



**Service Quality Delivery in the Food and Beverage Industry
in the Western Cape**

by

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DECLARATION

I, Vanessa Audrey Arizon hereby declare that the contents of this dissertation represent my own unaided work, and that the dissertation has not previously been submitted for academic examination towards any qualification. Furthermore it presents my own opinions and not those of the Cape Peninsula University of Technology.

Signature:

Date:

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude and appreciation to the following:

- God for giving me grace and love
- My family for their motivation and support
- My mother for her example in my life
- Professor Watkins and Dr Yan for their guidance and support

ABSTRACT

The Quality Control laboratory in the South African Breweries (SAB) measures the quality of raw materials to final product to enable the plant to make process changes if required. The brewing laboratory also co-ordinates taste sessions, and maintains and calibrates equipment for the plant. They also have internal verification (Reference control) systems and validation (standards) systems in place to ensure accuracy of measurements. The Service Level Agreement (SLA) scores according to the researcher are low owing to staff cuts and ineffective time management.

The aim of this research is to improve SLA scores and to investigate if using SLA scores is the best way to measure service quality in the Quality Control department of SAB. The researcher aims to use SERVQUAL as a measuring tool to measure service quality in conjunction with SLA's. Because the laboratory is a service department, it is expected by brewing internal customers that the laboratory provides the plant with quality data and equipment support in the virtual laboratories in the plant. Furthermore it is expected that the service provided will always be of a high standard, and that SLA scores will be of a high standard as well.

The major issue with service quality in the SAB laboratory is the low level of SLA scores. The focus areas of SLA's currently are:

- Quality Assurance (QA)/ Technical/ Production interaction.
- Reference control.
- Equipment support.
- Routine analysis and ad hoc requests.
- Trial support.
- In process taste requirements.
- Package product taste requirements (Routine, profile, trials and flavour stability).

The low score of SLA'S are mainly due to equipment support and reference control. The other factors also contribute to the low score; however the above mentioned two consistently return low scores. The results of service quality are not significantly improved through the use of SLA's calling for the requirement to improve service quality using the SERVQUAL instrument.

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GLOSSARY OF TERMS TERMS

SAB:	South African Breweries limited
SLA	Service level agreement is an agreement between customer and service provider to measure the level of service that was performed.
ILEC	Interlaboratory Error Control is a inter-brewery measure for accuracy and precision of results of the laboratory.
CAP	Competency Acquisition process to improve and measure the level of competency of brewery staff.
QA department	Quality Assurance department
SERVQUAL	The SERVQUAL instrument consists of 22 statements for assessing consumer perceptions
IMP	Improvement management process IMP is about holistic, aligned, customer-focused goals.Goals that are both output and behaviour orientated, defined in collaboration with key customers and aligned with business strategy. An IMP that engages and develops each unique individual and team in delivery of holistic aligned customer-focused goals for sustained high performance (sustained high performance that continually anticipates and meets customer expectations) IMP develops identifies and creates opportunities for team and individual learning to enable and sustain high performance.
E-Mark system	E-mark is a standard drawn up in accordance with EEC regulations, which serves as a guarantee by the packer or

importer, of compliance to the stipulated average quantity of packages, acting as a meteorological passport throughout Europe and South Africa.e-Mark certification guarantees conformance to standards.

ISO 14000 system

It is an environmental protection system.

The OSHAct

To ensure the health and safety of all employees.

HACCP

This is a system to prevent harm to employee and consumer.

ISO:9001:2000 system

The quality standard is based on 8 principles: Customer Focus, Leadership, Involvement of people, Process Approach, System Approach to Management, Continual Improvement, Factual Approach to Decision Making, Mutually beneficial Supplier Relationships.

OSHACT

A system to ensure the health and safety of all employees

PH

pH is the measurement of all stages of acidity or alkalinity of a sample .

Limit extract

The limit to which a sample is fermented by brewer's yeast under ideal conditions, that is, at an elevated temperature and with agitation, is termed the limit of attenuation or the limit to which it can be fermented.

Isohumulones

According to SAB section 7.16 (2002:1):The bitterness in beer arises from a group of closely related compounds which are extracted from hops during wort boiling. These compounds are isomerised under the wort pH and boiling conditions. "Isohumulone" (Iso.) is an index term used to describe these compounds.

The vicinal diketone (VDK) According to the SAB section 7.32 (2002:1): The vicinal diketone (VDK) determination is a measure of the amount of free diacetyl, 2,3 pentanedione and their precursors present in a sample i.e. the total VDK concentration in a sample. Vicinal diketones are normal products of yeast metabolism and are formed during fermentation. The precursors are excreted from the yeast and are oxidised to diacetyl and 2,3 pentanedione in the beer. These compounds are then reabsorbed by the yeast and metabolised to less flavour active compounds.

Total quality Management (TQM) A set of management practices throughout the organisation, geared to ensure the organisation consistently meets or exceeds customer requirements.

A Cycle of Service (C of S) is much like a flowchart but has the important difference is that it is written from the perspective of the customer, and is the sequence of events or Moments of Truth (MoT) experienced by the customer in dealing with the organisation. As the name suggests, a C of S is normally indicated as a circle. "A flowchart shows the progress of a document or product, a cycle of service shows the events experienced by a customer."

Moments of truth (MoT) Bicheno (2002:100), points out that a moment of truth is that moment in time when a customer make a judgement about the quality of that organization's products or services through contact with the products, systems, people, or procedures of an organization.

Service Blueprinting Bicheno (2002:101), notes that service blueprinting is the procedure of making a flowchart or map of a service process. This is one the longest established service mapping tools and was originally proposed by Shostack.

SERVPERF

Nhat and Hau (2007: **Online**), points out that Cronin and Taylor developed a performance-based service quality measurement scale referred to as SERVPERF. The key difference between these two scales is that SERVQUAL operationalises service quality by making comparisons of the perceptions of the service received with expectations, while SERVPERF maintains only the perceptions of service quality. The SERVPERF scale consists of 22 perception items, excluding any consideration of expectations.

LIMS

It is a system for capturing analytical data and is also used to analyse data and draw reports.

CHAPTER 1: SCOPE OF THE RESEARCH

1 INTRODUCTION AND MOTIVATION

The Brewing laboratory in the South African Breweries (SAB), provides testing services to the brewing division, where many factors have been identified that impact on service quality. This study evaluates the brewing laboratory in the SAB in terms of the Service Level Agreements (SLA's), to measure service quality. The current SLA measure has been used from time to time over the last 3 years, and more frequently since September 2009.

The brewing laboratory emphasises the accuracy of results with the aid of a system known as Interlab Error Control (ILEC), which is an inter-brewery measure for accuracy and precision of measurement, (reference control management, and using standards as verification). Employee competence is ensured via a Competency Acquisition process (CAP), and laboratory excellence is measured between breweries via Laboratory Excellence Index (LEI). To ensure internal customer satisfaction, the brewing division scores the level of service via SLA's on a monthly basis. The brewery also holds ISO 22000 and E-mark accreditations. Furthermore, the brewery uses the Six Sigma DMAIC process to ensure continuous improvements. Internal auditing on the quality systems takes place at frequent intervals to ensure compliance with its business standards. Against this background it could be said that SAB has a rigorous quality programme and that quality is of high priority.

The major issue with service quality in the SAB laboratory is the low level of SLA scores. The focus areas of SLA's currently are:

- Quality Assurance (QA)/ Technical/ Production interaction.
- Reference control.
- Equipment support.
- Routine analysis and ad hoc requests.
- Trial support.
- In process taste requirements.
- Package product taste requirements (Routine, profile, trials and flavour stability).

The low score of SLA's is mainly due to equipment support and reference control. The other factors also contribute to the low score; however the above mentioned two consistently return low scores. The results of service quality are not significantly improved through the use of SLA's calling for the requirement to improve service quality using the SERVQUAL instrument.

1.1 ABBREVIATED LITERATURE REVIEW

1.1.1 Origin of SERVQUAL

According to Arambewela and Hall (2006: **Online**), in their revolutionary study on service quality, Parasuraman developed the SERVQUAL instrument to measure service quality in 1988. The SERVQUAL instrument was initially used to assess customer perceptions of service quality in service and retailing organizations. It was presented as a synthetic scale with a high level of dependability and validity, constructive in many service situations.

1.1.2 SERVQUAL as a measuring instrument

According to Han and Baek (2004: **Online**), Parasuraman recognized more detailed dimensions of service quality in terms of SERVQUAL, to measure customer's perceptions and expectations from service. The SERVQUAL instrument contains five fundamental dimensions, with two sets of 22 item statements for the "expectation" and "perception" sections of the questionnaire. The measurement of perceived service quality is carried out by subtracting customer perception scores from customer expectation scores, both for each dimension and overall. According to Han and Baek (2004: **Online**), the five dimensions of SERVQUAL are:

- "Tangibles, which pertain to the physical facilities, equipment, personnel and communication materials.
- Reliability, which refers to the ability to perform the promised services dependably and accurately.
- Responsiveness, which refers to the willingness of service providers to help customers and provide prompt service.

- Assurance, which relates to the knowledge and courtesy of employees and their ability to convey trust and confidence.
- Empathy, which refers to the provision of caring and individualized attention to customers.”

According to Han and Baek (2004: **Online**), since the development of the SERVQUAL in 1988, numerous researchers have acknowledged that both the instrument itself and the conceptualization of service quality may profit from further modification. Cronin and Taylor have developed instruments to measure service quality pertaining only to customer perceptions. Following countless studies involving the appropriateness of SERVQUAL in measuring service quality in diverse types of service, they endeavoured to adapt the novel SERVQUAL items to various service contexts by somewhat altering the original items.

According to Arambewela and Hall (2006: **Online**), in terms of SERVQUAL, the expectations are not seen as predictions (what is likely to happen), but as needs or wants of consumers (what should happen). These sets of items are operationalised using a 7-point bi-polar scale labelled, Strongly Agree (7) to Strongly Disagree (1). Nearly half of the items are worded negatively with negative wording indicated by (-). “The scale produced scores, for the total scale and each factor, ranging between minus 6 and plus 7, where the positive scores are indicated as perceptions exceeding expectations. This SERVQUAL score is used to assess the quality of service, called the gap score computed by taking the difference for 1 to -7 scales and then averaging the number of items either in the total scale or for each subscale.

According to Arambewela and Hall (2006: **Online**), Parasuraman identified five dimensions of service quality, namely tangibility, reliability, responsiveness, assurance and empathy. Tangibility refers to the appearance of physical facilities, equipment, personnel, and communication materials; reliability to the ability to perform the promised service accurately and dependably; responsiveness to willingness to assist customers and provide prompt service; assurance to the knowledge and courtesy of employees and their ability to convey trust and confidence; and empathy to the caring; and individualised attention given to customers. It is possible to adapt the SERVQUAL dimensions to different service settings, depending on the nature of the inquiry. The practical application

of the measurement approach has been perceived as one of the major strengths of SERVQUAL over other measures.

According to Arambewela and Hall (2006: **Online**) the other strengths of SERVQUAL can be identified as, the reliability and validity of the scale in comparing customers' expectations and perceptions over time; the skill to compare own SERVQUAL scores against competitors; the relative importance of the five dimensions in influencing service quality perceptions; the possible use of measure in segmenting customers into several apparent quality segments (eg. High, Medium and Low), and the ability to analyse on the basis of (a) demographic (b) psychographic, and (c) other profiles; and the practical implications for companies to improve the global perception of its service quality.

According to Arambewela and Hall (2006: **Online**), the rising recognition of the SERVQUAL instrument in the midst of marketing practitioners and researchers is seen by the diversity of its use in research pursuits ranging from competitor analysis, segmentation, to customer profiling and covering the services, and manufacturing industries. The major applications, however, are in the service industry.

1.1.3 Applications of SERVQUAL

According to Han and Baek (2004: **Online**), many studies of service marketing have aimed at defining service quality and developing instruments to measure it. Since Parasuraman introduced SERVQUAL, several studies have used the instrument to measure service quality in various domains, ranging from financial services, health services, travel agent services, and retailing services, to restaurants.

1.1.4 Identified issues when using SERVQUAL

According to Van Dyke and Prybutok and Kappelman (1999: **Online**), the difficulties linked with the SERVQUAL are identified and grouped in four main categories namely: The use of difference or gap scores, poor predictive and convergent validity, the ambiguous definition of the expectations construct, and unstable dimensionality:

- **Problems with the use of difference or gap scores.** A difference score is formed by subtracting one measure from another in an effort to produce a third measure of

a distinct construct. For example, in scoring the SERVQUAL instrument, the expectations score is subtracted from the perceptions score to create such a gap measure of service quality. Quite a few problems with the employment of difference scores make them an unfortunate choice as measures of psychological constructs. The depicted problems related to the employment of difference measures include low reliability, poor discriminant validity, spurious correlations, and variance restrictions.

- **Reliability problems with gap scores:** Numerous studies reveal that Cronbach's alpha, a widely utilised method of estimating reliability, is inappropriate for difference scores. This is apparent because the reliability of a difference score is dependent on the reliability of the component scores and the association between them. With an increase in the correlation of the component scores, the reliability of the difference scores is decreased. As a result, Cronbach's alpha tends to overestimate the reliability of the difference scores when the component scores are correlated. Such is the case of the SERVQUAL instrument.
- **Validity issues:** Another difficulty with the SERVQUAL instrument concerns the poor prognostic and convergent validities of the measure.
- **Ambiguity of the expectations construct:** The SERVQUAL expectations have been defined as desires or wants, what a service provider should have, normative expectations, ideal standards, desired service, and the level of service a customer hopes to receive. These various definitions and matching operationalizations of expectations in the SERVQUAL literature result in a concept that is not entirely defined and is open to a variety of interpretations. These various interpretations can result in potentially serious measurement validity problems. For example, the classic ideal point interpretation results in an inverse of the relationship between SERVQUAL calculated as perceptions minus expectations (P-E) and perceived SERVQUAL (P only), for all values when perception scores are greater than expectation scores (i.e., $P > E$).
- **Unstable dimensionality of the SERVQUAL instrument:** Results obtained from a number of studies have established that the five dimensions claimed for the SERVQUAL instrument are unsound. The unstable dimensionality of SERVQUAL confirmed in many domains including information services, is not just a statistical

curiosity. The scoring process for SERVQUAL calls for averaging the P-E gap scores within each dimension. A resulting high expectation coupled with a low perception for one item would be cancelled by a low expectation and high perception for another item within the same dimension. This scoring method is only suitable if all of the items in that dimension are interchangeable. However, given the unstable number and pattern of the factor structures, averaging groups of items to calculate separate scores for each dimension cannot be justified.

1.1.5 Benefits of SERVQUAL

According to Arambewela and Hall (2006: **Online**), results can be used for the formation of benchmarks and to institute best practice for services by comparing SERVQUAL scores of major competitors within the same industry. By measuring company specific SERVQUAL scores over several periods, trends can be recognized and analyzed.

1.1.6 SERVPERF

According to Nhat and Hau (2007: **Online**), Cronin and Taylor developed a performance-based service quality measurement scale referred to as SERVPERF. The key difference between these two scales is that SERVQUAL operationalises service quality by making comparisons of the perceptions of the service received with expectations, while SERVPERF maintains only the perceptions of service quality. The SERVPERF scale consists of 22 perception items, excluding any consideration of expectations. The superiority of SERVPERF over SERVQUAL has been depicted in numerous studies. According to Landrum, Prybutok, Zhang and Peak (2009: **Online**), the SERVPERF instrument empirically surpasses the SERVQUAL scale across numerous industries.

1.1.7 The gap model

According to Haksever, Cook, and Chaganti (1997: **Online**), Zeithaml, Parasuraman, and Berry in 1990 developed a model of service quality (Gaps), that recognized gaps in service quality formulated measures to close them (PZB Gap Model). The Gaps model

has been utilised in large service corporations, but is yet to be implemented in small service firms.

According to Liao and Yu-Pan (2007: **Online**), consumer perceptions of service quality are influenced by five gaps transpiring for the duration of the process of service delivery.

'Gaps' for the PZB Gap Model are elaborated upon below:

- **Gap 1:** Not knowing what customers expect. The difference between “expected service of customer” and “management perceptions of customers expectations”.
- **Gap 2:** Not selecting the right service design. The difference between “service quality specification” and “management perceptions of customer’s expectations”.
- **Gap 3:** Not delivering to service standards. The difference between “service qualities specification” and “service delivery”.
- **Gap 4:** Not matching performance to promises. The difference between ‘external communications to customers’ and ‘service delivery’.
- **Gap 5:** Perceived service quality. The difference between “expected service” and “perceived service”. (Gap 5 results from the sum of degree and direction of Gaps 1 to 4).

A Conceptual Model of Service quality (Liao and Yu-Pan (2007: **Online**) is graphically depicted in Figure 1.1

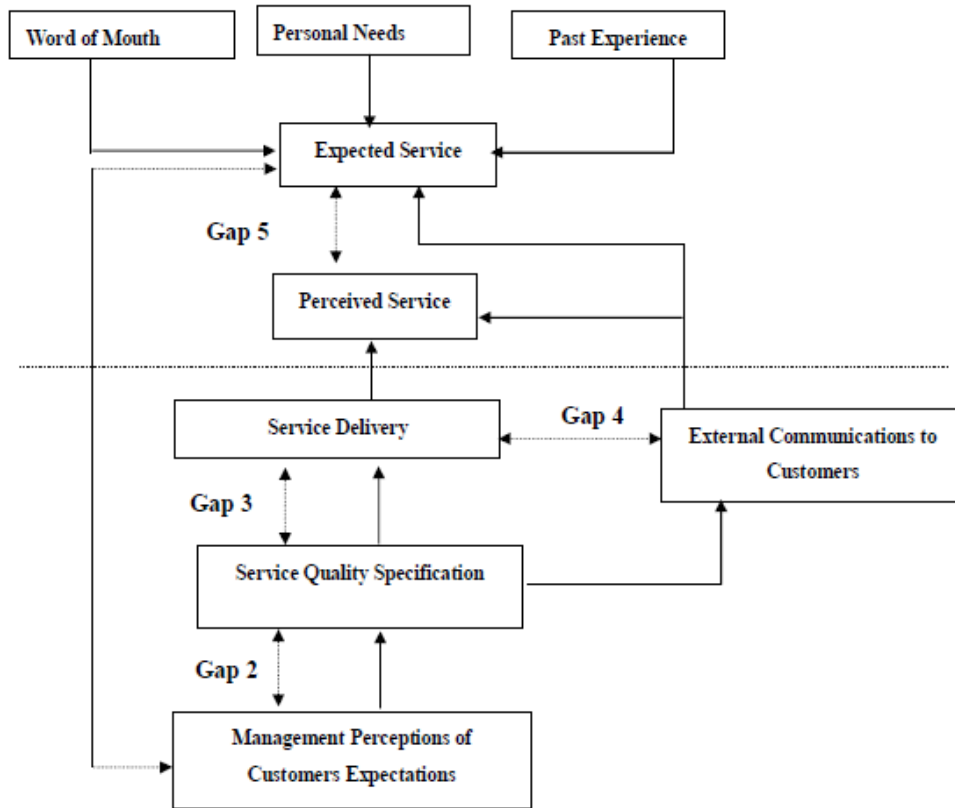


Figure 1.1: A Conceptual Model of Service Quality (Source: Liao Yu-Pan, 2007: **Online**)

1.2 BACKGROUND TO THE RESEARCH PROBLEM

The brewing laboratory in the SAB measures quality of raw materials to final product (raw materials-effluent samples, storm water samples, wort samples, fermenting vessel samples, storage vessel samples, filtration samples and final product-packaged product samples), to enable the plant to make process changes if required. The brewing laboratory also co-ordinates taste sessions, and maintain equipment for the plant. Furthermore they also have internal verification and validation systems in place. The SLA scores are low owing to staff cuts and ineffective time management.

SLA's forms part of the customer feedback process in the performance review process, which in turn is part of the Improvement Management Process (IMP) at the SAB. The SLA process started in earnest in November 2009, with initial scores running at 50% and is now levelling around 68% year to date. In this respect see Figure 1.2 below.

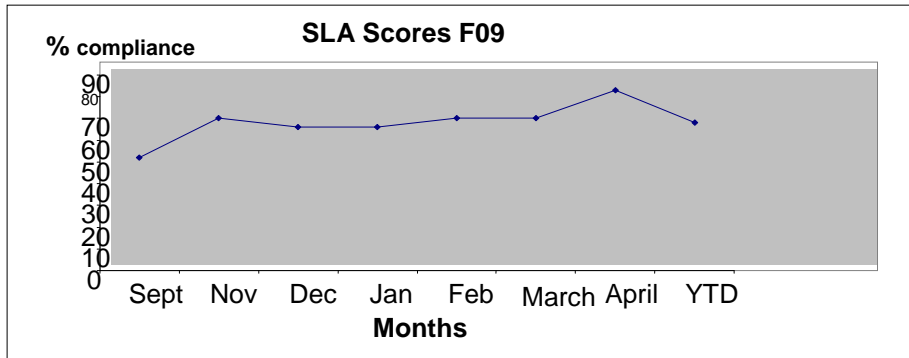


Figure 1.2: SLA monthly scores (Source: South African Breweries)

The aim of this research is to improve SLA scores and to investigate if using SLA scores is the best way to measure service quality in the Quality Control department. The researcher aims to use SERVQUAL as a measuring tool to measure service quality. Because the laboratory is a service department, it is expected that the laboratory provides the plant with quality data and equipment support in the virtual laboratories in the plant. Furthermore it is expected that the service provided will always be of a high standard, and that SLA scores will be of high standard as well.

Figure 1.3 reflects the key factors that affect poor service quality, which are equipment support, reference control and routine and adhoc requests.

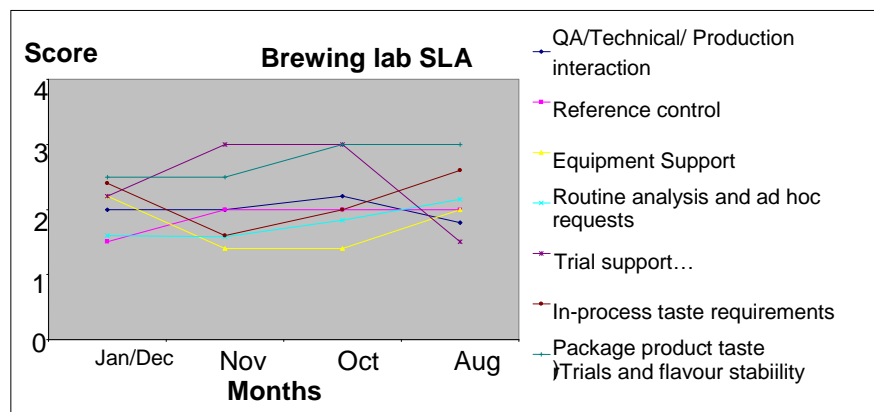


Figure1.3: Elements of SLA used in the brewing laboratory at South African Breweries (Source: South African Breweries)

1.2.1 Statement of the research problem

Against the above background, the research problem to be researched within the ambit of this dissertation reads as follows: Poor equipment support, poor reference control and slow response to routine and adhoc requests contribute to low SLA scores within the SAB.

1.3 RESEARCH QUESTION

The research question to be researched within the ambit of this dissertation, reads as follows: “How can SERVQUAL be used to improve service quality within the SAB?”

1.3.1 Investigative (sub)questions

The investigative questions to be researched in support of the research hypothesis reads as follows:

- What are the key factors that influence service quality?
- What are the benefits of using SERVQUAL instrument within a company?
- What are the differences between the SLA and SERVQUAL instrument?
- How can the SERVQUAL instrument be effectively applied to measure quality outputs?

1.4 PRIMARY RESEARCH OBJECTIVES

The primary research objectives of this dissertation read as follows:

- To investigate the key factors that impact on service quality within the laboratory of the SAB.
- To determine the benefits of using SERVQUAL instrument.
- To provide possible solutions for the laboratory to improve service quality by applying the SERVQUAL instrument.

1.5 THE RESEARCH PROCESS

Remenyi, Williams, Money and Swartz (2002:64-65) explain the research process as consisting of the following seven phases, namely:

- Reviewing the literature.
- Formalizing a research question.
- Establishing the methodology.
- Collecting evidence.
- Developing conclusions.
- Understanding the limitations of the research.
- Producing management guidelines or recommendations.

The above listed research process will be followed in this dissertation.

1.6 THE RESEARCH DESIGN AND METHODOLOGY

Case study research will serve as the research method in this dissertation. According to Yin (1994:19), a research design can be defined as, “the logical sequence that connects the empirical data to a study’s initial research question and ultimately to its conclusions. Colloquially, a research design is an action plan from getting here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions and answers about these questions”.

The type of research that will be conducted will be descriptive research, as it will describe phenomena as they exist. The research will be undertaken in the social world. According to Babbie (2005:120) “social science has to do with how are, and why”. The research will be theoretical in nature and conducted in terms of both positivistic and phenomenological research paradigms.

According to Yin (1994:1), a case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when boundaries between phenomenon and context are not clearly evident. Furthermore:

- 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 analysis. In this sense, the case study is neither a data collection tactic nor merely a design feature alone, but “a comprehensive research strategy.”
- A case study is typically used when contextual conditions are the subject of research.

A case study method will be utilised in this research. The Brewing laboratory processes will serve as the unit of analysis, while the Brewing and Packaging departments will serve as the sample frame. Sample selection will be executed using probability sampling, using the random sampling method. The sample size will be all seven employees of the brewing department. Questionnaires will serve as data collection methodology.

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, neighbourhoods or public agencies.
- Research into the social sciences, academic disciplines as well as professional fields such as business administration, management sciences and social work.

1.7 DATA COLLECTION DESIGN AND METHODOLOGY

Questionnaires fall within the ambit of a broader definition of “survey research” or “descriptive survey”. For absolute clarity, the concept of “survey” is defined by Remenyi et al. (2002:290) 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". A questionnaire is a list of carefully structured questions, chosen after considerable testing with a view to elicit reliable responses from a chosen sample. The aim is to establish what

a selected group of participants do, think or feel. A positivistic approach suggests structured “closed” questions, while a phenomenological approach suggests unstructured “open-ended” questions. Questionnaires will serve as the data collection methodology.

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 specifically, 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 defined 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 (1979:59), 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, one may observe someone shaking or sweating before

an interview, however, you are not actually observing anxiety, but a manifestation of anxiety.

Reliability (also referred to as “trustworthiness”), is concerned with the findings of the research (Collis & Hussey, 2003:186). The findings can be said to be reliable if anyone else repeats the research and obtains 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 then 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.

1.9 ETHICS

In the context of research, according to Saunders Lewis and Thornhill (2000:130), ethics refers to “the appropriateness of one’s behavior in relation to the rights of those who become the subject of one’s work, or are affected by it”. The following ethics will be observed in the research study:

- **Informed consent:** Questions are designed for participants to answer and participants should be given the choice of either participating or not participating, and furthermore be informed in advance about the nature of the study.
- **Right to privacy:** Participants names and identity numbers will not appear in the paper. All information gathered will be used only for research purposes.
- **Honesty with professional colleagues:** Findings must be reported in a complete and honest fashion, without misrepresenting what has been done or intentionally

misleading others as to the nature of it. Data may not be fabricated to support a particular conclusion.

- **Confidentiality/anonymity:** It is good research practice to offer confidentiality or anonymity, as this will lead to participants giving more open and honest responses.

1.10 RESEARCH ASSUMPTIONS

The following research assumptions will apply to this research study:

- The laboratory will benefit from SERVQUAL survey
- The SERVQUAL survey is more accurate than SLA's.

1.11 RESEARCH CONSTRAINTS

Research constraints refer to any applicable inhibiting factor which would in any way constrain the researcher's ability to conduct the research in a normal way. This is primarily attributed to two factors:

- **Limitations:** Not all in the Brewing department and packaging departments may wish to participate in the research.
- **Delimitations:** Questionnaires will be limited to staff in the Brewing department and Packaging departments.

1.12 SIGNIFICANCE OF THE PROPOSED RESEARCH

The significance of the proposed research pertains to the fact that this is the first known study of using the SERVQUAL instrument in the SAB laboratory. It is anticipated that value will be added from the results for continuous improvement in the laboratory environment.

1.13 CHAPTER AND CONTENT ANALYSIS

The following chapter and content analysis will be applicable in this research study:

- **Chapter 1 - Scope of the research:** In this chapter, a high level background will be provided of the scope of the research taking place in a laboratory environment in the

Food and beverage Industry. The research process will be explained and the research design and methodology elaborated upon. The research constraints will be listed, and a high level overview provided of the chapter and content analysis of the dissertation. The chapter will be concluded with a list of primary research objectives.

- **Chapter 2 - Holistic perspective of the research environment:** In this chapter, service delivery in the laboratory in South African Breweries will be analyzed in detail.
- **Chapter 3 - Quality management (A literature review):** In this chapter, an in depth literature review will be inducted on the concept of “service quality”.
- **Chapter 4 - Data collection design and methodology:** In this chapter the survey environment will be elaborated upon and the de-limitations of the survey listed. The approach to data collection will be explained and the target population defined. The measurement scales to be used in the survey and the survey design will be explained in detail. The chapter will be concluded with a list of questions to be posed to the target population.
- **Chapter 5 - Data analysis and interpretation of results:** In this chapter, data gleaned from the survey conducted in Chapter 4, will be analyzed in detail and interpreted in terms of the primary theme of the dissertation. In addition, the results from the survey will be mapped to the literature review conducted in Chapter 3.
- **Chapter 6 – Conclusion:** In this chapter, the research will be concluded. The research design and methodology, the research process, the research problem, research question and investigative questions and survey findings will be revisited and final conclusions drawn. In addition, a holistic reflective overview will be provided of the research.

CHAPTER 2: BACKGROUND TO THE RESEARCH ENVIRONMENT: A HOLISTIC PERSPECTIVE

2.1 INTRODUCTION

SAB Miller has approximately 70,000 employees worldwide and South African Breweries (SAB Ltd) has about 9,800 employees in South Africa. Service level agreements (SLA's) are part of the Brewing Laboratory's performance review process (part of the Improvement management process-IMP) as they are part of the department's goals. SLA's get filled in on a monthly basis and the Brewing Department (as an internal customer) gives feedback to the Brewing laboratory on their performance based on a set of criteria. This SLA scoring can be used as a customer feedback in the performance review process to decide on the performance level of the brewing laboratory.

Currently the department is not doing very well on SLA's, which means its Performance review rating is brought down by this one goal in which they are performing poorly, and this brings down the morale of the team.

2.2 BACKGROUND TO SAB MILLER AND SAB LTD

The South African Breweries (SAB) then called Castle Breweries, was founded in 1895 specifically to serve a new market of miners and prospectors in and around Johannesburg. Over the last 2 decades the business has expanded internationally, making several acquisitions in both emerging and developed markets. Today, SAB Ltd in South Africa is wholly owned subsidiary of London and JSE listed SAB Miller plc. SAB Miller is one of the world's largest brewers by volumes with over 200 brands and operating in 6 continents. With brewing operations in 19 countries and a total annual capacity of nearly 43 million hectolitres, SAB was then the fourth largest brewing group in the world. It is the 3rd biggest conglomerate in South Africa and focusses chiefly on African and East European markets. In December 2004, SAB Ltd acquired 100% of Amalgamated Beverage Industries Limited (ABI) which became the soft drink division of SAB Ltd, and the largest beverage company in South Africa was created. SAB miller has approximately 70,000 employees worldwide and SAB ltd has around 9,800 in South Africa. SAB Ltd has consistently been rated one of the top companies to work for.

The South African Breweries is the original brewing company and South Africa’s leading producer and distributor of alcoholic and non-alcoholic beverages. Its soft drinks division is South Africa’s leading producer of products for the Coca Cola Company. It also has hotel and gaming interests through Tsogo Sun, the largest hotel and gaming group in South Africa. Its regional offices are located in Johannesburg. In South Africa it has 7 breweries, 7 bottling plants and 12,184 average number of employees. Six of its brands are among the top 50 in the world. It is also one of the world’s largest bottlers of Coca Cola products.

2.3 THE BREWING PROCESS

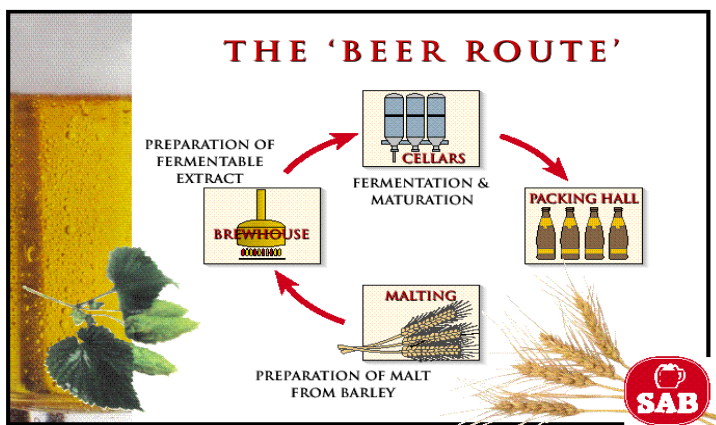


Figure 2.1: The brewing process:(Source SAB)

The brewing process consists of the following:

2.3.1 The brewhouse process

➤ Milling:

According to Parkes (1998:9-11) this process is to crush the kernel into fine particles while preserving the husk to use later as a filter during separation. The quality of grist is very important as it may have an effect on brewhouse performance: If the grist is too

coarse the starch remains protected and the enzymes will not be able to convert it into sugar. If too fine, “wort” separation will be slow and the filter bed will become choked. Systems used are four roll mill, six roll mill and wet milling system, and hammer mill.

➤ Mashing:

According to Parkes (1998:13-16) crushed malt is mixed with water under specified conditions so that enzymic action takes place to convert starch into fermentable sugar and to break down proteins into more soluble forms. Enzymes are sensitive to the conditions they exist in; they are affected by the amount of water they have to work in, temperature, PH and mash acidity. They take time to work and the length of time that is allowed for mash conversion will affect the degree of conversion.

➤ Wort separation:

According to Parkes (1998:17-22) when conversion is complete, the mash will consist of a sugar solution called wort and husks of malted barley. The purpose of wort separation is to remove these husks and husk particles that are not wanted in wort. Systems used are mash tun, lauter tun and mash filter.

➤ Boiling:

According to Parkes (1998:24-26) clear wort is boiled for several reasons:

- To sterilize wort
- Boiling stops enzymic action
- To evaporate unpleasant aromas
- Dissolve bittering substances from the hops and stabilize them
- To develop wort colour and flavour
- To increase the strength and concentration of the wort.
- Copper additions are: hops and hop extracts, liquid adjuncts like sugar and copper finings.

2.3.2 Fermentation process

According to Parkes (1998:29-37) yeast is added to the wort to start fermentation.

