DEVELOPMENT OF QUALITY CONTROL MANAGEMENT FRAMEWORK FOR SELECTED WATER PACKAGING COMPANIES IN MINNA, NIGERIA

BY

BOLAJI, Tolulope James

MEng/SEET/2017/6765

DEPARTMENT OF MECHANICAL ENGINEERING

FEDERAL UNIVERSITY OF TECHNOLOGY,

MINNA

SEPTEMBER, 2021.

ABSTRACT

Small and Medium Enterprises (SMEs), the applicability and utility of Quality Control Management (QCM) remains a challenge. It is generally recognized that SMEs face unique challenges, which affect their growth and profitability and hence, diminish their ability to contribute effectively to sustainable development. This study is focused on developing of quality control management framework for five selected sachet water packaging companies. Four (4) different sets of questionnaires as well as structured interviews were employed as the data collection tools. In all two hundred and eighty (280) respondents were sampled in the study. Statistical Package for Social Science(SPSS) and Microsoft Excel, were utilized in the data analysis. For the period investigated, the non-defective products is 97.08% of the total water production output with a percentage defectives of 2.92% made of production. From the operating characteristic curves (OC) and average outgoing quality (AOQ) curves, for varying acceptable percentage defectives of 2%, 3% and 5%, for a given constant sample size (n) 270, 550, 150, 200 and 250, for Table water A, B, C, D and E respectively. Important sampling plan parameters such as producer's risk, consumer's risk and average outgoing quality level (AOQL) are also presented. A quality control framework was proposed for sachet water companies. The findings of the study established that, there is a positive relationship between quality management and company performance. The study concluded that QCM strategy was the most appropriate quality management strategy to be adopted to turn around the quality fortunes of sachet water companies. Therefore, this study may be implemented. The framework will provide support for the sachet water producing companies and training of retailers/distributors.

TABLE OF CONTENTS

LIST OF TABLES

Table

Page

LIST OF FIGURES

Figure

Page

LIST OF PLATES

LIST OF APPENDICES

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the study

Small and Medium Enterprises (SMEs) have been widely acknowledged as the springboard for sustainable economic development. According to Etuk *et al.,* (2015), developing countries including Nigeria, have since the 1970s demonstrated expanded enthusiasm for the advancement of SMEs for three main reasons: the failure of past industrial policies to generate efficient self-sustaining growth; increased emphasis on self-reliant approach to development and the recognition that dynamic and growing SMEs can contribute substantially to a wide range of developmental objectives.

These objectives include efficient use of resources, employment creation, mobilisation of domestic savings for investments, encouragement, expansion and development of indigenous entrepreneurship and technology as well as income distribution, among others. Consequently, programmes of assistance in the areas of finance, extension and advisory services, training and provision of infrastructure were designed by the government for the development of SMEs to enhance the attainment of these objectives. However, the full potential of the SMEs in the developmental process have not been realized, owing to various constraints. Since the 1960s to date, SMEs have been given due recognition especially in the developed nations for playing very important roles towards fostering accelerated economic growth, development and stability within several economies. They make-up the largest proportion of businesses all over the world and play tremendous roles in employment generation, provision of goods and services, creating a better standard of living, as well as immensely contributing to the gross domestic products (GDPs) of many countries.

In today’s world, organisations are confronting the developing difficulties from worldwide challenge and increasingly modern clients as far as what they need and their evolving needs. Rivalry has become a significant test which SMEs must meet viably to stay in business. Organisations have begun receiving suitable administration procedures in the field of value, to prevail in the commercial center and SMEs are of no special case. Most directors concur that for an organisation to be effective it must change consistently in light of huge improvement, for example, client needs, innovative leaps forward and government guidelines (Eke, 2001). Globalisation of market and tasks powers organisations to re-evaluate their quality issues and thus their general organisation aggressiveness. So as to be effective in this worldwide market, organisations ought to devote themselves to improving efficiency and quality in an auspicious and shared way (Dobyns and Crawford, 1994).

