17143	0.70651	146.00000	2.00000	5.00000	A13
A14	35	4.05714	0.76477	142.00000	2.00000	5.00000	A14
A15	35	3.85714	0.87927	135.00000	2.00000	5.00000	A15
A16	35	3.71429	0.75035	130.00000	2.00000	5.00000	A16
A17	35	3.71429	0.82503	130.00000	2.00000	5.00000	A17

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.809844
Standardized	0.829041

Cronbach Coefficient Alpha with Deleted Variable

Deleted Variable	Raw Variables Correlation with Total	Raw Variables Alpha	Standardized Variables Correlation with Total	Standardized Variables Alpha	Label
A01	0.371565	0.802507	0.334392	0.825421	A01
A02	0.583957	0.788150	0.580133	0.811485	A02
A03	0.616557	0.784644	0.598490	0.810413	A03
A04	0.302683	0.809343	0.270552	0.828918	A04
A05	-.024394	0.833374	-.054347	0.845953	A05
A06	0.368992	0.803552	0.339186	0.825157	A06
A07	-.334518	0.841474	-.305104	0.858260	A07
A08	0.547865	0.789810	0.572182	0.811948	A08
A09	0.578230	0.789420	0.608874	0.809805	A09
A10	0.020575	0.822758	0.052493	0.840490	A10
A11	0.617935	0.785385	0.664225	0.806539	A11
A12	0.570870	0.791629	0.605726	0.809989	A12
A13	0.690528	0.787192	0.707790	0.803940	A13
A14	0.699212	0.785132	0.722954	0.803030	A14
A15	0.672488	0.783888	0.702862	0.804236	A15
A16	0.419070	0.799985	0.410690	0.821176	A16
A17	0.610633	0.788697	0.612096	0.809616	A17

Annexure C

Descriptive statistics: Frequency tables

A01	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	2	5.71	2	5.71
Undecided	10	28.57	12	34.29
Agree	20	57.14	32	91.43
Strongly agree	3	8.57	35	100.00

Chi-Square Test for Equal Proportions	
Chi-Square	23.6286
DF	3
Pr > ChiSq	<.0001
Sample Size = 35	

A02	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	5	14.29	5	14.29
Undecided	9	25.71	14	40.00
Agree	14	40.00	28	80.00
Strongly agree	7	20.00	35	100.00

Chi-Square Test for Equal Proportions	
Chi-Square	5.1143
DF	3
Pr > ChiSq	0.1636
Sample Size = 35	

A03	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	9	25.71	9	25.71
Undecided	6	17.14	15	42.86
Agree	14	40.00	29	82.86
Strongly agree	6	17.14	35	100.00

Chi-Square Test for Equal Proportions	
Chi-Square	4.8857
DF	3
Pr > ChiSq	0.1804
Sample Size = 35	

A04	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly disagree	6	17.14	6	17.14
Disagree	12	34.29	18	51.43
Undecided	8	22.86	26	74.29
Agree	6	17.14	32	91.43
Strongly agree	3	8.57	35	100.00

Chi-Square Test for Equal Proportions	
Chi-Square	6.2857
DF	4
Pr > ChiSq	0.1788
Sample Size = 35	

A05	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly disagree	10	28.57	10	28.57
Disagree	10	28.57	20	57.14
Undecided	5	14.29	25	71.43
Agree	10	28.57	35	100.00

Chi-Square Test for Equal Proportions	
Chi-Square	2.1429
DF	3
Pr > ChiSq	0.5433
Sample Size = 35	

A06	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly disagree	4	11.43	4	11.43
Disagree	10	28.57	14	40.00
Undecided	7	20.00	21	60.00

Agree	12	34.29	33	94.29
Strongly agree	2	5.71	35	100.00

Chi-Square Test
for Equal Proportions
ffffffffffffffffffff
Chi-Square 9.7143
DF 4
Pr > ChiSq 0.0455
Sample Size = 35

A07	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	2	5.71	2	5.71
Undecided	9	25.71	11	31.43
Agree	13	37.14	24	68.57
Strongly agree	11	31.43	35	100.00

Chi-Square Test
for Equal Proportions
ffffffffffffffffffff
Chi-Square 7.8571
DF 3
Pr > ChiSq 0.0491
Sample Size = 35

A08	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly disagree	1	2.86	1	2.86
Disagree	6	17.14	7	20.00
Undecided	7	20.00	14	40.00
Agree	15	42.86	29	82.86
Strongly agree	6	17.14	35	100.00

Chi-Square Test
for Equal Proportions
ffffffffffffffffffff
Chi-Square 14.5714
DF 4
Pr > ChiSq 0.0057
Sample Size = 35

A09	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	3	8.57	3	8.57
Undecided	3	8.57	6	17.14
Agree	16	45.71	22	62.86
Strongly agree	13	37.14	35	100.00

Chi-Square Test
for Equal Proportions
ffffffffffffffffffff
Chi-Square 15.6286
DF 3
Pr > ChiSq 0.0014
Sample Size = 35

A10	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly disagree	1	2.86	1	2.86
Disagree	4	11.43	5	14.29
Undecided	8	22.86	13	37.14
Agree	19	54.29	32	91.43
Strongly agree	3	8.57	35	100.00

Chi-Square Test
for Equal Proportions
ffffffffffffffffffff
Chi-Square 29.4286
DF 4
Pr > ChiSq <.0001
Sample Size = 35

A11	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly disagree	1	2.86	1	2.86
Disagree	3	8.57	4	11.43
Undecided	2	5.71	6	17.14
Agree	18	51.43	24	68.57
Strongly agree	11	31.43	35	100.00

Chi-Square Test
for Equal Proportions
ffffffffffffffffffff
Chi-Square 30.5714
DF 4
Pr > ChiSq <.0001
Sample Size = 35

			Cumulative	Cumulative

A12	Frequency	Percent	Frequency	Percent
Disagree	2	5.71	2	5.71
Undecided	5	14.29	7	20.00
Agree	20	57.14	27	77.14
Strongly agree	8	22.86	35	100.00

Chi-Square Test
for Equal Proportions
Chi-Square 21.3429
DF 3
Pr > ChiSq <.0001
Sample Size = 35

A13	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	1	2.86	1	2.86
Undecided	3	8.57	4	11.43
Agree	20	57.14	24	68.57
Strongly agree	11	31.43	35	100.00

Chi-Square Test
for Equal Proportions
Chi-Square 25.6857
DF 3
Pr > ChiSq <.0001
Sample Size = 35

A14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	1	2.86	1	2.86
Undecided	6	17.14	7	20.00
Agree	18	51.43	25	71.43
Strongly agree	10	28.57	35	100.00

Chi-Square Test
for Equal Proportions
Chi-Square 17.6857
DF 3
Pr > ChiSq 0.0005
Sample Size = 35

A15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	3	8.57	3	8.57
Undecided	7	20.00	10	28.57
Agree	17	48.57	27	77.14
Strongly agree	8	22.86	35	100.00

Chi-Square Test
for Equal Proportions
Chi-Square 11.9714
DF 3
Pr > ChiSq 0.0075
Sample Size = 35

A16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	2	5.71	2	5.71
Undecided	10	28.57	12	34.29
Agree	19	54.29	31	88.57
Strongly agree	4	11.43	35	100.00