Pitching yeast must have the following characteristics:

- The right strain for beer to be fermented
- Free of bacteria and other yeast
- Healthy and viable
- Cropped from a healthy and consistent fermentation itself

Actual fermentation: Conversion of sugar into alcohol and specific gravity drops as fermentation progresses. To prevent off-flavours in the beer and to preserve the quality of the beer it is important to control:

- Selection of pitching yeast
- Pitching rate
- Wort dissolved oxygen
- Initial temperature
- Rate of temperature increase
- The maximum temperature during fermentation(top heat)
- Final temperature

2.3.3 Maturation process:

According to Parkes (1998:43-46) this can be regarded as a continuation of primary fermentation although it is often carried out in a separate plant. The continuing action of yeast on green beer modifies the properties so that it meets consumer requirements

➤ **Flavour maturation:**

Improvement of beer flavour is achieved in two stages, warm maturation and cold maturation. Yeast must be present for improvements to occur. Lagers-lagers can be warm matured at 8-15 degrees celcius in order to reduce diacetyl levels. Further flavour maturation can also take place at 3-5 degrees celcius where flavour continues to improve as the undesirable compounds are reduced by yeast activity. Cold maturation takes place at

0 degrees or below and beer flavour continues to improve as the unpleasant compounds are reduced slowly.

➤ **Clarification:**

Particles will sediment out as long as they are heavier than beer. Clarifying agents are added to make the particles clump together and sediment quicker.

➤ **Stabilization:**

There are several ways of stabilizing beer to prevent hazes:

- Cold storage
- The addition of agents like lucillite to absorb proteins
- The addition of agents like P.V.P.P to absorb tannins
- The addition of agents like papain to break proteins
- The addition of agent like tannic acid to precipitate protein
- The addition of agents like ascorbic acid to scavenge oxygen from beer

➤ **Conditioning:**

Some fermentation will continue during maturation and cold storage because of the presence of yeast. The fermentation increases levels of carbon dioxide dissolved in the beer, especially if the beer is held under pressure. The formation of carbon dioxide will also help to purge out unwanted substances like oxygen or unpleasant compounds.

2.3.4 Filtration process:

According to Parkes (1998:46-51) filtration is used to remove particles from beer that causes it to be cloudy. Matured beer will have particles in suspension, mainly yeast but also smaller particles, unless it has been refined. There are 3 types of filtration:

- Rough filtration-removes all particles that would make the beer cloudy.
- Polish filtration-removes all yeast and bacteria so beer is sterile
- Stabilizing filtration-protein/tannin particles that form haze is removed.

Types of filter aids used: Kieselguhr, Perlite, Lucillite. Types of filters used: Plate and frame filter, horizontal/vertical leaf filter, horizontal pressure leaf filter, candle filter.

2.3.5 Packaging process:

The main aim of packaging is to provide consumers with a convenient package of their choice and to ensure that the quality of the beer is protected during and after packaging. Examples of packages provided: kegs, casks, bottles and cans.

2.4 BACKGROUND TO THE QC/QA DEPARTMENT

The QC department (the brewing lab) is part of the QC/QA department. The QC department's role is to microbiologically and analytically determine if the beer or raw materials conforms to specifications so that process changes can be made.

2.4.1 The QA department

The role of the QA department is to do documentation control via the SAP system and to maintain the:

➤ E-Mark system

E-mark is a standard drawn up in accordance with EEC regulations, which serves as a guarantee by the packer or importer, of compliance with the stipulated average quantity of packages, acting as a meteorological passport throughout Europe and South Africa.

- E - Mark certification guarantees conformance to standards.
- Ensures acceptability to export markets.
- Ensures customer confidence.
- Shows SAB's commitment to quality.

➤ ISO 14000 system

- To reduce noise from SAB, and the Supplier Vehicles
- To reduce noise from the plant
- Reduction of wasting water
- Prevention of polluting the rivers, wetlands or underground water

- Prevention of pollution of the atmosphere
- To Reduce bad odours into the environment
- Reduction of spillage's in public areas - spent grains, waste etc.

➤ **The OSHAct**

- To ensure the health and safety of all employees

➤ **HACCP**

Building blocks of HACCP

- Good manufacturing practices
- Pest control
- Cleaning and sanitising
- Best operating practises
- Personal hygiene

➤ **The ISO:9001:2000 system**

The standard is based on 8 principles:

- Customer Focus
- Leadership
- Involvement of people
- Process Approach
- System Approach to Management
- Continual Improvement
- Factual Approach to Decision Making
- Mutually beneficial Supplier Relationships

The 5 main clauses are:

- CLAUSE 4 - Quality Management System
- CLAUSE 5 - Management Responsibility

- CLAUSE 6 - Resource Management
- CLAUSE 7 - Product and / or Service realisation
- CLAUSE 8 - Measurement, Analysis and Improvement

2.4.2 Background to the QC Department

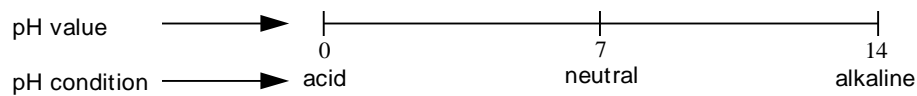
The critical measurements on the product that QC Department does on a daily basis include PH, foams, Limit Extract(LE), Isohumulones, Chillhaze, Accelerated Shelf life (ASL) and Normal Shelf life (NSL), Alpa glucans, Spent grain and vicinal diketone (VDK), Flavanoids, acetaldehyde, alcohol and density, and colour. These measures will now be discussed in detail.

PH

According to the SAB section 7.1 (2002:1):

- pH is the measurement of all stages of acidity or alkalinity of a sample using the following scale:
- pH is measured because different biological reactions require different pH ranges for optimum activities in the brewing process.
- Biological reactions include:
 - Enzyme activity.
 - Yeast growth.
 - Microbial spoilage.
- The above principles can be summarised as follows:
 - Hydrogen ion concentration is defined as: $\text{pH} = -\log_{10} [\text{H}^+]$ or $[\text{H}^+] = 10^{-\text{pH}}$.
- The [H] is the concentration of the hydrogen ions in moles per litre.
- Owing to the minus sign (see the definition), a low concentration of [H+] ions gives a high pH in the range 7 - 14, i.e. alkaline. A high [H+] ion concentration gives a low pH in the range 0 - 7, i.e. acidic.
- In water (in practice pH is nearly always measured in a watery solution) the following equilibrium exists:
 - $\text{H}_2\text{O} = [\text{H}^+] + [\text{OH}^-]$

- This $[H^+]$ concentration is equal to 10^{-7} mole per litre and corresponds to a pH of 7,0 which is neutral.
- When solutions contain hydrogen ions $[H^+]$, a voltage develops which is directly proportional to the $[H^+]$ concentration and thus, the pH can be measured electrometrically.
- It is measured by means of an electrode chain sensitive to the hydrogen ions.
- This electrode chain consists of a standard (glass) electrode and the reference (calomel) electrode. They may be separate electrodes or be combined into a single unit (combination electrode).
- The difference in electrode potential is measured on a potentiometer.
- In the pH meter the voltage across the electrode bridge is balanced with standard buffer solution or solutions (in a two-buffer calibration) of known pH (voltage) at 20°C.
- Observation of the deflection caused by a sample on the pre-calibrated pH scale is thus a direct measure of the $[H^+]$ concentration in the sample, that is, its pH.



Foams

According to the SAB section 7.10 (2002:1):

- Beer is artificially foamed up under standard conditions and the collapse rate of the foam is measured.
- The rate of collapse is described by the equation of a second order reaction.
- It is thus assumed that the foam is a single reacting species and its half life can be calculated in the same manner as the half life of radio active materials.
- In the case of SAB, this assumption is taken further and not only do they assume that the foam is a single reacting species, but that all foams behave identically

which has enabled them to construct straight line relationships between volume of collapsed foam and foam half life.

- Obviously temperature affects the rate of collapse and temperature corrections may be applied between narrow temperature limits.
- Bubble formation and size are affected by barometric pressure and are corrected for in the calculation.
- Foam half life is the rate of foam collapse in seconds, measured under standard conditions.
- Foam adhesion measures the adhesion of the beer foam to the surface of the glass. Adhesion is necessary to enhance the visual appearance of the product in the glass.
- Foam analysis is monitored in order to adjust the brewing process to ensure that the foam conforms with required quality standards.
- This method is applicable to packaged beer. However, it can be used for beer in a bright-beer tank, but special sampling equipment and conditions are required.

Limit extract

According to the SAB section 7.12 (2002:1):

- The limit to which a sample is fermented by brewer's yeast under ideal conditions, that is, at an elevated temperature and with agitation, is termed the limit of attenuation or the limit to which it can be fermented. The relative density (RD) of the extract is determined and from this RD value the LE percent Plato (%P) is determined from the Plato tables.
- When the RD of the extract is measured in the presence of alcohol, the residual extract is referred to as the "Apparent Limit of Attenuation" and is as described in this LE method.

- When the RD is measured after the alcohol is distilled off and the mass of the sample is made up to its original mass with purified water, the extract is referred to as the “True Limit of Attenuation”.
- The percentage attenuation is the difference between the original extract (OE) and the true limit of extract, divided by the OE and expressed as a percentage.
- LE is determined by shaking a fixed volume of sample and active brewer’s yeast under controlled temperature conditions for a defined period of time. The yeast is filtered off and the RD of the filtrate is measured.
- Broadly speaking LE is the determination of the amount of extract which cannot be fermented by the specific strain of brewers yeast in use. Often the LE value contains extract which can be fermented and for some specific reason was not.
- To the brewer, the LE value relates to milling conditions and or mash tun regimes.
- To some extent a beer’s character is defined by its LE, which is brand specific.

Isohumulones

According to the

According to the SAB section 7.16 (2002:1):

- The bitterness in beer arises from a group of closely related compounds which are extracted from hops during wort boiling. These compounds are isomerised under the wort pH and boiling conditions. “Isohumulone” (Iso.) is an index term used to describe these compounds.
- The method is based upon the suppression of the ionisation of these compounds by the addition of strong hydrochloric acid. This ensures their total extraction into 2,2,4 trimethyl-pentane (iso-octane) during shaking. The resulting emulsion is broken by centrifugation and the concentration of the iso-compounds in the iso-octane is determined spectrophotometrically by measuring their absorbance of ultra violet light at 255 nm.

- In addition to the iso-compounds a series of other organic compounds are extracted which account for approximately 30% of the absorption of light in the range in which isohumulones absorb.
- In the Rigby and Bethune II method, 90% of these compounds are removed by washing the solvent in acidified methanol prior to spectroscopy.
- The ratio of material removed to material remaining in the iso-octane depends on the physical washing conditions i.e. the height and rate of inversion and these must be held constant to achieve reproducible results.
- The method is used to determine whether the various brands comply with their specifications. Each beer has a characteristic bitterness which forms part of the brand profile.
- Note: Due to the high costs of this analysis it is not recommended for wort bitterness measurement.

Chillhaze

According to the SAB section 7.18 (2002:1):

- The measurement of haze falls into the category of turbidimetric analysis. Therefore, the haze we measure in a sample is the level of turbidity due to the presence of particles.
- Particles in suspension exhibit specific optical properties, namely, if a light beam is projected onto the particle it would reflect the beam away from it. Thus the light beam is scattered away from the particle and its natural direction. Particle size dictates the angle of scattering. Small particles (< 0,06 micron) scatter the light approximately to a 90° angle, whereas large particles (> 0,7 micron) will only partially reflect the beam off its forward course. The forward scatter angle is between 13° and 30° and is specific to some turbidity meters. Photo detectors placed at forward and right angles will detect both small and large particles. This meter only detects haze at a right angle.

- The nanometer wavelength of the light beam is of major importance. Unfortunately filters differ between brand name haze meters and results are not statistically comparable.
- The actual concentration of particles is of major importance to the brewer, and can be most helpful during problem solving. The brewer's output is to supply the customer with a product pleasing to the eye, visibly clear and free of particles for at least three months.
- Temperature has a significant impact on haze as it impacts on the solubility and stability of haze forming components. It is therefore necessary to standardise on the temperature at which measurements are made, namely 0°C, and the haze is therefore referred to as the CHILL HAZE.
- The unit of measurement is EBC units and is expressed as having been read in an optical cell with a 55 mm pathway.
- Applicable to packaged beer.

Accelerated shelf life and Normal shelf life

According to the SAB section 7.20 (2002:1):

- In this method, accelerated shelf life (ASL), temperature is used to accelerate the formation of haze in the product. Where normal shelf life (NSL) is conducted at 0°C and 25°C (25°C, typical of SAB average climatic conditions), ASL is conducted at 0°C and 50°C.
- This ASL determination is a measure of all hazes which can develop in the product over a period of time when subjected to a fixed temperature regime.
- Note: this method does not measure any specific haze or the compounds responsible. If required, other methods need to be employed.
- This method is applicable to packaged beer.

Alpha glucans

According to the SAB section 7.21 (2002:1):

- Alpha-glucan is the measure of starch and starch residues spectrophotometrically following a colour reaction with iodine.
- Alpha-glucan can negatively influence wort and beer filtration. Furthermore, it can adversely influence clarity and clarity stability.
- Iodine forms a coloured complex with these compounds which have an absorbance peak between 530 and 570 nm. This enables them to be quantified and be expressed as 'Delta E' (ΔE) units.
- Levels ex brewhouse are specific to brewhouse regimes and raw materials used.
- Wort levels should be trended and any positive (increasing) trend should be carefully monitored especially during filtration.
- Applicable to wort and packaged beer.

Spentgrain

According to the Analytical Methods section 7.26 (2002:1):

- The main objective of lautering is to separate clear wort from the particulate matter which is subsequently sparged (i.e. washed and leached) to remove water soluble material. That is, to achieve a maximum extract yield and a minimum extract loss with the spent grains without extracting from the grains undesirable compounds.
- Since the sample is rarely analysed at the brewery and of such a nature that it is rapidly degraded, it is necessary to prepare it into a stable state in which it can be despatched to an analysing centre/laboratory.
- The analysis of spent grain (soluble and available extract) gives a measure of brewhouse and lautering efficiencies.
- This procedure only deals with sampling, sample preparation (required to stabilise the sample) and its despatching.

The vicinal diketone (VDK)

According to the SAB section 7.32 (2002:1):

- The vicinal diketone (VDK) determination is a measure of the amount of free diacetyl, 2,3 pentanedione and their precursors present in a sample i.e. the total VDK concentration in a sample.
- Vicinal diketones are normal products of yeast metabolism and are formed during fermentation. The precursors are excreted from the yeast and are oxidised to diacetyl and 2,3 pentanedione in the beer. These compounds are then reabsorbed by the yeast and metabolised to less flavour active compounds.
- Beer flavour is adversely affected by the presence of high levels of diacetyl. The taste threshold of diacetyl is in the low ppb ($\mu\text{g/l}$) range for most trained tasters.
- Maximum removal of VDK's (specifically diacetyl) occurs in the fermenter. Yeast activity must not be halted since the yeast reabsorbs the diacetyl. Normally chill back is delayed until diacetyl levels $\leq 40 \mu\text{g/l}$ are obtained in order to ensure levels in beer of $\leq 15 \mu\text{g/l}$.
- Samples are incubated at 60°C to facilitate oxidation of the precursors to diacetyl and 2,3 pentanedione. A headspace sample is injected onto the chromatography column and the VDK's measured with an electron capture detector.
- The method is applicable to FV, SV, BBT and packaged beer samples. FV concentrations are monitored after a specific number of days in fermentation.
- A multi-level calibration is used and has the advantage that it can compensate for detector non-linearity when properly spaced calibrated points are included

Flavanoids

According to the SAB section 7.46 (2002:1):

- This method permits a quantitative determination of the catechin and proanthocyanidin beer haze precursors whilst flavanols and flavanol glycosides are not estimated.
- The beer to be analysed must have a flavanoid content in the range 3 to 200 mg/l (+) – catechin equivalents. It may be necessary to dilute the beer more than 10 fold.

- Under acidic conditions the chromogen p-(dimethylamino) cinnamaldehyde reacts with flavanoids such as (+) – catechin to form coloured pigments. The resultant pigments are determined by measuring the absorbance of the mixture on a spectrophotometer at a wavelength of 640 nm.
- The concentration of the flavanoids is determined directly by means of a regression equation. Since the method has been calibrated with (+) – catechin all results are (+) – catechin equivalents.
- The method is applicable to beer intended for export. The test is conducted on bright beer or packaged beer.

Acetaldehyde

According to the SAB section 7.63 (2002:1):

- The determination of Acetaldehyde in beer by automatic headspace gas chromatography using a HP-5, 5 % Phenyl Methyl Siloxane capillary column.
- This method can be applied to all in-process and packaged beer samples.
- The Acetaldehyde in the beer is “salted out” in a sealed 20 ml headspace vial and the equilibrium headspace vapour at 60oC is sampled and analysed by GC (gas chromatography) to resolve the mixture into its individual components which are measured with a flame ionisation detector.
- The areas of the eluted peaks are compared with the areas of a standard peak of known concentration (internal standard).
- Iso-Butanol is used as an Internal Standard in the preparation of the multilevel calibration.
- Acetaldehyde is normally present in green beer and gives the beer an apple-like taste. Like many other aldehydes it forms an addition compound with SO₂ which masks its smell.
- Acetaldehyde is an intermediate in the production of ethanol. This is catalysed by the enzyme alcohol dehydrogenase. Aldehydes can be oxidised to the corresponding

carboxylic acids or reduced to the corresponding alcohols. These are very important reactions in fermentation.

- The accuracy of the results is dependent upon a constant ratio of the sample and the headspace volumes. It is therefore important to check the actual volumes of the auto-sampler vials do not vary from the mean volume by more than $\pm 0,1\text{ml}$.
- Because the inherent variability with split injectors it is imperative that an internal standard is used.
- With the installation of a Y-Vu union it is possible to split one column into two different detectors, making the equipment more flexible. With only one GC oven, fitted with a single injector and auto-sampler, it is possible to use two different detectors at the same time without changing any columns

Alcohol and density

According to the SAB section 7.67 (2002:1):

- The Alcoalyzer / DMA combination system measures concentration in terms of alcohol and density. This eliminates the problems of human bias on refractometers, which impact on the reproducibility and repeatability of the analysis. Investigations showed that the alcohol and original extract as determined on the Alcoalyzer / DMA compare favourably with the Vapodest Distillation Method and the DSA.
- The Alcoalyzer is based on a highly accurate and patented NIR spectrometer, which measures the alcohol content of beer in the concentration range of 0-12 %v/v.
- The DMA 4500/5000 (oscillating u-tube density meter) measures the highest accuracy in wide viscosity and temperature ranges. A unique reference oscillator, in addition to u-tube oscillator, provides long-term stability and makes adjustments other than 20°C vitally unnecessary.
- The major advantages of this instrumental method, in addition to its good precision (reproducibility and repeatability) are:
- All FAB's can be analysed without setting programmes. The alcohol is measured directly rather than being calculated.

- All data (raw and calculated) is printed out on a hard copy as well as what can be stored in the memory.
- The instrument can transfer data directly into P.C. systems.
- The Alcoalyzer system measures the alcohol and density, enabling calculation of OE, RE, PE, calorific value, RD, RDF and several other related parameters.

Colour

According to the SAB section 7.13 (2002:1):

- The principle definition of beer colour is given as:
 - Beer colour intensity on a sample free of turbidity and having the spectral characteristics of an average beer, is 10 times the absorbance of the beer measured in a half inch cell with monochromatic light of wavelength 430 nm.
 - Turbidity exhibits equal spectral characteristics on the absorbance of monochromatic light with a wavelength 430 nm and the maximum absorbance is best established at wavelength 700 nm
 - It was further established that if the absorbance at 700 nm is equal to or less than 0,039 times absorbance at 430 nm, the sample is 'free of turbidity', that is, the result is not affected by turbidity. If, however, it is greater than 0,039 times, then the result is affected due to the presence of turbidity and is thus not an absolutely accurate and precise result. Special clarification is necessary.
 - Note: Evaluation studies conducted on wort shows that if the absorbance at 700 nm is equal to or less than 0,080 times absorbance at 430 nm, that the impact of turbidity on the wort colour result is negligible.
 - The ASBC method refer to colour as having been read in a 10 mm cell (pathway of travelling monochromatic light through the sample), whereas, traditionally colour is reported as having been read in a 25 mm cell.
 - The method is used to determine whether the various brands comply with their design specifications. Each brand has a characteristic colour.
 - This method is applicable to:
 - Packaged Beer

- Bright Beer
- In Process (FV and SV)
- Brewhouse wort
- Malt extracts

2.5 SERVICE LEVEL AGREEMENTS IN THE QC DEPARTMENT

The Quality Control /Quality Assurance department (QC/QA department) uses a SLA survey instrument to measure service quality.

1 = Poor

2 = Room for improvement

3 = Good (WOW!)

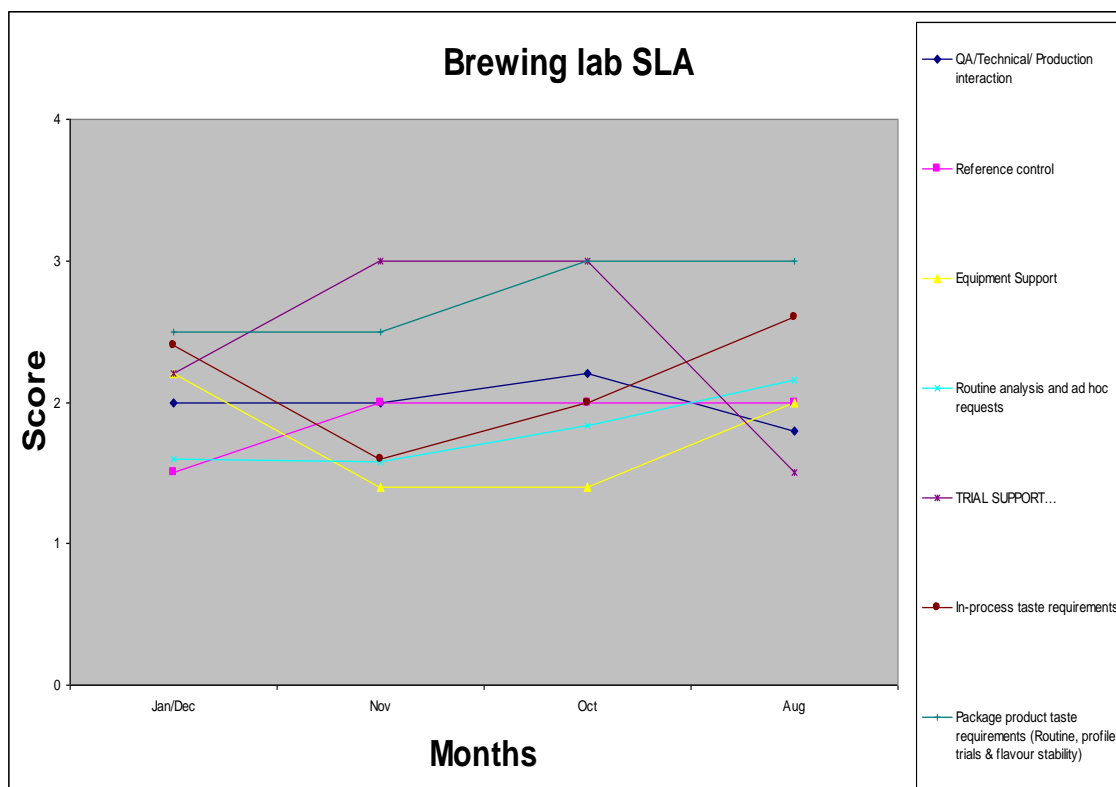


Figure 2.2: Brewing laboratory SLA (Source: SAB,2010, SLA Monthly Scores)

A service level agreement (frequently abbreviated as SLA) is a part of a service contract where the level of service is formally defined. In practice, the term “SLA” is sometimes

used to refer to the contracted delivery time (of the service) or performance. In the QC department the SLA is used between Brewing department and the QC department to monitor performance against agreed criteria. The level of performance can then be used as internal customer feedback in the performance review process which is part of the Improvement Management

From the graph the low scoring areas and areas to focus on are: Routine and adhoc requests, Equipment support.

2.6 THE IMP PROCESS

2.6.1 Defining IMP

IMP is about holistic, aligned, customer focussed goals. Goals that are both output and behaviour orientated, defined in collaboration with key customers and aligned with business strategy. An IMP that engages and develops each unique individual and team in delivery of holistic aligned customer focussed goals for sustained high performance (sustained high performance that continually anticipated and meet customer expectations)IMP develops, identifies and creates opportunities for team and individual learning to enable and sustain high performance.

➤ The outcome of IMP is:

- Sustainability of a high performance culture in SAB.
- Ongoing growth and performance of individuals and teams in the business.

➤ How do we measure this?

- Business growth
- Individual and team performance against goals

IMP principles:

Implementing the business strategy is the focus of all outputs in the business. Team goals are cascaded from the business plan and co-created by the team. Individual goals are developed (with the input of employees) to create accountability between the manager and the employee and cascaded from the business plan and team goals. Internal and external customers provide guidance on the quality of these outputs. Performance is measured

against outputs and quality requirements (the “what”) as well as values based behavior (the “how”).Managers are accountable for the management practices and employees are accountable for the self management practices. Commitment to ongoing development is the responsibility of the organization, the team and each individual.

2.6.2 Customer Feedback

Teams and individuals are required to obtain written feedback from their customers on the achievement of their agreed Customer Focused Goals in line with the Performance Review Process.

The objectives of customer feedback at SAB are as follows:

- To ensure that customers provide feedback to either the team or individual on their goals.
- To team or individual's performance is measured by the customer against agreed goals, quality requirements, and indicators.
- To review the team or individual's performance and agree an appropriate performance rating.
- To identify areas of weaknesses / strengths and address or recognise these appropriately.
- To ensure two-way communication on any relevant issues.

The process of Customer Feedback:

- The team and employee agree the goals, quality requirements and indicators with the customer when setting goals.
- The customer is approached at the time of preparing a performance review to provide feedback on the progress / achievement / performance of the goals.
- The standard customer feedback form is provided to the customer. Written feedback is obtained and this is discussed verbally with the team / individual.
- The written feedback is attached to the performance review form for inclusion in the performance review discussion.

2.6.3 Performance review guidelines

Managers conduct performance reviews with all their direct reports to manage their performance effectively. These reviews are held twice a year in April (year-end performance) and October (mid year review) and are typically maximum 60-90 minutes in duration. Performance review outcomes are related to the annual compensation review

The Objectives of Performance reviews:

- To ensure that the manager and employee both actively participate and review the employee's performance on a formal basis.
- To ensure that customers provide feedback on the individual's performance against agreed goals, quality requirements and indicators.
- To review the individual's performance and agree an appropriate performance rating.
- To identify areas of weaknesses / strengths and address or recognise appropriately.
- To ensure two-way communication on any relevant issues.

Process of performance reviews:

- The employee prepares a self-review of his/her performance and the manager / team leader prepares a review of the employee's performance.
- The performance review form is uploaded into the SAP HR System with relevant feedback.
- The performance review outcome is printed off the system and handed to the employee for signature, records are filed accordingly.
- Compensation review outcomes are as a result of the performance review process.

Give a performance rating of:

1. When the employee did not meet any of his/her goals
2. When not all goals were achieved
3. When ALL goals were achieved to satisfaction
4. When all goals were achieved and a few were exceeded
5. When the employee exceeded most of his/her goals
6. When the term “walking on water” jumps to mind! All goals have been exceeded. Tremendous value, beyond the call of duty, was added. The extra mile, and all that

7. When an employee is new in the organisation / position - not yet “up to speed”and/or working on a set of “induction” goals

2.7 CONCLUSION

The QC department falls under QC/QA department therefore an overview of both is given.The SLA score can be used as customer feedback in the performance review process therefore an overview of all three is given.The performance review process is also part of the IMP process.

CHAPTER 3: SERVICE QUALITY: A LITERATURE REVIEW

3.1 INTRODUCTION

In this chapter a literature review will be conducted on the following critical issues pertaining to the issue of service quality in the Food and Beverage Industry in Cape Town. The aspects which will be addressed include: the definition of Quality Management, the definition of South African Food and Beverage industry, and the key factors that impact on service quality in the Food and beverage industry. Also measuring instruments for Service Quality such as SERVQUAL, Service Level agreements (SLA), the Gap model, SERVPERV and Total Quality Management (TQM) will be covered. Other instruments and theories for measuring Service Quality include: Cycle of service and customer processing operation, Moments of truth and Service blueprinting. The researchers covered include: Dr W Edward Deming, Juran, Phillip B. Crosby, Isikawa and Garvin. The research problem states: "Poor equipment support, poor reference control and slow response to routine and adhoc requests contribute to low SLA scores within the SAB." The research question to be researched within the ambit of this dissertation, reads as follows: "How can SERVQUAL be used to improve service quality within the SAB?" The research problem to be researched within the ambit of this dissertation reads as follows: "Poor equipment support, poor reference control and slow response to routine and adhoc requests contribute to low SLA scores within the SAB." The research question to be researched within the ambit of this dissertation, reads as follows: "How can SERVQUAL be used to improve service quality within the SAB?"

3.2 QUALITY MANAGEMENT IN THE FOOD AND BEVERAGE INDUSTRY

3.2.1 Definition of Quality Management

Ballantyne, Christopher and Payne (1991: Online), noted that service quality management is about customer focused service improvement, it is also about planning and organizing improvements continuously, as well as monitoring customer service requirements externally and controlling the service support processes internally. The typical approach to quality management is moving away from final inspection to assessing whether critical work processes are in control and giving guidance to staff company-wide in the techniques involved. The starting point for effective

customer service management has to be the measurement of service quality performance and the response of customers to that performance.

According to Nixon (2010: **Online**) most agree that it is an integration of all functions of a business to achieve superior quality of products through continuous improvement efforts of all employees. Quality revolves around the concept of meeting or exceeding customer expectation. Quality management emphasizes the ideas of working constantly towards improved quality. It involves all areas of the company: processes, environment and people. The CEO to the line worker must be involved in a shared commitment to improving quality. Quality management, is focused on the customer and meeting the customer's needs. Quality is controlled by prevention. Teams solve problems. Management's role is to delegate, coach, facilitate and mentor. The major quality management principles are: quality, teamwork, and proactive management philosophies for process improvement. Quality management is a collection of ideas, and has been called by various names and acronyms: TQM, total quality management; CQU, continuous quality improvement; SQC, statistical quality control; TQC, total quality control, etc. However each of these ideas encompasses the underlying idea of productivity initiatives that increase profit by improving the product.

According to Thomas (2008: **Online**) Quality Management, in a project context, is concerned with having the right processes to ensure both quality product and a quality project.

3.2.2 Definition of South African Food and Beverage industry

Gehlhar & Regmi (2005:Online),points out that “The South African Food and Beverage Industry includes the following: Beer, Wine, Spirits, Flavoured alcoholic beverages, Wine-based drinks, Hot drinks Coffee Instant coffee, Tea, Other drinks, Soft drinks Carbonates, Fruit/vegetable juice Nectars, Bottled water, Functional drinks Sports drinks, Ready-to-drink (RTD) concentrates Powder concentrates, RTD tea, Packaged foods, Confectionery, Bakery products, Breakfast cereals, Ice cream Take-home ice cream, Dairy products Yogurt, Savoury snacks, Snack bars, Meal replacement drinks Slimming drinks, Ready meals, Soup Instant soup, Pasta, Noodles, Instant pasta, Canned food, Frozen food, Dried food Rice, Chilled food ,Oils and fats Olive oil, Sauces, condiments Soy-based sauces Baby food Milk formula, Spreads and Jams.”

3.2.3 The key factors that impact on service quality in the Food and beverage industry

According to Parasuraman et al. (1988) in the SERVQUAL survey the key factors that impact on service quality are as follows: *Tangibles* refers to: The physical representations or images of service; *Reliability* refers to the ability to perform the service dependably and accurately; *Responsiveness* refers to willingness to help customers and to provide prompt service; *Assurance* refers to the knowledge and courtesy of staff and their ability to inspire trust and confidence; *Empathy* refers to the caring individualized attention provided to stakeholders.

According to the SLA used within the SAB the key factors that impact on service quality are:

- Morning meeting support
- Reference control
- Equipment support
- Routine adhoc requests
- Managing of missing data
- Trial support
- In-process taste requirements
- Package product taste requirements

3.3 MEASURING INSTRUMENTS FOR SERVICE QUALITY

3.3.1 SERVQUAL

In this part will be discussed: reasons for using SERVQUAL, origin of SERVQUAL, difficulties in using SERVQUAL and applications of SERVQUAL.

Cody and Hope (1999: **Online**), are of the opinion that top service providers see quality as a tactical tool. By delivering outstanding quality these companies receive benefits including increased growth through customer retention and increased customer acquisition. It is however difficult to measure. SERVQUAL has been used in a wide

variety of domains to measure service quality. It can also be used as a benchmark tool to advance business. According to Arambewela and Hall (2006: **Online**), results can be used for the formation of benchmarks and to institute best practice for services by comparing SERVQUAL scores of major competitors within the same industry. By measuring company specific SERVQUAL scores over several periods, trends can be recognized and analysed.

According to Arambewela and Hall (2006: Online), Parasuraman developed the SERVQUAL instrument to measure service quality in 1988. The SERVQUAL instrument was initially used to assess customer perceptions of service quality in service and retailing organizations.

Van Dyke and Prybutok and Kappelman (1999: **Online**), explains that the difficulties linked with the SERVQUAL are identified and grouped in four main categories namely: The use of difference or gap scores, poor predictive and convergent validity, the ambiguous definition of the expectations construct, and unstable dimensionality:

- **Problems with the use of difference or gap scores.** A difference score is formed by subtracting one measure from another in an effort to produce a third measure of a distinct construct. For example, in scoring the SERVQUAL instrument, the expectations score is subtracted from the perceptions score to create such a gap measure of service quality. Quite a few problems with the employment of difference scores make them an unfortunate choice as measures of psychological constructs. The depicted problems related to the employment of difference measures include low reliability, poor discriminant validity, spurious correlations, and variance restrictions.
- **Reliability problems with gap scores:** Numerous studies reveal that Cronbach's alpha, a widely utilised method of estimating reliability, is inappropriate for difference scores. This is apparent because the reliability of a difference score is dependent on the reliability of the component scores and the association between them. With an increase in the correlation of the component scores, the reliability of the difference scores is decreased. As a result, Cronbach's alpha tends to overestimate the reliability of the difference scores when the component scores are correlated. Such is the case of the SERVQUAL instrument.

- **Validity issues:** Another difficulty with the SERVQUAL instrument concerns the poor prognostic and convergent validities of the measure.
- **Ambiguity of the expectations construct:** The SERVQUAL expectations have been defined as desires or wants, what a service provider should have, normative expectations, ideal standards, desired service, and the level of service a customer hopes to receive. These various definitions and matching operationalizations of expectations in the SERVQUAL literature result in a concept that is not entirely defined and is open to a variety of interpretations. These various interpretations can result in potentially serious measurement validity problems. For example, the classic ideal point interpretation results in an inverse of the relationship between SERVQUAL calculated as perceptions minus expectations (P-E) and perceived SERVQUAL (P only), for all values when perception scores are greater than expectation scores (i.e., $P > E$).