Quality Control Management (QCM) systems, upheld by the management duty and great organisation will give target methods for improving quality and thus the general organisation intensity. QCM is a coordinated way to fulfill interior and outer customers, planning and overseeing process. It includes quality planning, quality control, quality assurance and quality improvement. It is among the new strategies that cutting edge organisations presently utilize with excellent impact to verify and keep their customers for all time fulfilled.

As indicated by Saumyaranjan and Sudhir (2018), SMEs has an indispensable contribution to the financial and welfare advancement of any country and can't be overestimated. SMEs are the foundation of present day economy. SMEs are the significant angle in maintaining private division improvement and joint venture thus, they have to stay focused and produce top notch yields, which is of principal significance at large scale level as well as at miniaturized scale level. SMEs

are frequently the providers of products and ventures required by large scale undertakings, and in the event that they need quality in their merchandise and enterprises, it will adverse affect aggressive capacity of the large scale units. SMEs not just contribute essentially to improved expectations for everyday comforts, business age and destitution decrease however they additionally realize considerable household or nearby capital development and accomplish significant levels of efficiency and ability.

1.2 Problem Statement

SMEs face remarkable difficulties, which influence their development and productivity and henceforth, decrease their capacity to contribute adequately to feasible improvement. In any case, it can not be denied that SMEs appreciate numerous preferences over enormous scale ventures and furthermore, viable usage of QCM, with responsibility, can realize perceptible improvement in item/administration quality and authoritative execution. In Nigeria, the SME part's commitment has missed the mark regarding its potential due to a great extent to absence of powerful quality control the board and composed exertion to help SMEs tasks. Among the various difficulties to build execution and development of a large portion of these companies incorporate quality management rehearses. It appears to be that the attention to the ideal and its standards is still low in creating nations, most particularly SMEs, and in this way, very little has been done to realize the advantages. The consistently expanding multiplication of sachet water companies everywhere throughout the nation has offered ascend to all way of packaged water available; the greater part of which are unregistered and not guaranteed by the administrative offices.

Perhaps most upsetting of all is the wellbeing dangers related with these quality issues, by all accounts no imaginable closure for the quality misfortunes of the business. It is in the light of these issues in this way that this investigation looks to propose QCM as a system to address the quality incidents standing up to the sachet water industry.

1.3 Aim and Objectives

The aim of this research is to assess and develop quality control management framework for water packaging industry.

The primary objectives of this study are to:

(i) Measure quality control management in some selected water packaging companies in Minna.
(ii) Investigate quality control of defects in water packaging company using statistical application.
(iii) Develop quality control management framework for water packaging company.

1.4 Significance of the Study

The nature of packaged water may anyway not be underestimated. Likewise reports that however uncommon, infection flare-up has been related with sachet water utilisation in different pieces of the world. Concentrates from various urban communities have reported the absence of virtue and nature of prepared savouring water Nigeria. This investigation set out to find out the procedures of value and imperfections of the water in sachets, to recognize contributory elements that decide the destiny of the bundled water item as it moves from catchment to buyer, and to create unharnessed system for arrangement enhancements that would take into

account continued and improved guideline of the sachet water industry. Water in sachets is promptly accessible and the cost is moderate, yet there are worries about its immaculateness and quality. The respectability of the clean condition and the conditions where most of the water in sachets are created has likewise been addressed. With on-going episode of water borne maladies like cholera, typhoid and the runs around Minna city, it ended up important to examine the nature of bundled sachet water sold in the city (Abubakar and Nasir, 2018). The study will feature the quality control the board weaknesses of the sachet water industry and devise methodologies for dispensing with these issues. The exploration would likewise add to scholastic learning of the bundled water industry since there is restricted documentation on the business.

The findings of this study would help Government approach on guideline of value control the executives in sachet water industry. It would empower checking offices and different partners to understand the requirement for Quality Control Management as a methodology to improve execution of the water makers so as to accomplish the visualized goal of guaranteeing protected and adequate drinking water for the masses. It would further help the arrangement making bodies to turn out with the required or proper approaches to successfully direct and deal with the business.