Chi-Square Test
for Equal Proportions
Chi-Square 19.9714
DF 3
Pr > ChiSq 0.0002
Sample Size = 35

A17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Disagree	4	11.43	4	11.43
Undecided	6	17.14	10	28.57
Agree	21	60.00	31	88.57
Strongly agree	4	11.43	35	100.00

Chi-Square Test
for Equal Proportions
Chi-Square 23.1714
DF 3
Pr > ChiSq <.0001
Sample Size = 35

B01	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Manufacturing	13	37.14	13	37.14
Service	21	60.00	34	97.14
Others	1	2.86	35	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	17.3714
DF	2
Pr > ChiSq	0.0002

Sample Size = 35

B01_1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Import & Export	1	100.00	1	100.00

B02	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	23	65.71	23	65.71
No	12	34.29	35	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	3.4571
DF	1
Pr > ChiSq	0.0630

Sample Size = 35

B03	Frequency	Percent	Cumulative Frequency	Cumulative Percent
<10	23	65.71	23	65.71
10-50	10	28.57	33	94.29
50-120	1	2.86	34	97.14
>200	1	2.86	35	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	37.1143
DF	3
Pr > ChiSq	<.0001

Sample Size = 35

B04	Frequency	Percent	Cumulative Frequency	Cumulative Percent
<5	31	88.57	31	88.57
5-15	1	2.86	32	91.43
15-25	2	5.71	34	97.14
25-50	1	2.86	35	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	75.5143
DF	3
Pr > ChiSq	<.0001

Sample Size = 35

B05_Yrs	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	2.86	1	2.86
1	9	25.71	10	28.57
2	9	25.71	19	54.29
3	3	8.57	22	62.86
4	7	20.00	29	82.86
5	1	2.86	30	85.71
8	1	2.86	31	88.57
10	3	8.57	34	97.14
15	1	2.86	35	100.00

B05_Mnths	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	20	57.14	20	57.14
1	1	2.86	21	60.00
2	1	2.86	22	62.86
3	2	5.71	24	68.57
4	3	8.57	27	77.14
6	3	8.57	30	85.71
7	1	2.86	31	88.57
8	2	5.71	33	94.29
9	1	2.86	34	97.14
10	1	2.86	35	100.00

Annexure D

Descriptive statistics: Uni-variate with means & standard deviations where appropriate

```
                    The UNIVARIATE Procedure
                      Variable:  timeowned
N                          35    Sum Weights               35
Mean                3.67857143    Sum Observations       128.75
Std Deviation       3.24012722    Variance           10.4984244
Skewness            1.99562363    Kurtosis           3.86658082
Uncorrected SS         830.5625    Corrected SS       356.946429
Coeff Variation     88.0811282    Std Error Mean      0.54768146

                  Basic Statistical Measures
        Location                    Variability
     Mean     3.678571     Std Deviation            3.24013
     Median   2.500000     Variance                10.49842
     Mode     4.000000     Range                   14.50000
                           Interquartile Range      2.33333

                   Quantiles (Definition 5)
                   Quantile      Estimate
                   100% Max       15.00000
                   99%            15.00000
                   95%            10.25000
                   90%            10.00000
                   75% Q3          4.00000
                   50% Median      2.50000
                   25% Q1          1.66667
                   10%             1.08333
                   5%              1.00000
                   1%              0.50000
                   0% Min          0.50000

                    Variable:  A01  (A01)
N                          35    Sum Weights               35
Mean                3.68571429    Sum Observations          129
Std Deviation        0.718308    Variance            0.51596639
Skewness            -0.4522357    Kurtosis           0.34190982
Uncorrected SS             493    Corrected SS       17.5428571
Coeff Variation     19.4889768    Std Error Mean      0.12141621

                  Basic Statistical Measures
        Location                    Variability
     Mean     3.685714     Std Deviation            0.71831
     Median   4.000000     Variance                0.51597
     Mode     4.000000     Range                   3.00000
                           Interquartile Range      1.00000

                   Quantiles (Definition 5)
                    Quantile      Estimate
                    100% Max             5
                    99%                  5
                    95%                  5
                    90%                  4
                    75% Q3               4
                    50% Median           4
                    25% Q1               3
                    10%                  3
                    5%                   2
                    1%                   2
                    0% Min               2


                    Variable:  A02  (A02)
N                          35    Sum Weights               35
Mean                3.65714286    Sum Observations          128
Std Deviation       0.96840855    Variance            0.93781513
Skewness            -0.2676607    Kurtosis           -0.7966042
Uncorrected SS             500    Corrected SS       31.8857143
Coeff Variation     26.4799214    Std Error Mean      0.16369092

                  Basic Statistical Measures
        Location                    Variability
     Mean     3.657143     Std Deviation            0.96841
     Median   4.000000     Variance                0.93782
     Mode     4.000000     Range                   3.00000
                           Interquartile Range      1.00000

                   Quantiles (Definition 5)
                    Quantile      Estimate
                    100% Max             5
                    99%                  5
                    95%                  5
                    90%                  5
                    75% Q3               4
                    50% Median           4
                    25% Q1               3
                    10%                  2
                    5%                   2
                    1%                   2
                    0% Min               2


                    Variable:  A03  (A03)
N                          35    Sum Weights               35
Mean                3.48571429    Sum Observations          122
Std Deviation       1.06747169    Variance             1.1394958
```

Skewness	-0.1914283	Kurtosis	-1.2107336
Uncorrected SS	464	Corrected SS	38.7428571
Coeff Variation	30.6241877	Std Error Mean	0.18043565

Basic Statistical Measures

Location		Variability	
Mean	3.485714	Std Deviation	1.06747
Median	4.000000	Variance	1.13950
Mode	4.000000	Range	3.00000
		Interquartile Range	2.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	4
50% Median	4
25% Q1	2
10%	2
5%	2
1%	2
0% Min	2

Variable: A04 (A04)

N	35	Sum Weights	35
Mean	2.65714286	Sum Observations	93
Std Deviation	1.21129141	Variance	1.46722689
Skewness	0.39881254	Kurtosis	-0.7166897
Uncorrected SS	297	Corrected SS	49.8857143
Coeff Variation	45.586236	Std Error Mean	0.20474562

Basic Statistical Measures

Location		Variability	
Mean	2.657143	Std Deviation	1.21129
Median	2.000000	Variance	1.46723
Mode	2.000000	Range	4.00000
		Interquartile Range	2.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	4
75% Q3	4
50% Median	2
25% Q1	2
10%	1
5%	1
1%	1
0% Min	1

Variable: A05 (A05)

N	35	Sum Weights	35
Mean	2.42857143	Sum Observations	85
Std Deviation	1.19522861	Variance	1.42857143
Skewness	0.17896471	Kurtosis	-1.5043449
Uncorrected SS	255	Corrected SS	48.5714286
Coeff Variation	49.2152957	Std Error Mean	0.20203051

Basic Statistical Measures

Location		Variability	
Mean	2.428571	Std Deviation	1.19523
Median	2.000000	Variance	1.42857
Mode	1.000000	Range	3.00000
		Interquartile Range	3.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4
99%	4
95%	4
90%	4
75% Q3	4
50% Median	2
25% Q1	1
10%	1
5%	1
1%	1
0% Min	1