Unstable dimensionality of the SERVQUAL instrument: Results obtained from a number of studies have established that the five dimensions claimed for the SERVQUAL instrument are unsound. The unstable dimensionality of SERVQUAL confirmed in many domains including information services, is not just a statistical curiosity. The scoring process for SERVQUAL calls for averaging the P-E gap scores within each dimension. A resulting high expectation coupled with a low perception for one item would be cancelled by a low expectation and high perception for another item within the same dimension. This scoring method is only suitable if all of the items in that dimension are interchangeable. Though, given the unstable number and pattern of the factor structures, averaging groups of items to calculate separate scores for each dimension cannot be justified.

Han and Baek (2004: **Online**), find that many studies of service marketing have aimed at defining service quality and develop instruments to measure it. Since Parasuraman et al., (1988) introduced SERVQUAL, several studies have used the instrument to measure service quality in various domains, ranging from financial services, health services, travel agent services, and retailing services, to restaurants.

3.3.2 Service Level Agreement (SLA)

In this part will be discussed: What a SLA is, when a SLA will fail, benefits of SLA, items that can make an SLA function ineffectively.

Karten (2003: **Online**), suggests that “a service level agreement is a formal negotiated agreement which helps to identify expectations, clarify responsibilities, and facilitate communication between two parties, typically a service provider and its customers”. As such, it is:

➤ **A communication tool**

A well established SLA fosters improved communication between the two parties. Furthermore, the very process of establishing an SLA helps to improve communication, so that the parties come to a better understanding of each others' needs, priorities, and concerns.

➤ **An expectations-managing mechanism**

According to Karten (2003: **Online**), “often it is not until it's too late that an organization realizes its expectations are not going to be met.” The process of creating an SLA facilitates the identification and discussion of expectations. As a result, the two parties reach shared expectations about services and service delivery.

➤ **A conflict-reduction tool**

According to Karten (2003: **Online**), if there is no shared understanding about each others needs and priorities, conflicts can easily arise. “An SLA, and the communication process involved in establishing it, helps to minimize the number and intensity of conflicts, and to more readily resolve those that do occur.”

➤ **A living document**

According to Karten (2003: **Online**), “the SLA acknowledges that changing circumstances may necessitate modifications to services, expectations, and

responsibilities. Accordingly, it provides mechanisms for periodic review and modifications as warranted.”

➤ **An objective process for gauging service effectiveness**

According to Karten (2003: **Online**), in the absence of an agreement, the parties may disagree about quality of service. An SLA provides a consistent, ongoing and mutually agreed to basis for assessing service quality.

An SLA is unlikely to succeed if undertaken as:

➤ **A mandate**

According to Karten (2003: **Online**), a service level agreement has a reduced probability of succeeding if ordered into existence. “When the decision to create an SLA is driven by a major restructuring (such as a reorganization, downsizing, the consolidation of services, or the transition to a shared services environment), extra care must be taken to involve and seek input from all pertinent parties”.

➤ **A "get" strategy**

According to Karten (2003: **Online**), to get others to do things your way may make them feel coerced, and is likely to cause resistance and resentment. It is counterproductive to view an SLA as a way to get customers to stop complaining or **to** get a better quality of service from service providers.

➤ **A complaint-stifling mechanism**

According to Karten (2003: **Online**), an SLA that attempts to suppress complaints rather than understand and resolve those complaints can actually trigger an *increase* in complaints. An SLA cannot be used to force the other party into conforming to a particular standard.

➤ **A unilateral decision-making process**

According to Karten (2003: **Online**), “trust cannot easily be built between two parties if one imposes decisions about how things will be done”. For an SLA to succeed, both parties must have an input in formulating it.

➤ **A quick fix**

According to Karten (2003: **Online**), establishing an agreement should not be a rushed process. Rushing through it undermines the value of that process in helping the parties to understand each other's perspective and build a good relationship.

Karten (2003: **Online**), is of the opinion that:

SLA’s help to improve communication by:

- Improving understanding between provider and customer
- Facilitating increased sharing of vital information
- Providing well-timed feedback (and feed forward) about problems and needs
- Reducing the number complaints

According to Karten (2003: **Online**), SLA’s help to manage expectations by:

- Clarifying the scope of services assigning responsibilities
- “Providing a context for realistic and reasonable expectations”
- Creating a common language
- Establishing priorities and service quality levels

According to Karten (2003: **Online**), SLA’s help to improve service delivery by:

- Providing basis for assessing service effectiveness
- Facilitating the setting of performance levels
- “Providing a basis for continuous improvement”

According to Karten (2003: **Online**), SLAs help to strengthen relationships by:

- Helping providers and customers make contact more regularly
- Fostering a customer perspective on issues
- Often reversing bothered relationships

- Conveying to customers that you're paying attention

According to Karten (2003: **Online**), SLAs help to create a business orientation by:

- “Providing a link between services and business objectives
- Facilitating the integration of new service offerings
- Creating cost/performance accountabilities
- Creating awareness of cost/benefit tradeoffs”

Karten (**Online**: 2003), points out that many factors can account for an SLA either never reaching completion or being used but functioning ineffectively. However, the following items stand out as ones to particularly guard against.

- **Use of the SLA as a weapon**

According to Karten (2003: **Online**), service providers sometimes want to create an SLA to stifle customer complaints; however, customers will see such an SLA as just one more thing to complain about. Conversely, customers sometimes want to use an SLA as a club with which to hammer the service provider whenever service quality deteriorates, as though each such blow will motivate them to deliver better service. For an SLA to succeed, both parties must view it as a tool designed to manage expectations, improve communications, clarify responsibilities and strengthen relationships.

- **Confusion between the SLA document and the SLA process**

According to Karten (2003: **Online**), establishing an effective SLA requires *much* more than simply filling in the blanks of an SLA template. The process of building the foundation for a win-win relationship is essential to the success of the SLA. When this process works, the resulting document is trivial. If this relationship is lacking, even the best-written document will be insignificant.

- **Holding unrealistic expectation about how long it will take to establish**

According to Karten (2003: **Online**), the assumption that creating an SLA is a start-today, done-tomorrow process is a very common false impression. “It's difficult to develop an SLA quickly because of the workload involved in such tasks as negotiating service standards, establishing tracking mechanisms, designing reports, documenting procedures, and generating buy-in. The process is designed to help the two parties build the

foundation for a strong, successful, long-term relationship.” To rush this process is to sabotage the entire endeavor.

➤ **Omitting the management elements of the agreement**

According to Karten (2003: **Online**), an SLA requires both service elements (the quality of services provided and the conditions of service delivery) and management elements (service tracking and reporting, periodic service reviews, and the process for making changes to the SLA). Both service and management elements are essential if an SLA is to be effective; yet the management elements are often lacking. “The result is not an SLA, but a statement of services that cannot be expected to function as an SLA.”

➤ **Creating the agreement unilaterally**

According to Karten (2003: **Online**), “both parties must be involved in the formulation of an SLA”. If one party attempts to be in command of the process, members of the other party may resist its provisions even if they might otherwise support them. “Although it may not be feasible for both parties to collaborate on every aspect of the SLA development, the overall process must be one in which both parties have some say.”

➤ **Misunderstanding the development process**

According to Karten (2003: **Online**), “establishing an SLA is a process of information-gathering, analyzing, documenting, educating, negotiating, and consensus-building.” If SLA developers lack familiarity with this process, it sometimes drags along and never reaches completion. “Some managers initiate an SLA development process enthusiastically and with good intentions, but conclude, sometimes after several months of unproductive attempts, that they didn't really know how to go about it.”

➤ **Neglecting to manage the implemented agreement**

According to Karten (2003: **Online**), a common misconception is that once the SLA document is complete, the job is done. Unfortunately, if an SLA is not managed it dies upon implementation. “Managing the SLA entails such things as ongoing communications about service delivery, reassessing service standards, tracking and reporting key performance indicators, holding periodic service review meetings, and overseeing pertinent service modifications.”

3.3.3 The gap model

According to Haksever, Cook, and Chaganti (1997: **Online**), Zeithaml, Parasuraman, and Berry in 1990 developed a model of service quality (Gaps), that recognized gaps in service quality formulated measures to close them (PZB Gap Model). The Gaps model has been utilised in large service corporations, but is yet to be implemented in small service firms.

According to Liao and Yu-Pan (2007: **Online**), consumer perceptions of service quality are influenced by five gaps transpiring for the duration of the process of service delivery. 'Gaps' for the PZB Gap Model are elaborated upon below:

- **Gap 1:** Not knowing what customers expect. The difference between “expected service of customer” and “management perceptions of customers expectations”.
- **Gap 2:** Not selecting the right service design. The difference between “service quality specification” and ‘management perceptions of customer’s expectations”.
- **Gap 3:** Not delivering to service standards. The difference between ‘service qualities specification’ and “service delivery”.
- **Gap 4:** Not matching performance to promises. The difference between ”external communications to customers “and “service delivery”.
- **Gap 5:** Perceived service quality. The difference between “expected service” and “perceived service”. (Gap 5 results from the sum of degree and direction of Gaps 1 to 4).

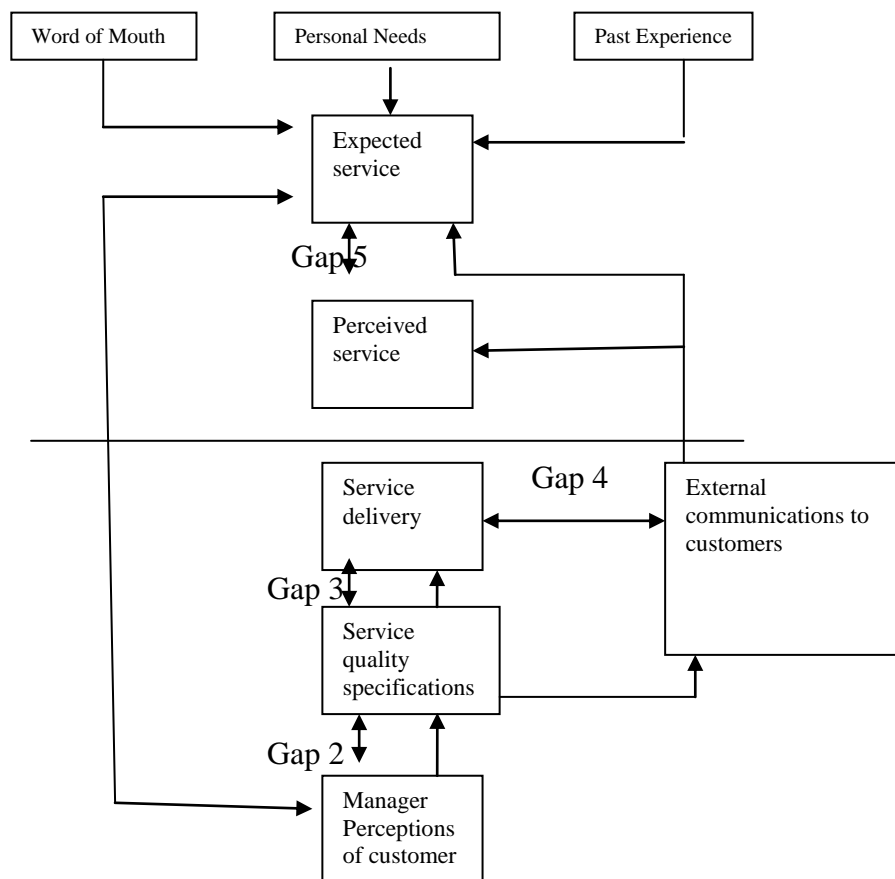


Figure 3.1: A Conceptual Model of Service Quality (Source: Liao Yu-Pan, 2007: Online)

3.3.4 SERVPERF

Nhat and Hau (2007: **Online**), points out that Cronin and Taylor developed a performance-based service quality measurement scale referred to as SERVPERF. The key difference between these two scales is that SERVQUAL operationalises service quality by making comparisons of the perceptions of the service received with expectations, while SERVPERF maintains only the perceptions of service quality. The SERVPERF scale consists of 22 perception items, excluding any consideration of expectations. The superiority of SERVPERF over SERVQUAL has been depicted in numerous studies. According to Landrum, Prybutok, Zhang and Peak (2009: **Online**), the SERVPERF instrument empirically surpasses the SERVQUAL scale across numerous industries.

3.3.5 TOTAL QUALITY MANAGEMENT

In this section we will discuss what TQM is, Foundational elements of TQM, the implementation phases of TQM, Origins of TQM and the advantages of employing TQM.

Grant, Shani and Krishnan (1994: Online), are of the opinion that TQM is a technique for controlling and motivating employees. Companies such as Xerox, Allen Bradley, Motorola, Marriot, Haley Davidson, Ford and Hewlett Packard proved the success of TQM. They implemented changes in their management practices and improved product quality and company performance. Where TQM programmes were not in line with strategic initiatives, it led to failure. According to Grant, Shani and Krishnan (1994: **Online**), TQM is about statistical process control where quality improvement methods extend to all functions and all management levels with the aim to improve on customer requirements by improving quality of products and processes. Decision making is not limited to only higher level employees. Management roles are adapted to allow participative decision making. Under TQM the flow of information becomes less vertical and more lateral as shop floor team members communicate with other team members in other departments. Middle management falls away, resulting in a flatter organizational structure that is less formal. TQM causes the entire company to be customer-orientated brought about by employee interaction with customers. TQM is the responsibility of top management and not only the quality assurance department.

According to Andres (2000:9-22), the foundation elements for TQM are Customer Focus, Executive Leadership, and Strategic Quality Management. The infrastructure elements are Education and Training, Measurement and Information, Total Organization Involvement and Customer Supplier Partnerships, and the Quality System. The operational processes for quality management are: Quality control and quality improvement.

- **Customer focus:** To successfully focus on customers, each organization must communicate a common definition of a customer. Customers can be internal or external. To satisfy the customer one must understand their needs.
- **Executive leadership:** leadership is needed to facilitate quality improvement
 - “Serve on a quality council

- Approve strategic quality goals
- Allocate needed resources
- Review progress
- Give recognition
- Serve on some project teams
- Revise merit rating”
- **Strategic quality management:** Once the company has developed its vision and mission it must develop a strategy to achieve its goals.
- **Education and training:**
 - Train from top down
 - Select and certify managers to do training of workgroups
 - Adapt training material for the group receiving training
 - Train just in time
 - Assess the efficacy of training from results
- **Measurement and information**
- **Total Organization Involvement**

Middle managers support is required for:

- “Serving on task forces for developing plans and procedures and elements of quality infrastructure.
- Nominating projects
- Screening project nominations
- Participating on quality teams
- Supporting their employees training and participation on cross-functional teams”

The Workforce through Quality Circles (QC's):

- “Training in quality concepts and tools.
- Providing suggestions

- Participating on QC's
- Participating in cross-departmental teams
- Participating on self-directed and self management teams
- Leading and facilitating teams"
- **Customer-Supplier partnerships:** mostly to reduce inventory cycle time
- **Quality System:** Systems such as the more limited ISO 9001
- **Operational Processes for managing Quality**

Quality planning:

- Establish goals
- Identify customers
- Discover customer needs
- Develop product features
- Develop process features
- Establish process controls, transfer to operations

Quality control

- Choose control subjects
- Set goals
- Create a sensor
- Measure actual performance
- Interpret the difference
- Take action on the difference

Quality improvement

- Prove the need
- Identify projects
- Organize project teams
- Diagnose the cause

- Provide remedies, prove remedies are effective
- Deal with resistance to change
- Control to hold the gains

According to Kirchner (1995:**Online**) most organizations on the TQM journey pass through five distinct phases:

Phase 0. Product and service quality are not improving. This phase is characterized by an inspection mentality: Find the problems and fix them.

Phase 1. At this stage, top management develop and document a vision of improved quality, along with a strategic quality plan. Customer satisfaction becomes the focus.

Phase 2. Corrective action and improvements begin. Quality improvement teams are trained in problem solving and teamwork. These teams are then set off to work towards achieving strategic goals.

Phase 3. Manufacturing processes are under control; only randomly caused variations remain within processes. Procedures and work instructions have been effectively implemented. Control charts are routinely used .Training and education are ongoing.

Phase 4 is the designing of products and processes to the requirements of customers, both internal and external. This is the design-for-quality phase.

Phase 5. “All employees have a "do it right the first time" attitude. The culture is oriented toward defect and problem prevention. Management support is continuous, and decisions are generally based upon facts.

Grant, Shani and Krishnan (1994: **Online**), points out that “the techniques and philosophy can be traced back to WA Stewarts’ Economic Control of Quality of manufactured products, established in 1932.” In 1980 Deming’s appearance on a CBS documentary broadcast awakened interest in Quality management methods that originated in the United States but those Japanese companies had applied and developed in the 1980’s. According to Grant, Shani and Krishnan (1994: **Online**) the pioneers of TQM were Deming,

Shewart, Juran, and Fiengenbaum. Their field of expertise was industrial engineering and physics. TQM combines American Technical expertise and European and Asian traditions of craftsmanship.

Grant, Shani and Krishnan (1994: **Online**) suggest that “Quality improvement can lower cost and give consumers the dual benefit of improved performance and lower prices”. This enhances competitive advantage due to economic benefits to owners and employees.

3.4 OTHER INSTRUMENTS AND THEORIES FOR MEASURING SERVICE QUALITY

3.4.1 Cycle of service and customer processing operation

According to Bicheno (2002:99), Albrecht and Zemke originated the concept of a Cycle of Service, but the idea had been further developed by Mahesh and by Van der Merwe.

A Cycle of Service (C of S) is much like a flowchart but has the important difference is that it is written from the perspective of the customer, and is the sequence of events or Moments of Truth (MoT) experienced by the customer in dealing with the organisation. As the name suggests, a C of S is normally indicated as a circle. “A flowchart shows the progress of a document or product, a cycle of service shows the events experienced by a customer.”

The best way to draw up a cycle of service is to track a customer as he or she moves through a service process. Because not all customers will experience the same Moments of Truth, several customer experiences may have to be combined. Front line employees play an important role in drawing up the chart; where customer tracking is not possible. “It is best to use the verb plus noun rule in drawing up a C of S chart: for instance, receive notice, "join queue", and the like.”

According to Bicheno (2002:99), then analysis begins. Points of dissatisfaction from customer are identified. The value of the C of S is that, for the first time, the complete

sequence of events as experienced by the customer, is seen. A useful starting point is the PETS framework: ask for each moment of truth, if the Procedure is known, if the Equipment is capable of doing the job, if training has been satisfactory, and if Standards are in place. Some of the MoT's will be more key than others and will require much more consideration. Where necessary each MoT can be further broken down into greater level of detail. "Thereafter the Kano model is extremely useful." For each MoT find out what are the Basics, the Performance factors, and possible Delighters. In this way a systematic analysis of weaknesses and of opportunities can be undertaken. "The Kano model emphasizes that the identification of the three Kano factors is not necessarily trivial: good analysis and insight may only be gained by detailed observation."

According to Bicheno (2002:99), In addition we can consider how each MoT can be failsafed; by contact (a height barrier in a car park) by fixed value (an airline meal tray with indentations), and by motion step (a customer number at a supermarket "deli" to ensure first come first serve).

3.4.2 Moments of truth (MoT)

Bicheno (2002:100), points out that a moment of truth is that moment in time when a customer makes a judgement about the quality of that organization's products or services through contact with the products, systems, people, or procedures of an organization.

According to Bicheno (2002:100), hundreds of MoT's are possible for a single customer in interaction with a company. Each one may result in dissatisfaction or delight, as a result, the customer may be lost, or on the other hand become a loyal user. Some MoT's are critical, others less so, and here it is useful to bring in the Kano model concept. Moreover, the customer builds an impression of the organisation through the growing effect of MoT experiences. In many services the customer has little or no tangible product that remains after the operation is complete. All that remains is a memory - of hundreds of moments of truth. That is why the analysis of MoTs should be an important concern of management, particularly if they believe that it costs five times as much to regain a lost customer as it does to acquire a new one.

Bicheno (2002:101), noted that MoT analysis begins with the assembly of process-type diagrams (these are referred to as cycles of service). Every little step taken by a customer in his or her dealings with company products, services or people is recorded. This begins when the customer first makes contact to the last time the product or service is experienced. There would be a different chart for each type of customer service, whether called a process chart or a cycle of service, the point is that the steps follow the experiences of the customer, irrespective of organizational boundaries.

According to Bicheno (2002:101), the problem from a quality management viewpoint is that most MoTs take place away from the eyes of management, but in interaction with the front line staff. That is why it is desirable to work through all possible MoTs in advance. If a product or service fails, a good backup service might cause the customer not to be resentful, but grateful. One may argue that it is not possible to identify all MoTs, but at least if a systematic effort has been made; the number and severity of unexpected failures will be limited. In this respect MoT analysis has much in common with failure mode and effect analysis (FMEA).

3.4.3 Service Blueprinting

Bicheno (2002:101), noted that service blueprinting is the procedure of making a flowchart or map of a service process. This is one the longest established service mapping tools and was originally proposed by Shostack. The technique is similar to industrial engineering flowcharts, with the exception that customer links are included. The aim is to identify areas at which the service may fail to satisfy customers and areas where value may be added for customers. A service blueprint shows time horizontally, and the hierarchy of support vertically. In drawing up a blueprint, four areas are included:

- customer actions interactions undertaken by the customer. These activities come into contact with two types of employee actions:
- on stage employee actions are visible to the customer and are separated in a service blue-print by a line, drawn horizontally. Any vertical line crossing this line of interaction represents a direct contact or encounter between customer and front line employee.

- backstage employee actions are not visible to customers but are nevertheless in direct contact with customers. “These are separated from on stage activities by a line of visibility, thus making clear what customers can see and possibly be influenced by.”
- support processes are all those activities that support the front-line staff, irrespective if visible or not. “These are separated from backstage activities by a line of internal interaction. Vertical lines crossing the line of internal interaction represent internal encounters.”

Bicheno (2002:102), suggests that “the power of service blueprints can be added to by pokayoke and the Kano model.” A service blueprint can be a good tool for training or standardisation purposes. (Photo’s can be added.)

3.4.4 Deming’s contribution to quality

According to Bicheno (2002:7), Dr. W. Edwards Deming (*1900-1993*) is probably the most respected figure in quality management. In the 1950s, Deming taught quality to the Japanese by insisting that especially top management attend his courses. They did and prospered. “Originally Deming taught statistical process control (SPC) to the Japanese and has always maintained that management must have an appreciation of statistical variation.” Today Deming is mainly associated with his 14 point plan, the Deming Cycle and his deadly diseases.

Bicheno (2002:8-9), explains that many ideas which are regarded as new and fashionable today were recommended by Deming over 30 years ago. These include continuous improvement (Kaizen) business process reengineering, supplier partnership, self directed work teams and Hoshin.

- There should be a consistent message about quality, throughout the organization.
- The new age of quality requires a commitment to continuous improvement.
- Switch from defect detection to defect prevention. Rather inspect the process than the product. Work to understand and reduce the natural variation in processes.
- In selecting suppliers, end the practice of awarding business on price. Look at quality of product, reliability- of delivery, and build partnerships with suppliers.

- Constantly improve. Use the PDCA cycle. Improvement should include all supporting services and activities.
- Train in a modern way. Let employees understand basic SPC, improvement, and the total approach to quality.
- Supervision must change from chasing to coaching and support.
- "Drive out fear" of improvement.
- Remove any organizational barrier(improved visibility between sections and easier communications).
- Don't have slogans that mean nothing. Don't have unrealistic targets.
- Work standards and numerical quotas should be eliminated as this is controversial, unless
- interpreted with the understanding of natural variation.
"Natural variation says that no
- standard or quota can be exact and without variation. If the natural variation is
- understood, the quotas and standards that are beyond the control of employees should not be penalized (nor rewarded for undeserved performance.)"
- Remove barriers (unrealistic quotas and time pressure and short-term requirements for profit rather than quality, and lack of investment in the right machines and lack of management support or consistency).
- Train and educate.
- Create an organizational structure that will support all the previous points.

According to Bicheno (2002:9), the seven deadly diseases of quality, amount to a severe criticism of Western management and organizational practices.

- "Lack of constancy of purpose" is a reminder about inconsistent policy on quality.
- "Emphasis on short term profits" is a reminder to take a more constant view, without being influenced by the end-of-period financial performance. And this may be brought about by the next point.
- Overemphasis on performance appraisal and merit rating, particularly when judged solely on financial performance. According to Deming America had become great through teamwork, not competition. He was concerned by focus on short-term results rather than on coaching and helping staff to develop their potential.

- Too much emphasis on short term figures, while the longer term suffers. The last two points relate to medical costs and legal costs, which Deming believes are detrimental to competitiveness.

3.4.5 Juran's contribution to quality

Bicheno (2002:9), points out that “like Deming’ Dr. Joseph Juran is given credit for developing Japanese quality in the 1950s. Perhaps the best known Juran concepts are his definitions of quality, the concepts of breakthrough and the internal customer and the quality trilogy. Juran also was responsible for Pareto analysis as applied to problem solving, for work on the costing of quality, and for the idea of a Quality Council within the organization.”

According to Bicheno (2002:10), “Juran emphasises the necessity for ongoing quality improvement. Juran was the first to name the Pareto principle and to describe it as a universal problem solving methodology. The Pareto principle simply sets out to identify the vital few as opposed to the trivial many. This is the well known phenomenon that there will always be a relatively few problems that somehow take up most of the time or effort or cost. Hence it makes sense to identify these and to tackle them first.”

Bicheno (2002:10), is of the opinion that “improvement projects can also be identified through costs. Juran was responsible for suggesting that quality costs should be recorded and classified, so as to home in on where effort should be made. To do this we need a classification system, and Juran suggested that quality costs could be grouped into failure or appraisal or prevention costs.”

According to Bicheno (2002:10), Juran emphasized that management needs to tackle the constant underlying poor quality that is often not even recognized. He says that there is a tendency to tackle only random quality problems. Breakthrough is needed. “The way to deal with constant quality problems is project by project improvement. Quality management requires the quality actions to be planned out, improved, and controlled; so the process can be seen as achieving control at one level of quality performance, then planning to be better, then eventually achieving breakthrough to an improved level, and

then once again controlling at the new level. The Quality Council, a body, comprising senior managers, has the responsibility for coordinating the quality improvement actions and projects.

Bicheno (2002:11), researched that the Juran breakthrough sequence sees the improvement process as taking two journeys - the journey from symptom to cause and the journey from cause to remedy. The first journey moves one from the problem to diagnosis. Here we are concerned with identification, using for example Pareto and using of hypotheses testing to find the contributing causes. The second journey moves one from the diagnosis to the solution. "Here one makes the selection of the appropriate cause, implements the necessary actions, and then replicates the improvements where possible in other areas."

According to Bicheno (2002:11), "Juran has also written on product design." His Road Map has 9 junctions: identify customers, determine the needs of customers, translate the needs into company language, develop a product that can respond to those needs, optimise the product's features to meet both company needs and customer needs.

Bicheno (2002:11), researched that "more recently Juran has spoken about Big Q." This is to emphasize that quality is not just the concern of production or even of total quality within the organization, but extends further into the association between organizations, and includes all service organizations and operations. Under Big Q the concept of customer includes stakeholders who have a legitimate concern such as legislators and consumer groups. Juran states that in many companies there is only a faint awareness that the scope of the customer has widened, so there is no longer an agreement on who is the customer.

According to Bicheno (2002:11), finally in his last (edited) book covering the history of quality Juran expresses his views on the future of managing for quality. "He sees a parallel with the field of finance and accounting where, for example, the field is organised into distinct processes such as auditing, standard reports have been developed which are widely read and used by top managers, key terms are in widespread use."

3.4.6 Crosby's contribution to quality

Zhang (1995-1999: **Online**), found that “Crosby defines quality as conformance to requirements.” The requirements of a product need to be distinct and specified clearly so that they are properly understood. His maxim is that superior quality reduces costs and raises profits and thus quality cost is used as a tool to help achieve that goal. His categories of quality costs are similar to costs of Juran -prevention, appraisal and failure. The aim is zero defects. This requires an accent on prevention rather than after-the-fact inspection. “Crosby also presents the quality management maturity grid which may be used by organizations to assess their quality management maturity. The five stages are uncertainty, awakening, enlightenment, wisdom, and certainty. These can be used to assess progress on a number of measurement categories, such as management understanding and attitude, the status of quality in the organization, problem handling, cost of quality as a percentage of sales, quality improvement actions. The quality management maturity grid and the cost of quality measures are the two main tools for managers to assess the seriousness of their quality problems.” “Crosby provides 14 steps to quality improvement (Crosby, 1979, 1984):

- To show management commitment
- To set up a high-level, cross-functional Quality improvement team
- Quality measurement - to provide a report of current and potential non-conformance problems;
- To define the ingredients of the cost of quality and explain its use as a management tool;
- To ensure quality awareness
- To provide a systematic method for corrective action;
- To provide preparatory activities for zero defect program-launching;
- To provide Employee (supervisor) education
- Popularize ZD philosophy and raise quality consciousness;
- Goals are set by employees for themselves and their groups;
- Develop a method for employees to communicate with the management regarding error-cause removal;
- Recognition of excellent work in the quality process

- Bring together quality councils for a planned communication on a regular basis;
- Emphasize that quality improvement never ends and is a constant effort.

According to Zhang (1995-1999: **Online**), Crosby (1984) claims "Mistakes are caused by lack of knowledge and lack of attention". Education and training can eliminate lack of knowledge, and a personal commitment to excellence (zero defects) and attention to detail will cure lack of attention.

3.4.7 Isikawa's contribution to quality

Bicheno (2002:15), found that Ishikawa's quality philosophy is summarised in his 11 points which are:

- "Quality begins and ends with education.
- Know customer requirements.
- The ideal state is when inspection is no longer required.
- Remove the root cause, not the symptoms.
- Quality is everybody's responsibility.
- Do not confuse means with objectives."
- Put quality first to achieve long term profits."
- Marketing is the entrance and exit of quality.
- Top management should not be angered by facts shown by subordinates.
- 95% of problems can be solved with simple tools.
- Data without variability is false data."

3.4.8 Garvin's contribution to quality

According to Bicheno (2002:16), Garvin identified eight dimensions of quality. The eight dimensions are:

- "Performance: the primary operating characteristics of the product or service. Examples would be size, speed, power, sound.

- Features: the extras that supplement the main performance characteristics, example: The sunroof and spotlamps.
- Reliability: what may go wrong and how often it is likely to.
- Conformance: the closeness of match between the design specification and what is actually produced (or the match between what is advertised and what is experienced by customers).
- Durability: how long the product may last, and its robustness in operating conditions. How often service is needed is also relevant.
- Serviceability: the ease, speed, cost and friendliness of service. Whereas reliability is concerned with mean time between failures, serviceability is concerned with mean time to repair.
- Aesthetics: the appearance, style, class and impression.
- Perceived Quality: the feel, the finish, and perhaps the reputation. Also the friendliness and the manner in which the customer is served.”

3.5 BENEFITS OF SERVQUAL INSTRUMENT FOR SERVICE QUALITY

According to Arambewela and Hall (2006: Online) the other strengths of SERVQUAL has been identified as:

- the reliability and validity of the scale in comparing customers' expectations and perceptions over time;
- the ability to compare own SERVQUAL scores against competitors;
- the relative importance of the five dimensions in influencing service quality perceptions;
- The potential use of measure in segmenting customers into several perceived quality segments (eg. High, Medium and Low, and the ability to analyse on the basis of (a) demographic (b) psychographic, and (c) other profiles; and
- The practical implications for companies to improve the global perception of its service quality.

3.6 Disadvantages of SERVQUAL application in Industry

Van Dyke and Prybutok and Kappelman (1999: **Online**), the disadvantages of SERVQUAL:

- Problems with the use of difference or gap scores.
- Reliability problems with gap scores:
- Validity issues:
- Ambiguity of the expectations construct:
- Unstable dimensionality of the SERVQUAL instrument

3.7 CONCLUSION

In this Chapter a literature review was conducted on the primary theme of the dissertation, namely Service quality delivery in the Food and Beverage Industry in Cape Town. Furthermore measuring instruments for Service Quality and Benefits of the SERVQUAL Instrument were elaborated upon in detail.

According to Arambewela and Hall (2006: **Online**), results from the SERVQUAL instrument can be used for the formation of benchmarks and to institute best practice for services by comparing SERVQUAL scores of major competitors within the same industry. By measuring company specific SERVQUAL scores over several periods, trends can be recognized and analyzed.

CHAPTER 4: SURVEY DESIGN AND METHODOLOGY

4.1 THE SURVEY ENVIRONMENT

The South African Breweries (SAB) is the second largest listed company on the JSE Securities Exchange, South Africa's leading producer and distributor of alcoholic and non-alcoholic beverages and is one of the nation's largest manufacturing firms. SAB is the second largest Brewer in the world and it is therefore representative of the Brewing industry. The South African Breweries (Newlands-Cape Town, South Africa) consists of various functional areas, each with a unique role in the delivery quality service to internal customers. The various functional areas are:

- Human Resource Department.
- Quality Assurance and Quality Control Department.
- Finance Department.
- Engineering Departments.
- Manufacturing systems Department.
- Manufacturing development Department
- Brewing Department.
- Packaging Department.
- Operations Department.

The QC/QA department comprises of the Quality control department and the Quality Assurance Department. The Quality Control department will serve as the research environment.

4.2 AIM OF THIS CHAPTER

The ultimate objective being is to solve the research problem as defined in Chapter 1, which reads "How can SERVQUAL be used to improve service quality within the SAB?" thus, the aim of this chapter and the survey contained therein is to determine what the key factors are that impact on the deteriorated service delivery to the Brewing Department and then to improve the service delivery to the Brewing Department.

4.3 CHOICE OF SAMPLING METHOD

According to Collis and Hussy (2003:155-160), a sample is made up of the members of a population (the target population), the latter referring to a body of people or to any other collection of items under consideration for the purpose of the research. A 'sample frame' in turn refers to a list or any other record of the population from which all the sampling units are drawn, for example in a large company, one can have a list of all the employees and this list will form the 'sample frame' from which one can take a 'sample'. Two main categories of sampling can be identified namely 'probability sampling' (where the researcher can in advance determine that each segment of the population will be represented in the sample, and 'non probability sampling' (where the researcher has no way of forecasting or guaranteeing that each element of the population will be represented in the sample). Three of the more popular methods of probability sampling which can be used to select a sample, are random sampling, systematic sampling and stratified sampling. Random sampling was selected as the sampling method in this dissertation.

Thirty five respondents from the Brewing Department (All eight managers and twenty seven staff members) were selected from a population of sixty six, therefore the data collected have representativeness of the population.

4.4 THE TARGET POPULATION

With any survey, it is necessary to clearly define the target population, which Collis and Hussey (2003:56), define as follows: "A population is any precisely defined set of people or collection of items which is under consideration".

The "sampling frame" is defined by Collis and Hussey (2003:155-160) as "a list or record of the population from which all the sampling units are drawn." For the current study , 8 managers and 27 staff members were chosen as they serve as the customers of the Brewing Laboratory and they have knowledge on the SLA process, therefore data collected will be representative of the population. From the different functional areas in the Brewing department the target population is 64 from which 35 were randomly chosen

for the SERVQUAL survey. The QC/QA department has 16 employees 4 of whom as management respondents were chosen for interviews.