The discoveries of this study would help the small scale sachet water producers to enhance the general nature of their yield and add to their items being acknowledged available. Besides, it would likewise direct the main organizations to use superb control the executives practices to build their pieces of the overall industry, guarantee gainfulness and eventually accomplish superior.

1.5 Scope and Limitation of the Study

The scope of this research is limited to assessment and development of quality control management framework for water packaging industry. For this research, the scope included the following:

(a) The research covered only five sachet packaged drinking water producers in Minna.

(b) The research was concerned with mainly the quality control aspect of the management systems and the quality of sachet water products in Minna.

(c) Finally, although the study was conducted in Minna, data was collected only from Sachet Water A, Sachet Water B, Sachet Water C, Sachet Water D and Sachet Water E, (the studied companies name are denoted because the researcher are not allowed to disclose it).

CHAPTER TWO

2.0 LITERATURE REVIEW

An audit of literature was conducted to increase a comprehension of the idea of quality control management of water packaging company. There is significant literature covering quality control management in water packaging industry and its significant in creating nations which helped in giving a general comprehension of how QCM can prompt upper hand. In the course of recent decades, quality analysts, for example, Upadhaya, (2014), Ishikawa (1985), Manish, (2017), and Deming (1994), have built up specific suggestions in the field of QCM, which had increased noteworthy acknowledgment all through the world. Their bits of knowledge gave a decent comprehension of the QCM theory, standards, and practices. After cautious investigation of their works, it has been discovered that these quality specialists have various perspectives about QCM, albeit a few likenesses can be found. Around the world, there are a few Quality Awards such the Deming Prize 1996 in Japan, the European Quality Award 1994 in Europe, and Malcolm Baldrige National Quality Award 1999 in United States of America. Each grant model depends on apparent model of QCM. However, these three award models are not the same as one another and everyone has its own qualities. The principle hypothetical field that is utilized in this theory is the idea of QCM, inside this field the word quality is focal.

2.1 Quality Management

Before the concept of QCM is defined, it is necessary to define the concept of quality management. According to ISO 8402(1994), quality management can be defined as follows: All activities of the overall management function that determine the quality policy, objectives and responsibilities, and implement them by means such as quality planning, quality control, quality assurance and quality improvement within the

quality system. The management must keep in mind the QCM way of thinking when managing a company.

Quality management involves the formulation of strategies, setting goals and objectives, planning and implementing the plans and using control systems for monitoring feedback and taking corrective actions. An organisation's quality management implementations are of two folds namely, satisfying customer's expectation and improvement in the overall business efficiency (Dale *et al*. 1994). According to Juran (2010), the basic goal of quality management is the elimination of failure, both in the concept and in the reality of products, services and processes. It does not only mean that products, services and processes will fail in fulfilling their function but that their function was not what the customer desire. Failure must be prevented in quality management and to handle this there should be planning, organizing and controlling.

Quality Management System (QMS) can be defined a management system used for managing a process to achieve maximum customer satisfaction at the lowest overall cost level to the organisation while continuing to improve the process (ASQ). As discussed in the literature, QMS implementation in an organization can be influenced by either external factors like customers and competitiveness or internal factors like organisations motivation to improve the quality of its current processes and culture within the company. International Standard Orgainsation (ISO) 9001 standard states that the foundation of a QMS should be developed based on eight quality principles (ISO 9001, 2005). These principles are described as follows:

1) Customer Focus
2) Leadership

3) Involvement of people
4) Process approach
5) System approach to management
6) Continual improvement
7) Factual approach to decision making, and
8) Mutually beneficial supplier relationships

These quality principles must be inherited within the organisation to achieve its quality improvement goals as show in Figure 2.1.