Variable: A06 (A06)

N	35	Sum Weights	35
Mean	2.94285714	Sum Observations	103
Std Deviation	1.16171418	Variance	1.34957983
Skewness	-0.1219129	Kurtosis	-1.0548125
Uncorrected SS	349	Corrected SS	45.8857143
Coeff Variation	39.4757245	Std Error Mean	0.19636554

Basic Statistical Measures

Location		Variability	
Mean	2.942857	Std Deviation	1.16171
Median	3.000000	Variance	1.34958
Mode	4.000000	Range	4.00000

Interquartile Range	2.00000

Quantiles (Definition 5)	
Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	4
75% Q3	4
50% Median	3
25% Q1	2
10%	1
5%	1
1%	1
0% Min	1

Variable: A07 (A07)

N	35	Sum Weights	35
Mean	3.94285714	Sum Observations	138
Std Deviation	0.90563131	Variance	0.82016807
Skewness	-0.3869233	Kurtosis	-0.7096275
Uncorrected SS	572	Corrected SS	27.8857143
Coeff Variation	22.96891	Std Error Mean	0.15307963

Basic Statistical Measures

Location		Variability	
Mean	3.942857	Std Deviation	0.90563
Median	4.000000	Variance	0.82017
Mode	4.000000	Range	3.00000
		Interquartile Range	2.00000

Quantiles (Definition 5)	
Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	5
50% Median	4
25% Q1	3
10%	3
5%	2
1%	2
0% Min	2

Variable: A08 (A08)

N	35	Sum Weights	35
Mean	3.54285714	Sum Observations	124
Std Deviation	1.06668417	Variance	1.13781513
Skewness	-0.503802	Kurtosis	-0.4616555
Uncorrected SS	478	Corrected SS	38.6857143
Coeff Variation	30.108021	Std Error Mean	0.18030253

Basic Statistical Measures

Location		Variability	
Mean	3.542857	Std Deviation	1.06668
Median	4.000000	Variance	1.13782
Mode	4.000000	Range	4.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)	
Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	4
50% Median	4
25% Q1	3
10%	2
5%	2
1%	1
0% Min	1

Variable: A09 (A09)

N	35	Sum Weights	35
Mean	4.11428571	Sum Observations	144
Std Deviation	0.90004668	Variance	0.81008403
Skewness	-1.0052289	Kurtosis	0.59708053
Uncorrected SS	620	Corrected SS	27.5428571
Coeff Variation	21.8761347	Std Error Mean	0.15213566

Basic Statistical Measures

Location		Variability	
Mean	4.114286	Std Deviation	0.90005
Median	4.000000	Variance	0.81008
Mode	4.000000	Range	3.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)	
Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	5

Quantiles (Definition 5)	
Quantile	Estimate
50% Median	4
25% Q1	4
10%	3
5%	2
1%	2
0% Min	2

Variable: A10 (A10)

N	35	Sum Weights	35
Mean	3.54285714	Sum Observations	124
Std Deviation	0.91853006	Variance	0.84369748
Skewness	-0.8580234	Kurtosis	0.63657765
Uncorrected SS	468	Corrected SS	28.6857143
Coeff Variation	25.9262518	Std Error Mean	0.15525992

Basic Statistical Measures

Location		Variability	
Mean	3.542857	Std Deviation	0.91853
Median	4.000000	Variance	0.84370
Mode	4.000000	Range	4.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)	
Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	4
75% Q3	4
50% Median	4
25% Q1	3
10%	2
5%	2
1%	1
0% Min	1

Variable: A11 (A11)

N	35	Sum Weights	35
Mean	4	Sum Observations	140
Std Deviation	1	Variance	1
Skewness	-1.3101604	Kurtosis	1.69919786
Uncorrected SS	594	Corrected SS	34
Coeff Variation	25	Std Error Mean	0.16903085

Basic Statistical Measures

Location		Variability	
Mean	4.000000	Std Deviation	1.00000
Median	4.000000	Variance	1.00000
Mode	4.000000	Range	4.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)	
Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	5
50% Median	4
25% Q1	4
10%	2
5%	2
1%	1
0% Min	1

Variable: A12 (A12)

N	35	Sum Weights	35
Mean	3.97142857	Sum Observations	139
Std Deviation	0.78537044	Variance	0.61680672
Skewness	-0.7213281	Kurtosis	0.73924256
Uncorrected SS	573	Corrected SS	20.9714286
Coeff Variation	19.7755146	Std Error Mean	0.13275183

Basic Statistical Measures

Location		Variability	
Mean	3.971429	Std Deviation	0.78537
Median	4.000000	Variance	0.61681
Mode	4.000000	Range	3.00000
		Interquartile Range	0

Quantiles (Definition 5)	
Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	4
50% Median	4
25% Q1	4
10%	3
5%	2
1%	2
0% Min	2

Variable: A13 (A13)

N	35	Sum Weights	35
Mean	4.17142857	Sum Observations	146
Std Deviation	0.70651232	Variance	0.49915966
Skewness	-0.787635	Kurtosis	1.37559015
Uncorrected SS	626	Corrected SS	16.9714286
Coeff Variation	16.9369393	Std Error Mean	0.11942238

Basic Statistical Measures

Location		Variability	
Mean	4.171429	Std Deviation	0.70651
Median	4.000000	Variance	0.49916
Mode	4.000000	Range	3.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	5
50% Median	4
25% Q1	4
10%	3
5%	3
1%	2
0% Min	2

Variable: A14 (A14)

N	35	Sum Weights	35
Mean	4.05714286	Sum Observations	142
Std Deviation	0.76477052	Variance	0.58487395
Skewness	-0.5171575	Kurtosis	0.13265458
Uncorrected SS	596	Corrected SS	19.8857143
Coeff Variation	18.8499776	Std Error Mean	0.12926981

Basic Statistical Measures

Location		Variability	
Mean	4.057143	Std Deviation	0.76477
Median	4.000000	Variance	0.58487
Mode	4.000000	Range	3.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	5
50% Median	4
25% Q1	4
10%	3
5%	3
1%	2
0% Min	2

Variable: A15 (A15)

N	35	Sum Weights	35
Mean	3.85714286	Sum Observations	135
Std Deviation	0.87926631	Variance	0.77310924
Skewness	-0.5338173	Kurtosis	-0.1651997
Uncorrected SS	547	Corrected SS	26.2857143
Coeff Variation	22.7957932	Std Error Mean	0.14862313

Basic Statistical Measures

Location		Variability	
Mean	3.857143	Std Deviation	0.87927
Median	4.000000	Variance	0.77311
Mode	4.000000	Range	3.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	4
50% Median	4
25% Q1	3
10%	3
5%	2
1%	2
0% Min	2

Variable: A16 (A16)

N	35	Sum Weights	35
Mean	3.71428571	Sum Observations	130
Std Deviation	0.75035006	Variance	0.56302521
Skewness	-0.352617	Kurtosis	0.1403785
Uncorrected SS	502	Corrected SS	19.1428571
Coeff Variation	20.2017323	Std Error Mean	0.12683231

Basic Statistical Measures

Location		Variability	

Mean	3.714286	Std Deviation	0.75035
Median	4.000000	Variance	0.56303
Mode	4.000000	Range	3.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	4
50% Median	4
25% Q1	3
10%	3
5%	2
1%	2
0% Min	2