The brewing department has a nine level hierarchy, which is made up as follows:

- 1 Brewing Manager
- 1 Brew Master
- 3 Technical Brewers
- 3 Area Managers
- 4 Team leaders
- 9 Artisans and 2 process operators
- 30 Brewing technicians
- 8 Best operating practice(BOP) operators
- 5 In service trainees

All the managers and 27 staff members were selected from the brewing department as these staff members were either directly or indirectly involved in the SLA program. The target population is 66 and 35 were chosen for the SERVQUAL survey. The target population was specifically chosen in order to validate the practicality of the concepts as presented here. The risk of bias, which cannot be statistically eliminated, is recognised by the author based on the definition of the target population as well as the number of respondents selected.

4.5 DATA COLLECTION

According to Emory and Cooper (1995:278), three primary types of data collection (survey) methods can be utilised namely:

- Personal interviewing.
- Telephone interviewing.
- Self-administered questionnaires/surveys.

While all of the above listed methods were used, the primary data collection method used in this survey was a combination of personal interviews and a structured questionnaire.

Interviews, according to Collis and Hussey (2003:64), are associated with both positivist and phenomenological methodologies. They are a method of collecting data in which selected participants are asked questions in order to find out what they do, think or feel. The use of personal interviews as an additional element to the data collection process is in the opinion of the researcher, important, since this allows for the identification of issues within

the target environment, which may not be readily identifiable using a pure survey questionnaire. Furthermore, according to Collis and Hussey (2003:64), interviews are associated with both positivist and phenomenological methodologies as employed within the ambit of this dissertation.

Three managers from the QC/QA department participated in the interview.

The data collection method used in the survey, falls within the context of a survey, defined by Collis and Hussey (2003:60), as: “A sample of subjects being drawn from a population and studied to make inferences about the population”

More specifically, the survey conducted in this dissertation falls within the ambit of the “descriptive survey” as defined by Ghauri, Grønhaug and Kristianslund (1995:58-64). One survey will be conducted to collect “primary data” using the “personal interview” method to conduct the interviews.

The data collection method used falls within the ambit of both the definitions attributed to the concepts “survey” and “field study”. According to Gay and Diebl (1992:238), survey is an attempt 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, while Kerlinger (1986:372), defines “field study” as non-experimental scientific inquiries aimed at discovering the relations and interactions among variables in real structures. As in the case of most academic research, the collection of data forms an important part of the overall dissertation content.

Eight Managers from the Brewing Department, 27 staff members from the Brewing Department, and three Managers of the QC/QA department were involved in this study in the form of questionnaires and interviews.

4.6 MEASUREMENT SCALES

Measurement scales are used in this dissertation. While a plethora of measurement scales are available for academic research, the well known Likert scale whereby respondents are asked to respond to each of the statements, by choosing one of five agreement choices (Emory and Cooper, 1995:179) is commonly used. The advantages of using the Likert scale according to Emory and Cooper (Emory and Cooper 1995:180-181) are:

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

The Likert style questionnaire has the following rank scales: 1 equals strongly disagree, 2 equals disagree, 3 equals undecided, 4 equals agree, 5 equals strongly agree.

4.7 THE DEMAND FOR A QUALITATIVE RESEARCH STRATEGY

While the researcher acknowledges that a number of strategies can be applied in similar research projects, the well-known concepts of objectivity, reliability etc., 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. Yin (2003), identifies three subsets to the concept validity, namely: Construct validity, internal validity and external validity. The study used actual data therefore it is valid. The study used eight out of 8 respondents for questionnaires therefore data is valid.
- **Reliability:** Reliability has to do with the accuracy and precision of a measurement procedure. The Customer and the QC department form a triangle therefore it is a good method to prove reliability.

4.8 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 and 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 demands intimate personal involvement, but also demands 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 but 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”.

4.9 SURVEY DESIGN

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 the 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.

The survey design to be used in this instance is that of the descriptive survey as opposed to the analytical survey. The descriptive survey is according to Collis and Hussey (2003: 10), frequently used in business research in the form of attitude surveys. The descriptive survey as defined by Ghauri, Grønhaug and Kristianslund (1995: 60), has furthermore the characteristics to indicate how many members of a particular population have a certain characteristic. Particular care was taken to avoid bias in the formulation of the questions.

According to Watkins (2008: 143), the statements in the survey have been designed with the following principles in mind:

- Avoidance of double-barrelled statements.
- Avoidance of double-negative statements.
- Avoidance of prestige bias.
- Avoidance of leading statements.
- Avoidance of the assumption of prior knowledge.

Statements were so formulated as to allow the same respondents to respond to each of the questionnaires, to determine if a paradigm shift occurred after the concept of “service delivery improvement” was adopted.

4.10 THE VALIDITY OF THE RESEARCH

The questionnaire contains two sections: the first to rate performance, and the second to give opinions on expectations. These two sections can collect information which will increase the validity of the questionnaire because the two sections are correlated to each other. Based on the pilot study the final version of the questionnaire was modified based on comments and suggestions of employees. Because that face-to-face interviews are highly structured, questions were prepared and piloted to ensure they reflected a high degree of “validity”(Babbie, 2005:285).

4.11 SERVQUAL QUESTIONNAIRE

The questionnaire has been designed in two sections:

- Section 1: Expectations
- Section 2: Performance

The actual questionnaire is showed in Tables 4.1 and 4.2.

4.11.1 Expectations

Table 4.1: Tangibles: Refers to physical representations or images of services

No.	Questions
1	The Brewing laboratory should have up to date equipment and technology. To what extent do you agree with this statement?
2	The Brewing laboratory should have appealing facilities (5S standard, standard of work areas). To what extent do you agree with this statement?
3	The Brewing laboratory should have visually appealing materials-example taste bottles labelling and presentation (neat, legible, professional).To what extent do you agree with this statement?
4	Communicating channels should make you find information easily (LIMS, v-drive, e-mails, and web pages). To what extent do you agree with this statement?

Reliability: Refers to the ability to perform the promised service dependably and accurately

No.	Questions
5	When the Brewing laboratory promises to do something by a certain time it should do so. To what extent do you agree with this statement?
6	The Brewing laboratory should show a sincere interest in solving problems. To what extent do you agree with this statement?
7	The Brewing laboratory should perform the service right the first time. To what extent do you agree with this statement?
8	The Brewing laboratory should insist on error free records. To what extent do you agree with this statement?

Responsiveness: Refers to willingness to help customers; and to provide a prompt service

No.	Questions
9	The staff of the Brewing laboratory should tell you exactly when services will be performed. To what extent do you agree with this statement?
10	The staff of the Brewing laboratory should give you prompt service. To what extent do you agree with this statement?
11	The staff of the Brewing laboratory should always be willing to help you. To what extent do you agree with this statement?
12	The staff of the Brewing laboratory should not be too busy to respond to your questions. To what extent do you agree with this statement?

Assurance: Refers to the knowledge and courtesy of staff; their ability to inspire trust and confidence

No.	Questions
13	The staff of the Brewing laboratory should instil confidence in customers. To what extent do you agree with this statement?
14	Customers should have comfortable interactions with employees. (Respects confidentiality of info etcetera). To what extent do you agree with this statement?
15	The staff of the Brewing laboratory should be courteous with. To what extent do you agree with this statement?
16	The staff of the Brewing laboratory should have the knowledge to answer your questions. To what extent do you agree with this statement?

Empathy: Caring and individualised attention provided to stakeholders

No.	Questions
17	Customers should be given individual attention by Brewing laboratory staff. To what extent do you agree with this statement?
18	The operating hours of the Brewing laboratory should be convenient to all its customers. To what extent do you agree with this statement?
19	The staff of the Brewing laboratory should have your best interest at heart. To what extent do you agree with this statement?
20	The staff of the Brewing laboratory should understand your specific needs. To what extent do you agree with this statement?

4.11.2 Perceptions

Table 4.2: Tangibles: Refers to physical representations or images of services

No.	Questions
1	The Brewing laboratory has up to date equipment and technology. To what extent do you agree with this statement?
2	The Brewing laboratory has appealing facilities (5S standard, standard of work areas). To what extent do you agree with this statement?
3	The Brewing laboratory has visually appealing materials-example taste bottles labelling and presentation (neat, legible, professional).To what extent do you agree with this statement?
4	Communicating channels makes you find information easily (LIMS, v-drive, e-mails, web pages). To what extent do you agree with this statement?

Reliability: Refers to the ability to perform the promised service dependably and accurately

No.	Questions
5	When the Brewing laboratory promises to do something by a certain time it does so. To what extent do you agree with this statement?
6	The Brewing laboratory shows a sincere interest in solving problems. To what extent do you agree with this statement?
7	The Brewing laboratory performs the service right the first time. To what extent do you agree with this statement?
8	The Brewing laboratory insists on error free records. To what extent do you agree with this statement?

Responsiveness: Refers to willingness to help customers; and to provide a prompt service

No.	Questions
9	The staff of the Brewing laboratory tells you exactly when services will be performed. To what extent do you agree with this statement?
10	The staff of the Brewing laboratory gives you prompt service. To what extent do you agree with this statement?
11	The staff of the Brewing laboratory is always be willing to help you. To what extent do you agree with this statement?
12	The staff of the Brewing laboratory is not too busy to respond to your questions. To what extent do you agree with this statement?

Assurance: Refers to the knowledge and courtesy of staff; their ability to inspire trust and confidence

No.	Questions
13	The staff of the Brewing laboratory should instil confidence in customers. To what extent do you agree with this statement?
14	Customers has comfortable interactions with employees. (Respects confidentiality of info etcetera). To what extent do you agree with this statement?
15	The staff of the Brewing laboratory is courteous with. To what extent do you agree with this statement?
16	The staff of the Brewing laboratory has the knowledge to answer your questions. To what extent do you agree with this statement?

Empathy: Caring and individualised attention provided to stakeholders

No.	Questions
17	Customers are given individual attention by Brewing laboratory staff. To what extent do you agree with this statement?
18	The operating hours of the Brewing laboratory are convenient to all its customers. To what extent do you agree with this statement?
19	The Brewing laboratory staff has your best interest at heart. To what extent do you agree with this statement?
20	The staff of the Brewing laboratory understands your specific needs. To what extent do you agree with this statement?

4.12 CONCLUSION

In conclusion in this chapter was addressed:

The survey method and questionnaire were developed to collect data for both performance and expectations for functional departments at the SAB. This data collected from the questionnaire will provide information (for expectation and performance regarding SERVQUAL) from both managers and staff members. Several interviews have gained data and information regarding SERVQUAL. The validity of the study has been established through the survey research method and questionnaire.

In Chapter 5, results from the survey will be analysed in detail and conclusions drawn.

CHAPTER 5: SERVQUAL SURVEY DATA ANALYSIS AND RESULTS

5.1 INTRODUCTION

Data analysis is “the process of bringing order, structure and meaning to the mass of collected data” (de Vos 2002, 339). The aim of this study is to determine how SERVQUAL can be used to improve service quality within the SAB. This chapter discusses the results of the data analysis of the survey conducted among employees in the brewing and packaging departments of SAB. The data obtained from the completed questionnaires will be presented and analysed by means of various analyses (uni-variate, bi-variate and multivariate) as applicable.

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

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

This information has been analysed using SAS software. Descriptive statistics and frequency tables displayed in paragraph 5.2 shows, the distributions of biographical variables and statement responses. As a measure of central tendency, Table 5.4 shows the means and standard deviations of the statement responses (Likert scale is an ordinal scale but is sometimes treated as an interval scale in the literature) of survey respondents.

5.2 ANALYSIS METHOD

5.2.1 Validation survey results

A descriptive analysis of the survey results returned by the research questionnaire respondents is reflected below. The responses to the questions obtained through the

questionnaires are indicated in table format for ease of reference. Each variable is tested to fall within the boundaries.

5.2.2 Data format

The data was received in questionnaires, which were coded and captured on a database that was developed on Microsoft Access. These questionnaires are captured twice and then the two datasets are compared to make sure that the information captured was correct. When the database was developed, use was 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
- Neutral 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 is then imported into SAS-format through the SAS ACCESS module. This information, which was double checked for correctness, is then analysed by researcher.

5.2.3 Preliminary analysis

The reliability of the statements in the questionnaire posted to the staff and the questionnaire posted to the employees of the brewing department was measured by using the Cronbach Alpha tests (see paragraph 5.3.1). Descriptive statistics were performed on all variables; displaying means, standard deviations, frequencies, percentages, cumulative frequencies and cumulative percentages. These descriptive statistics are discussed in paragraphs 5.3.2 and 5.3.3 (see also computer printout in Annexure A).

5.2.4 Inferential statistics

The following inferential statistics were performed on the data:

- 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.
- 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).
- The **Wilcoxon signed-rank test** is a non-parametric statistical hypothesis test for the case of two related samples or repeated measurements on a single sample. It can be used as an alternative to the paired Student's t-test when the population cannot be assumed to be normally distributed.
- The **Wilcoxon signed-rank test**, also known as the Wilcoxon matched pairs test, is a non-parametric test used to test the median difference in paired data. This test is the non-parametric equivalent of the paired t-test (Bland J.M, 1995). The main difference is that parametric techniques make distributional assumptions, usually that data follow a normal distribution.
- The SAS software computes a P-value (Probability value) that measures statistical significance when comparing variables with each other, determining relationships between variables or determining associations 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 $\alpha=0.05$, 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.

5.2.5 Technical report with graphical displays

A written report with explanations of all variables and their outcome has been compiled. A Cross analysis of variables where necessary was performed, attaching statistical probabilities to indicate the magnitude of differences or associations.

All inferential statistics are discussed in paragraph 5.3.4.

5.2.6 Assistance to the researcher

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

5.2.7 Sample

The target population was the employees of the brewing and packaging departments of SAB. The total sample of employees was 35. A sample was drawn of employees that were involved in the SLA and they therefore had the experience and knowledge for the requirement of the SERVQUAL questionnaire.

5.3 ANALYSIS

In total 35 respondents from the brewing and packaging departments of SAB answered the questionnaires posted to them. The items (statements) in the questionnaires were tested for reliability, as described in the following paragraph.

5.3.1 Reliability testing

The reliability test (Cronbach's Alpha Coefficient) was done on all the items (statements) which represent the measuring instrument of this survey, with respect to the responses rendered in this questionnaire. The Cronbach's Alpha Coefficients for each item were more than 0.70 (the acceptable level according to Nunnally, 1978: 245), and thus these items (statements) in the questionnaire proved 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 5.1 and Annexure A. They show 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 were 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 5.1, it can be seen that the reliability of the scale would be higher if any of these statements were deleted.

For instance, if statement 3 of the performance questionnaire was deleted from this measuring scale then the Cronbach Alpha Coefficient would increase to 0.8978. This however is not needed, as the alpha for each item is greater than 0.70. Table 5.1, because it is so big, has been placed into Annexure D.

The Cronbach's Coefficient Alpha for raw variables which is equal to 0.8924 was used and proved this questionnaire to be reliable and consistent because it was more than the acceptable level of 0.70.

5.3.2 Descriptive statistics

Table 5.2 shows the descriptive statistics for all the information in the questionnaires that measured a number for quality of service delivery- related variables (questions) in the brewing laboratory with the frequencies in each category and the percentage out of total number of questionnaires. The descriptive statistics are based on the total sample. These descriptive statistics are also shown in Annexure B. Table 5.3 shows the descriptive statistics like mean, standard deviation and range for the continuous variables and in this case for the statements as the Lickert scale are sometimes referred to as an interval scale. If a statement was left blank it will fall under the unknown category in Table 5.2. Table 5.2, because it is so big, is placed in Annexure E.

Table 5.3 has been placed in Annexure F.

The expectation statements have a higher average than the performance statements and thus the respondents agreed more with the expectation questionnaire statements. This came down to the fact that the expectations were higher than the actual performance, and this will be tested later in this document to determine whether these differences were statistically significant.

5.3.3 UNI-VARIATE GRAPHS

5.3.3.1 Performance questionnaires

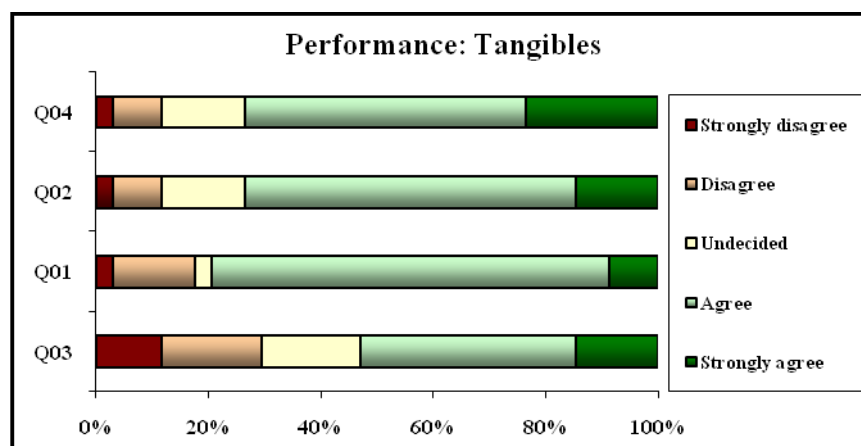


Figure 5.1: Performance - Tangibles

Although more respondents agreed than disagreed with the four statements measuring tangibles in the performance questionnaire the statement that they agreed the least with was “Brewing laboratory uses visually appealing materials” (52.9% agree to strongly agree).

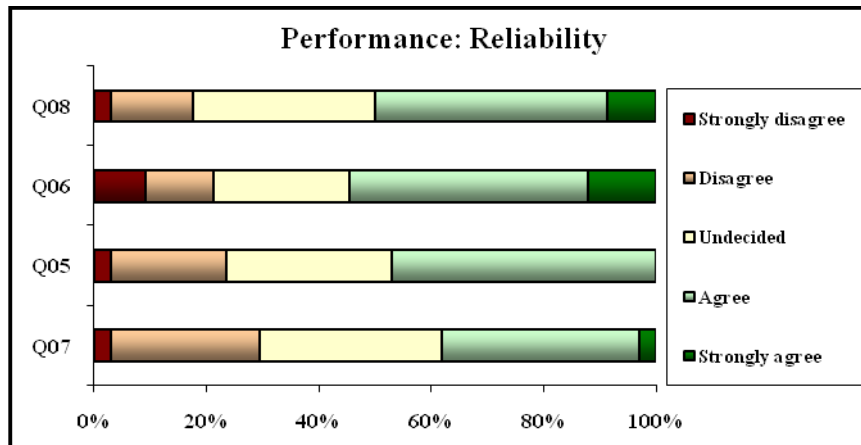


Figure 5. 2: Performance - Reliability

Although on average a quarter of the respondents were undecided about the reliability statements; there were still more respondents who agreed than disagreed with these statements. The statement that the respondents agreed the most with was “Brewing lab shows a sincere interest in solving problems” (53.0% agree to strongly agree).

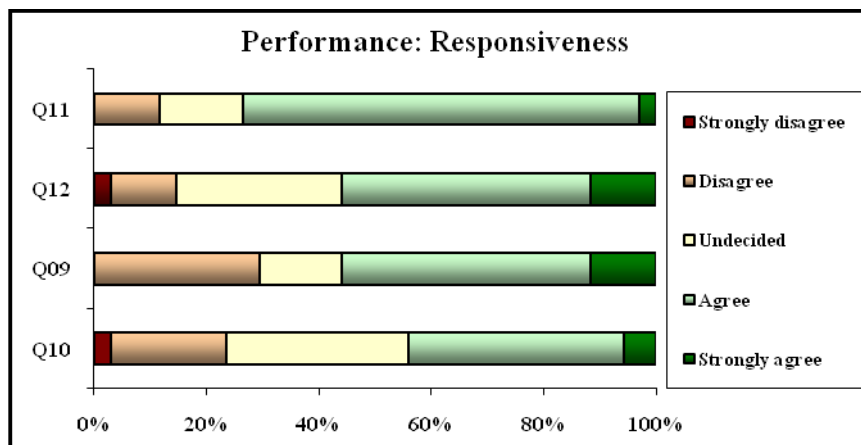


Figure 5. 3: Performance - Responsiveness

The statement that the respondents agreed the most with, with respect to the responsiveness statements was “The staff of the Brewing lab is always willing to help you” (72.5% agree to strongly agree).

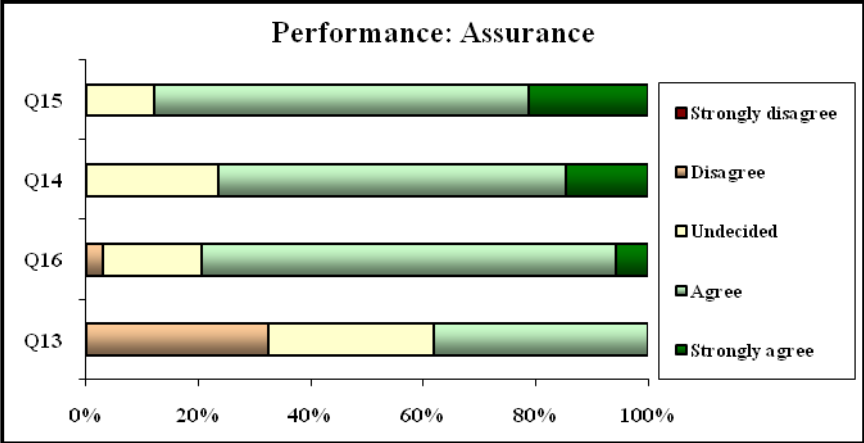


Figure 5. 4: Performance - Assurance

It seems that the respondents were split with regard to the statement “The staff of the Brewing lab instils confidence in customers”. Nearly 30% of the respondents were undecided, 32.4% disagreed, and 38.2% agreed.

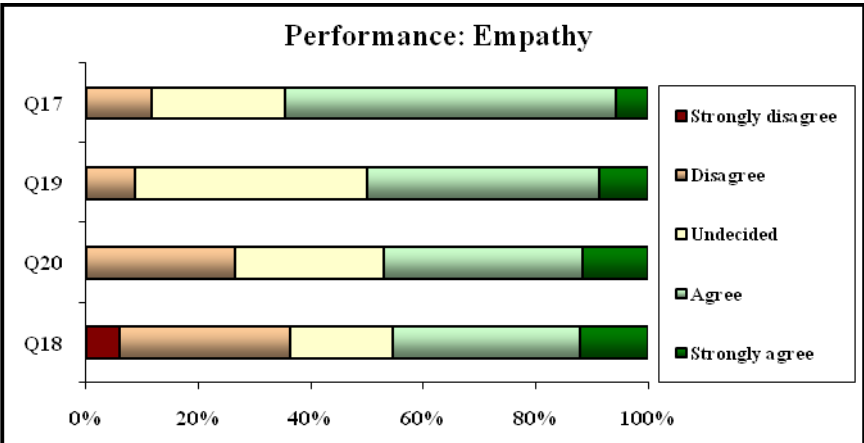


Figure 5. 5: Performance – Empathy

The statement that the respondents agreed the most with, with respect to the empathy statements was “Customers are given individual attention by Brewing lab staff” (64.7% agree to strongly agree).

5.3.3.2 Expectation questionnaire

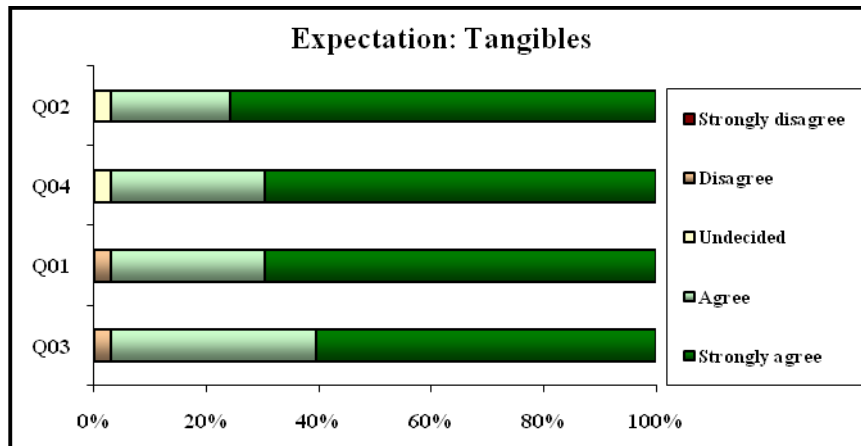


Figure 5. 6: Expectation – Tangibles

As can be seen in Figures 5.6-5.10, most of the respondents agreed with these statements and the only difference between the statements measuring the expectations on the respondents was in the degree in which the respondents agreed.

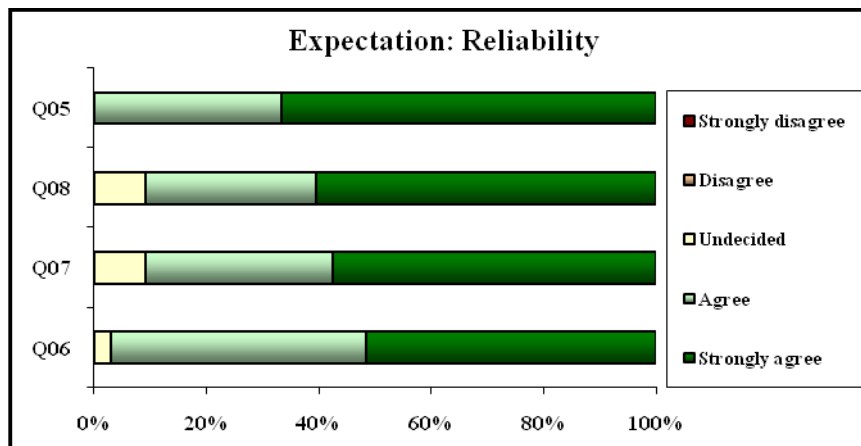


Figure 5. 7: Expectation – Reliability

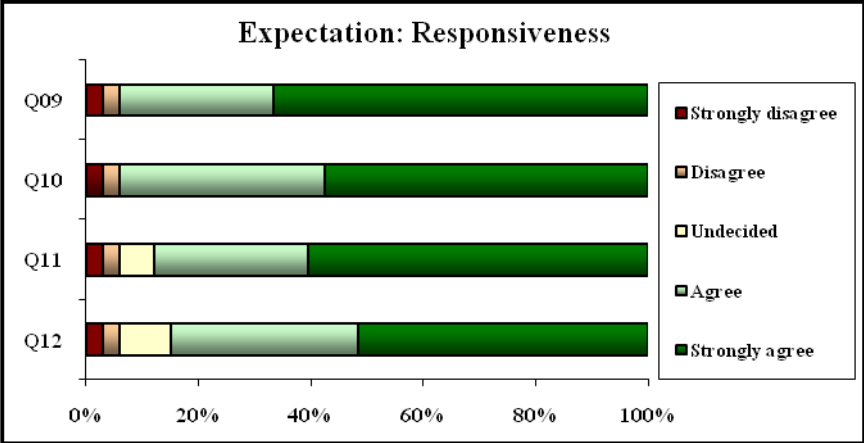


Figure 5. 8: Expectation - Responsiveness

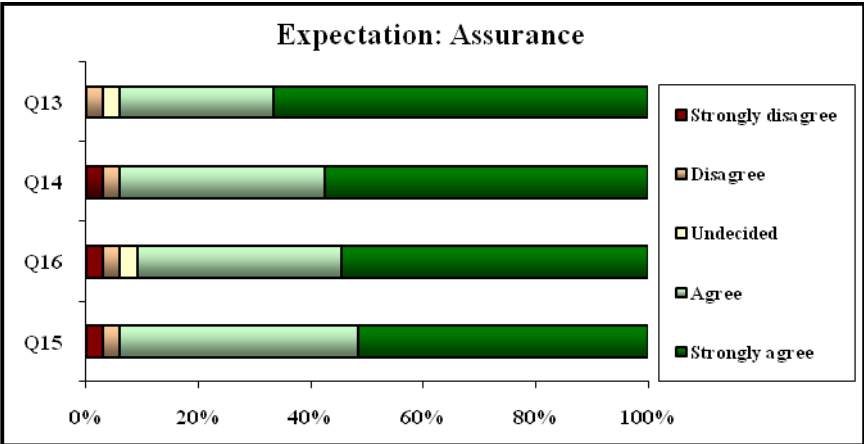


Figure 5. 9: Expectation – Assurance

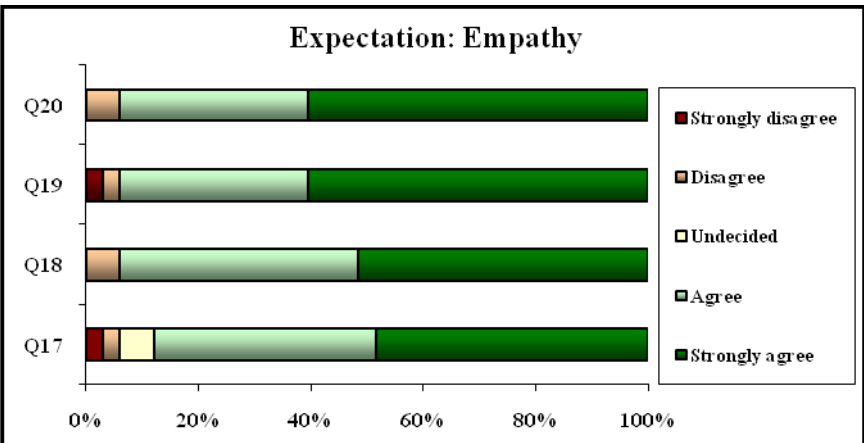


Figure 5. 10: Expectation - Empathy

More than 90% of the respondents agreed to strongly agreed to almost all the statements regarding the expectations of the Brewing lab staff. It means that the expectation of the SAB Brewing laboratory service quality is very high. It also means that the expectations are much higher than the actual performance perceived by the respondents. In order to determine whether the expectations with regard to the service quality of the SAB Brewing laboratory is significantly higher than the actual performance perceived by the respondents; the Wilcoxon sign rank test was performed on the data and will be discussed in the following paragraph.

5.3.4 Comparative Statistic

Comparisons are made between the actual performance questionnaire and the expectation questionnaire by calculating the difference between the two and then testing these differences by using the Wilcoxon sign rank test in order to determine whether this difference is zero. Because doubt existed whether the distribution of the data was normal, this non-parametric test was the best suitable to use as it does not make assumptions of how the data is distributed.

The hypothesis being tested was as follows:

- H_0 = There is no difference between the responses of the performance questionnaire and the expectation questionnaire.
- H_1 = The expectation questionnaires have higher responses than the performance questionnaires.

The results when there were statistically significant differences between performance and expectation can be found in Tables 5.4, but note must be taken that all the comparisons (significant and not significant) will be attached in Annexure C. Table 5.4 has been placed in Annexure G.

Except for the statement “Staff of the Brewing lab is courteous with you” there were statistically significant differences in all the statements between performance and expectation. The following graphs will show is that the expectations were always higher than the performance.

It seems from this that the performance of the staff of the brewing lab regarding being courteous to the client complied with the expectations of the staff. However, for the rest of the statements there seemed to be much room for improvement to satisfy the expectations of the staff. The average difference was mostly around one, and thus the expectations of the staff are at least one up of the five available choices.