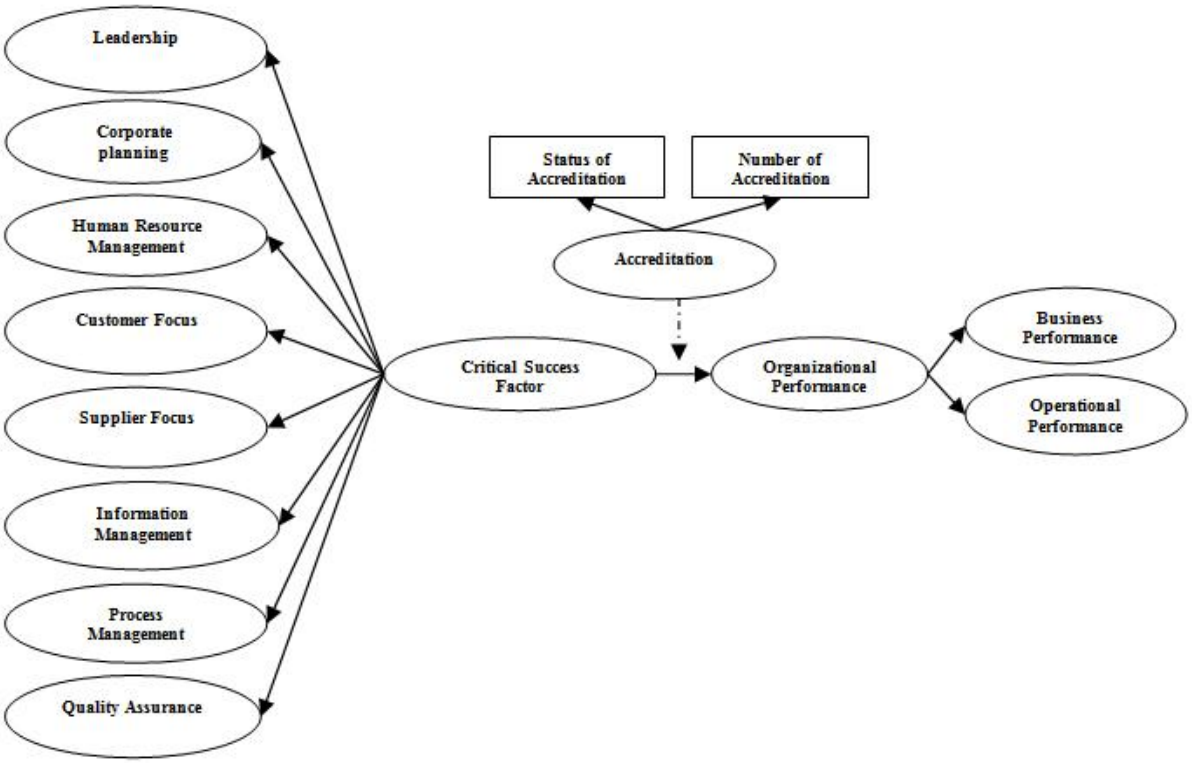

Figure 2.1: Quality Management framework

Source: (Ghobadian and Gallear, 1997)

2.1.1 Strategic quality management

Strategic quality management (SQM) is defined as systematic approach for setting and meeting quality goals throughout the company (Juran, 1989). Once management decides to implement QCM, it is essential to make changes in certain arrangement within the organisation's structure and culture. Juran (1989) suggested six major changes to apply in order to adopt SQM approach which are:

(a) The establishment of broad quality goals as part of the company's business plan.
(b) The adoption of cultural changes that is aligned with QCM philosophy.
(c) The rearrangement of priorities knowing that Quality first, customer satisfaction, employee participation and continuous improvement form part of the core of the foundation of QCM.
(d) Creating a new infrastructure to accommodate QCM requirement such as instituting a quality council and training facilities.
(e) Extensive training for the entire hierarchy.
(f) Upper-management participation in managing for quality.

As mention above, the main components of quality management are quality planning, quality control, quality improvement. Strategic quality management, basically, concerned with setting an organisation's quality objectives, mapping out the route and the maenad for reaching these objectives.

A process approach to QMS is proposed in ISO 9001 standard and defined as the application of a system of processes within an organisation, together with the identification and interactions of these processes, and their management to produce the desired outcome (ISO 9001, 2005). The process-based model is illustrated in Figure 2.3. An organisations QM adoption should start with identifying various

process and activities linked with each other. As shown in figure 1, we can see that QM begins with customer processes i.e. Customer requirements serve as an input to all the other processes and drives organisations operations. Input in the form of customer requirements are directly fed to the product realisation processes i.e. purchasing from raw material, reviving raw material, converting raw material to customer desired specifications and then delivery to the customer.