Variable: A17 (A17)

N	35	Sum Weights	35
Mean	3.71428571	Sum Observations	130
Std Deviation	0.82502865	Variance	0.68067227
Skewness	-0.7413952	Kurtosis	0.28937523
Uncorrected SS	506	Corrected SS	23.1428571
Coeff Variation	22.2123097	Std Error Mean	0.13945529

Basic Statistical Measures

Location		Variability	
Mean	3.714286	Std Deviation	0.82503
Median	4.000000	Variance	0.68067
Mode	4.000000	Range	3.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	4
50% Median	4
25% Q1	3
10%	2
5%	2
1%	2
0% Min	2

Annexure E

Comparisons using Mann-Whitney rank test

The NPAR1WAY Procedure

Wilcoxon Scores (Rank Sums) for Variable A01
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	441.0	414.0	25.574409	19.173913
No	12	189.0	216.0	25.574409	15.750000

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic	189.0000
Normal Approximation	
Z	-1.0362
One-Sided Pr < Z	0.1501
Two-Sided Pr > |Z|	0.3001
t Approximation	
One-Sided Pr < Z	0.1537
Two-Sided Pr > |Z|	0.3074

Z includes a continuity correction of 0.5.

Wilcoxon Scores (Rank Sums) for Variable A02
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	426.0	414.0	27.431841	18.521739
No	12	204.0	216.0	27.431841	17.000000

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic	204.0000
Normal Approximation	
Z	-0.4192
One-Sided Pr < Z	0.3375
Two-Sided Pr > |Z|	0.6751
t Approximation	
One-Sided Pr < Z	0.3388
Two-Sided Pr > |Z|	0.6777

Z includes a continuity correction of 0.5.

Wilcoxon Scores (Rank Sums) for Variable A03
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	402.50	414.0	27.444520	17.500000
No	12	227.50	216.0	27.444520	18.958333

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic	227.5000
Normal Approximation	
Z	0.4008
One-Sided Pr > Z	0.3443
Two-Sided Pr > |Z|	0.6886
t Approximation	
One-Sided Pr > Z	0.3455
Two-Sided Pr > |Z|	0.6911

Z includes a continuity correction of 0.5.

Wilcoxon Scores (Rank Sums) for Variable A04
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	448.50	414.0	27.865946	19.5000
No	12	181.50	216.0	27.865946	15.1250

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic	181.5000
Normal Approximation	
Z	-1.2201
One-Sided Pr < Z	0.1112
Two-Sided Pr > |Z|	0.2224
t Approximation	
One-Sided Pr < Z	0.1154
Two-Sided Pr > |Z|	0.2308

Z includes a continuity correction of 0.5.

Wilcoxon Scores (Rank Sums) for Variable A05
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	449.0	414.0	27.717816	19.521739

```
No      12        181.0        216.0     27.717816    15.083333
                Average scores were used for ties.

                   Wilcoxon Two-Sample Test
                Statistic            181.0000
                Normal Approximation
                Z                     -1.2447
                One-Sided Pr <  Z      0.1066
                Two-Sided Pr > |Z|     0.2132
                t Approximation
                One-Sided Pr <  Z      0.1109
                Two-Sided Pr > |Z|     0.2218
          Z includes a continuity correction of 0.5.


          Wilcoxon Scores (Rank Sums) for Variable A06
                  Classified by Variable B02
                 Sum of      Expected       Std Dev         Mean
B02      N       Scores      Under H0      Under H0        Score
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Yes     23       424.50        414.0     27.711539    18.456522
No      12       205.50        216.0     27.711539    17.125000
                Average scores were used for ties.

                   Wilcoxon Two-Sample Test
                Statistic            205.5000
                Normal Approximation
                Z                     -0.3609
                One-Sided Pr <  Z      0.3591
                Two-Sided Pr > |Z|     0.7182
                t Approximation
                One-Sided Pr <  Z      0.3602
                Two-Sided Pr > |Z|     0.7204
          Z includes a continuity correction of 0.5.


          Wilcoxon Scores (Rank Sums) for Variable A07
                  Classified by Variable B02
                 Sum of      Expected       Std Dev         Mean
B02      N       Scores      Under H0      Under H0        Score
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Yes     23       392.50        414.0     27.317461    17.065217
No      12       237.50        216.0     27.317461    19.791667
                Average scores were used for ties.

                   Wilcoxon Two-Sample Test
                Statistic            237.5000
                Normal Approximation
                Z                      0.7687
                One-Sided Pr >  Z      0.2210
                Two-Sided Pr > |Z|     0.4420
                t Approximation
                One-Sided Pr >  Z      0.2237
                Two-Sided Pr > |Z|     0.4474
          Z includes a continuity correction of 0.5.


          Wilcoxon Scores (Rank Sums) for Variable A08
                  Classified by Variable B02
                 Sum of      Expected       Std Dev         Mean
B02      N       Scores      Under H0      Under H0        Score
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Yes     23        451.0        414.0     27.357760    19.608696
No      12        179.0        216.0     27.357760    14.916667
                Average scores were used for ties.

                   Wilcoxon Two-Sample Test
                Statistic            179.0000
                Normal Approximation
                Z                     -1.3342
                One-Sided Pr <  Z      0.0911
                Two-Sided Pr > |Z|     0.1821
                t Approximation
                One-Sided Pr <  Z      0.0955
                Two-Sided Pr > |Z|     0.1910
          Z includes a continuity correction of 0.5.


          Wilcoxon Scores (Rank Sums) for Variable A09
                  Classified by Variable B02
                 Sum of      Expected       Std Dev         Mean
B02      N       Scores      Under H0      Under H0        Score
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Yes     23       408.50        414.0     26.570724    17.760870
No      12       221.50        216.0     26.570724    18.458333
                Average scores were used for ties.

                   Wilcoxon Two-Sample Test
                Statistic            221.5000
                Normal Approximation
                Z                      0.1882
                One-Sided Pr >  Z      0.4254
                Two-Sided Pr > |Z|     0.8507
                t Approximation
                One-Sided Pr >  Z      0.4259
                Two-Sided Pr > |Z|     0.8519
          Z includes a continuity correction of 0.5.
```

Wilcoxon Scores (Rank Sums) for Variable A10
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	398.0	414.0	26.161682	17.304348
No	12	232.0	216.0	26.161682	19.333333

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic	232.0000
Normal Approximation	
Z	0.5925
One-Sided Pr > Z	0.2768
Two-Sided Pr > |Z|	0.5535
t Approximation	
One-Sided Pr > Z	0.2787
Two-Sided Pr > |Z|	0.5575

Z includes a continuity correction of 0.5.

Wilcoxon Scores (Rank Sums) for Variable A11
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	435.50	414.0	26.259020	18.934783
No	12	194.50	216.0	26.259020	16.208333

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic	194.5000
Normal Approximation	
Z	-0.7997
One-Sided Pr < Z	0.2119
Two-Sided Pr > |Z|	0.4239
t Approximation	
One-Sided Pr < Z	0.2147
Two-Sided Pr > |Z|	0.4294

Z includes a continuity correction of 0.5.