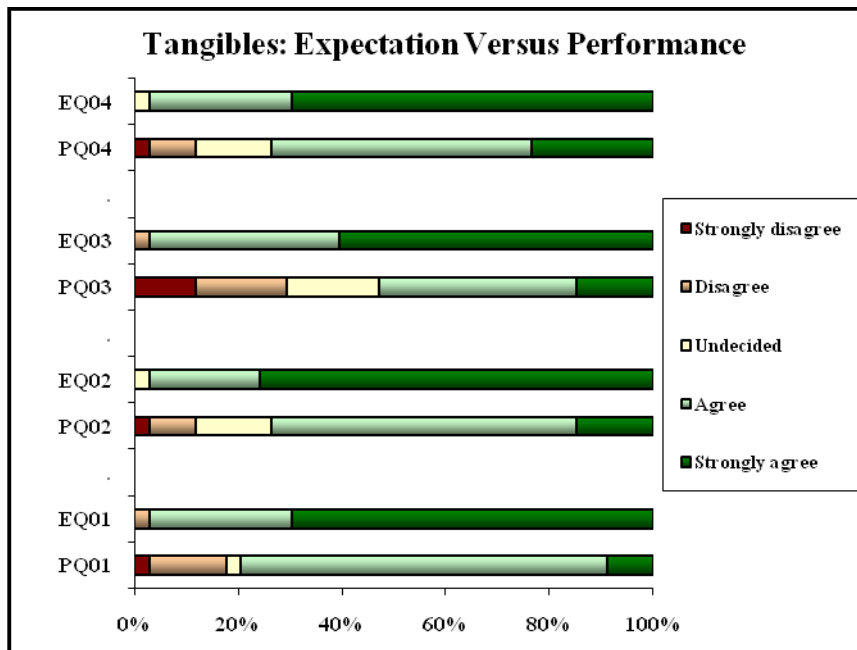


Figure 5. 1: Tangibles

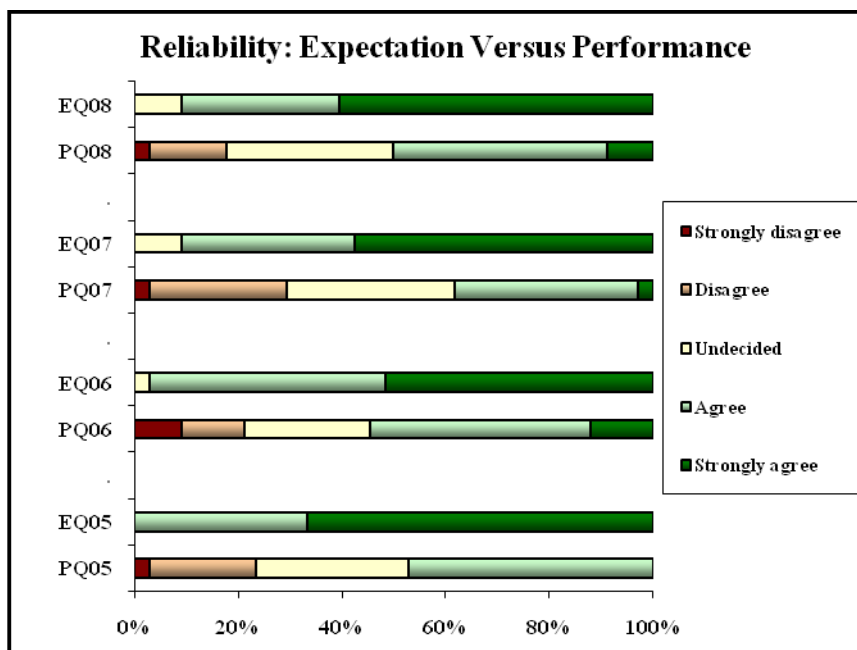


Figure 5. 2: Reliability

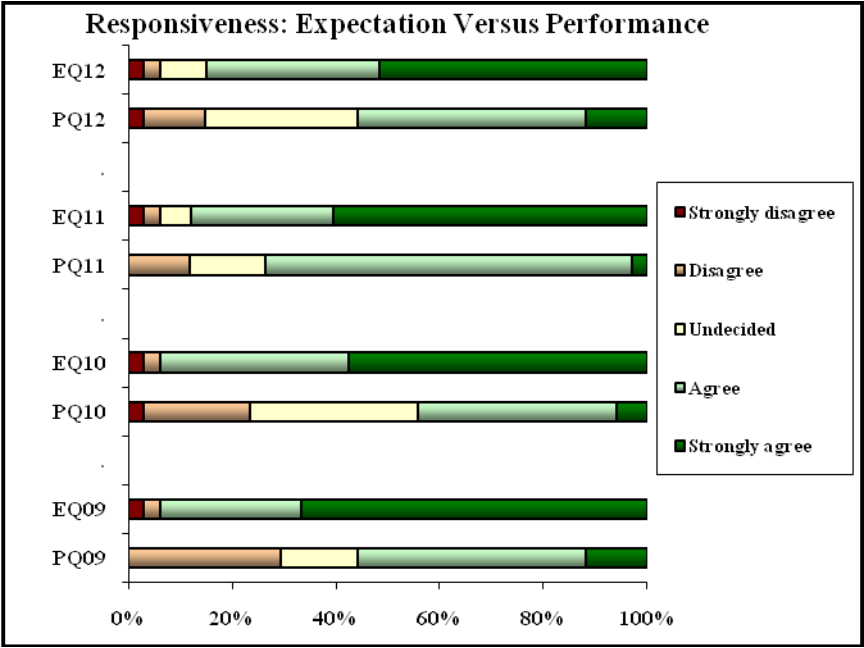


Figure 5. 3: Responsiveness

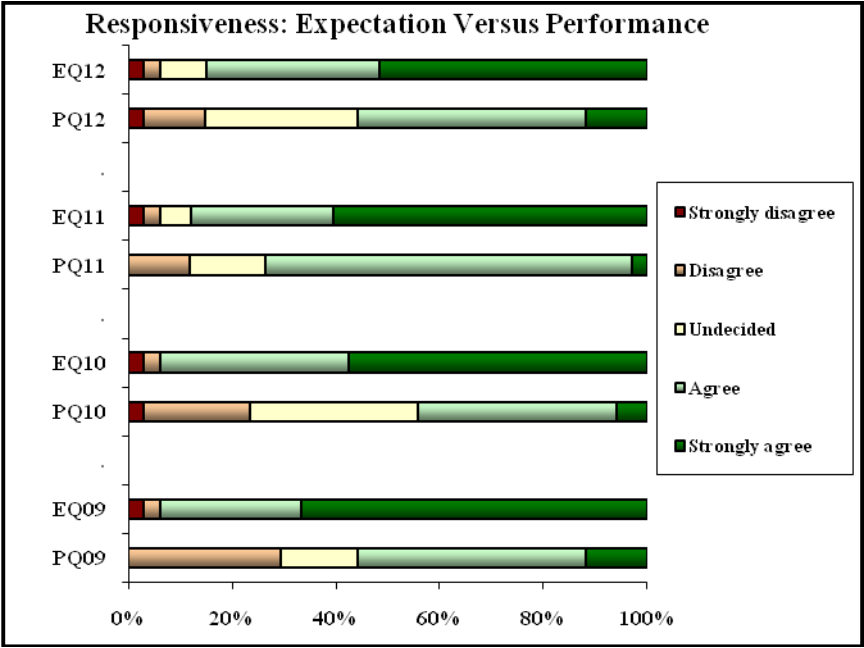


Figure 5. 4: Assurance

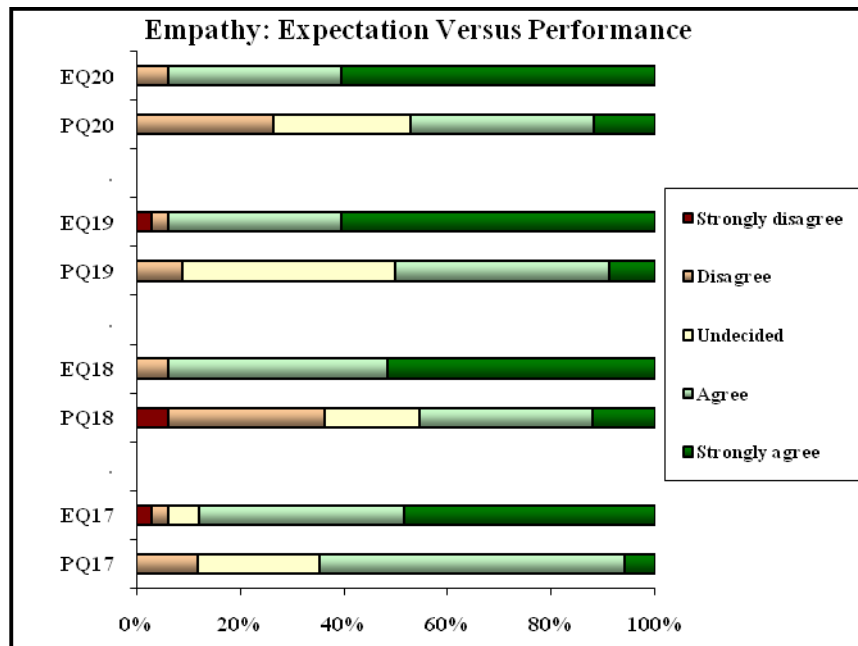


Figure 5. 5: Empathy

5.4 Responses from interviews

Besides the data that was collected through the SERVQUAL instrument, other information was gathered by several personal interviews. The results and discussions are given below:

5.4.1 Feedback from participants to questions utilized during the interviews are summarized below:

- *Do you think there can be benefits using SERVQUAL survey and why?*

There is an SLA survey in place. Some of the items of the SERVQUAL survey can be used in the SLA survey. The SERVQUAL survey can be useful in the times when SLA is drawn up still. The laboratory manager should add a comment section in the SERVQUAL survey as the SERVQUAL survey questions are not very specific and improvement can be easier made if the comment section is included.

- *Do you think any improvements can be made through SLA or SERVQUAL if the company uses it?*

Yes is the authors reply on the abovementioned question, review scoring on a regular basis and communicate findings to all involved so all are aware where improvements can

be made. Review scoring on a regular basis and focus on low scoring areas. Give accountabilities to people on low scoring areas. Track improvements over time per section per individual.

- *What do you think are the key service quality factors?*

See section 3.2.3 and section 6.2.1.

How can we improve on the 5S status in the laboratory?

Begin applying 5S principles in a smaller area (Kitchen) and take the learnings to the laboratory. Take before pictures and divide the area into sections and assign duties. By month ends score the area and show improvement over time. The improved score must be sustainable for four to five months. (If 5S is achieved all quality issues will improve as well.)

How can we improve our visual presentability?

- Purchase enough lab coats for all and discard old ones to prevent them from being recirculated.
- Purchase new taste bottles and label neatly.
- Put graphs and reference trends at workstations so performance of equipment is visible to all.
- Have a television screen in a central place to flash up the following:
 - Competency of laboratory staff
 - Amount of analysis done per month
 - 5S status (pictures and score)
 - Downtime of equipment
 - Reference and standard trends
- Use the taste room and haze room as a model area after the kitchen as this is where the customers mostly interact with the laboratory staff.

How can we improve on our communication channels?

Use a television screen to flash up different aspects of quality

- Competency of laboratory staff
- Amount of analysis done per month
- 5S status (pictures and score)

- Downtime of equipment
- Reference and standard trends

How can we improve on reference control?

Adhere to frequencies and plot results regularly, give regular weekly reference feedback, have quicker turnaround time for new reference limits.

How can we improve on equipment support in the virtual laboratories?

More visibility of the Big Q technician and improve on after hours standby support. Continuous training for shop floor representatives and feedback should be given at Business Continuity Management meetings.

How can we improve on routine adhoc requests?

Have a quicker turnaround time for plotting and communication of results.

5.4.2 All the low scoring areas in the questionnaire are summarized below:

5.4.2.1 Performance questionnaire

Tangibles: Refers to the physical representations or images of one's service

- The brewing laboratory uses visually appealing materials.
(Tangibles are still not up to the expectations of the staff; especially use of visually appealing material.)

Reliability: Refers to one's ability to perform the promised service dependability and accurately

- When the brewing laboratory promises to do something by a certain time, it does so;
- that it performs the service right the first time
- and brewing laboratory insist on error free records.

(A large part of the respondents were undecided on the reliability aspect of the brewing lab; which could indicate that they were not knowledgeable of this aspect of quality. Because fact that a large part of the respondents could not decide whether the brewing lab was reliable the expected reliability is significant higher than the actual reliability shown.

Responsiveness: Refers to one's willingness to help customers and to provide a prompt service

- The staff of the brewing lab tells the customer exactly when services will be performed
- The staff of the brewing laboratory gives the customer prompt service.
(The respondents indicated that the responsiveness of the brewing laboratory was better than the reliability but it was still not up with the expectation of the respondents. The willingness of the staff of the brewing laboratory to help is the only aspect that comes near to the expectation)

Assurance: Refers to knowledge and courtesy of staff; their ability to inspire trust and confidence

- The staff of the brewing laboratory instils confidence in customers.

Empathy: Refers to caring individualised attention the brewing laboratory provide their stakeholders

- The brewing laboratory operating hours are convenient to all its customers
- The brewing laboratory staff have the customer's best interest at heart.
- The staff of the brewing laboratory understands your specific needs.
(In the case of empathy there was in some statements a large percentage of uncertainty especially whether the staff had the customers' best interest at heart, but the actual performance seems still to be above the average. The expected service, is however, much higher.)

Note should be taken of the aspects which showed a large percentage of uncertainty. It may mean that the staff was not knowledgeable of their performance with regard to these aspects of quality in service.

5.5 CONCLUSIONS

In conclusion, according to the research results, all the questions from the expectation survey showed high ratings while the performance survey showed high ratings on some questions and low ratings on some questions. Generally all questions in the expectation questionnaire scored higher than those in the performance questionnaire.

5.5.1 Conclusion on Expectation Survey

All the questions were highly scored in the survey by respondents. This is shown in Annexure E (Table 5.2). This indicates high expectations of good service delivery amongst respondents.

5.5.2 Conclusion on Performance Survey

Based on the results of the performance questionnaire, high scoring areas from the questionnaire and possible reasons were identified which included the following:

Tangibles: in terms of the Brewing laboratory that has up to date equipment and technology, equipment and technology is controlled from head office and all regions within SAB have the same standard. The brewing laboratory has appealing facilities (5S standard, standard of work areas); in the brewing laboratory there is a constant focus on housekeeping and ways to improve on it. Regarding the communication channels, there is a constant focus on communication of results and analysis information and how to get analysis information out quickly to customers.

Reliability: the brewing laboratory shows a sincere interest in solving problems

Responsiveness: the staff of the brewing laboratory is always willing to help you as the customer , the staff of the brewing laboratory is not too busy to respond to your (the customer's) questions.

Assurance: Customers have comfortable interactions with employees, the staff of the brewing laboratory is courteous with you, the staff of the brewing laboratory have the knowledge to answer your questions.

Empathy: Customers are given individual attention by brewing laboratory staff.

All the above is at the core of the function of the brewing laboratory which is to see to the needs of the customer, and therefore it is not surprising that the brewing laboratory scored high in these areas.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 THE RESEARCH THUS FAR

This chapter aims to answer the research question asked from chapter one. This chapter also attempts to determine whether the research has achieved the research objectives. In chapter one, the scope of the research was elaborated upon. In chapter two, a holistic perspective of the research environment was provided. In chapter three, a literature review was conducted on SERVQUAL and associated factors. In chapter four the survey design and methodology were elaborated upon. In chapter five, data gleaned from the survey conducted in chapter four was analyzed and interpreted. In this chapter, final conclusions and recommendations will be made to solve the research problem.

6.2 ANALOGIES DRAWN FROM LITERATURE REVIEW

6.2.1 The key factors that impact on service quality in the Food and beverage industry

According Parasuraman et al. (1988) in the SERVQUAL survey the key factors that impact on service quality are the following: *Tangibles* refers to: The physical representations or images of one's service; *Reliability* refers to one's ability to perform the service dependably and accurately; *Responsiveness* refers to one's willingness to help customers and to provide prompt service; *Assurance* refers to the knowledge and courtesy of staff and their ability to inspire trust and confidence; *Empathy* refers to the caring individualized attention one provides to one's stakeholders.

According to the SLA used in the SAB the key factors that impact on service quality are:

- Morning meeting support
- Reference control
- Equipment support
- Routine adhoc requests
- Managing of missing data
- Trial support
- In process taste requirements
- Package product taste requirements

6.2.2 Benefits of SERVQUAL instrument for service quality:

According to Arambewela and Hall (2006: **Online**) the other strengths of SERVQUAL has been identified as:

- “the reliability and validity of the scale in comparing customers' expectations and perceptions over time;
- the ability to compare own SERVQUAL scores against competitors;
- the relative importance of the five dimensions in influencing service quality perceptions;
- the potential use of measure in segmenting customers into several perceived quality segments (eg. High, Medium and Low, and the ability to analyze on the basis of (a) demographic (b) psychographic, and (c) other profiles; and
- the practical implications for companies to improve the global perception of its service quality.

According to Brysland, Curry, (2001) an advantage of SERVQUAL is that it is a tried and tested instrument which can be used for benchmarking purposes.

According to Fedoroff, (2010) SERVQUAL provides detailed information about:

- Customers perceptions of service quality
- Performance levels as seen by customers
- Customers' suggestions
- Input from employees with respect to customer expectations and satisfaction.

According to Yilmaz (1998) “SERVQUAL was found to be simple and practical to implement in the case company. It is very easy to modify the questionnaires to any service environment. Researchers do not need to know the organizational and technical details of service organization. Questions do not include any technical jargon, and are easily answered by both users and IS personnel.”

According to Foster (2004:13) the advantages of SERVQUAL are:

- “Accepted as a standard for assessing different dimensions of services quality.
- Shown to be valid for a number of different service situations.

- Demonstrated to be reliable, meaning that different readers interpret the questions similarly.
- Only has 22 items making it parsimonious. It can be filled out quickly by customers and employees.
- Has a standardized analysis procedure to aid interpretation and results.”

6.3 THE RESEARCH PROBLEM RE-VISITED

The research problem that was formulated in chapter one paragraph 4.1 reads as follows: “Poor equipment support, poor reference control and slow response to routine adhoc requests contribute to low SLA scores within the South African Breweries (SAB).”

The issues pertaining to poor service delivery from the Brewing Laboratory were elaborated upon in detail in chapter five, and further poor quality delivery was confirmed by the surveys in chapter five. In the opinion of the researcher, should the recommendations be implemented as set out in this chapter, the research problem can be solved.

6.4 THE RESEARCH QUESTION RE-VISITED

The research question which was formulated in chapter 1 paragraph 5 reads as follows: “How can SERVQUAL be used to improve service quality within SAB?”

The interviews stated that SAB already has an SLA in place and a SERVQUAL survey can be used when SLA is not yet developed and used. Some of the SERVQUAL survey questions can also be incorporated into the SLA survey when the SLA is in use. The SERVQUAL survey and the SLA scores should be reviewed regularly and the low scoring areas should be audited. Duties should also be assigned to low scoring areas and thus reviewed in this way.

6.5 INVESTIGATIVE QUESTIONS RE-VISITED.

The investigative research questions that were asked in Chapter 1 were as follows:

- What are the key factors that influence service quality?
- What are the benefits of using SERVQUAL instrument within a company?

- What are the differences between the SLA and SERVQUAL instrument?

6.5.1 The key factors that influence service quality

According Parasuraman et al. (1988) in the SERVQUAL survey the key factors that impact on service quality are the following: *Tangibles* refers to: The physical representations or images of one's service; *Reliability* refers to one's ability to perform the service dependably and accurately; *Responsiveness* refers to one's willingness to help customers and to provide prompt service; *Assurance* refers to the knowledge and courtesy of staff and their ability to inspire trust and confidence; *Empathy* refers to the caring individualized attention one provides to one's stakeholders.

According to the SLA used in the SAB the key factors that impact on service quality are:

- Morning meeting support
- Reference control
- Equipment support
- Routine adhoc requests
- Managing of missing data
- Trial support
- In process taste requirements
- Package product taste requirements

6.5.2 The benefits of using SERVQUAL instrument within a company

According to Arambewela and Hall (2006: **Online**) the other strengths of SERVQUAL has been identified as:

- “the reliability and validity of the scale in comparing customers' expectations and perceptions over time;
- the ability to compare own SERVQUAL scores against competitors;
- the relative importance of the five dimensions in influencing service quality perceptions;
- the potential use of measure in segmenting customers into several perceived quality segments (eg. High, Medium and Low, and the ability to analyze on the basis of (a) demographic (b) psychographic, and (c) other profiles; and

- the practical implications for companies to improve the global perception of its service quality.

According to Brysland, Curry, (2001) an advantage of SERVQUAL is that it is a tried and tested instrument which can be used for benchmarking purposes.

According to Fedoroff, (2010) SERVQUAL provides detailed information about:

- Customers perceptions of service quality
- Performance levels as seen by customers
- Customers's suggestions
- Input from employees with respect to customer expectations and satisfaction.

According to Yilmaz (1998) "SERVQUAL was found to be simple and practical to implement in the case company. It is very easy to modify the questionnaires to any service environment. Researchers do not need to know the organizational and technical details of service organization. Questions do not include any technical jargon, and are easily answered by both users and IS personnel."

According to Foster (2004:13) the advantages of SERVQUAL are:

- "Accepted as a standard for assessing different dimensions of services quality.
- Shown to be valid for a number of different service situations.
- Demonstrated to be reliable, meaning that different readers interpret the questions similarly.
- Only has 22 items making it parsimonious. It can be filled out quickly by customers and employees.
- Has a standardized analysis procedure to aid interpretation and results."

6.5.3 The differences between the SLA and SERVQUAL instrument

The SLA is more company-specific and specific to the Brewing laboratory and therefore feedback is also much more specific and improvements can be made without any further investigations. The SERVQUAL instrument, on the other hand, is a much more general questionnaire and can be used off the shelf for any company. The recommendation is that

a comment section be inserted in the SERVQUAL questionnaire to allow for more specific feedback.

- How can the SERVQUAL instrument be effectively applied to measure quality outputs?

6.6 KEY RESEARCH OBJECTIVES RE-VISITED

The primary research objectives of this dissertation read as follows:

- To investigate the key factors that impact on service quality within the laboratory of the SAB.

According to Parasuraman et al. (1988) in the SERVQUAL survey, the key factors that impact on service quality is: *Tangibles* refers to: The physical representations or images of one's service; *Reliability* refers to one's ability to perform the service dependably and accurately; *Responsiveness* refers to one's willingness to help customers and to provide prompt service; *Assurance* refers to the knowledge and courtesy of staff and their ability to inspire trust and confidence; *Empathy* refers to the caring individualized attention one provides one's stakeholders.

According to the SLA used within the SAB the key factors that impact on service quality is:

- Morning meeting support
- Reference control
- Equipment support
- Routine adhoc requests
- Managing of missing data
- Trial support
- In process taste requirements
- Package product taste requirements
- To determine the benefits using SERVQUAL instrument.

According to Arambewela and Hall (2006: **Online**) the other strengths of SERVQUAL has been identified as:

- “the reliability and validity of the scale in comparing customers' expectations and perceptions over time;

- the ability to compare own SERVQUAL scores against competitors;
- the relative importance of the five dimensions in influencing service quality perceptions;
- the potential use of measure in segmenting customers into several perceived quality segments (eg. High, Medium and Low, and the ability to analyze on the basis of (a) demographic (b) psychographic, and (c) other profiles; and
- the practical implications for companies to improve the global perception of its service quality.

According to Brysland, Curry, (2001) an advantage of SERVQUAL is that it is a tried and tested instrument which can be used for benchmarking purposes.

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- Input from employees with respect to customer expectations and satisfaction.

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- Shown to be valid for a number of different service situations.
- Demonstrated to be reliable, meaning that different readers interpret the questions similarly.
- Only has 22 items making it parsimonious. It can be filled out quickly by customers and employees.
- as a standardized analysis procedure to aid interpretation and results."
- To provide possible solutions for the laboratory to improve service quality by applying the SERVQUAL instrument.

See recommendations made below.

6.7 RECOMMENDATIONS

Recommendations to mitigate the research problem and to provide an answer to the research question and associated investigative questions. This study has identified the weak areas that the company should make improvements on. This section focuses on the two surveys SERVQUAL and interviews:

6.7.1 Recommendations for improvements on low scoring questions from the SERVQUAL questionnaire:

Q3) the brewing laboratory should use visually appealing materials-example taste bottles (neat, legible, professional)

The brewing laboratory needs enough new laboratory coats and new taste bottles. The labeling of the taste bottles should be improved so as not to damage the caps.

Q5) when the brewing laboratory promises to do something by a certain time, it does so.

Because of the heavy workloads and shortage of staff the brewing laboratory are pressed for time and sometimes makes promises they cannot keep. Requests should happen in a structured way for example, it first should go through the manager or specialist's approval before times are agreed upon so that adhoc requests can have priority above the rest of the work and some work that is not priority can be down sized. A time study should be done to see if work is manageable and if more technicians should be employed. Daily morning meeting agenda should include giving feedback by technicians on actions of the previous day.

Q7) the brewing laboratory performs the services right the first time and Q8) Brewing laboratory insists on error free records.

Attention to detail should be adhered to at all times. Clarity on certain requests need to be attained via email from customers before analysis begins.

Q9) the staff of the brewing laboratory tells you exactly when services will be performed and

Q10) The staff of the brewing laboratory gives you prompt service.

Q19) the brewing laboratory has your best interest at heart.

Technicians should prioritize work and any urgent requests and any results should be communicated promptly. The laboratory staff needs to negotiate with customers on time when results are required or come to an agreement on what needs to be considered important and what work can be cut down.

Q13) the staff of the brewing laboratory instills confidence in its customers.

- Reference control: Inform the customers immediately if any out of specification references are experienced.
- Standards: Inform the customer immediately if any problems with the calibration occurred.
- Equipment downtime – Inform customers immediately if any problems on equipment are experienced.

Q18) the brewing laboratory operating hours are convenient to all its customers.

The manager of the brewing laboratory should look at the efficiency of afterhours support given to the virtual laboratory. The contact person should always be available at any time after hours. Help should be prompt and any after hour support that did not occur promptly should be reported directly and immediately to the laboratory manager. A procedure should also be drawn up for afterhours support. All after-hour requests should be communicated upfront by the customer so that the laboratory makes the necessary arrangements for people to be available to attend to their requests.

Q20) Staff of the brewing laboratory understands your specific needs

Trial briefs should be given to all laboratory staff before requests are accepted and before any analysis begins. Specific needs to be communicated via the laboratory manager to all laboratory staff in lab daily meeting or via one on ones (a discussion between employee and manager).

6.7.2) Interviews summary and recommendations:

- *Do you think there can be benefits using SERVQUAL survey and why?*

There is an SLA survey in place. Some of the items of the SERVQUAL survey can be used in the SLA survey. SERVQUAL survey can be useful in the times when SLA is drawn up still. Also add a comment section in the SERVQUAL survey as the SERVQUAL survey questions are not very specific and improvement can more easily be made if the comment section is included.

- *Do you think any improvements can be made through SLA or SERVQUAL if the company uses it?*

Yes; review scoring on a regular basis and communicate findings to all involved so all are aware where improvements can be made. Review scoring on a regular basis and focus on low scoring areas. Give accountabilities to people on low scoring areas. Track improvements over time per section per individual.

- *What do you think are the key service quality factors?*

According to Parasuraman et al (1988) in the SERVQUAL survey the key factors that impact on service quality is: **Tangibles** refers to: The physical representations or images of one's service; **Reliability** refers to one's ability to perform the service dependably and accurately; **Responsiveness** refers to one's willingness to help customers and to provide prompt service; **Assurance** refers to the knowledge and courtesy of staff and their ability to inspire trust and confidence; **Empathy** refers to the caring individualized attention one provides one's stakeholders.

According to the SLA used within the SAB the key factors that impact on service quality is:

- Morning meeting support
- Reference control
- Equipment support
- Routine adhoc requests
- Managing of missing data
- Trial support
- In process taste requirements

- Package product taste requirements

How can we improve on the 5S status in the laboratory?

Begin in a smaller area (Kitchen) and take the learnings to the laboratory. Take before pictures and divide the area into sections and assign duties. By month ends score the area and show improvement over time. The improved score must be sustainable for four to five months. (If 5S is achieved all quality issues will improve as well.

How can we improve our visual presentability?

- Purchase enough lab coats for all and discard old ones to prevent them from recirculation.
- Purchase new taste bottles and label neatly.
- Put graphs and reference trends at workstations so performance of equipment is visible to all.
- Have a television screen on a central place to flash up the following:
 - Competency of laboratory staff
 - Amount of analysis done per month
 - 5S status (pictures and score)
 - Downtime of equipment
 - Reference and standard trends
- Use the taste room and haze room as a model area after the kitchen as this is where the customers mostly interact with the laboratory staff.

How can we improve on our communication channels?

- Use a television screen to flash up different aspects of quality
- Competency of laboratory staff
- Amount of analysis done per month
- 5S status (pictures and score)
- Downtime of equipment
- Reference and standard trends

How can we improve on reference control?

Adhere to frequencies and plot results regularly, give regular weekly reference feedback, have quicker turnaround time for new reference limits.

How can we improve on equipment support in the virtual laboratories?

More visibility of the Big Q technician and improve on after hours standby support. Continuous training for shop floor representatives and feedback should be given at Business Continuity Management.

How can we improve on routine adhoc requests?

Have a quicker turnaround time for plotting and communication of results.

6.8 FINAL CONCLUSION:

In conclusion the research problem and objective were revisited to determine if the research solved the problem. The research question also have been revisited which include sub-investigative questions as well.

This study set out to improve service quality delivery in the food and beverage industry using the SERVQUAL instrument. The recommendations include that the SERVQUAL instrument should be used in the time that the SLA are still being developed so there is constant feedback from customers and months are not missed. The low scoring areas of the SERVQUAL instrument and SLA should be reviewed and communicated regularly and tasks should be assigned to individuals so that service delivery can be improved. The main effort of management and employees should be focused to satisfy the customers and respond to their individual requirements.

The researcher has engaged in discussion with most of the brewing laboratory staff and managers of the Brewing Department. When reviewing the research problem the researcher is of the opinion that if the institution implements the recommendations made concerning improving the service quality delivery to the Brewing Department using the SERVQUAL survey as a tool, the service quality delivery will improve.

BIBLIOGRAPHY

Andres, A. 2000. Implementing Juran's road map for quality leadership, Benchmarks and Results John Wiley & Sons, Inc

Arambewela, R. & Hall, J. 2006. *A comparative analysis of international education satisfaction using SERVQUAL* [Online] Available from: <http://www.deakin.edu.au/dro/eserv/DU:30003511/arambewela-comparativeanalysisof-2006.pdf>. [Accessed on 2/6/2010]

Babbie, E. 2005. *The basics of social research*. Belmont: Thomson Wadsworth

Ballantyne, D. Christopher, M. & Payne, A. 1991. *Relationship marketing: Bringing quality customer service and marketing together* [Online] Available from: <https://dspace.lib.cranfield.ac.uk/bitstream/1826/621/2/SWP3191.pdf>. [Accessed on 13/8/2010]

Bicheno, J. 2002. *The Quality 75: towards six sigma performance in service and manufacturing* PICSIE books

Bland J.M. 1995. *An introduction to medical statistics*. 2nd edtn. Oxford University Press, Oxford.

Bryslan, A. & Curry, A. 2001. *Service improvements in public services using SERVQUAL*. [Online] Available from: <http://www.emeraldinsight.com/journals.htm?articleid=842750&show=abstract>. [Accessed on 05/9/2010]

Checkland, P. 1989. *Systems Thinking, Systems practice*. John Wiley and Sons. Chichester. New York. Brisbane. Toronto.

Cody, K. Hope, B. 1999. *EX-SERVQUAL An instrument to measure service quality of Extranets* [Online] Available from: http://scholar.google.co.za/scholar?q=EX-SERVQUAL+An+instrument+to+measure+service+quality+of+Extranets&hl=en&btnG=Search&as_sdt=2001&as_sdt=on [Accessed on 13/8/2010]

Collis, J. & Hussey, R. 2003. *Business Research: A Practical guide for undergraduate and post graduate students*. Palgrave: Macmillan

Cooper, D. R. & Schindler, P.S. 2006. *Business research methods*. Boston: McGraw-Hill

De Vos, A.S. (2002). Scientific theory and professional research. in de Vos, A.S. Strydom, H. Fouché, C.S.L. & Delpont, C.S.L. (eds) *Research at grass roots: for the social sciences and human service professions*. 2nd edition. Pretoria: Van Schaik.

Emory, C.W. & Cooper, D.R. 1995. *Business Research Methods*. Fifth Edition. Irwin: Homewood. 2010. *Encyclopedia of Business, 2nd Edition*. [Online] Available from: <http://www.referenceforbusiness.com/management/Pr-Sa/Quality-and-Total-Quality-Management.html>

Foster, S. T. 2004. *Managing quality: An Integrative Approach*; 2nd edition Prentice -Hall.

Fedoroff, P. 2010. Comparing service quality performance with customer service quality needs. Explanation of SERVQUAL Methodology of Zeithaml, Parasuraman, and Berry('88) [Online] Available from: http://www.12manage.com/methods_zeithaml_servqual.html [Accessed on 05/9/2010]

Gehlhar, M. Regmi, A. 2005. *Factors Shaping Global Food Markets* [Online] Available from: <http://www.ers.usda.gov/publications/aib794/aib794c.pdf> [Accessed on 13/8/2010]

Grant, M. Shani, R. & Krishnan, 1994 R. TQM's Challenge to Management Theory and Practice [Online] Available from: http://buiznt.cob.calpoly.edu/COB/MGT/Shani/FromHughes/articles/TQM_Challenge_Mgt_Practice.pdf [Accessed on 13/8/2010]

Haksever, C. Cook, R. & Chaganti, R. 1997. *Service quality for small firms: Can the gaps model help?* [Online] Available from: <http://www.sbaer.uca.edu/research/sbida/1997/PDF/03.pdf> [Accessed on 2/6/2010]

Han, S. & Baek, S. 2004. *Antecedents and consequences of service quality in online banking: An Application of the SERVQUAL instrument* [Online] Available from: http://www.acrwebsite.org/volumes/v31/acr_vol31_87.pdf [Accessed on 2/6/2010]

Gay, L. R. and Diebl, P. L. 1992. *Research methods for business and management*. MacMillan Publishing Company. New York. Ghauri, P. Grønhaug, K. & Kristianslund, I. (1995) *Research methods in business studies*. Prentice Hall: New York

Karten, N. 2003. *How to establish Service Level Agreements* [Online] Available from: <http://www.nkarten.com/ExcerptSLAHandbook.pdf> [Accessed on 13/8/2010]

Kerlinger, F. N. 1986. *Foundations of behavioural research*. CBS College Publishing. New York.

Kirchner, R. 1995. *What's beyond ISO 9000* [Online] Available from: <http://www.qualitydigest.com/nov96/iso9000.html> [Accessed on 2/6/2010]

Liao, R. & Yu-Pan, C. 2007. *Combining ISO 9001:2000 QMS and PZB gap model to reach customer satisfaction-An intergrated approach and empirical study* [Online] Available from: <http://www.bm.nsysu.edu.tw/tutorial/iylu/12th%20ICIT/02-08.pdf> [Accessed on 2/6/2010]

Meulenberg-Buskens, I. 1997. *Turtles all the way down? – On a quest for quality in qualitative research*. South African Journal of Psychology. Vol. 27, No. 2, June.

Nhat, N. & Hau, L. 2007. *Determinants of retail service quality-a study of supermarkets in Vietnam* [Online] Available from: http://www.google.co.za/search?hl=en&source=hp&q=Determinants+of+retail+service+quality+a+study+of+supermarkets+in+Vietnam%5B&btnG=Google+Search&meta=&aq=f&aqi=&aql=&oq=&gs_rfai= [Accessed on 2/6/2010]

Nunnally, J.C. 1978. *Psychometric theory* (2nd ed.). New York. McGraw-Hill.

Nixon, J. 2010. Quality and total quality management org. reference for business. Encyclopedia of business, 2nd Edition. [Online] Available from: <http://www.referenceforbusiness.com/management/Pr-Sa/Quality-and-Total-Quality-Management.html> [Accessed on 2/6/2010]

Oskowitz, B. & Meulenbergh-Buskens, I. 1997. *Preparing researchers for qualitative investigation of a particularly sensitive nature: Reflections from the field*. South African Journal of Psychology. Vol. 27, No. 2, June.

Parkes, D. 1998. Foundation certificate workbooks one to five. Institute of Brewing Burton College. England

Parasuraman A., Zeithaml V A., and Berry L L. 1988. "SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality", *Journal of Retailing*, vol.64, No.1.

Remenyi, D. Money, A. Twite, A. 1995. *Effective Measurement & Management of IT Costs & Benefits*. Butterworth-Heinemann Ltd. Linacre House, Jordan Hill, Oxford. OX2 8DP.

Remenyi, D. Williams, B. Money, A. & Swartz, E. 2002. *Doing research in business and Management*. London: Sage

SAB. 2002. Analytical Methods Section 7: Analytical Methods Section. Brewing Manual volume X:-SAB.B.AM.S07-00

Saunders, M. K. Lewis, P. & Thornhill, A. 2000. *Research methods for business students*. Edinburgh Gate: Pearson Education.

Schindler, D.R. & Cooper, P.S. 2001/2003. *Business Research Methods*. Seventh/Eighth Edition. New York, NY. McGraw-Hill.

Thomas, S. 2008. *What's new on it's a delivery thing*[Online] Available from: <http://www.itsadeliverything.com/new/new.htm>

Accessed on 05/9/2010

Van Dyke, T. Prybutok, V. & Kappelman, L. 1999. *Cautions on the use of the SERVQUAL measure to assess the quality information systems services* [Online] Available from: <http://www3.interscience.wiley.com/journal/119935091/abstract>

[Accessed on 2/6/2010]

Yilmaz, D. 1998. *Managing service quality of an internal information services department*. [Online] Available from:<http://www.itnomy.com/pubs/publication2.html>

Yin, R. K. 1994. *Case study Research: Design and Methods*. Sage: Thousand Oaks.