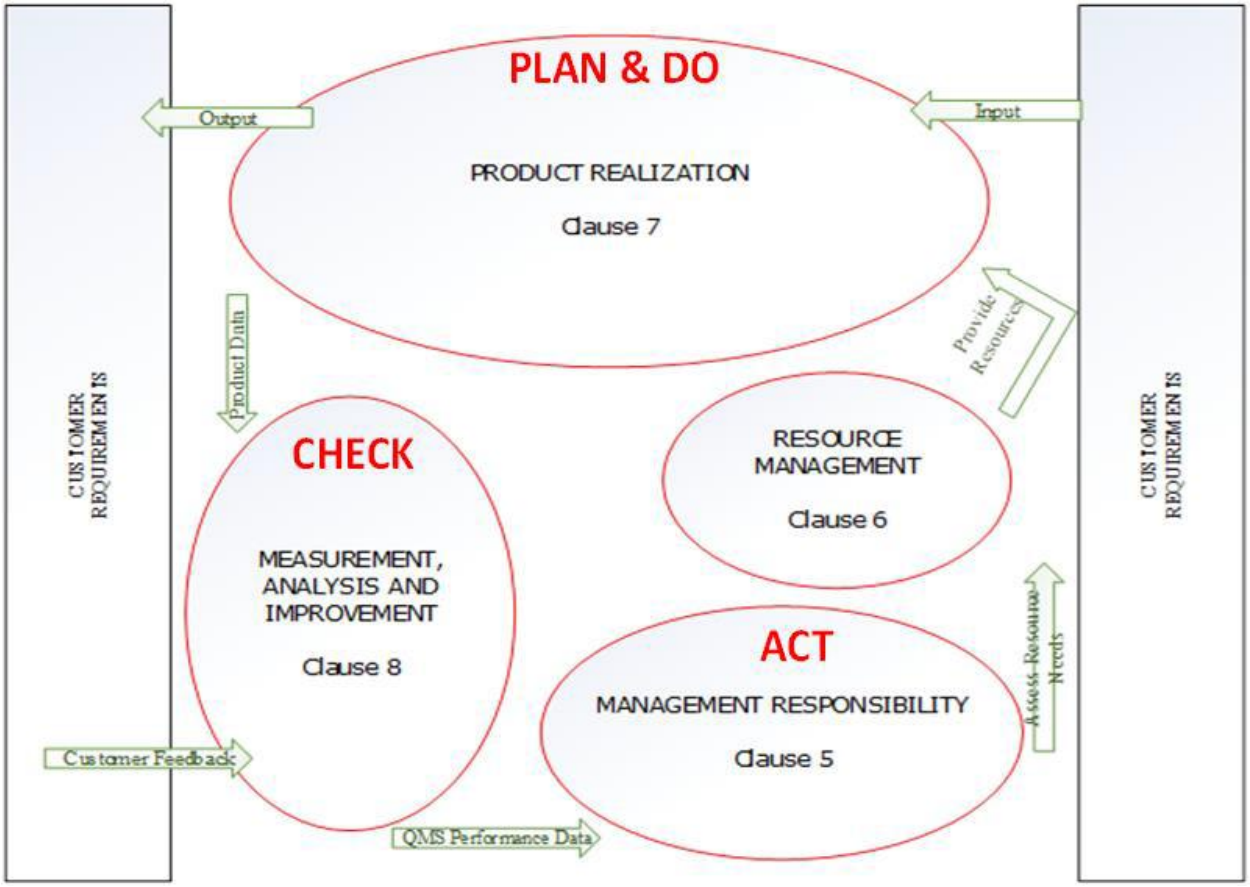

Figure 2.2: Process-based Approach to Quality Management

Source: (Manish, 2017)