Wilcoxon Scores (Rank Sums) for Variable A12
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	433.0	414.0	25.721358	18.826087
No	12	197.0	216.0	25.721358	16.416667

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic	197.0000
Normal Approximation	
Z	-0.7192
One-Sided Pr < Z	0.2360
Two-Sided Pr > |Z|	0.4720
t Approximation	
One-Sided Pr < Z	0.2385
Two-Sided Pr > |Z|	0.4769

Z includes a continuity correction of 0.5.

Wilcoxon Scores (Rank Sums) for Variable A13
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	403.50	414.0	25.451684	17.543478
No	12	226.50	216.0	25.451684	18.875000

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic	226.5000
Normal Approximation	
Z	0.3929
One-Sided Pr > Z	0.3472
Two-Sided Pr > |Z|	0.6944
t Approximation	
One-Sided Pr > Z	0.3484
Two-Sided Pr > |Z|	0.6968

Z includes a continuity correction of 0.5.

Wilcoxon Scores (Rank Sums) for Variable A14
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	401.50	414.0	26.314165	17.456522
No	12	228.50	216.0	26.314165	19.041667

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic	228.5000
Normal Approximation	
Z	0.4560
One-Sided Pr > Z	0.3242
Two-Sided Pr > |Z|	0.6484

```
                t Approximation
                One-Sided Pr >  Z      0.3256
                Two-Sided Pr > |Z|     0.6513
            Z includes a continuity correction of 0.5.


          Wilcoxon Scores (Rank Sums) for Variable A15
                  Classified by Variable B02
                Sum of     Expected      Std Dev         Mean
B02      N       Scores     Under H0     Under H0        Score
ffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff
Yes      23         422.0        414.0    26.770735    18.347826
No       12         208.0        216.0    26.770735    17.333333
              Average scores were used for ties.

                   Wilcoxon Two-Sample Test
                Statistic           208.0000
                Normal Approximation
                Z                   -0.2802
                One-Sided Pr <  Z      0.3897
                Two-Sided Pr > |Z|     0.7794
                t Approximation
                One-Sided Pr <  Z      0.3905
                Two-Sided Pr > |Z|     0.7811
            Z includes a continuity correction of 0.5.


          Wilcoxon Scores (Rank Sums) for Variable A16
                  Classified by Variable B02
                Sum of     Expected      Std Dev         Mean
B02      N       Scores     Under H0     Under H0        Score
ffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff
Yes      23         433.0        414.0    25.988233    18.826087
No       12         197.0        216.0    25.988233    16.416667
              Average scores were used for ties.

                   Wilcoxon Two-Sample Test
                Statistic           197.0000
                Normal Approximation
                Z                   -0.7119
                One-Sided Pr <  Z      0.2383
                Two-Sided Pr > |Z|     0.4766
                t Approximation
                One-Sided Pr <  Z      0.2407
                Two-Sided Pr > |Z|     0.4814
            Z includes a continuity correction of 0.5.


          Wilcoxon Scores (Rank Sums) for Variable A17
                  Classified by Variable B02
                Sum of     Expected      Std Dev         Mean
B02      N       Scores     Under H0     Under H0        Score
ffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff
Yes      23        460.50        414.0    25.358107    20.021739
No       12        169.50        216.0    25.358107    14.125000
              Average scores were used for ties.

                   Wilcoxon Two-Sample Test
                Statistic           169.5000
                Normal Approximation
                Z                   -1.8140
                One-Sided Pr <  Z      0.0348
                Two-Sided Pr > |Z|     0.0697
                t Approximation
                One-Sided Pr <  Z      0.0393
                Two-Sided Pr > |Z|     0.0785
            Z includes a continuity correction of 0.5.
```

Annexure F

Exploratory factor analysis

Means and Standard Deviations from 35 Observations

Variable	Mean	Std Dev
A01	3.6857143	0.7183080
A02	3.6571429	0.9684086
A03	3.4857143	1.0674717
A04	2.6571429	1.2112914
A05	2.4285714	1.1952286
A06	2.9428571	1.1617142
A07	3.9428571	0.9056313
A08	3.5428571	1.0666842
A09	4.1142857	0.9000467
A10	3.5428571	0.9185301
A11	4.0000000	1.0000000
A12	3.9714286	0.7853704
A13	4.1714286	0.7065123
A14	4.0571429	0.7647705
A15	3.8571429	0.8792663
A16	3.7142857	0.7503501
A17	3.7142857	0.8250286

Initial Factor Method: Principal Factors
Prior Communality Estimates: SMC

A01	A02	A03	A04	A05	A06	A07	A08	A09
0.71068218	0.69370733	0.76559821	0.78899559	0.58766980	0.75161229	0.58322898	0.71827934	0.79807729

A10	A11	A12	A13	A14	A15	A16	A17
0.72646447	0.85033831	0.72604322	0.78340144	0.80347572	0.70377025	0.71312271	0.75582420

Eigenvalues of the Reduced Correlation Matrix: Total = 12.4602913 Average = 0.73295831

	Eigenvalue	Difference	Proportion	Cumulative
1	5.84318109	2.88249282	0.4689	0.4689
2	2.96068827	1.76747106	0.2376	0.7066
3	1.19321721	0.19048343	0.0958	0.8023
4	1.00273377	0.36074860	0.0805	0.8828
5	0.64198518	0.12781891	0.0515	0.9343
6	0.51416626	0.11467771	0.0413	0.9756
7	0.39948855	0.18972079	0.0321	1.0076
8	0.20976775	0.04918905	0.0168	1.0245
9	0.16057871	0.01616579	0.0129	1.0374
10	0.14441292	0.08489465	0.0116	1.0489
11	0.05951827	0.07202947	0.0048	1.0537
12	-.01251120	0.06536434	-0.0010	1.0527
13	-.07787554	0.01855871	-0.0062	1.0465
14	-.09643426	0.01922782	-0.0077	1.0387
15	-.11566208	0.04345865	-0.0093	1.0295
16	-.15912073	0.04872211	-0.0128	1.0167
17	-.20784284		-0.0167	1.0000

4 factors will be retained by the NFACTOR criterion.

Factor Pattern

		Factor1	Factor2	Factor3	Factor4
A14	A14	85 *	-16	-18	-5
A13	A13	81 *	-14	-8	-9
A11	A11	80 *	-43 *	8	-6
A15	A15	78 *	-7	-6	14
A08	A08	72 *	-7	-17	-6
A09	A09	72 *	-36	20	-13
A12	A12	69 *	-31	23	24
A17	A17	66 *	28	-35	33
A03	A03	60 *	36	29	-17
A02	A02	57 *	40 *	19	13
A16	A16	45 *	31	-42 *	36
A04	A04	20	83 *	6	2
A05	A05	-10	58 *	-24	-16
A06	A06	36	56 *	12	-45 *
A10	A10	21	-63 *	0	-33
A01	A01	29	47 *	62 *	13
A07	A07	-28	-28	39	50 *

Variance Explained by Each Factor

Factor1	Factor2	Factor3	Factor4
5.8431811	2.9606883	1.1932172	1.0027338

Final Communality Estimates: Total = 10.999820

A01	A02	A03	A04	A05	A06	A07	A08	A09
0.70167885	0.54630369	0.61111378	0.73920361	0.42568855	0.66452081	0.55729595	0.55458904	0.69712032