Zhang, Z. 1995-1999. Developing a TQM Quality Management Method Model[Online] Available from:

<http://som.eldoc.ub.rug.nl/FILES/reports/1995-1999/themeA/1997/97A48/97a48.pdf>

[Accessed on 13/8/2010]

ANNEXURE A

Descriptive statistics and Cronbach Alpha for the survey

Variable	N	Simple Statistics					Label
		Mean	Std Dev	Sum	Minimum	Maximum	
PQ01	30	3.73333	0.94443	112.00000	1.00000	5.00000	PQ01
PQ02	30	3.70000	0.98786	111.00000	1.00000	5.00000	PQ02
PQ03	30	3.20000	1.27035	96.00000	1.00000	5.00000	PQ03
PQ04	30	3.80000	1.03057	114.00000	1.00000	5.00000	PQ04
PQ05	30	3.20000	0.92476	96.00000	1.00000	4.00000	PQ05
PQ06	30	3.33333	1.12444	100.00000	1.00000	5.00000	PQ06
PQ07	30	3.03333	0.92786	91.00000	1.00000	5.00000	PQ07
PQ08	30	3.33333	0.95893	100.00000	1.00000	5.00000	PQ08
PQ09	30	3.33333	1.09334	100.00000	2.00000	5.00000	PQ09
PQ10	30	3.20000	0.99655	96.00000	1.00000	5.00000	PQ10
PQ11	30	3.66667	0.71116	110.00000	2.00000	5.00000	PQ11
PQ12	30	3.56667	0.97143	107.00000	1.00000	5.00000	PQ12
PQ13	30	3.03333	0.85029	91.00000	2.00000	4.00000	PQ13
PQ14	30	3.90000	0.60743	117.00000	3.00000	5.00000	PQ14
PQ15	30	4.06667	0.58329	122.00000	3.00000	5.00000	PQ15
PQ16	30	3.80000	0.61026	114.00000	2.00000	5.00000	PQ16
PQ17	30	3.56667	0.81720	107.00000	2.00000	5.00000	PQ17
PQ18	30	3.06667	1.20153	92.00000	1.00000	5.00000	PQ18
PQ19	30	3.46667	0.77608	104.00000	2.00000	5.00000	PQ19
PQ20	30	3.23333	1.04000	97.00000	2.00000	5.00000	PQ20
EQ01	30	4.63333	0.66868	139.00000	2.00000	5.00000	EQ01
EQ02	30	4.70000	0.53498	141.00000	3.00000	5.00000	EQ02
EQ03	30	4.56667	0.67891	137.00000	2.00000	5.00000	EQ03
EQ04	30	4.66667	0.54667	140.00000	3.00000	5.00000	EQ04
EQ05	30	4.66667	0.47946	140.00000	4.00000	5.00000	EQ05
EQ06	30	4.50000	0.57235	135.00000	3.00000	5.00000	EQ06
EQ07	30	4.50000	0.68229	135.00000	3.00000	5.00000	EQ07
EQ08	30	4.50000	0.68229	135.00000	3.00000	5.00000	EQ08
EQ09	30	4.50000	0.93772	135.00000	1.00000	5.00000	EQ09
EQ10	30	4.40000	0.93218	132.00000	1.00000	5.00000	EQ10
EQ11	30	4.40000	1.00344	132.00000	1.00000	5.00000	EQ11
EQ12	30	4.26667	1.01483	128.00000	1.00000	5.00000	EQ12
EQ13	30	4.60000	0.72397	138.00000	2.00000	5.00000	EQ13
EQ14	30	4.43333	0.93526	133.00000	1.00000	5.00000	EQ14
EQ15	30	4.36667	0.92786	131.00000	1.00000	5.00000	EQ15
EQ16	30	4.36667	0.96431	131.00000	1.00000	5.00000	EQ16
EQ17	30	4.30000	0.95231	129.00000	1.00000	5.00000	EQ17
EQ18	30	4.40000	0.81368	132.00000	2.00000	5.00000	EQ18
EQ19	30	4.50000	0.93772	135.00000	1.00000	5.00000	EQ19

EQ20 30 4.50000 0.82001 135.00000 2.00000 5.00000 EQ20

Cronbach Coefficient Alpha

Variables Alpha
 ffffffffffffffffffffffffffffffffff
 Raw 0.892433
 Standardized 0.902678

Cronbach Coefficient Alpha with Deleted Variable

Deleted Variable	Raw Variables		Standardized Variables		Label
	Correlation with Total	Alpha	Correlation with Total	Alpha	
PQ01	0.290710	0.891668	0.253875	0.902591	PQ01
PQ02	0.359857	0.890575	0.303361	0.901918	PQ02
PQ03	0.062624	0.897821	-.001582	0.906009	PQ03
PQ04	0.327907	0.891226	0.288279	0.902123	PQ04
PQ05	0.177138	0.893453	0.090335	0.904790	PQ05
PQ06	0.401953	0.890019	0.337989	0.901445	PQ06
PQ07	0.325780	0.891059	0.258299	0.902531	PQ07
PQ08	-.027268	0.896942	-.081419	0.907057	PQ08
PQ09	0.300871	0.891912	0.242936	0.902739	PQ09
PQ10	0.231475	0.892830	0.157926	0.903886	PQ10
PQ11	0.301724	0.891212	0.277777	0.902266	PQ11
PQ12	0.399727	0.889865	0.370782	0.900995	PQ12
PQ13	0.432604	0.889352	0.371087	0.900991	PQ13
PQ14	0.307544	0.891170	0.273490	0.902325	PQ14
PQ15	0.498052	0.889222	0.467892	0.899654	PQ15
PQ16	0.245644	0.891830	0.183732	0.903539	PQ16
PQ17	0.500913	0.888391	0.480506	0.899478	PQ17
PQ18	0.304865	0.892246	0.293063	0.902058	PQ18
PQ19	0.408839	0.889775	0.378867	0.900884	PQ19
PQ20	0.513429	0.887813	0.476044	0.899540	PQ20
EQ01	0.409849	0.889933	0.457453	0.899798	EQ01
EQ02	0.445643	0.889938	0.502598	0.899171	EQ02
EQ03	0.474442	0.889133	0.543278	0.898603	EQ03
EQ04	0.438806	0.889961	0.508390	0.899090	EQ04
EQ05	0.346605	0.890995	0.389627	0.900736	EQ05
EQ06	0.500914	0.889241	0.549490	0.898516	EQ06
EQ07	0.578438	0.887850	0.630711	0.897373	EQ07
EQ08	0.478500	0.889073	0.542455	0.898614	EQ08
EQ09	0.566264	0.887047	0.627260	0.897422	EQ09
EQ10	0.547178	0.887384	0.615620	0.897586	EQ10
EQ11	0.534847	0.887461	0.589104	0.897959	EQ11
EQ12	0.630074	0.885686	0.684472	0.896611	EQ12

EQ13	0.384283	0.890161	0.445663	0.899962	EQ13
EQ14	0.445485	0.889086	0.508072	0.899094	EQ14
EQ15	0.584024	0.886775	0.648202	0.897125	EQ15
EQ16	0.494827	0.888222	0.556028	0.898424	EQ16
EQ17	0.548020	0.887323	0.602692	0.897768	EQ17
EQ18	0.556083	0.887592	0.603937	0.897751	EQ18
EQ19	0.517640	0.887871	0.571084	0.898213	EQ19
EQ20	0.493045	0.888500	0.542279	0.898617	EQ20

ANNEXURE B

Descriptive statistics for each variable of the survey

	Cumulative		Cumulative	
PQ01	Frequency	Percent	Frequency	Percent
Strongly disagree	1	2.94	1	2.94
Disagree	5	14.71	6	17.65
Undecided	1	2.94	7	20.59
Agree	24	70.59	31	91.18
Strongly agree	3	8.82	34	100.00

Chi-Square Test
 for Equal Proportions
 Chi-Square 56.0000
 DF 4
 Pr > ChiSq <.0001
 Sample Size = 34

	Cumulative		Cumulative	
PQ02	Frequency	Percent	Frequency	Percent
Strongly disagree	1	2.94	1	2.94
Disagree	3	8.82	4	11.76
Undecided	5	14.71	9	26.47
Agree	20	58.82	29	85.29
Strongly agree	5	14.71	34	100.00

Chi-Square Test
 for Equal Proportions
 Chi-Square 33.6471
 DF 4
 Pr > ChiSq <.0001
 Sample Size = 34

	Cumulative		Cumulative	
PQ03	Frequency	Percent	Frequency	Percent
Strongly disagree	4	11.76	4	11.76
Disagree	6	17.65	10	29.41
Undecided	6	17.65	16	47.06
Agree	13	38.24	29	85.29

Strongly agree 5 14.71 34 100.00

Chi-Square Test
 for Equal Proportions
 ffffffffffffffffffffffff
 Chi-Square 7.4706
 DF 4
 Pr > ChiSq 0.1130
 Sample Size = 34

	Cumulative		Cumulative	
PQ04	Frequency	Percent	Frequency	Percent
Strongly disagree	1	2.94	1	2.94
Disagree	3	8.82	4	11.76
Undecided	5	14.71	9	26.47
Agree	17	50.00	26	76.47
Strongly agree	8	23.53	34	100.00

Chi-Square Test
 for Equal Proportions
 ffffffffffffffffffffffff
 Chi-Square 23.0588
 DF 4
 Pr > ChiSq 0.0001
 Sample Size = 34

	Cumulative		Cumulative	
PQ05	Frequency	Percent	Frequency	Percent
Strongly disagree	1	2.94	1	2.94
Disagree	7	20.59	8	23.53
Undecided	10	29.41	18	52.94
Agree	16	47.06	34	100.00

Chi-Square Test
 for Equal Proportions
 ffffffffffffffffffffffff
 Chi-Square 13.7647
 DF 3
 Pr > ChiSq 0.0032
 Sample Size = 34

	Cumulative		Cumulative	
PQ06	Frequency	Percent	Frequency	Percent

ff

	0	1	2.94	1	2.94
Strongly disagree	3	8.82		4	11.76
Disagree	4	11.76		8	23.53
Undecided	8	23.53		16	47.06
Agree	14	41.18		30	88.24
Strongly agree	4	11.76		34	100.00

Chi-Square Test
for Equal Proportions

ffffffffffffffffffffffff

Chi-Square 19.2941

DF 5

Pr > ChiSq 0.0017

Sample Size = 34

	Cumulative		Cumulative	
PQ07	Frequency	Percent	Frequency	Percent
Strongly disagree	1	2.94	1	2.94
Disagree	9	26.47	10	29.41
Undecided	11	32.35	21	61.76
Agree	12	35.29	33	97.06
Strongly agree	1	2.94	34	100.00

Chi-Square Test
for Equal Proportions

ffffffffffffffffffffffff

Chi-Square 17.1765

DF 4

Pr > ChiSq 0.0018

Sample Size = 34

	Cumulative		Cumulative	
PQ08	Frequency	Percent	Frequency	Percent
Strongly disagree	1	2.94	1	2.94
Disagree	5	14.71	6	17.65
Undecided	11	32.35	17	50.00
Agree	14	41.18	31	91.18
Strongly agree	3	8.82	34	100.00

Chi-Square Test
for Equal Proportions

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Chi-Square 17.7647
 DF 4
 Pr > ChiSq 0.0014
 Sample Size = 34

		Cumulative	Cumulative		
PQ09	Frequency	Percent	Frequency	Percent	
Disagree	10	29.41	10	29.41	
Undecided	5	14.71	15	44.12	
Agree	15	44.12	30	88.24	
Strongly agree	4	11.76	34	100.00	

Chi-Square Test
 for Equal Proportions
 Chi-Square 9.0588
 DF 3
 Pr > ChiSq 0.0285
 Sample Size = 34

		Cumulative	Cumulative		
PQ10	Frequency	Percent	Frequency	Percent	
Strongly disagree	1	2.94	1	2.94	
Disagree	7	20.59	8	23.53	
Undecided	11	32.35	19	55.88	
Agree	13	38.24	32	94.12	
Strongly agree	2	5.88	34	100.00	

Chi-Square Test
 for Equal Proportions
 Chi-Square 16.5882
 DF 4
 Pr > ChiSq 0.0023
 Sample Size = 34

		Cumulative	Cumulative		
PQ11	Frequency	Percent	Frequency	Percent	
Disagree	4	11.76	4	11.76	
Undecided	5	14.71	9	26.47	
Agree	24	70.59	33	97.06	
Strongly agree	1	2.94	34	100.00	

Chi-Square Test
for Equal Proportions
ffffffffffffffffffff
Chi-Square 38.7059
DF 3
Pr > ChiSq <.0001
Sample Size = 34

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
PQ12 Strongly disagree	1	2.94	1	2.94
Disagree	4	11.76	5	14.71
Undecided	10	29.41	15	44.12
Agree	15	44.12	30	88.24
Strongly agree	4	11.76	34	100.00

Chi-Square Test
for Equal Proportions
ffffffffffffffffffff
Chi-Square 18.6471
DF 4
Pr > ChiSq 0.0009
Sample Size = 34

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
PQ13 Disagree	11	32.35	11	32.35
Undecided	10	29.41	21	61.76
Agree	13	38.24	34	100.00

Chi-Square Test
for Equal Proportions
ffffffffffffffffffff
Chi-Square 0.4118
DF 2
Pr > ChiSq 0.8139
Sample Size = 34

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
PQ14 Undecided	8	23.53	8	23.53

Agree	21	61.76	29	85.29
Strongly agree	5	14.71	34	100.00

Chi-Square Test
for Equal Proportions
 ffffffffffffffffffffffff
 Chi-Square 12.7647
 DF 2
 Pr > ChiSq 0.0017
 Sample Size = 34

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
PQ15				
	0	2.94	1	2.94
Undecided	4	11.76	5	14.71
Agree	22	64.71	27	79.41
Strongly agree	7	20.59	34	100.00

Chi-Square Test
for Equal Proportions
 ffffffffffffffffffffffff
 Chi-Square 30.7059
 DF 3
 Pr > ChiSq <.0001
 Sample Size = 34

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
PQ16				
Disagree	1	2.94	1	2.94
Undecided	6	17.65	7	20.59
Agree	25	73.53	32	94.12
Strongly agree	2	5.88	34	100.00

Chi-Square Test
for Equal Proportions
 ffffffffffffffffffffffff
 Chi-Square 44.3529
 DF 3
 Pr > ChiSq <.0001
 Sample Size = 34

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
PQ17				

<i>ff</i>				
Disagree	4	11.76	4	11.76
Undecided	8	23.53	12	35.29
Agree	20	58.82	32	94.12
Strongly agree	2	5.88	34	100.00

Chi-Square Test
for Equal Proportions

ffffffffffffffffffffffff

Chi-Square 22.9412

DF 3

Pr > ChiSq <.0001

Sample Size = 34

Cumulative Cumulative					
PQ18	Frequency	Percent	Frequency	Percent	
<i>ff</i>					
	0	1	2.94	1	2.94
Strongly disagree	2	5.88	3	8.82	
Disagree	10	29.41	13	38.24	
Undecided	6	17.65	19	55.88	
Agree	11	32.35	30	88.24	
Strongly agree	4	11.76	34	100.00	

Chi-Square Test
for Equal Proportions

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Chi-Square 15.0588

DF 5

Pr > ChiSq 0.0101

Sample Size = 34

Cumulative Cumulative					
PQ19	Frequency	Percent	Frequency	Percent	
<i>ff</i>					
Disagree	3	8.82	3	8.82	
Undecided	14	41.18	17	50.00	
Agree	14	41.18	31	91.18	
Strongly agree	3	8.82	34	100.00	

Chi-Square Test
for Equal Proportions

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Chi-Square 14.2353

DF 3

Pr > ChiSq 0.0026

Sample Size = 34

		Cumulative	Cumulative		
PQ20	Frequency	Percent	Frequency	Percent	
Disagree	9	26.47	9	26.47	
Undecided	9	26.47	18	52.94	
Agree	12	35.29	30	88.24	
Strongly agree	4	11.76	34	100.00	

Chi-Square Test
for Equal Proportions
Chi-Square 3.8824
DF 3
Pr > ChiSq 0.2745
Sample Size = 34

		Cumulative	Cumulative		
EQ01	Frequency	Percent	Frequency	Percent	
0	1	2.94	1	2.94	
Disagree	1	2.94	2	5.88	
Agree	9	26.47	11	32.35	
Strongly agree	23	67.65	34	100.00	

Chi-Square Test
for Equal Proportions
Chi-Square 38.0000
DF 3
Pr > ChiSq <.0001
Sample Size = 34

		Cumulative	Cumulative		
EQ02	Frequency	Percent	Frequency	Percent	
0	1	2.94	1	2.94	
Undecided	1	2.94	2	5.88	
Agree	7	20.59	9	26.47	
Strongly agree	25	73.53	34	100.00	

Chi-Square Test
for Equal Proportions

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Chi-Square 45.5294

DF 3

Pr > ChiSq <.0001

Sample Size = 34

	Cumulative		Cumulative		
EQ03	Frequency	Percent	Frequency	Percent	
	0	1	2.94	1	2.94
Disagree	1	2.94	2	5.88	
Agree	12	35.29	14	41.18	
Strongly agree	20	58.82	34	100.00	

Chi-Square Test

for Equal Proportions

ffffffffffffffffffff

Chi-Square 30.2353

DF 3

Pr > ChiSq <.0001

Sample Size = 34

	Cumulative		Cumulative		
EQ04	Frequency	Percent	Frequency	Percent	
	0	1	2.94	1	2.94
Undecided	1	2.94	2	5.88	
Agree	9	26.47	11	32.35	
Strongly agree	23	67.65	34	100.00	

Chi-Square Test

for Equal Proportions

ffffffffffffffffffff

Chi-Square 38.0000

DF 3

Pr > ChiSq <.0001

Sample Size = 34

	Cumulative		Cumulative		
EQ05	Frequency	Percent	Frequency	Percent	
	0	1	2.94	1	2.94
Agree	11	32.35	12	35.29	
Strongly agree	22	64.71	34	100.00	

Chi-Square Test
 for Equal Proportions
 ~~~~~  
 Chi-Square 19.4706  
 DF 2  
 Pr > ChiSq <.0001  
 Sample Size = 34

|                | EQ06 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|----------------|------|-----------|---------|----------------------|--------------------|
|                | 0    | 1         | 2.94    | 1                    | 2.94               |
| Undecided      |      | 1         | 2.94    | 2                    | 5.88               |
| Agree          |      | 15        | 44.12   | 17                   | 50.00              |
| Strongly agree |      | 17        | 50.00   | 34                   | 100.00             |

Chi-Square Test  
 for Equal Proportions  
 ~~~~~  
 Chi-Square 26.7059
 DF 3
 Pr > ChiSq <.0001
 Sample Size = 34

	EQ07	Frequency	Percent	Cumulative Frequency	Cumulative Percent
	0	1	2.94	1	2.94
Undecided		3	8.82	4	11.76
Agree		11	32.35	15	44.12
Strongly agree		19	55.88	34	100.00