A10	A11	A12	A13	A14	A15	A16	A17
0.54608925	0.82917738	0.67555985	0.69909526	0.78175569	0.62972402	0.59981731	0.74108696

Prerotation Method: Varimax
Orthogonal Transformation Matrix

	1	2	3	4
1	0.86189	0.32686	0.35457	-0.15681
2	-0.48373	0.65688	0.37589	-0.43957
3	0.06389	0.67743	-0.58405	0.44260
4	-0.13812	0.05246	0.62600	0.76570

Rotated Factor Pattern

		Factor1	Factor2	Factor3	Factor4
A11	A11	91 *	3	4	5
A09	A09	82 *	13	-8	3
A14	A14	80 *	5	32	-18
A13	A13	78 *	11	23	-17
A12	A12	72 *	19	14	31

A15	A15	68 *	17	37	-1	
A08	A08	65 *	7	29	-20	
A10	A10	53 *	-36	-37	-1	
A01	A01	5	83 *	0	12	
A04	A04	-23	65 *	37	-36	
A03	A03	39	62 *	7	-26	
A02	A02	30	59 *	32	-8	
A17	A17	36	18	75 *	-13	
A16	A16	16	8	75 *	-11	
A07	A07	-15	1	-12	72 *	
A05	A05	-36	18	22	-47 *	
A06	A06	11	55 *	-2	-59 *	

Variance Explained by Each Factor

Factor1	Factor2	Factor3	Factor4
5.0573854	2.4521395	1.9528982	1.5373973

Final Communality Estimates: Total = 10.999820

A01	A02	A03	A04	A05	A06	A07	A08	A09
0.70167885	0.54630369	0.61111378	0.73920361	0.42568855	0.66452081	0.55729595	0.55458904	0.69712032

A10	A11	A12	A13	A14	A15	A16	A17
0.54608925	0.82917738	0.67555985	0.69909526	0.78175569	0.62972402	0.59981731	0.74108696

Rotation Method: Promax (power = 3)

Target Matrix for Procrustean Transformation

		Factor1	Factor2	Factor3	Factor4
A11	A11	100 *	0	0	0
A09	A09	96 *	0	0	0
A14	A14	76 *	0	5	-1
A13	A13	82 *	0	2	-1
A12	A12	69 *	1	1	6
A15	A15	64 *	1	11	0
A08	A08	68 *	0	7	-2
A10	A10	37	-12	-14	0
A01	A01	0	100 *	0	0
A04	A04	-2	45 *	9	-8
A03	A03	12	53 *	0	-4
A02	A02	6	53 *	9	0
A17	A17	8	1	74 *	0
A16	A16	1	0	100 *	0
A07	A07	-1	0	0	100 *
A05	A05	-17	2	4	-40 *
A06	A06	0	31	0	-43 *

Procrustean Transformation Matrix

	1	2	3	4
1	0.95059	-0.03294	-0.07142	-0.00841
2	-0.03230	0.92639	-0.13654	0.07584
3	-0.09237	-0.18794	0.91426	0.13912
4	0.02746	0.10113	0.11293	0.89523

Normalized Oblique Transformation Matrix

	1	2	3	4
1	0.82483	0.22219	0.24462	-0.08691
2	-0.56419	0.58972	0.29176	-0.33972
3	0.11218	0.90304	-0.70969	0.43249
4	-0.18148	0.01498	0.80795	0.91947

Inter-Factor Correlations

	Factor1	Factor2	Factor3	Factor4
Factor1	100 *	12	20	-8
Factor2	12	100 *	39	-27
Factor3	20	39	100 *	-34
Factor4	-8	-27	-34	100 *

Rotated Factor Pattern (Standardized Regression Coefficients)

		Factor1	Factor2	Factor3	Factor4
A11	A11	92 *	-1	-3	6
A09	A09	84 *	13	-18	2
A14	A14	78 *	-7	25	-14
A13	A13	76 *	2	14	-14
A12	A12	72 *	18	11	36
A15	A15	65 *	8	32	6
A08	A08	62 *	-3	23	-17
A10	A10	59 *	-33	-40	-11
A01	A01	2	90 *	-13	20
A03	A03	36	61 *	-10	-21
A04	A04	-30	59 *	27	-26
A02	A02	25	54 *	22	1
A16	A16	8	-9	79 *	1
A17	A17	29	0	76 *	0
A07	A07	-12	13	-2	75 *
A05	A05	-40 *	10	18	-44 *
A06	A06	8	52 *	-20	-58 *

Reference Axis Correlations

	Factor1	Factor2	Factor3	Factor4
Factor1	100 *	-5	-16	0
Factor2	-5	100 *	-32	16
Factor3	-16	-32	100 *	26
Factor4	0	16	26	100 *

Reference Structure (Semipartial Correlations)

		Factor1	Factor2	Factor3	Factor4
A11	A11	90 *	-1	-3	5
A09	A09	82 *	12	-16	2
A14	A14	76 *	-6	22	-13
A13	A13	74 *	2	13	-13
A12	A12	71 *	16	9	33

A15	A15	64	*	7		28		5	
A08	A08	61	*	-3		20		-16	
A10	A10	57	*	-30		-35		-10	
A01	A01	2		82	*	-11		18	
A03	A03	35		55	*	-8		-19	
A04	A04	-29		53	*	24		-24	
A02	A02	24		49	*	20		1	
A16	A16	8		-8		69	*	1	
A17	A17	28		0		66	*	0	
A07	A07	-12		12		-2		70	*
A05	A05	-40		9		16		-41	*
A06	A06	8		47	*	-18		-54	*

Variance Explained by Each Factor Eliminating Other Factors

Factor1	Factor2	Factor3	Factor4
4.7557568	1.8892654	1.4270887	1.2607838

Factor Structure (Correlations)

		Factor1		Factor2		Factor3		Factor4	
A11	A11	91	*	7		13		0	
A09	A09	82	*	15		3		-1	
A14	A14	83	*	16		43	*	-27	
A13	A13	80	*	20		35		-25	
A12	A12	74	*	21		20		22	
A15	A15	72	*	27		46	*	-12	
A08	A08	68	*	18		39		-28	
A10	A10	48	*	-39		-37		7	
A01	A01	9		80	*	16		0	
A03	A03	43	*	67	*	28		-37	
A04	A04	-16		73	*	53	*	-48	*
A02	A02	35		66	*	48	*	-22	
A16	A16	23		22		77	*	-24	
A17	A17	44	*	33		81	*	-28	
A07	A07	-16		-9		-25		73	*
A05	A05	-32		24		29		-50	*
A06	A06	15		60	*	21		-66	*

Variance Explained by Each Factor Ignoring Other Factors

Factor1	Factor2	Factor3	Factor4
5.3142030	3.0267999	2.9236074	2.0431514

Final Communality Estimates: Total = 10.999820

A01	A02	A03	A04	A05	A06	A07	A08	A09
0.70167885	0.54630369	0.61111378	0.73920361	0.42568855	0.66452081	0.55729595	0.55458904	0.69712032

A10	A11	A12	A13	A14	A15	A16	A17
0.54608925	0.82917738	0.67555985	0.69909526	0.78175569	0.62972402	0.59981731	0.74108696

Annexure G

Non-parametric tests for comparisons: Kruskal-Wallis test and Mann-Whitney tests

```
                    The NPAR1WAY Procedure
              Analysis of Variance for Variable factor1
                    Classified by Variable B01
              B01                  N          Mean
              ffffffffffffffffffffffffffffffffffffffff
              Service             21       31.523810
              Others               1       33.000000
              Manufacturing       13       30.692308

    Source    DF    Sum of Squares    Mean Square    F Value    Pr > F
    fffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff
    Among      2         8.678388      4.339194     0.1420    0.8682
    Within    32       978.007326     30.562729
         Average scores were used for ties.

        Wilcoxon Scores (Rank Sums) for Variable factor1
                  Classified by Variable B01
                      Sum of     Expected      Std Dev         Mean
B01               N       Scores     Under H0     Under H0        Score
fffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff
Service          21        393.0        378.0    29.585966    18.714286
Others            1         23.0         18.0    10.061241    23.000000
Manufacturing    13        214.0        234.0    29.180660    16.461538

                      Kruskal-Wallis Test
                    Chi-Square        0.6380
                    DF                     2
                    Pr > Chi-Square    0.7269


              Analysis of Variance for Variable factor2
                    Classified by Variable B01
              B01                  N           Mean
              ffffffffffffffffffffffffffffffffffffffff
              Service             21       13.809524
              Others               1       12.000000
              Manufacturing       13       13.076923

    Source    DF    Sum of Squares    Mean Square    F Value    Pr > F
    fffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff
    Among      2         6.581685      3.290842     0.3352    0.7177
    Within    32       314.161172      9.817537
         Average scores were used for ties.

        Wilcoxon Scores (Rank Sums) for Variable factor2
                  Classified by Variable B01
                      Sum of     Expected      Std Dev         Mean
B01               N       Scores     Under H0     Under H0        Score
fffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff
Service          21        403.50        378.0    29.525363    19.214286
Others            1         11.50         18.0    10.040632    11.500000
Manufacturing    13        215.00        234.0    29.120887    16.538462

                      Kruskal-Wallis Test
                    Chi-Square        0.9731
                    DF                     2
                    Pr > Chi-Square    0.6148


              Analysis of Variance for Variable factor3
                    Classified by Variable B01
              B01                  N           Mean
              ffffffffffffffffffffffffffffffffffffffff
              Service             21        7.666667
              Others               1        4.000000
              Manufacturing       13        7.307692

    Source    DF    Sum of Squares    Mean Square    F Value    Pr > F
    fffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff
    Among      2        13.135531      6.567766     3.7912    0.0333
    Within    32        55.435897      1.732372
         Average scores were used for ties.

        Wilcoxon Scores (Rank Sums) for Variable factor3
                  Classified by Variable B01
                      Sum of     Expected      Std Dev         Mean
B01               N       Scores     Under H0     Under H0        Score
fffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff
Service          21        408.50        378.0    27.817049    19.452381
Others            1          1.50         18.0     9.459689     1.500000
Manufacturing    13        220.00        234.0    27.435976    16.923077

                      Kruskal-Wallis Test

                    Chi-Square        3.6000
                    DF                     2
                    Pr > Chi-Square    0.1653


              Analysis of Variance for Variable factor4
                    Classified by Variable B01
              B01                  N           Mean
```

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               ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
               Service              21        9.666667
               Others                1        9.000000
               Manufacturing        13        8.769231

     Source    DF    Sum of Squares    Mean Square     F Value    Pr > F
     ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
     Among      2          6.568498       3.284249      1.2666    0.2955
     Within    32         82.974359       2.592949

            Wilcoxon Scores (Rank Sums) for Variable factor4
                      Classified by Variable B01
                          Sum of      Expected       Std Dev         Mean
B01                N       Scores      Under H0      Under H0         Score
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Service           21       423.50         378.0     29.006186     20.166667
Others             1        14.50          18.0      9.864076     14.500000
Manufacturing     13       192.00         234.0     28.608822     14.769231

                          Kruskal-Wallis Test
                       Chi-Square        2.4613
                       DF                     2
                       Pr > Chi-Square    0.2921


               Analysis of Variance for Variable factor1
                      Classified by Variable B02
               B02              N                Mean
               ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
               Yes             23            31.695652
               No              12            30.416667

     Source    DF    Sum of Squares    Mean Square     F Value    Pr > F
     ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
     Among      1         12.899482      12.899482      0.4371    0.5131
     Within    33        973.786232      29.508674
                  Average scores were used for ties.

            Wilcoxon Scores (Rank Sums) for Variable factor1
                      Classified by Variable B02
                     Sum of      Expected       Std Dev         Mean
     B02      N       Scores      Under H0      Under H0         Score
     ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
     Yes     23       413.50         414.0     28.665970     17.978261
     No      12       216.50         216.0     28.665970     18.041667

                        Wilcoxon Two-Sample Test
                     Statistic            216.5000
                     Normal Approximation
                     Z                      0.0000
                     One-Sided Pr <  Z       0.5000
                     Two-Sided Pr > |Z|      1.0000
                     t Approximation
                     One-Sided Pr <  Z       0.5000
                     Two-Sided Pr > |Z|      1.0000
               Z includes a continuity correction of 0.5.

                          Kruskal-Wallis Test
                     Chi-Square             0.0003
                     DF                          1
                     Pr > Chi-Square        0.9861

               Analysis of Variance for Variable factor2
                      Classified by Variable B02
               B02              N                Mean
               ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
               Yes             23            13.739130
               No              12            13.000000

     Source    DF    Sum of Squares    Mean Square     F Value    Pr > F
     ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
     Among      1          4.308075       4.308075      0.4493    0.5073
     Within    33        316.434783       9.588933
                  Average scores were used for ties.

            Wilcoxon Scores (Rank Sums) for Variable factor2
                      Classified by Variable B02
                     Sum of      Expected       Std Dev         Mean
     B02      N       Scores      Under H0      Under H0         Score
     ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
     Yes     23        434.0         414.0     28.607251     18.869565
     No      12        196.0         216.0     28.607251     16.333333

                        Wilcoxon Two-Sample Test
                     Statistic            196.0000
                     Normal Approximation
                     Z                     -0.6816
                     One-Sided Pr <  Z       0.2477
                     Two-Sided Pr > |Z|      0.4955
                     t Approximation
                     One-Sided Pr <  Z       0.2500
                     Two-Sided Pr > |Z|      0.5001
               Z includes a continuity correction of 0.5.