Chi-Square Test
 for Equal Proportions
 ~~~~~  
 Chi-Square 23.8824  
 DF 3  
 Pr > ChiSq <.0001  
 Sample Size = 34

|  | EQ08 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|--|------|-----------|---------|----------------------|--------------------|
|  | 0    | 1         | 2.94    | 1                    | 2.94               |

|                |    |       |    |        |
|----------------|----|-------|----|--------|
| Undecided      | 3  | 8.82  | 4  | 11.76  |
| Agree          | 10 | 29.41 | 14 | 41.18  |
| Strongly agree | 20 | 58.82 | 34 | 100.00 |

Chi-Square Test  
for Equal Proportions  
*ffffffffffffffffffff*  
Chi-Square 26.0000  
DF 3  
Pr > ChiSq <.0001  
Sample Size = 34

|                   | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|-------------------|-----------|---------|----------------------|--------------------|
| EQ09              |           |         |                      |                    |
|                   | 0         | 2.94    | 1                    | 2.94               |
| Strongly disagree | 1         | 2.94    | 2                    | 5.88               |
| Disagree          | 1         | 2.94    | 3                    | 8.82               |
| Agree             | 9         | 26.47   | 12                   | 35.29              |
| Strongly agree    | 22        | 64.71   | 34                   | 100.00             |

Chi-Square Test  
for Equal Proportions  
*ffffffffffffffffffff*  
Chi-Square 49.5294  
DF 4  
Pr > ChiSq <.0001  
Sample Size = 34

|                   | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|-------------------|-----------|---------|----------------------|--------------------|
| EQ10              |           |         |                      |                    |
|                   | 0         | 2.94    | 1                    | 2.94               |
| Strongly disagree | 1         | 2.94    | 2                    | 5.88               |
| Disagree          | 1         | 2.94    | 3                    | 8.82               |
| Agree             | 12        | 35.29   | 15                   | 44.12              |
| Strongly agree    | 19        | 55.88   | 34                   | 100.00             |

Chi-Square Test  
for Equal Proportions  
*ffffffffffffffffffff*  
Chi-Square 40.7059  
DF 4  
Pr > ChiSq <.0001  
Sample Size = 34

| EQ11              | Frequency | Percent | Cumulative Frequency | Cumulative Percent |      |
|-------------------|-----------|---------|----------------------|--------------------|------|
|                   | 0         | 1       | 2.94                 | 1                  | 2.94 |
| Strongly disagree | 1         | 2.94    | 2                    | 5.88               |      |
| Disagree          | 1         | 2.94    | 3                    | 8.82               |      |
| Undecided         | 2         | 5.88    | 5                    | 14.71              |      |
| Agree             | 9         | 26.47   | 14                   | 41.18              |      |
| Strongly agree    | 20        | 58.82   | 34                   | 100.00             |      |

Chi-Square Test  
for Equal Proportions  
Chi-Square 52.1176  
DF 5  
Pr > ChiSq <.0001  
Sample Size = 34

| EQ12              | Frequency | Percent | Cumulative Frequency | Cumulative Percent |      |
|-------------------|-----------|---------|----------------------|--------------------|------|
|                   | 0         | 1       | 2.94                 | 1                  | 2.94 |
| Strongly disagree | 1         | 2.94    | 2                    | 5.88               |      |
| Disagree          | 1         | 2.94    | 3                    | 8.82               |      |
| Undecided         | 3         | 8.82    | 6                    | 17.65              |      |
| Agree             | 11        | 32.35   | 17                   | 50.00              |      |
| Strongly agree    | 17        | 50.00   | 34                   | 100.00             |      |

Chi-Square Test  
for Equal Proportions  
Chi-Square 40.4706  
DF 5  
Pr > ChiSq <.0001  
Sample Size = 34

| EQ13           | Frequency | Percent | Cumulative Frequency | Cumulative Percent |      |
|----------------|-----------|---------|----------------------|--------------------|------|
|                | 0         | 1       | 2.94                 | 1                  | 2.94 |
| Disagree       | 1         | 2.94    | 2                    | 5.88               |      |
| Undecided      | 1         | 2.94    | 3                    | 8.82               |      |
| Agree          | 9         | 26.47   | 12                   | 35.29              |      |
| Strongly agree | 22        | 64.71   | 34                   | 100.00             |      |

Chi-Square Test  
 for Equal Proportions  
 ffffffffffffffffffffffff  
 Chi-Square 49.5294  
 DF 4  
 Pr > ChiSq <.0001  
 Sample Size = 34

|                   | EQ14 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|-------------------|------|-----------|---------|----------------------|--------------------|
|                   | 0    | 1         | 2.94    | 1                    | 2.94               |
| Strongly disagree |      | 1         | 2.94    | 2                    | 5.88               |
| Disagree          |      | 1         | 2.94    | 3                    | 8.82               |
| Agree             |      | 12        | 35.29   | 15                   | 44.12              |
| Strongly agree    |      | 19        | 55.88   | 34                   | 100.00             |

Chi-Square Test  
 for Equal Proportions  
 ffffffffffffffffffffffff  
 Chi-Square 40.7059  
 DF 4  
 Pr > ChiSq <.0001  
 Sample Size = 34

|                   | EQ15 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|-------------------|------|-----------|---------|----------------------|--------------------|
|                   | 0    | 1         | 2.94    | 1                    | 2.94               |
| Strongly disagree |      | 1         | 2.94    | 2                    | 5.88               |
| Disagree          |      | 1         | 2.94    | 3                    | 8.82               |
| Agree             |      | 14        | 41.18   | 17                   | 50.00              |
| Strongly agree    |      | 17        | 50.00   | 34                   | 100.00             |

Chi-Square Test  
 for Equal Proportions  
 ffffffffffffffffffffffff  
 Chi-Square 37.7647  
 DF 4  
 Pr > ChiSq <.0001  
 Sample Size = 34

|  | EQ16 | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|--|------|-----------|---------|----------------------|--------------------|
|--|------|-----------|---------|----------------------|--------------------|

0 1 2.94 1 2.94  
 Strongly disagree 1 2.94 2 5.88  
 Disagree 1 2.94 3 8.82  
 Undecided 1 2.94 4 11.76  
 Agree 12 35.29 16 47.06  
 Strongly agree 18 52.94 34 100.00

Chi-Square Test  
 for Equal Proportions  
 Chi-Square 49.2941  
 DF 5  
 Pr > ChiSq <.0001  
 Sample Size = 34

Cumulative Cumulative  
 EQ17 Frequency Percent Frequency Percent  
 0 1 2.94 1 2.94  
 Strongly disagree 1 2.94 2 5.88  
 Disagree 1 2.94 3 8.82  
 Undecided 2 5.88 5 14.71  
 Agree 13 38.24 18 52.94  
 Strongly agree 16 47.06 34 100.00

Chi-Square Test  
 for Equal Proportions  
 Chi-Square 42.2353  
 DF 5  
 Pr > ChiSq <.0001  
 Sample Size = 34

Cumulative Cumulative  
 EQ18 Frequency Percent Frequency Percent  
 0 1 2.94 1 2.94  
 Disagree 2 5.88 3 8.82  
 Agree 14 41.18 17 50.00  
 Strongly agree 17 50.00 34 100.00

Chi-Square Test  
 for Equal Proportions



Chi-Square 23.6471  
 DF 3  
 Pr > ChiSq <.0001  
 Sample Size = 34

| EQ19              | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|-------------------|-----------|---------|----------------------|--------------------|
|                   | 0         | 1 2.94  | 1                    | 2.94               |
| Strongly disagree | 1         | 2.94    | 2                    | 5.88               |
| Disagree          | 1         | 2.94    | 3                    | 8.82               |
| Agree             | 11        | 32.35   | 14                   | 41.18              |
| Strongly agree    | 20        | 58.82   | 34                   | 100.00             |

Chi-Square Test  
 for Equal Proportions  
 Chi-Square 43.0588  
 DF 4  
 Pr > ChiSq <.0001  
 Sample Size = 34

| EQ20           | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|----------------|-----------|---------|----------------------|--------------------|
|                | 0         | 1 2.94  | 1                    | 2.94               |
| Disagree       | 2         | 5.88    | 3                    | 8.82               |
| Agree          | 11        | 32.35   | 14                   | 41.18              |
| Strongly agree | 20        | 58.82   | 34                   | 100.00             |

Chi-Square Test  
 for Equal Proportions  
 Chi-Square 27.8824  
 DF 3  
 Pr > ChiSq <.0001  
 Sample Size = 34

Variable: PQ01 (PQ01)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.67647059 | Sum Observations | 125        |
| Std Deviation   | 0.94454056 | Variance         | 0.89215686 |
| Skewness        | -1.3477209 | Kurtosis         | 1.2961034  |
| Uncorrected SS  | 489        | Corrected SS     | 29.4411765 |
| Coeff Variation | 25.6915031 | Std Error Mean   | 0.16198737 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.676471 | Std Deviation | 0.94454 |
| Median              | 4.000000 | Variance      | 0.89216 |
| Mode                | 4.000000 | Range         | 4.00000 |
| Interquartile Range |          | 0             |         |

Variable: PQ02 (PQ02)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.73529412 | Sum Observations | 127        |
| Std Deviation   | 0.9312365  | Variance         | 0.86720143 |
| Skewness        | -1.1021218 | Kurtosis         | 1.42107988 |
| Uncorrected SS  | 503        | Corrected SS     | 28.6176471 |
| Coeff Variation | 24.930741  | Std Error Mean   | 0.15970574 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.735294 | Std Deviation | 0.93124 |
| Median              | 4.000000 | Variance      | 0.86720 |
| Mode                | 4.000000 | Range         | 4.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: PQ03 (PQ03)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.26470588 | Sum Observations | 111        |
| Std Deviation   | 1.26272489 | Variance         | 1.59447415 |
| Skewness        | -0.4384101 | Kurtosis         | -0.8663466 |
| Uncorrected SS  | 415        | Corrected SS     | 52.6176471 |
| Coeff Variation | 38.6780598 | Std Error Mean   | 0.21655553 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.264706 | Std Deviation | 1.26272 |
| Median              | 4.000000 | Variance      | 1.59447 |
| Mode                | 4.000000 | Range         | 4.00000 |
| Interquartile Range |          | 2.00000       |         |

Variable: PQ04 (PQ04)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.82352941 | Sum Observations | 130        |
| Std Deviation   | 0.99910834 | Variance         | 0.99821747 |
| Skewness        | -0.9805618 | Kurtosis         | 0.87908716 |
| Uncorrected SS  | 530        | Corrected SS     | 32.9411765 |
| Coeff Variation | 26.1305257 | Std Error Mean   | 0.17134567 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.823529 | Std Deviation | 0.99911 |
| Median              | 4.000000 | Variance      | 0.99822 |
| Mode                | 4.000000 | Range         | 4.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: PQ05 (PQ05)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.20588235 | Sum Observations | 109        |
| Std Deviation   | 0.88006239 | Variance         | 0.7745098  |
| Skewness        | -0.7124652 | Kurtosis         | -0.5748635 |
| Uncorrected SS  | 375        | Corrected SS     | 25.5588235 |
| Coeff Variation | 27.4514873 | Std Error Mean   | 0.15092945 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.205882 | Std Deviation | 0.88006 |
| Median              | 3.000000 | Variance      | 0.77451 |
| Mode                | 4.000000 | Range         | 3.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: PQ06 (PQ06)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 3.36363636 | Sum Observations | 111        |
| Std Deviation   | 1.14067364 | Variance         | 1.30113636 |
| Skewness        | -0.6501893 | Kurtosis         | -0.217024  |
| Uncorrected SS  | 415        | Corrected SS     | 41.6363636 |
| Coeff Variation | 33.9119192 | Std Error Mean   | 0.19856579 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.363636 | Std Deviation | 1.14067 |
| Median              | 4.000000 | Variance      | 1.30114 |
| Mode                | 4.000000 | Range         | 4.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: PQ07 (PQ07)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.08823529 | Sum Observations | 105        |
| Std Deviation   | 0.9331487  | Variance         | 0.87076649 |
| Skewness        | -0.1834513 | Kurtosis         | -0.7385231 |
| Uncorrected SS  | 353        | Corrected SS     | 28.7352941 |
| Coeff Variation | 30.2162435 | Std Error Mean   | 0.16003368 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.088235 | Std Deviation | 0.93315 |
| Median              | 3.000000 | Variance      | 0.87077 |
| Mode                | 4.000000 | Range         | 4.00000 |
| Interquartile Range |          | 2.00000       |         |

Variable: PQ08 (PQ08)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.38235294 | Sum Observations | 115        |
| Std Deviation   | 0.95392986 | Variance         | 0.90998217 |
| Skewness        | -0.4208325 | Kurtosis         | -0.0761844 |
| Uncorrected SS  | 419        | Corrected SS     | 30.0294118 |
| Coeff Variation | 28.2031436 | Std Error Mean   | 0.16359762 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.382353 | Std Deviation | 0.95393 |
| Median              | 3.500000 | Variance      | 0.90998 |
| Mode                | 4.000000 | Range         | 4.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: PQ09 (PQ09)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.38235294 | Sum Observations | 115        |
| Std Deviation   | 1.04489251 | Variance         | 1.09180036 |
| Skewness        | -0.1757822 | Kurtosis         | -1.2746882 |
| Uncorrected SS  | 425        | Corrected SS     | 36.0294118 |
| Coeff Variation | 30.8924742 | Std Error Mean   | 0.17919759 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.382353 | Std Deviation | 1.04489 |
| Median              | 4.000000 | Variance      | 1.09180 |
| Mode                | 4.000000 | Range         | 3.00000 |
| Interquartile Range |          | 2.00000       |         |

Variable: PQ10 (PQ10)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.23529412 | Sum Observations | 110        |
| Std Deviation   | 0.95533029 | Variance         | 0.91265597 |
| Skewness        | -0.2844341 | Kurtosis         | -0.4504622 |
| Uncorrected SS  | 386        | Corrected SS     | 30.1176471 |
| Coeff Variation | 29.5283909 | Std Error Mean   | 0.16383779 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.235294 | Std Deviation | 0.95533 |
| Median              | 3.000000 | Variance      | 0.91266 |
| Mode                | 4.000000 | Range         | 4.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: PQ11 (PQ11)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.64705882 | Sum Observations | 124        |
| Std Deviation   | 0.73370595 | Variance         | 0.53832442 |
| Skewness        | -1.2794522 | Kurtosis         | 0.97618092 |
| Uncorrected SS  | 470        | Corrected SS     | 17.7647059 |
| Coeff Variation | 20.1177438 | Std Error Mean   | 0.12582953 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.647059 | Std Deviation | 0.73371 |
| Median              | 4.000000 | Variance      | 0.53832 |
| Mode                | 4.000000 | Range         | 3.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: PQ12 (PQ12)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.5        | Sum Observations | 119        |
| Std Deviation   | 0.96137528 | Variance         | 0.92424242 |
| Skewness        | -0.5435349 | Kurtosis         | 0.1589193  |
| Uncorrected SS  | 447        | Corrected SS     | 30.5       |
| Coeff Variation | 27.4678651 | Std Error Mean   | 0.1648745  |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.500000 | Std Deviation | 0.96138 |
| Median              | 4.000000 | Variance      | 0.92424 |
| Mode                | 4.000000 | Range         | 4.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: PQ13 (PQ13)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.05882353 | Sum Observations | 104        |
| Std Deviation   | 0.85071009 | Variance         | 0.72370766 |
| Skewness        | -0.1161736 | Kurtosis         | -1.625774  |
| Uncorrected SS  | 342        | Corrected SS     | 23.8823529 |
| Coeff Variation | 27.8116762 | Std Error Mean   | 0.14589558 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.058824 | Std Deviation | 0.85071 |
| Median              | 3.000000 | Variance      | 0.72371 |
| Mode                | 4.000000 | Range         | 2.00000 |
| Interquartile Range |          | 2.00000       |         |

Variable: PQ14 (PQ14)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.91176471 | Sum Observations | 133        |
| Std Deviation   | 0.62122299 | Variance         | 0.385918   |
| Skewness        | 0.05297603 | Kurtosis         | -0.2320384 |
| Uncorrected SS  | 533        | Corrected SS     | 12.7352941 |
| Coeff Variation | 15.8808885 | Std Error Mean   | 0.10653886 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.911765 | Std Deviation | 0.62122 |
| Median              | 4.000000 | Variance      | 0.38592 |
| Mode                | 4.000000 | Range         | 2.00000 |
| Interquartile Range |          | 0             |         |

Variable: PQ15 (PQ15)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.09090909 | Sum Observations | 135        |
| Std Deviation   | 0.57898815 | Variance         | 0.33522727 |
| Skewness        | 0.00849883 | Kurtosis         | 0.20191454 |
| Uncorrected SS  | 563        | Corrected SS     | 10.7272727 |
| Coeff Variation | 14.1530436 | Std Error Mean   | 0.1007889  |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.090909 | Std Deviation | 0.57899 |
| Median              | 4.000000 | Variance      | 0.33523 |
| Mode                | 4.000000 | Range         | 2.00000 |
| Interquartile Range |          | 0             |         |

Variable: PQ16 (PQ16)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.82352941 | Sum Observations | 130        |
| Std Deviation   | 0.57580448 | Variance         | 0.3315508  |
| Skewness        | -1.0154096 | Kurtosis         | 2.5508417  |
| Uncorrected SS  | 508        | Corrected SS     | 10.9411765 |
| Coeff Variation | 15.0595019 | Std Error Mean   | 0.09874965 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.823529 | Std Deviation | 0.57580 |
| Median              | 4.000000 | Variance      | 0.33155 |
| Mode                | 4.000000 | Range         | 3.00000 |
| Interquartile Range |          | 0             |         |

Variable: PQ17 (PQ17)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.58823529 | Sum Observations | 122        |
| Std Deviation   | 0.78306496 | Variance         | 0.61319073 |
| Skewness        | -0.7127628 | Kurtosis         | 0.08357463 |
| Uncorrected SS  | 458        | Corrected SS     | 20.2352941 |
| Coeff Variation | 21.8231218 | Std Error Mean   | 0.13429453 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.588235 | Std Deviation | 0.78306 |
| Median              | 4.000000 | Variance      | 0.61319 |
| Mode                | 4.000000 | Range         | 3.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: PQ18 (PQ18)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 3.15151515 | Sum Observations | 104        |
| Std Deviation   | 1.17582982 | Variance         | 1.38257576 |
| Skewness        | -0.0659926 | Kurtosis         | -1.077574  |
| Uncorrected SS  | 372        | Corrected SS     | 44.2424242 |
| Coeff Variation | 37.3099846 | Std Error Mean   | 0.2046857  |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.151515 | Std Deviation | 1.17583 |
| Median              | 3.000000 | Variance      | 1.38258 |
| Mode                | 4.000000 | Range         | 4.00000 |
| Interquartile Range |          | 2.00000       |         |

Variable: PQ19 (PQ19)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.5        | Sum Observations | 119        |
| Std Deviation   | 0.78817011 | Variance         | 0.62121212 |
| Skewness        | 0          | Kurtosis         | -0.2672372 |
| Uncorrected SS  | 437        | Corrected SS     | 20.5       |
| Coeff Variation | 22.519146  | Std Error Mean   | 0.13517006 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.500000 | Std Deviation | 0.78817 |
| Median              | 3.500000 | Variance      | 0.62121 |
| Mode                | 3.000000 | Range         | 3.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: PQ20 (PQ20)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 34         | Sum Weights      | 34         |
| Mean            | 3.32352941 | Sum Observations | 113        |
| Std Deviation   | 1.0066623  | Variance         | 1.01336898 |
| Skewness        | 0.04390276 | Kurtosis         | -1.1048144 |
| Uncorrected SS  | 409        | Corrected SS     | 33.4411765 |
| Coeff Variation | 30.2889541 | Std Error Mean   | 0.17264116 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 3.323529 | Std Deviation | 1.00666 |
| Median              | 3.000000 | Variance      | 1.01337 |
| Mode                | 4.000000 | Range         | 3.00000 |
| Interquartile Range |          | 2.00000       |         |

Variable: EQ01 (EQ01)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.63636364 | Sum Observations | 153        |
| Std Deviation   | 0.65279121 | Variance         | 0.42613636 |
| Skewness        | -2.3363692 | Kurtosis         | 7.11630452 |
| Uncorrected SS  | 723        | Corrected SS     | 13.6363636 |
| Coeff Variation | 14.0798104 | Std Error Mean   | 0.11363636 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.636364 | Std Deviation | 0.65279 |
| Median              | 5.000000 | Variance      | 0.42614 |
| Mode                | 5.000000 | Range         | 3.00000 |
| Interquartile Range |          | 1.00000       |         |



Variable: EQ02 (EQ02)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.72727273 | Sum Observations | 156        |
| Std Deviation   | 0.51676441 | Variance         | 0.26704545 |
| Skewness        | -1.7690988 | Kurtosis         | 2.51101798 |
| Uncorrected SS  | 746        | Corrected SS     | 8.54545455 |
| Coeff Variation | 10.9315548 | Std Error Mean   | 0.08995714 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.727273 | Std Deviation | 0.51676 |
| Median              | 5.000000 | Variance      | 0.26705 |
| Mode                | 5.000000 | Range         | 2.00000 |
| Interquartile Range |          | 0             |         |

Variable: EQ03 (EQ03)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.54545455 | Sum Observations | 150        |
| Std Deviation   | 0.66571902 | Variance         | 0.44318182 |
| Skewness        | -1.8674187 | Kurtosis         | 5.1231151  |
| Uncorrected SS  | 696        | Corrected SS     | 14.1818182 |
| Coeff Variation | 14.6458185 | Std Error Mean   | 0.11588681 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.545455 | Std Deviation | 0.66572 |
| Median              | 5.000000 | Variance      | 0.44318 |
| Mode                | 5.000000 | Range         | 3.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: EQ04 (EQ04)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.66666667 | Sum Observations | 154        |
| Std Deviation   | 0.54006172 | Variance         | 0.29166667 |
| Skewness        | -1.3609982 | Kurtosis         | 1.03015142 |
| Uncorrected SS  | 728        | Corrected SS     | 9.33333333 |
| Coeff Variation | 11.5727512 | Std Error Mean   | 0.09401268 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.666667 | Std Deviation | 0.54006 |
| Median              | 5.000000 | Variance      | 0.29167 |
| Mode                | 5.000000 | Range         | 2.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: EQ05 (EQ05)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.6666667  | Sum Observations | 154        |
| Std Deviation   | 0.47871355 | Variance         | 0.22916667 |
| Skewness        | -0.7412339 | Kurtosis         | -1.5483871 |
| Uncorrected SS  | 726        | Corrected SS     | 7.33333333 |
| Coeff Variation | 10.2581476 | Std Error Mean   | 0.08333333 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.666667 | Std Deviation | 0.47871 |
| Median              | 5.000000 | Variance      | 0.22917 |
| Mode                | 5.000000 | Range         | 1.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: EQ06 (EQ06)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.48484848 | Sum Observations | 148        |
| Std Deviation   | 0.56575238 | Variance         | 0.32007576 |
| Skewness        | -0.4885329 | Kurtosis         | -0.7686909 |
| Uncorrected SS  | 674        | Corrected SS     | 10.2424242 |
| Coeff Variation | 12.6147491 | Std Error Mean   | 0.09848485 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.484848 | Std Deviation | 0.56575 |
| Median              | 5.000000 | Variance      | 0.32008 |
| Mode                | 5.000000 | Range         | 2.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: EQ07 (EQ07)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.48484848 | Sum Observations | 148        |
| Std Deviation   | 0.66713998 | Variance         | 0.44507576 |
| Skewness        | -0.9497718 | Kurtosis         | -0.1573537 |
| Uncorrected SS  | 678        | Corrected SS     | 14.2424242 |
| Coeff Variation | 14.8754186 | Std Error Mean   | 0.11613416 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.484848 | Std Deviation | 0.66714 |
| Median              | 5.000000 | Variance      | 0.44508 |
| Mode                | 5.000000 | Range         | 2.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: EQ08 (EQ08)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.51515152 | Sum Observations | 149        |
| Std Deviation   | 0.66713998 | Variance         | 0.44507576 |
| Skewness        | -1.0668472 | Kurtosis         | 0.05027176 |
| Uncorrected SS  | 687        | Corrected SS     | 14.2424242 |
| Coeff Variation | 14.7755835 | Std Error Mean   | 0.11613416 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 4.515152 | Std Deviation       | 0.66714 |
| Median   | 5.000000 | Variance            | 0.44508 |
| Mode     | 5.000000 | Range               | 2.00000 |
|          |          | Interquartile Range | 1.00000 |

Variable: EQ09 (EQ09)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.51515152 | Sum Observations | 149        |
| Std Deviation   | 0.90558034 | Variance         | 0.82007576 |
| Skewness        | -2.6011046 | Kurtosis         | 7.60297383 |
| Uncorrected SS  | 699        | Corrected SS     | 26.2424242 |
| Coeff Variation | 20.0564774 | Std Error Mean   | 0.1576413  |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 4.515152 | Std Deviation       | 0.90558 |
| Median   | 5.000000 | Variance            | 0.82008 |
| Mode     | 5.000000 | Range               | 4.00000 |
|          |          | Interquartile Range | 1.00000 |

Variable: EQ10 (EQ10)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.42424242 | Sum Observations | 146        |
| Std Deviation   | 0.90243778 | Variance         | 0.81439394 |
| Skewness        | -2.3395827 | Kurtosis         | 6.61625388 |
| Uncorrected SS  | 672        | Corrected SS     | 26.0606061 |
| Coeff Variation | 20.3975662 | Std Error Mean   | 0.15709425 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 4.424242 | Std Deviation       | 0.90244 |
| Median   | 5.000000 | Variance            | 0.81439 |
| Mode     | 5.000000 | Range               | 4.00000 |
|          |          | Interquartile Range | 1.00000 |

Variable: EQ11 (EQ11)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.39393939 | Sum Observations | 145        |
| Std Deviation   | 0.9662878  | Variance         | 0.93371212 |
| Skewness        | -2.0031452 | Kurtosis         | 4.30756373 |
| Uncorrected SS  | 667        | Corrected SS     | 29.8787879 |
| Coeff Variation | 21.9913776 | Std Error Mean   | 0.16820912 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 4.393939 | Std Deviation       | 0.96629 |
| Median   | 5.000000 | Variance            | 0.93371 |
| Mode     | 5.000000 | Range               | 4.00000 |
|          |          | Interquartile Range | 1.00000 |

Variable: EQ12 (EQ12)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.27272727 | Sum Observations | 141        |
| Std Deviation   | 0.97700842 | Variance         | 0.95454545 |
| Skewness        | -1.6644197 | Kurtosis         | 3.07261356 |
| Uncorrected SS  | 633        | Corrected SS     | 30.5454545 |
| Coeff Variation | 22.8661545 | Std Error Mean   | 0.17007534 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 4.272727 | Std Deviation       | 0.97701 |
| Median   | 5.000000 | Variance            | 0.95455 |
| Mode     | 5.000000 | Range               | 4.00000 |
|          |          | Interquartile Range | 1.00000 |

Variable: EQ13 (EQ13)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.57575758 | Sum Observations | 151        |
| Std Deviation   | 0.70844473 | Variance         | 0.50189394 |
| Skewness        | -1.9684277 | Kurtosis         | 4.46226971 |
| Uncorrected SS  | 707        | Corrected SS     | 16.0606061 |
| Coeff Variation | 15.482567  | Std Error Mean   | 0.1233244  |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 4.575758 | Std Deviation       | 0.70844 |
| Median   | 5.000000 | Variance            | 0.50189 |
| Mode     | 5.000000 | Range               | 3.00000 |
|          |          | Interquartile Range | 1.00000 |

Variable: EQ14 (EQ14)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.42424242 | Sum Observations | 146        |
| Std Deviation   | 0.90243778 | Variance         | 0.81439394 |
| Skewness        | -2.3395827 | Kurtosis         | 6.61625388 |
| Uncorrected SS  | 672        | Corrected SS     | 26.0606061 |
| Coeff Variation | 20.3975662 | Std Error Mean   | 0.15709425 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.424242 | Std Deviation | 0.90244 |
| Median              | 5.000000 | Variance      | 0.81439 |
| Mode                | 5.000000 | Range         | 4.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: EQ15 (EQ15)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.36363636 | Sum Observations | 144        |
| Std Deviation   | 0.89506221 | Variance         | 0.80113636 |
| Skewness        | -2.2061096 | Kurtosis         | 6.22777007 |
| Uncorrected SS  | 654        | Corrected SS     | 25.6363636 |
| Coeff Variation | 20.5118424 | Std Error Mean   | 0.15581033 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.363636 | Std Deviation | 0.89506 |
| Median              | 5.000000 | Variance      | 0.80114 |
| Mode                | 5.000000 | Range         | 4.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: EQ16 (EQ16)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.36363636 | Sum Observations | 144        |
| Std Deviation   | 0.92932038 | Variance         | 0.86363636 |
| Skewness        | -2.0614495 | Kurtosis         | 5.07950139 |
| Uncorrected SS  | 656        | Corrected SS     | 27.6363636 |
| Coeff Variation | 21.2969253 | Std Error Mean   | 0.16177391 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.363636 | Std Deviation | 0.92932 |
| Median              | 5.000000 | Variance      | 0.86364 |
| Mode                | 5.000000 | Range         | 4.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: EQ17 (EQ17)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.27272727 | Sum Observations | 141        |
| Std Deviation   | 0.94448158 | Variance         | 0.89204545 |
| Skewness        | -1.7777616 | Kurtosis         | 3.86029506 |
| Uncorrected SS  | 631        | Corrected SS     | 28.5454545 |
| Coeff Variation | 22.104888  | Std Error Mean   | 0.16441314 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.272727 | Std Deviation | 0.94448 |
| Median              | 4.000000 | Variance      | 0.89205 |
| Mode                | 5.000000 | Range         | 4.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: EQ18 (EQ18)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.39393939 | Sum Observations | 145        |
| Std Deviation   | 0.78817011 | Variance         | 0.62121212 |
| Skewness        | -1.665312  | Kurtosis         | 3.37124216 |
| Uncorrected SS  | 657        | Corrected SS     | 19.8787879 |
| Coeff Variation | 17.9376646 | Std Error Mean   | 0.13720281 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.393939 | Std Deviation | 0.78817 |
| Median              | 5.000000 | Variance      | 0.62121 |
| Mode                | 5.000000 | Range         | 3.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: EQ19 (EQ19)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.45454545 | Sum Observations | 147        |
| Std Deviation   | 0.90453403 | Variance         | 0.81818182 |
| Skewness        | -2.4183722 | Kurtosis         | 6.88814217 |
| Uncorrected SS  | 681        | Corrected SS     | 26.1818182 |
| Coeff Variation | 20.3058661 | Std Error Mean   | 0.15745916 |

Basic Statistical Measures

| Location            |          | Variability   |         |
|---------------------|----------|---------------|---------|
| Mean                | 4.454545 | Std Deviation | 0.90453 |
| Median              | 5.000000 | Variance      | 0.81818 |
| Mode                | 5.000000 | Range         | 4.00000 |
| Interquartile Range |          | 1.00000       |         |

Variable: EQ20 (EQ20)

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 4.48484848 | Sum Observations | 148        |
| Std Deviation   | 0.79534631 | Variance         | 0.63257576 |
| Skewness        | -1.9310224 | Kurtosis         | 4.07072739 |
| Uncorrected SS  | 684        | Corrected SS     | 20.2424242 |
| Coeff Variation | 17.7340732 | Std Error Mean   | 0.13845202 |

Basic Statistical Measures

| Location |                     | Variability   |         |
|----------|---------------------|---------------|---------|
| Mean     | 4.484848            | Std Deviation | 0.79535 |
| Median   | 5.000000            | Variance      | 0.63258 |
| Mode     | 5.000000            | Range         | 3.00000 |
|          | Interquartile Range |               | 1.00000 |

## ANNEXURE C

### Wilcoxon sign-rank test

Variable: Diff01

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 0.96969697 | Sum Observations | 32         |
| Std Deviation   | 1.23705417 | Variance         | 1.53030303 |
| Skewness        | -0.2556338 | Kurtosis         | 3.05543574 |
| Uncorrected SS  | 80         | Corrected SS     | 48.969697  |
| Coeff Variation | 127.571212 | Std Error Mean   | 0.21534349 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 0.969697 | Std Deviation       | 1.23705 |
| Median   | 1.000000 | Variance            | 1.53030 |
| Mode     | 1.000000 | Range               | 7.00000 |
|          |          | Interquartile Range | 1.00000 |

Tests for Location: Mu0=0

| Test        | -Statistic- | -----p Value----- |
|-------------|-------------|-------------------|
| Student's t | t 4.503024  | Pr >  t  <.0001   |
| Sign        | M 11        | Pr >=  M  <.0001  |
| Signed Rank | S 128.5     | Pr >=  S  <.0001  |

Variable: Diff02

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 1          | Sum Observations | 33         |
| Std Deviation   | 1.17260394 | Variance         | 1.375      |
| Skewness        | 0.37138189 | Kurtosis         | 1.16363636 |
| Uncorrected SS  | 77         | Corrected SS     | 44         |
| Coeff Variation | 117.260394 | Std Error Mean   | 0.20412415 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 1.000000 | Std Deviation       | 1.17260 |
| Median   | 1.000000 | Variance            | 1.37500 |
| Mode     | 1.000000 | Range               | 6.00000 |
|          |          | Interquartile Range | 1.00000 |

Tests for Location: Mu0=0

| Test        | -Statistic- | -----p Value----- |
|-------------|-------------|-------------------|
| Student's t | t 4.898979  | Pr >  t  <.0001   |
| Sign        | M 10.5      | Pr >=  M  <.0001  |
| Signed Rank | S 121       | Pr >=  S  <.0001  |

Variable: Diff03

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 1.3030303  | Sum Observations | 43         |
| Std Deviation   | 1.61021832 | Variance         | 2.59280303 |
| Skewness        | -0.050559  | Kurtosis         | 0.19458547 |
| Uncorrected SS  | 139        | Corrected SS     | 82.969697  |
| Coeff Variation | 123.574894 | Std Error Mean   | 0.28030303 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 1.303030 | Std Deviation       | 1.61022 |
| Median   | 1.000000 | Variance            | 2.59280 |
| Mode     | 0.000000 | Range               | 7.00000 |
|          |          | Interquartile Range | 2.00000 |

Tests for Location: Mu0=0

| Test        | -Statistic- | -----p Value----- |
|-------------|-------------|-------------------|
| Student's t | t           | Pr >  t           |
| Sign        | M           | Pr >=  M          |
| Signed Rank | S           | Pr >=  S          |



Student's t t 4.648649 Pr > |t| <.0001  
 Sign M 9.5 Pr >= |M| <.0001  
 Signed Rank S 100.5 Pr >= |S| <.0001

Variable: Diff04  
 N 33 Sum Weights 33  
 Mean 0.84848485 Sum Observations 28  
 Std Deviation 1.17582982 Variance 1.38257576  
 Skewness 0.67988201 Kurtosis 0.46443826  
 Uncorrected SS 68 Corrected SS 44.2424242  
 Coeff Variation 138.579943 Std Error Mean 0.2046857

Basic Statistical Measures  
 Location Variability  
 Mean 0.848485 Std Deviation 1.17583  
 Median 1.000000 Variance 1.38258  
 Mode 0.000000 Range 5.00000  
 Interquartile Range 1.00000

Tests for Location: Mu0=0  
 Test -Statistic- -----p Value-----  
 Student's t t 4.145306 Pr > |t| 0.0002  
 Sign M 8 Pr >= |M| 0.0009  
 Signed Rank S 104 Pr >= |S| <.0001

Variable: Diff05  
 N 33 Sum Weights 33  
 Mean 1.45454545 Sum Observations 48  
 Std Deviation 1.12057209 Variance 1.25568182  
 Skewness 0.40445279 Kurtosis -0.7046877  
 Uncorrected SS 110 Corrected SS 40.1818182  
 Coeff Variation 77.0393315 Std Error Mean 0.19506656

Basic Statistical Measures  
 Location Variability  
 Mean 1.454545 Std Deviation 1.12057  
 Median 1.000000 Variance 1.25568  
 Mode 1.000000 Range 4.00000  
 Interquartile Range 1.00000

Tests for Location: Mu0=0  
 Test -Statistic- -----p Value-----  
 Student's t t 7.456662 Pr > |t| <.0001  
 Sign M 13 Pr >= |M| <.0001  
 Signed Rank S 175.5 Pr >= |S| <.0001

Variable: Diff06  
 N 32 Sum Weights 32  
 Mean 1.15625 Sum Observations 37  
 Std Deviation 1.24717423 Variance 1.55544355  
 Skewness 0.3241547 Kurtosis 0.28697973  
 Uncorrected SS 91 Corrected SS 48.21875  
 Coeff Variation 107.863717 Std Error Mean 0.22047134

Basic Statistical Measures  
 Location Variability  
 Mean 1.156250 Std Deviation 1.24717  
 Median 1.000000 Variance 1.55544  
 Mode 1.000000 Range 5.00000  
 Interquartile Range 2.00000

Tests for Location: Mu0=0  
 Test -Statistic- -----p Value-----  
 Student's t t 5.244446 Pr > |t| <.0001

Sign M 10 Pr >= |M| <.0001  
 Signed Rank S 153 Pr >= |S| <.0001

Variable: Diff07  
 N 33 Sum Weights 33  
 Mean 1.42424242 Sum Observations 47  
 Std Deviation 1.11888066 Variance 1.25189394  
 Skewness -0.0832643 Kurtosis 0.34414501  
 Uncorrected SS 107 Corrected SS 40.0606061  
 Coeff Variation 78.5597062 Std Error Mean 0.19477212

Basic Statistical Measures  
 Location Variability  
 Mean 1.424242 Std Deviation 1.11888  
 Median 1.000000 Variance 1.25189  
 Mode 1.000000 Range 5.00000  
 Interquartile Range 1.00000

Tests for Location: Mu0=0  
 Test -Statistic- ----p Value-----  
 Student's t t 7.312353 Pr > |t| <.0001  
 Sign M 13 Pr >= |M| <.0001  
 Signed Rank S 216.5 Pr >= |S| <.0001

Variable: Diff08  
 N 33 Sum Weights 33  
 Mean 1.15151515 Sum Observations 38  
 Std Deviation 1.32573593 Variance 1.75757576  
 Skewness -0.038255 Kurtosis -0.1927062  
 Uncorrected SS 100 Corrected SS 56.2424242  
 Coeff Variation 115.129699 Std Error Mean 0.230781

Basic Statistical Measures  
 Location Variability  
 Mean 1.151515 Std Deviation 1.32574  
 Median 1.000000 Variance 1.75758  
 Mode 0.000000 Range 6.00000  
 Interquartile Range 2.00000

Tests for Location: Mu0=0  
 Test -Statistic- ----p Value-----  
 Student's t t 4.989644 Pr > |t| <.0001  
 Sign M 9.5 Pr >= |M| <.0001  
 Signed Rank S 120 Pr >= |S| <.0001

Variable: Diff09  
 N 33 Sum Weights 33  
 Mean 1.15151515 Sum Observations 38  
 Std Deviation 1.50252313 Variance 2.25757576  
 Skewness -1.3332917 Kurtosis 3.27616454  
 Uncorrected SS 116 Corrected SS 72.2424242  
 Coeff Variation 130.482272 Std Error Mean 0.2615557

Basic Statistical Measures  
 Location Variability  
 Mean 1.151515 Std Deviation 1.50252  
 Median 1.000000 Variance 2.25758  
 Mode 1.000000 Range 7.00000  
 Interquartile Range 2.00000

Tests for Location: Mu0=0  
 Test -Statistic- ----p Value-----  
 Student's t t 4.402562 Pr > |t| 0.0001  
 Sign M 11 Pr >= |M| <.0001

Signed Rank S 134.5 Pr >= |S| <.0001

Variable: Diff10  
N 33 Sum Weights 33  
Mean 1.21212121 Sum Observations 40  
Std Deviation 1.53617983 Variance 2.35984848  
Skewness -0.9852792 Kurtosis 1.83962728  
Uncorrected SS 124 Corrected SS 75.5151515  
Coeff Variation 126.734836 Std Error Mean 0.26741458

Basic Statistical Measures  
Location Variability  
Mean 1.212121 Std Deviation 1.53618  
Median 1.000000 Variance 2.35985  
Mode 1.000000 Range 7.00000  
Interquartile Range 2.00000

Tests for Location: Mu0=0  
Test -Statistic- ----p Value-----  
Student's t t 4.532742 Pr > |t| <.0001  
Sign M 11 Pr >= |M| <.0001  
Signed Rank S 131.5 Pr >= |S| 0.0002

Variable: Diff11  
N 33 Sum Weights 33  
Mean 0.75757576 Sum Observations 25  
Std Deviation 1.22551783 Variance 1.50189394  
Skewness -0.9140999 Kurtosis 2.24407974  
Uncorrected SS 67 Corrected SS 48.0606061  
Coeff Variation 161.768353 Std Error Mean 0.21333527

Basic Statistical Measures  
Location Variability  
Mean 0.757576 Std Deviation 1.22552  
Median 1.000000 Variance 1.50189  
Mode 1.000000 Range 6.00000  
Interquartile Range 1.00000

Tests for Location: Mu0=0  
Test -Statistic- ----p Value-----  
Student's t t 3.551104 Pr > |t| 0.0012  
Sign M 9.5 Pr >= |M| 0.0002  
Signed Rank S 110.5 Pr >= |S| 0.0008

Variable: Diff12  
N 33 Sum Weights 33  
Mean 0.78787879 Sum Observations 26  
Std Deviation 1.4738889 Variance 2.17234848  
Skewness -1.2929935 Kurtosis 3.65192366  
Uncorrected SS 90 Corrected SS 69.5151515  
Coeff Variation 187.070514 Std Error Mean 0.25657112

Basic Statistical Measures  
Location Variability  
Mean 0.787879 Std Deviation 1.47389  
Median 1.000000 Variance 2.17235  
Mode 1.000000 Range 8.00000  
Interquartile Range 2.00000

Tests for Location: Mu0=0  
Test -Statistic- ----p Value-----  
Student's t t 3.070801 Pr > |t| 0.0043  
Sign M 9.5 Pr >= |M| 0.0002  
Signed Rank S 108 Pr >= |S| 0.0014

Variable: Diff13

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 1.54545455 | Sum Observations | 51         |
| Std Deviation   | 1.22706227 | Variance         | 1.50568182 |
| Skewness        | -0.8678299 | Kurtosis         | 0.92460483 |
| Uncorrected SS  | 127        | Corrected SS     | 48.1818182 |
| Coeff Variation | 79.398147  | Std Error Mean   | 0.21360412 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 1.545455 | Std Deviation       | 1.22706 |
| Median   | 2.000000 | Variance            | 1.50568 |
| Mode     | 1.000000 | Range               | 5.00000 |
|          |          | Interquartile Range | 1.00000 |

Tests for Location: Mu0=0

|             |             |                   |
|-------------|-------------|-------------------|
| Test        | -Statistic- | -----p Value----- |
| Student's t | t 7.235134  | Pr >  t  <.0001   |
| Sign        | M 13        | Pr >=  M  <.0001  |
| Signed Rank | S 209.5     | Pr >=  S  <.0001  |

Variable: Diff14

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 0.51515152 | Sum Observations | 17         |
| Std Deviation   | 1.20211304 | Variance         | 1.44507576 |
| Skewness        | -1.8188002 | Kurtosis         | 5.4847552  |
| Uncorrected SS  | 55         | Corrected SS     | 46.2424242 |
| Coeff Variation | 233.351355 | Std Error Mean   | 0.20926102 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 0.515152 | Std Deviation       | 1.20211 |
| Median   | 1.000000 | Variance            | 1.44508 |
| Mode     | 1.000000 | Range               | 6.00000 |
|          |          | Interquartile Range | 1.00000 |

Tests for Location: Mu0=0

|             |             |                   |
|-------------|-------------|-------------------|
| Test        | -Statistic- | -----p Value----- |
| Student's t | t 2.461765  | Pr >  t  0.0194   |
| Sign        | M 8         | Pr >=  M  0.0009  |
| Signed Rank | S 78        | Pr >=  S  0.0052  |

Variable: Diff15

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 32         | Sum Weights      | 32         |
| Mean            | 0.28125    | Sum Observations | 9          |
| Std Deviation   | 1.08462495 | Variance         | 1.17641129 |
| Skewness        | -2.224281  | Kurtosis         | 7.38864384 |
| Uncorrected SS  | 39         | Corrected SS     | 36.46875   |
| Coeff Variation | 385.644428 | Std Error Mean   | 0.19173641 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 0.281250 | Std Deviation       | 1.08462 |
| Median   | 0.000000 | Variance            | 1.17641 |
| Mode     | 0.000000 | Range               | 6.00000 |
|          |          | Interquartile Range | 1.00000 |

Tests for Location: Mu0=0

|             |             |                   |
|-------------|-------------|-------------------|
| Test        | -Statistic- | -----p Value----- |
| Student's t | t 1.466858  | Pr >  t  0.1525   |
| Sign        | M 6         | Pr >=  M  0.0075  |
| Signed Rank | S 43        | Pr >=  S  0.0513  |

Variable: Diff16

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 0.54545455 | Sum Observations | 18         |
| Std Deviation   | 1.17502418 | Variance         | 1.38068182 |
| Skewness        | -1.5922802 | Kurtosis         | 3.5325588  |
| Uncorrected SS  | 54         | Corrected SS     | 44.1818182 |
| Coeff Variation | 215.421099 | Std Error Mean   | 0.20454545 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 0.545455 | Std Deviation       | 1.17502 |
| Median   | 1.000000 | Variance            | 1.38068 |
| Mode     | 1.000000 | Range               | 5.00000 |
|          |          | Interquartile Range | 1.00000 |

Tests for Location: Mu0=0

| Test        | -Statistic- | -----p Value----- |
|-------------|-------------|-------------------|
| Student's t | t 2.666667  | Pr >  t  0.0119   |
| Sign        | M 8.5       | Pr >=  M  0.0005  |
| Signed Rank | S 84.5      | Pr >=  S  0.0045  |

Variable: Diff17

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 0.6969697  | Sum Observations | 23         |
| Std Deviation   | 1.23705417 | Variance         | 1.53030303 |
| Skewness        | -1.5914421 | Kurtosis         | 5.56691532 |
| Uncorrected SS  | 65         | Corrected SS     | 48.969697  |
| Coeff Variation | 177.490382 | Std Error Mean   | 0.21534349 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 0.696970 | Std Deviation       | 1.23705 |
| Median   | 1.000000 | Variance            | 1.53030 |
| Mode     | 1.000000 | Range               | 7.00000 |
|          |          | Interquartile Range | 1.00000 |

Tests for Location: Mu0=0

| Test        | -Statistic- | -----p Value----- |
|-------------|-------------|-------------------|
| Student's t | t 3.236549  | Pr >  t  0.0028   |
| Sign        | M 9         | Pr >=  M  0.0003  |
| Signed Rank | S 109       | Pr >=  S  0.0003  |

Variable: Diff18

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 32         | Sum Weights      | 32         |
| Mean            | 1.28125    | Sum Observations | 41         |
| Std Deviation   | 1.52895442 | Variance         | 2.33770161 |
| Skewness        | -0.5666105 | Kurtosis         | 1.14716253 |
| Uncorrected SS  | 125        | Corrected SS     | 72.46875   |
| Coeff Variation | 119.333028 | Std Error Mean   | 0.27028351 |

Basic Statistical Measures

| Location |          | Variability         |         |
|----------|----------|---------------------|---------|
| Mean     | 1.281250 | Std Deviation       | 1.52895 |
| Median   | 1.000000 | Variance            | 2.33770 |
| Mode     | 1.000000 | Range               | 7.00000 |
|          |          | Interquartile Range | 1.50000 |

Tests for Location: Mu0=0

| Test        | -Statistic- | -----p Value----- |
|-------------|-------------|-------------------|
| Student's t | t 4.740393  | Pr >  t  <.0001   |
| Sign        | M 11        | Pr >=  M  <.0001  |
| Signed Rank | S 139       | Pr >=  S  <.0001  |

Variable: Diff19

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 1          | Sum Observations | 33         |
| Std Deviation   | 1.19895788 | Variance         | 1.4375     |
| Skewness        | -1.3897062 | Kurtosis         | 3.6663699  |
| Uncorrected SS  | 79         | Corrected SS     | 46         |
| Coeff Variation | 119.895788 | Std Error Mean   | 0.20871178 |

Basic Statistical Measures

|        | Location |                     | Variability |
|--------|----------|---------------------|-------------|
| Mean   | 1.000000 | Std Deviation       | 1.19896     |
| Median | 1.000000 | Variance            | 1.43750     |
| Mode   | 1.000000 | Range               | 6.00000     |
|        |          | Interquartile Range | 1.00000     |

Tests for Location: Mu0=0

| Test        | -Statistic- | -----p Value----- |
|-------------|-------------|-------------------|
| Student's t | t 4.791296  | Pr >  t  <.0001   |
| Sign        | M 12        | Pr >=  M  <.0001  |
| Signed Rank | S 155       | Pr >=  S  <.0001  |

Variable: Diff20

|                 |            |                  |            |
|-----------------|------------|------------------|------------|
| N               | 33         | Sum Weights      | 33         |
| Mean            | 1.18181818 | Sum Observations | 39         |
| Std Deviation   | 1.4021088  | Variance         | 1.96590909 |
| Skewness        | -0.923398  | Kurtosis         | 1.4878257  |
| Uncorrected SS  | 109        | Corrected SS     | 62.9090909 |
| Coeff Variation | 118.639976 | Std Error Mean   | 0.24407581 |

Basic Statistical Measures

|        | Location |                     | Variability |
|--------|----------|---------------------|-------------|
| Mean   | 1.181818 | Std Deviation       | 1.40211     |
| Median | 1.000000 | Variance            | 1.96591     |
| Mode   | 1.000000 | Range               | 6.00000     |
|        |          | Interquartile Range | 2.00000     |

Tests for Location: Mu0=0

| Test        | -Statistic- | -----p Value----- |
|-------------|-------------|-------------------|
| Student's t | t 4.842013  | Pr >  t  <.0001   |
| Sign        | M 11        | Pr >=  M  <.0001  |
| Signed Rank | S 137.5     | Pr >=  S  <.0001  |

## ANNEXURE D

**TABLE 5. 1: Cronbach's Alpha Coefficients for survey questionnaire.**

| Statements                                                                                            | Variable nr. | Correlation with total | Cronbach's Alpha Coefficient |
|-------------------------------------------------------------------------------------------------------|--------------|------------------------|------------------------------|
| <b>Performance questions</b>                                                                          |              |                        |                              |
| <b>Tangibles: The physical representation or images of your service</b>                               |              |                        |                              |
| 1. Brewing lab has up to date equipment and technology.                                               | PQ01         | 0.2907                 | 0.8917                       |
| 2. Brewing lab has appealing facilities.                                                              | PQ02         | 0.3599                 | 0.8906                       |
| 3. Brewing laboratory uses visually appealing materials – e.g. taste bottles.                         | PQ03         | 0.0626                 | 0.8978                       |
| 4. Communication channels make you find information easily.                                           | PQ04         | 0.3279                 | 0.8912                       |
| <b>Reliability: Your ability to perform the promised service dependably and accurately</b>            |              |                        |                              |
| 5. When brewing lab promises to do something by a certain time, it does so.`                          | PQ05         | 0.1771                 | 0.8934                       |
| 6. Brewing lab shows a sincere interest in solving problems.                                          | PQ06         | 0.4020                 | 0.8900                       |
| 7. Brewing lab performs the service right the first time.                                             | PQ07         | 0.3578                 | 0.8911                       |
| 8. Brewing lab insists on error free records.                                                         | PQ08         | -0.0273                | 0.8969                       |
| <b>Responsiveness: Your willingness to help customers and to provide prompt service</b>               |              |                        |                              |
| 9. The staff of the Brewing lab tells you exactly when services will be performed.                    | PQ09         | 0.3009                 | 0.8919                       |
| 10. The staff of the Brewing lab gives you prompt service.                                            | PQ10         | 0.2315                 | 0.8928                       |
| 11. The staff of the Brewing lab is always willing to help you.                                       | PQ11         | 0.3017                 | 0.8912                       |
| 12. The staff of the Brewing lab is not too busy to respond to your questions.                        | PQ12         | 0.3997                 | 0.8899                       |
| <b>Assurance: The knowledge and courtesy of staff, their ability to inspire trust and confidence.</b> |              |                        |                              |
| 13. The staff of the Brewing lab instils confidence in customers.                                     | PQ13         | 0.4326                 | 0.8894                       |
| 14. Customers have comfortable interactions with                                                      | PQ14         | 0.3075                 | 0.8912                       |

| Statements                                                                                 | Variable nr. | Correlation with total | Cronbach's Alpha Coefficient |
|--------------------------------------------------------------------------------------------|--------------|------------------------|------------------------------|
| employees.                                                                                 |              |                        |                              |
| 15. Staff of the Brewing lab is courteous with you.                                        | PQ15         | 0.4980                 | 0.8892                       |
| 16. Staff of the Brewing lab Have the knowledge to answer your questions.                  | PQ16         | 0.2456                 | 0.8918                       |
| <b>Empathy: The caring individualised attention you provide your stakeholders.</b>         |              |                        |                              |
| 17. Customers are given individual attention by Brewing lab staff.                         | PQ17         | 0.5009                 | 0.8884                       |
| 18. Brewing lab operating hours are convenient to all its customers.                       | PQ18         | 0.3049                 | 0.8922                       |
| 19. Brewing lab staff has your best interest at heart.                                     | PQ19         | 0.4088                 | 0.8898                       |