                          Kruskal-Wallis Test
                     Chi-Square             0.4888
                     DF                          1
                     Pr > Chi-Square        0.4845
```

Analysis of Variance for Variable factor3
Classified by Variable B02

B02	N	Mean
Yes	23	7.695652
No	12	6.916667

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	1	4.785197	4.785197	2.4756	0.1252
Within	33	63.786232	1.932916		

Average scores were used for ties.

Wilcoxon Scores (Rank Sums) for Variable factor3
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	449.0	414.0	26.952058	19.521739
No	12	181.0	216.0	26.952058	15.083333

Wilcoxon Two-Sample Test

Statistic	181.0000
Normal Approximation	
Z	-1.2801
One-Sided Pr < Z	0.1003
Two-Sided Pr > |Z|	0.2005
t Approximation	
One-Sided Pr < Z	0.1046
Two-Sided Pr > |Z|	0.2092

Z includes a continuity correction of 0.5.

Kruskal-Wallis Test

Chi-Square	1.6864
DF	1
Pr > Chi-Square	0.1941

Analysis of Variance for Variable factor4
Classified by Variable B02

B02	N	Mean
Yes	23	9.478261
No	12	9.000000

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	1	1.803727	1.803727	0.6784	0.4160
Within	33	87.739130	2.658762		

Average scores were used for ties.

Wilcoxon Scores (Rank Sums) for Variable factor4
Classified by Variable B02

B02	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Yes	23	449.50	414.0	28.104218	19.543478
No	12	180.50	216.0	28.104218	15.041667

Wilcoxon Two-Sample Test

Statistic	180.5000
Normal Approximation	
Z	-1.2454
One-Sided Pr < Z	0.1065
Two-Sided Pr > |Z|	0.2130
t Approximation	
One-Sided Pr < Z	0.1108
Two-Sided Pr > |Z|	0.2215

Z includes a continuity correction of 0.5.

Kruskal-Wallis Test

Chi-Square	1.5956
DF	1
Pr > Chi-Square	0.2065

Analysis of Variance for Variable factor1
Classified by Variable B03

B03	N	Mean
10-50	10	28.900000
<10	23	32.260870
>200	1	26.000000
50-120	1	37.000000

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	3	139.350932	46.450311	1.6994	0.1875
Within	31	847.334783	27.333380		

Average scores were used for ties.

Wilcoxon Scores (Rank Sums) for Variable factor1
Classified by Variable B03

B03	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score

10-50	10	136.50	180.0	27.282370	13.650000
<10	23	459.00	414.0	28.665970	19.956522
>200	1	5.00	18.0	10.061241	5.000000
50-120	1	29.50	18.0	10.061241	29.500000

Kruskal-Wallis Test

Chi-Square	5.5517
DF	3
Pr > Chi-Square	0.1356

Analysis of Variance for Variable factor2
Classified by Variable B03

B03	N	Mean
10-50	10	13.500000
<10	23	13.260870
>200	1	13.000000
50-120	1	19.000000

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	3	31.808075	10.602692	1.1376	0.3492
Within	31	288.934783	9.320477		

Average scores were used for ties.

Wilcoxon Scores (Rank Sums) for Variable factor2
Classified by Variable B03

B03	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
10-50	10	186.50	180.0	27.226485	18.650000
<10	23	393.00	414.0	28.607251	17.086957
>200	1	16.50	18.0	10.040632	16.500000
50-120	1	34.00	18.0	10.040632	34.000000

Kruskal-Wallis Test

Chi-Square	2.7139
DF	3
Pr > Chi-Square	0.4379

Analysis of Variance for Variable factor3
Classified by Variable B03

B03	N	Mean
10-50	10	7.300000
<10	23	7.521739
>200	1	6.000000
50-120	1	8.000000

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	3	2.732298	0.910766	0.4288	0.7338
Within	31	65.839130	2.123843		

Average scores were used for ties.

Wilcoxon Scores (Rank Sums) for Variable factor3
Classified by Variable B03

B03	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
10-50	10	168.0	180.0	25.651183	16.800000
<10	23	433.0	414.0	26.952058	18.826087
>200	1	6.0	18.0	9.459689	6.000000
50-120	1	23.0	18.0	9.459689	23.000000

Kruskal-Wallis Test

Chi-Square	2.1613
DF	3
Pr > Chi-Square	0.5396

Analysis of Variance for Variable factor4
Classified by Variable B03

B03	N	Mean
10-50	10	9.700000
<10	23	9.043478
>200	1	10.000000
50-120	1	11.000000

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	3	6.486335	2.162112	0.8070	0.4996
Within	31	83.056522	2.679243		

Average scores were used for ties.

Wilcoxon Scores (Rank Sums) for Variable factor4
Classified by Variable B03

B03	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
10-50	10	193.00	180.0	26.747732	19.300000
<10	23	382.50	414.0	28.104218	16.630435
>200	1	23.50	18.0	9.864076	23.500000
50-120	1	31.00	18.0	9.864076	31.000000

Kruskal-Wallis Test

Chi-Square	2.5887
DF	3
Pr > Chi-Square	0.4595

Analysis of Variance for Variable factor1
Classified by Variable B04

B04	N	Mean
15-25	2	37.500000
<5	31	31.096774
5-15	1	26.000000
25-50	1	29.000000

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	3	111.476037	37.158679	1.3162	0.2868
Within	31	875.209677	28.232570		

Average scores were used for ties.

Wilcoxon Scores (Rank Sums) for Variable factor1
Classified by Variable B04

B04	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
15-25	2	61.0	36.0	14.017936	30.500000
<5	31	555.0	558.0	19.214228	17.903226
5-15	1	5.0	18.0	10.061241	5.000000
25-50	1	9.0	18.0	10.061241	9.000000

Kruskal-Wallis Test

Chi-Square	5.4008
DF	3
Pr > Chi-Square	0.1447

Analysis of Variance for Variable factor2
Classified by Variable B04

B04	N	Mean
15-25	2	18.500000
<5	31	13.129032
5-15	1	13.000000
25-50	1	15.000000

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	3	56.758986	18.919662	2.2218	0.1054
Within	31	263.983871	8.515609		

Average scores were used for ties.

Wilcoxon Scores (Rank Sums) for Variable factor2
Classified by Variable B04

B04	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
15-25	2	66.00	36.0	13.989222	33.000000
<5	31	522.50	558.0	19.174870	16.854839
5-15	1	16.50	18.0	10.040632	16.500000
25-50	1	25.00	18.0	10.040632	25.000000

Kruskal-Wallis Test

Chi-Square	5.2217
DF	3
Pr > Chi-Square	0.1563

Analysis of Variance for Variable factor3
Classified by Variable B04

B04	N	Mean
15-25	2	9.000000
<5	31	7.387097
5-15	1	6.000000
25-50	1	7.000000

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	3	7.216590	2.405530	1.2154	0.3206
Within	31	61.354839	1.979188		

Average scores were used for ties.

Wilcoxon Scores (Rank Sums) for Variable factor3
Classified by Variable B04

B04	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
15-25	2	57.00	36.0	13.179817	28.500000
<5	31	555.50	558.0	18.065427	17.919355
5-15	1	6.00	18.0	9.459689	6.000000
25-50	1	11.50	18.0	9.459689	11.500000

Kruskal-Wallis Test

Chi-Square	4.4177
DF	3
Pr > Chi-Square	0.2197

Analysis of Variance for Variable factor4
Classified by Variable B04

B04	N	Mean
15-25	2	11.000000
<5	31	9.161290
5-15	1	10.000000
25-50	1	10.000000

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	3	7.349309	2.449770	0.9240	0.4408
Within	31	82.193548	2.651405		

Average scores were used for ties.

Wilcoxon Scores (Rank Sums) for Variable factor4
Classified by Variable B04

B04	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
15-25	2	62.00	36.0	13.743234	31.000000
<5	31	521.00	558.0	18.837697	16.806452
5-15	1	23.50	18.0	9.864076	23.500000
25-50	1	23.50	18.0	9.864076	23.500000

Average scores were used for ties.

Kruskal-Wallis Test

Chi-Square	4.4195
DF	3
Pr > Chi-Square	0.2196