| 20. Staff of the Brewing lab understands your specific needs.                              | PQ20         | 0.5134                 | 0.8878                       |
| <b>Expectation questions</b>                                                               |              |                        |                              |
| <b>Tangibles: The physical representation or images of your service</b>                    |              |                        |                              |
| 1. Brewing lab should have up to date equipment and technology.                            | EQ01         | 0.4098                 | 0.8899                       |
| 2. Brewing lab should have appealing facilities.                                           | EQ02         | 0.4456                 | 0.8899                       |
| 3. Brewing laboratory should use visually appealing materials – e.g. taste bottles.        | EQ03         | 0.4744                 | 0.8891                       |
| 4. Communication channels should make you find information easily.                         | EQ04         | 0.4388                 | 0.8900                       |
| <b>Reliability: Your ability to perform the promised service dependably and accurately</b> |              |                        |                              |
| 5. When brewing lab promises to do something by a certain time, it should do so.           | EQ05         | 0.3466                 | 0.8910                       |
| 6. Brewing lab should show a sincere interest in solving problems.                         | EQ06         | 0.5009                 | 0.8892                       |
| 7. Brewing lab should perform the service right the first time.                            | EQ07         | 0.5784                 | 0.8878                       |
| 8. Brewing lab should insist on error free records.                                        | EQ08         | 0.4785                 | 0.8891                       |
| <b>Responsiveness: Your willingness to help customers and to provide prompt service</b>    |              |                        |                              |
| 9. The staff of the Brewing lab should tell you exactly when services will be performed.   | EQ09         | 0.5663                 | 0.8870                       |
| 10. The staff of the Brewing lab should give you prompt service.                           | EQ10         | 0.5472                 | 0.8874                       |



| Statements                                                                                            | Variable nr. | Correlation with total | Cronbach's Alpha Coefficient |
|-------------------------------------------------------------------------------------------------------|--------------|------------------------|------------------------------|
| 11. The staff of the Brewing lab should always be willing to help you.                                | EQ11         | 0.5348                 | 0.8875                       |
| 12. The staff of the Brewing lab should not be too busy to respond to your questions.                 | EQ12         | 0.6301                 | 0.8857                       |
| <b>Assurance: The knowledge and courtesy of staff, their ability to inspire trust and confidence.</b> |              |                        |                              |
| 13. The staff of the Brewing lab should instil confidence in customers.                               | EQ13         | 0.3843                 | 0.8902                       |
| 14. Customers should have comfortable interactions with employees.                                    | EQ14         | 0.4455                 | 0.8891                       |
| 15. Staff of the Brewing lab should be courteous with you.                                            | EQ15         | 0.5840                 | 0.8868                       |
| 16. Staff of the Brewing lab should have the knowledge to answer your questions.                      | EQ16         | 0.4948                 | 0.8882                       |
| <b>Empathy: The caring individualised attention you provide your stakeholders.</b>                    |              |                        |                              |
| 17. Customers should be given individual attention by Brewing lab staff.                              | EQ17         | 0.5480                 | 0.8873                       |
| 18. Brewing lab operating hours should be convenient to all its customers.                            | EQ18         | 0.5561                 | 0.8876                       |
| 19. Brewing lab staff should have your best interest at heart.                                        | EQ19         | 0.5176                 | 0.8879                       |
| 20. Staff of the Brewing lab should understand your specific needs.                                   | EQ20         | 0.4930                 | 0.8874                       |
| <b>Cronbach's Coefficient Alpha for standardized variables</b>                                        |              |                        | <b>0.9027</b>                |
| <b>Cronbach's Coefficient Alpha for raw variables</b>                                                 |              |                        | <b>0.8924</b>                |

## ANNEXURE E

**TABLE 5. 2: Descriptive statistics for quality variables**

| Variables                                                                                  | Categories        | Frequency | Percentage out of total |
|--------------------------------------------------------------------------------------------|-------------------|-----------|-------------------------|
| <b>Performance questions</b>                                                               |                   |           |                         |
| <b>Tangibles: The physical representation or images of your service</b>                    |                   |           |                         |
| 1. Brewing lab has up to date equipment and technology.                                    | Strongly disagree | 1         | 2.9%                    |
|                                                                                            | Disagree          | 5         | 14.7%                   |
|                                                                                            | Undecided         | 1         | 2.9%                    |
|                                                                                            | Agree             | 24        | 70.6%                   |
|                                                                                            | Strongly agree    | 3         | 8.8%                    |
| 2. Brewing lab has appealing facilities.                                                   | Strongly disagree | 1         | 2.9%                    |
|                                                                                            | Disagree          | 3         | 8.8%                    |
|                                                                                            | Undecided         | 5         | 14.7%                   |
|                                                                                            | Agree             | 20        | 58.8%                   |
|                                                                                            | Strongly agree    | 5         | 14.7%                   |
| 3. Brewing laboratory uses visually appealing materials – e.g. taste bottles.              | Strongly disagree | 4         | 11.8%                   |
|                                                                                            | Disagree          | 6         | 17.6%                   |
|                                                                                            | Undecided         | 6         | 17.6%                   |
|                                                                                            | Agree             | 13        | 38.2%                   |
|                                                                                            | Strongly agree    | 5         | 14.7%                   |
| 4. Communication channels make you find information easily.                                | Strongly disagree | 1         | 2.9%                    |
|                                                                                            | Disagree          | 3         | 8.8%                    |
|                                                                                            | Undecided         | 5         | 14.7%                   |
|                                                                                            | Agree             | 17        | 50.0%                   |
|                                                                                            | Strongly agree    | 8         | 23.5%                   |
| <b>Reliability: Your ability to perform the promised service dependably and accurately</b> |                   |           |                         |
| 5. When brewing lab promises to do something by a certain time, it does so.                | Strongly disagree | 1         | 2.9%                    |
|                                                                                            | Disagree          | 7         | 20.6%                   |
|                                                                                            | Undecided         | 10        | 29.4%                   |
|                                                                                            | Agree             | 16        | 47.1%                   |
|                                                                                            | Strongly agree    | 0         | 0.0%                    |
| 6. Brewing lab shows a sincere interest in solving problems.                               | Strongly disagree | 3         | 8.8%                    |
|                                                                                            | Disagree          | 4         | 11.8%                   |
|                                                                                            | Undecided         | 8         | 23.5%                   |
|                                                                                            | Agree             | 14        | 41.2%                   |

| Variables                                                                                             | Categories        | Frequency | Percentage out of total |
|-------------------------------------------------------------------------------------------------------|-------------------|-----------|-------------------------|
|                                                                                                       | Strongly agree    | 4         | 11.8%                   |
|                                                                                                       | Unknown           | 1         | 2.9%                    |
| 7. Brewing lab performs the service right the first time.                                             | Strongly disagree | 1         | 2.9%                    |
|                                                                                                       | Disagree          | 9         | 26.5%                   |
|                                                                                                       | Undecided         | 11        | 32.4%                   |
|                                                                                                       | Agree             | 12        | 35.3%                   |
|                                                                                                       | Strongly agree    | 1         | 2.9%                    |
| 8. Brewing lab insists on error free records.                                                         | Strongly disagree | 1         | 2.9%                    |
|                                                                                                       | Disagree          | 5         | 14.7%                   |
|                                                                                                       | Undecided         | 11        | 32.4%                   |
|                                                                                                       | Agree             | 14        | 41.2%                   |
|                                                                                                       | Strongly agree    | 3         | 8.8%                    |
| <b>Responsiveness: Your willingness to help customers and to provide prompt service</b>               |                   |           |                         |
| 9. The staff of the Brewing lab tells you exactly when services will be performed.                    | Strongly disagree | 0         | 0.0%                    |
|                                                                                                       | Disagree          | 10        | 29.4%                   |
|                                                                                                       | Undecided         | 5         | 14.7%                   |
|                                                                                                       | Agree             | 15        | 44.1%                   |
|                                                                                                       | Strongly agree    | 4         | 11.8%                   |
| 10. The staff of the Brewing lab gives you prompt service.                                            | Strongly disagree | 1         | 2.9%                    |
|                                                                                                       | Disagree          | 7         | 20.6%                   |
|                                                                                                       | Undecided         | 11        | 32.4%                   |
|                                                                                                       | Agree             | 13        | 38.2%                   |
|                                                                                                       | Strongly agree    | 2         | 5.9%                    |
| 11. The staff of the Brewing lab is always willing to help you.                                       | Strongly disagree | 0         | 0.0%                    |
|                                                                                                       | Disagree          | 4         | 11.8%                   |
|                                                                                                       | Undecided         | 5         | 14.7%                   |
|                                                                                                       | Agree             | 24        | 70.6%                   |
|                                                                                                       | Strongly agree    | 1         | 2.9%                    |
| 12. The staff of the Brewing lab is not too busy to respond to your questions.                        | Strongly disagree | 1         | 2.9%                    |
|                                                                                                       | Disagree          | 4         | 11.8%                   |
|                                                                                                       | Undecided         | 10        | 29.4%                   |
|                                                                                                       | Agree             | 15        | 44.1%                   |
|                                                                                                       | Strongly agree    | 4         | 11.8%                   |
| <b>Assurance: The knowledge and courtesy of staff, their ability to inspire trust and confidence.</b> |                   |           |                         |

| Variables                                                                          | Categories        | Frequency | Percentage out of total |
|------------------------------------------------------------------------------------|-------------------|-----------|-------------------------|
| 13. The staff of the Brewing lab instils confidence in customers.                  | Strongly disagree | 0         | 0.0%                    |
|                                                                                    | Disagree          | 11        | 32.4%                   |
|                                                                                    | Undecided         | 10        | 29.4%                   |
|                                                                                    | Agree             | 13        | 38.2%                   |
|                                                                                    | Strongly agree    | 0         | 0.0%                    |
| 14. Customers have comfortable interactions with employees.                        | Strongly disagree | 0         | %                       |
|                                                                                    | Disagree          | 0         | %                       |
|                                                                                    | Undecided         | 8         | 23.5%                   |
|                                                                                    | Agree             | 21        | 61.8%                   |
|                                                                                    | Strongly agree    | 5         | 14.7%                   |
| 15. Staff of the Brewing lab is courteous with you.                                | Strongly disagree | 0         | 0.0%                    |
|                                                                                    | Disagree          | 0         | 0.0%                    |
|                                                                                    | Undecided         | 4         | 11.8%                   |
|                                                                                    | Agree             | 22        | 64.7%                   |
|                                                                                    | Strongly agree    | 7         | 20.6%                   |
| 16. Staff of the Brewing lab Have the knowledge to answer your questions.          | Strongly disagree | 0         | %                       |
|                                                                                    | Disagree          | 1         | 2.9%                    |
|                                                                                    | Undecided         | 6         | 17.6%                   |
|                                                                                    | Agree             | 25        | 73.5%                   |
|                                                                                    | Strongly agree    | 2         | 5.9%                    |
| <b>Empathy: The caring individualised attention you provide your stakeholders.</b> |                   |           |                         |
| 17. Customers are given individual attention by Brewing lab staff.                 | Strongly disagree | 0         | 0.0%                    |
|                                                                                    | Disagree          | 4         | 11.8%                   |
|                                                                                    | Undecided         | 8         | 23.5%                   |
|                                                                                    | Agree             | 20        | 58.8%                   |
|                                                                                    | Strongly agree    | 2         | 5.9%                    |
| 18. Brewing lab operating hours are convenient to all its customers.               | Strongly disagree | 2         | 5.9%                    |
|                                                                                    | Disagree          | 10        | 29.4%                   |
|                                                                                    | Undecided         | 6         | 17.6%                   |
|                                                                                    | Agree             | 11        | 32.4%                   |
|                                                                                    | Strongly agree    | 4         | 11.8%                   |
|                                                                                    | Unknown           | 1         | 2.9%                    |
| 19. Brewing lab staff has your best interest at                                    | Strongly disagree | 0         | 0.0%                    |

| Variables                                                                           | Categories        | Frequency | Percentage out of total |
|-------------------------------------------------------------------------------------|-------------------|-----------|-------------------------|
| heart.                                                                              | Disagree          | 3         | 8.8%                    |
|                                                                                     | Undecided         | 14        | 41.2%                   |
|                                                                                     | Agree             | 14        | 41.2%                   |
|                                                                                     | Strongly agree    | 3         | 8.8%                    |
| 20. Staff of the Brewing lab understands your specific needs.                       | Strongly disagree | 0         | 0.0%                    |
|                                                                                     | Disagree          | 9         | 26.5%                   |
|                                                                                     | Undecided         | 9         | 26.5%                   |
|                                                                                     | Agree             | 12        | 35.3%                   |
|                                                                                     | Strongly agree    | 4         | 11.8%                   |
| <b>Expectation questions</b>                                                        |                   |           |                         |
| <b>Tangibles: The physical representation or images of your service</b>             |                   |           |                         |
| 1. Brewing lab should have up to date equipment and technology.                     | Strongly disagree | 0         | 0.0%                    |
|                                                                                     | Disagree          | 1         | 2.9%                    |
|                                                                                     | Undecided         | 0         | 0.0%                    |
|                                                                                     | Agree             | 9         | 26.5%                   |
|                                                                                     | Strongly agree    | 23        | 67.6%                   |
|                                                                                     | Unknown           | 1         | 2.9%                    |
| 2. Brewing lab should have appealing facilities.                                    | Strongly disagree | 0         | 0.0%                    |
|                                                                                     | Disagree          | 0         | 0.0%                    |
|                                                                                     | Undecided         | 1         | 2.9%                    |
|                                                                                     | Agree             | 7         | 20.6%                   |
|                                                                                     | Strongly agree    | 25        | 73.5%                   |
|                                                                                     | Unknown           | 1         | 2.9%                    |
| 3. Brewing laboratory should use visually appealing materials – e.g. taste bottles. | Strongly disagree | 0         | 0.0%                    |
|                                                                                     | Disagree          | 1         | 2.9%                    |
|                                                                                     | Undecided         | 0         | 0.0%                    |
|                                                                                     | Agree             | 12        | 35.3%                   |
|                                                                                     | Strongly agree    | 20        | 58.8%                   |
|                                                                                     | Unknown           | 1         | 2.9%                    |
| 4. Communication channels should make you find information easily.                  | Strongly disagree | 0         | 0.0%                    |
|                                                                                     | Disagree          | 0         | 0.0%                    |
|                                                                                     | Undecided         | 1         | 2.9%                    |
|                                                                                     | Agree             | 9         | 26.5%                   |
|                                                                                     | Strongly agree    | 23        | 67.6%                   |

| Variables                                                                                  | Categories        | Frequency | Percentage out of total |
|--------------------------------------------------------------------------------------------|-------------------|-----------|-------------------------|
|                                                                                            | Unknown           | 1         | 2.9%                    |
| <b>Reliability: Your ability to perform the promised service dependably and accurately</b> |                   |           |                         |
| 5. When brewing lab promises to do something by a certain time, it should do so.           | Strongly disagree | 0         | 0.0%                    |
|                                                                                            | Disagree          | 0         | 0.0%                    |
|                                                                                            | Undecided         | 0         | 0.0%                    |
|                                                                                            | Agree             | 11        | 32.4%                   |
|                                                                                            | Strongly agree    | 22        | 64.7%                   |
|                                                                                            | Unknown           | 1         | 2.9%                    |
| 6. Brewing lab should show a sincere interest in solving problems.                         | Strongly disagree | 0         | 0.0%                    |
|                                                                                            | Disagree          | 0         | 0.0%                    |
|                                                                                            | Undecided         | 1         | 2.9%                    |
|                                                                                            | Agree             | 15        | 44.1%                   |
|                                                                                            | Strongly agree    | 17        | 50.0%                   |
|                                                                                            | Unknown           | 1         | 2.9%                    |
| 7. Brewing lab should perform the service right the first time.                            | Strongly disagree | 0         | 0.0%                    |
|                                                                                            | Disagree          | 0         | 0.0%                    |
|                                                                                            | Undecided         | 3         | 8.8%                    |
|                                                                                            | Agree             | 11        | 32.4%                   |
|                                                                                            | Strongly agree    | 19        | 55.9%                   |
|                                                                                            | Unknown           | 1         | 2.9%                    |
| 8. Brewing lab should insist on error free records.                                        | Strongly disagree | 0         | 0.0%                    |
|                                                                                            | Disagree          | 0         | 0.0%                    |
|                                                                                            | Undecided         | 3         | 8.8%                    |
|                                                                                            | Agree             | 10        | 29.4%                   |
|                                                                                            | Strongly agree    | 20        | 58.8%                   |
|                                                                                            | Unknown           | 1         | 2.9%                    |
| <b>Responsiveness: Your willingness to help customers and to provide prompt service</b>    |                   |           |                         |
| 9. The staff of the Brewing lab should tell you exactly when services will be performed.   | Strongly disagree | 1         | 2.9%                    |
|                                                                                            | Disagree          | 1         | 2.9%                    |
|                                                                                            | Undecided         | 0         | 0.0%                    |
|                                                                                            | Agree             | 9         | 26.5%                   |
|                                                                                            | Strongly agree    | 22        | 64.7%                   |
| 10. The staff of the Brewing lab should give you prompt service.                           | Strongly disagree | 1         | 2.9%                    |
|                                                                                            | Disagree          | 1         | 2.9%                    |

| Variables                                                                                             | Categories        | Frequency | Percentage out of total |
|-------------------------------------------------------------------------------------------------------|-------------------|-----------|-------------------------|
|                                                                                                       | Undecided         | 0         | 0.0%                    |
|                                                                                                       | Agree             | 12        | 35.3%                   |
|                                                                                                       | Strongly agree    | 19        | 55.9%                   |
|                                                                                                       | Unknown           | 1         | 2.9%                    |
| 11. The staff of the Brewing lab should always be willing to help you.                                | Strongly disagree | 1         | 2.9%                    |
|                                                                                                       | Disagree          | 1         | 2.9%                    |
|                                                                                                       | Undecided         | 2         | 5.9%                    |
|                                                                                                       | Agree             | 9         | 26.5%                   |
|                                                                                                       | Strongly agree    | 20        | 58.8%                   |
|                                                                                                       | Unknown           | 1         | 2.9%                    |
| 12. The staff of the Brewing lab should not be too busy to respond to your questions.                 | Strongly disagree | 1         | 2.9%                    |
|                                                                                                       | Disagree          | 1         | 2.9%                    |
|                                                                                                       | Undecided         | 3         | 8.8%                    |
|                                                                                                       | Agree             | 11        | 32.4%                   |
|                                                                                                       | Strongly agree    | 17        | 50.0%                   |
|                                                                                                       | Unknown           | 1         | 2.9%                    |
| <b>Assurance: The knowledge and courtesy of staff, their ability to inspire trust and confidence.</b> |                   |           |                         |
| 13. The staff of the Brewing lab should instil confidence in customers.                               | Strongly disagree | 0         | 0.0%                    |
|                                                                                                       | Disagree          | 1         | 2.9%                    |
|                                                                                                       | Undecided         | 1         | 2.9%                    |
|                                                                                                       | Agree             | 9         | 26.5%                   |
|                                                                                                       | Strongly agree    | 22        | 64.7%                   |
|                                                                                                       | Unknown           | 1         | 2.9%                    |
| 14. Customers should have comfortable interactions with employees.                                    | Strongly disagree | 1         | 2.9%                    |
|                                                                                                       | Disagree          | 1         | 2.9%                    |
|                                                                                                       | Undecided         | 0         | 0.0%                    |
|                                                                                                       | Agree             | 12        | 35.3%                   |
|                                                                                                       | Strongly agree    | 19        | 55.9%                   |
|                                                                                                       | Unknown           | 1         | 2.9%                    |
| 15. Staff of the Brewing lab should be courteous with you.                                            | Strongly disagree | 1         | 2.9%                    |
|                                                                                                       | Disagree          | 1         | 2.9%                    |
|                                                                                                       | Undecided         | 0         | 0.0%                    |
|                                                                                                       | Agree             | 14        | 41.2%                   |

| Variables                                                                          | Categories        | Frequency | Percentage out of total |
|------------------------------------------------------------------------------------|-------------------|-----------|-------------------------|
|                                                                                    | Strongly agree    | 17        | 50.0%                   |
|                                                                                    | Unknown           | 1         | 2.9%                    |
| 16. Staff of the Brewing lab should have the knowledge to answer your questions.   | Strongly disagree | 1         | 2.9%                    |
|                                                                                    | Disagree          | 1         | 2.9%                    |
|                                                                                    | Undecided         | 1         | 2.9%                    |
|                                                                                    | Agree             | 12        | 35.3%                   |
|                                                                                    | Strongly agree    | 18        | 52.9%                   |
|                                                                                    | Unknown           | 1         | 2.9%                    |
| <b>Empathy: The caring individualised attention you provide your stakeholders.</b> |                   |           |                         |
| 17. Customers should be given individual attention by Brewing lab staff.           | Strongly disagree | 1         | 2.9%                    |
|                                                                                    | Disagree          | 1         | 2.9%                    |
|                                                                                    | Undecided         | 2         | 5.9%                    |
|                                                                                    | Agree             | 13        | 38.2%                   |
|                                                                                    | Strongly agree    | 16        | 47.1%                   |
|                                                                                    | Unknown           | 1         | 2.9%                    |
| 18. Brewing lab operating hours should be convenient to all its customers.         | Strongly disagree | 0         | 0.0%                    |
|                                                                                    | Disagree          | 2         | 5.9%                    |
|                                                                                    | Undecided         | 0         | 0.0%                    |
|                                                                                    | Agree             | 14        | 41.2%                   |
|                                                                                    | Strongly agree    | 17        | 50.0%                   |
|                                                                                    | Unknown           | 1         | 2.9%                    |
| 19. Brewing lab staff should have your best interest at heart.                     | Strongly disagree | 1         | 2.9%                    |
|                                                                                    | Disagree          | 1         | 2.9%                    |
|                                                                                    | Undecided         | 0         | 0.0%                    |
|                                                                                    | Agree             | 11        | 32.4%                   |
|                                                                                    | Strongly agree    | 20        | 58.8%                   |
|                                                                                    | Unknown           | 1         | 2.9%                    |
| 20. Staff of the Brewing lab should understand your specific needs.                | Strongly disagree | 0         | 2.9%                    |
|                                                                                    | Disagree          | 2         | 5.9%                    |
|                                                                                    | Undecided         | 0         | 0.0%                    |
|                                                                                    | Agree             | 11        | 32.4%                   |
|                                                                                    | Strongly agree    | 20        | 58.8%                   |
|                                                                                    | Unknown           | 1         | 2.9%                    |



## ANNEXURE F

**TABLE 5. 3: Descriptive statistics for the statements of survey questionnaire**

| Variable                                                                                              | N  | Mean | Median | Standard Deviation | Range |
|-------------------------------------------------------------------------------------------------------|----|------|--------|--------------------|-------|
| <b>Performance questions</b>                                                                          |    |      |        |                    |       |
| <b>Tangibles: The physical representation or images of your service</b>                               |    |      |        |                    |       |
| 1. Brewing lab has up to date equipment and technology.                                               | 34 | 3.68 | 4.0    | 0.9445             | 4.0   |
| 2. Brewing lab has appealing facilities.                                                              | 34 | 3.74 | 4.0    | 0.9312             | 4.0   |
| 3. Brewing laboratory uses visually appealing materials – e.g. taste bottles.                         | 34 | 3.26 | 4.0    | 1.2627             | 4.0   |
| 4. Communication channels make you find information easily.                                           | 34 | 3.82 | 4.0    | 0.9991             | 4.0   |
| <b>Reliability: Your ability to perform the promised service dependably and accurately</b>            |    |      |        |                    |       |
| 5. When brewing lab promises to do something by a certain time, it does so.                           | 34 | 3.21 | 3.0    | 0.8801             | 3.0   |
| 6. Brewing lab shows a sincere interest in solving problems.                                          | 33 | 3.36 | 4.0    | 1.1407             | 4.0   |
| 7. Brewing lab performs the service right the first time.                                             | 34 | 3.09 | 3.0    | 0.9331             | 4.0   |
| 8. Brewing lab insists on error free records.                                                         | 34 | 3.38 | 3.5    | 0.9539             | 4.0   |
| <b>Responsiveness: Your willingness to help customers and to provide prompt service</b>               |    |      |        |                    |       |
| 9. The staff of the Brewing lab tells you exactly when services will be performed.                    | 34 | 3.38 | 4.0    | 1.0449             | 3.0   |
| 10. The staff of the Brewing lab gives you prompt service.                                            | 34 | 3.24 | 3.0    | 0.9553             | 4.0   |
| 11. The staff of the Brewing lab is always willing to help you.                                       | 34 | 3.65 | 4.0    | 0.7337             | 3.0   |
| 12. The staff of the Brewing lab is not too busy to respond to your questions.                        | 34 | 3.50 | 4.0    | 0.9614             | 4.0   |
| <b>Assurance: The knowledge and courtesy of staff, their ability to inspire trust and confidence.</b> |    |      |        |                    |       |
| 13. The staff of the Brewing lab instils confidence in customers.                                     | 34 | 3.06 | 3.0    | 0.8507             | 2.0   |
| 14. Customers have comfortable interactions with employees.                                           | 34 | 3.91 | 4.0    | 0.6212             | 2.0   |
| 15. Staff of the Brewing lab is courteous with you.                                                   | 33 | 4.09 | 4.0    | 0.5790             | 2.0   |

|                                                                                                       |    |      |     |        |     |
|-------------------------------------------------------------------------------------------------------|----|------|-----|--------|-----|
| 16. Staff of the Brewing lab Have the knowledge to answer your questions.                             | 34 | 3.82 | 4.0 | 0.5758 | 3.0 |
| <b>Empathy: The caring individualised attention you provide your stakeholders.</b>                    |    |      |     |        |     |
| 17. Customers are given individual attention by Brewing lab staff.                                    | 34 | 3.59 | 4.0 | 0.7831 | 3.0 |
| 18. Brewing lab operating hours are convenient to all its customers.                                  | 33 | 3.15 | 3.0 | 1.1758 | 4.0 |
| 19. Brewing lab staff has your best interest at heart.                                                | 34 | 3.50 | 3.5 | 0.7882 | 3.0 |
| 20. Staff of the Brewing lab understands your specific needs.                                         | 34 | 3.32 | 3.0 | 1.0067 | 3.0 |
| <b>Expectation questions</b>                                                                          |    |      |     |        |     |
| <b>Tangibles: The physical representation or images of your service</b>                               |    |      |     |        |     |
| 1. Brewing lab should have up to date equipment and technology.                                       | 33 | 4.64 | 5.0 | 0.6528 | 3.0 |
| 2. Brewing lab should have appealing facilities.                                                      | 33 | 4.73 | 5.0 | 0.5168 | 2.0 |
| 3. Brewing laboratory should use visually appealing materials – e.g. taste bottles.                   | 33 | 4.54 | 5.0 | 0.6657 | 3.0 |
| 4. Communication channels should make you find information easily.                                    | 33 | 4.67 | 5.0 | 0.5401 | 2.0 |
| <b>Reliability: Your ability to perform the promised service dependably and accurately</b>            |    |      |     |        |     |
| 5. When brewing lab promises to do something by a certain time, it should do so.                      | 33 | 4.67 | 5.0 | 0.4787 | 1.0 |
| 6. Brewing lab should show a sincere interest in solving problems.                                    | 33 | 4.48 | 5.0 | 0.5658 | 2.0 |
| 7. Brewing lab should perform the service right the first time.                                       | 33 | 4.48 | 5.0 | 0.6671 | 2.0 |
| 8. Brewing lab should insist on error free records.                                                   | 33 | 4.52 | 5.0 | 0.6671 | 2.0 |
| <b>Responsiveness: Your willingness to help customers and to provide prompt service</b>               |    |      |     |        |     |
| 9. The staff of the Brewing lab should tell you exactly when services will be performed.              | 33 | 4.52 | 5.0 | 0.9056 | 4.0 |
| 10. The staff of the Brewing lab should give you prompt service.                                      | 33 | 4.42 | 5.0 | 0.9024 | 4.0 |
| 11. The staff of the Brewing lab should always be willing to help you.                                | 33 | 4.39 | 5.0 | 0.9663 | 4.0 |
| 12. The staff of the Brewing lab should not be too busy to respond to your questions.                 | 33 | 4.27 | 5.0 | 0.9770 | 4.0 |
| <b>Assurance: The knowledge and courtesy of staff, their ability to inspire trust and confidence.</b> |    |      |     |        |     |

|                                                                                    |    |      |     |        |     |
|------------------------------------------------------------------------------------|----|------|-----|--------|-----|
| 13. The staff of the Brewing lab should instil confidence in customers.            | 33 | 4.58 | 5.0 | 0.7084 | 3.0 |
| 14. Customers should have comfortable interactions with employees.                 | 33 | 4.42 | 5.0 | 0.9024 | 4.0 |
| 15. Staff of the Brewing lab should be courteous with you.                         | 33 | 4.36 | 5.0 | 0.8951 | 4.0 |
| 16. Staff of the Brewing lab should have the knowledge to answer your questions.   | 33 | 4.36 | 5.0 | 0.9293 | 4.0 |
| <b>Empathy: The caring individualised attention you provide your stakeholders.</b> |    |      |     |        |     |
| 17. Customers should be given individual attention by Brewing lab staff.           | 33 | 4.27 | 4.0 | 0.9445 | 4.0 |
| 18. Brewing lab operating hours should be convenient to all its customers.         | 33 | 4.39 | 5.0 | 0.7882 | 3.0 |
| 19. Brewing lab staff should have your best interest at heart.                     | 33 | 4.45 | 5.0 | 0.9045 | 4.0 |
| 20. Staff of the Brewing lab should understand your specific needs.                | 33 | 4.48 | 5.0 | 0.7953 | 3.0 |

## ANNEXURE G

**TABLE 5. 4: Wilcoxon sign ranks.**

| Statement                                                                                             | N  | Mean difference | Standard Dev of difference | Sign Statistic | P-Value    |
|-------------------------------------------------------------------------------------------------------|----|-----------------|----------------------------|----------------|------------|
| <b>Tangibles: The physical representation or images of your service</b>                               |    |                 |                            |                |            |
| 1. Brewing lab has up to date equipment and technology.                                               | 33 | 0.97            | 1.2370                     | 128.5          | <0.0001*** |
| 2. Brewing lab has appealing facilities.                                                              | 33 | 1.00            | 1.1726                     | 121.0          | <0.0001*** |
| 3. Brewing laboratory uses visually appealing materials – e.g. taste bottles.                         | 33 | 1.30            | 1.6102                     | 100.5          | <0.0001*** |
| 4. Communication channels make you find information easily.                                           | 33 | 0.85            | 1.1758                     | 104.0          | <0.0001*** |
| <b>Reliability: Your ability to perform the promised service dependably and accurately</b>            |    |                 |                            |                |            |
| 5. When brewing lab promises to do something by a certain time, it does so.                           | 33 | 1.45            | 1.1206                     | 175.5          | <0.0001*** |
| 6. Brewing lab shows a sincere interest in solving problems.                                          | 32 | 1.16            | 1.2472                     | 153.0          | <0.0001*** |
| 7. Brewing lab performs the service right the first time.                                             | 33 | 1.42            | 1.1189                     | 216.5          | <0.0001*** |
| 8. Brewing lab insists on error free records.                                                         | 33 | 1.15            | 1.3257                     | 120.0          | <0.0001*** |
| <b>Responsiveness: Your willingness to help customers and to provide prompt service</b>               |    |                 |                            |                |            |
| 9. The staff of the Brewing lab tells you exactly when services will be performed.                    | 33 | 1.15            | 1.5025                     | 134.5          | <0.0001*** |
| 10. The staff of the Brewing lab gives you prompt service.                                            | 33 | 1.21            | 1.5362                     | 131.5          | 0.0002***  |
| 11. The staff of the Brewing lab is always willing to help you.                                       | 33 | 0.76            | 1.2255                     | 110.5          | 0.0008***  |
| 12. The staff of the Brewing lab is not too busy to respond to your questions.                        | 33 | 0.79            | 1.4739                     | 108.0          | 0.0014**   |
| <b>Assurance: The knowledge and courtesy of staff, their ability to inspire trust and confidence.</b> |    |                 |                            |                |            |
| 13. The staff of the Brewing lab instils confidence in customers.                                     | 33 | 1.55            | 1.2271                     | 209.5          | <0.0001*** |
| 14. Customers have comfortable interactions with employees.                                           | 33 | 0.52            | 1.2021                     | 78.0           | 0.0058**   |
| 15. Staff of the Brewing lab is courteous with you.                                                   | 32 | 0.28            | 1.0846                     | 43.0           | 0.0513     |

| Statement                                                                          | N  | Mean difference | Standard Dev of difference | Sign Statistic | P-Value    |
|------------------------------------------------------------------------------------|----|-----------------|----------------------------|----------------|------------|
| 16. Staff of the Brewing lab Have the knowledge to answer your questions.          | 33 | 0.55            | 1.1750                     | 84.5           | 0.0045**   |
| <b>Empathy: The caring individualised attention you provide your stakeholders.</b> |    |                 |                            |                |            |
| 17. Customers are given individual attention by Brewing lab staff.                 | 33 | 0.70            | 1.2350                     | 109            | 0.0003***  |
| 18. Brewing lab operating hours are convenient to all its customers.               | 32 | 1.28            | 1.5290                     | 139            | <0.0001*** |
| 19. Brewing lab staff has your best interest at heart.                             | 33 | 1.00            | 1.1990                     | 155            | <0.0001*** |
| 20. Staff of the Brewing lab understands your specific needs.                      | 33 | 1.18            | 1.4021                     | 137.5          | <0.0001*** |