Quality control management is the highest level of quality management. It is concerned with the management of quality principle in all the facets of a business including customers and suppliers (Dale *et al*., 1994; Lockwood *et al*., 1996). Quality Control Management (QCM) involves the application of quality management principles to all aspects of the organisation, including customers and suppliers, and their integration with the key business processes. It is an approach which involves continuous improvement by everyone in the organisation. QCM is a principle which involves the mutual cooperation of everyone that aids the business process of an organisation and it involves all stakeholders of an organisation. Four stages of quality management were treated by Dale *et al.,* (1994), these include:

(i) Inspection

(ii) Quality Control (QC)

(iii) Quality Assurance (QA) and

(iv) Total Quality Management (TQM)

2.1.2 Inspection

According to ISO 8402 (1986), inspection can be characterised as activities, for example, estimating, looking at, testing, measuring at least one quality of an item or administration and contrasting these with indicated necessities with decide congruity. It includes the assessment, estimation, and testing of an item or administration and the correlation with determined necessity (Dale *et al.,* 1994). Inspection is a proficient and successful method for finding abandons in administrations and items. As indicated by Deming (1986), inspection with the point of discovering awful item and tossing them out is past the point of no return, ineffectual and expensive. Quality to Deming originates from the improvement in the process instead of assessment.

2.1.3 Quality control

Quality control is a traditional way that organisations use to oversee quality. It is worried about checking and looking into work that has been finished. This for the most part accomplished by examination of items and administrations (checking to ensure that what is being delivered is satisfying the necessary guideline) happen during and toward the finish of the task's procedure. Juran (1989), characterized quality control as the administrative procedure through which we measure the real quality exhibition, contrast it and principles and follow up on the distinction. It is a progressively advanced administration instrument that targets anticipating products and enterprises which don't adjust to fundamental prerequisites from getting to the last purchaser. Quality controls are operational methods and exercises that are utilized to satisfy quality prerequisites (ISO 8402, 1994).

As a proportion of value, quality control is expensive when seen regarding substantial and elusive variable expense. It could likewise bring about the creation of unacceptable merchandise and enterprises when directed late during the time spent generation. Because of issues related with quality control, organisations currently center around different roads or means through which quality could be overseen viably. Dale *et al*. (1994), noticed that the tackling of an issue after a non-conformance issue has been made isn't a viable course towards disposing of the main driver of an issue.

2.1.4 Quality assurance

This is a standard dependent on the structuring of business procedure of creation so as to limit the odds of delivering unacceptable merchandise. As indicated by Dale *et al* (1994), quality confirmation is a preventive based framework, which improves item

and administration quality with expanded profitability by putting accentuation on item, administration and procedure plan. Quality assurance accentuation on defects, not at all like quality control that spotlights on deformity recognition once the thing is created. In this manner, it is an administration configuration planned for controlling quality at all phases of production to keep quality issues from rising (Eriksson, 2002).

The quality assurance reasoning opined that quality is made in the design stage and not the control arranges and that issues related with quality are brought about by poor procedure plan. As per Lockwood *et al.* (1996), to be viable, quality affirmation must include the improvement of another working way of thinking and approach that seems to be proactive as opposed to receptive, that incorporates inspiring and including individuals in the process crosswise over ordinary departmental hindrances.

2.1.5 Quality planning

Ozeki and Asaka (1990) characterized management as planning and actualizing controls for sorted out exercises in an objective and proficient way. It hence pursues from these definitions that planning and control are vital to the management. Nonetheless, Ozeki and Aasaka break controlling into a four-advance cycle of Plan-DO-Check-Act, which is known as PDCA cycle. The hypothesis of Ozeki and Asaka is that rehashed utilization of the PDCA cycle brings about progress. Thus, the board ′s duties as per the perspective on the two incorporate three principle viewpoints viz; planning, controlling and improvement. Juran (1992) puts it more clear by referencing that administration covers three territories of procedure of arranging, control and improvement in what he named Juran′s Trilogy. Quality arranging is directed to outline a course towards QCM. Juran's meaning of 1989 for quality arranging is that it is the action of:

(i) Determining customer needs, and

(ii) Developing the item highlights and procedures required to address those issues

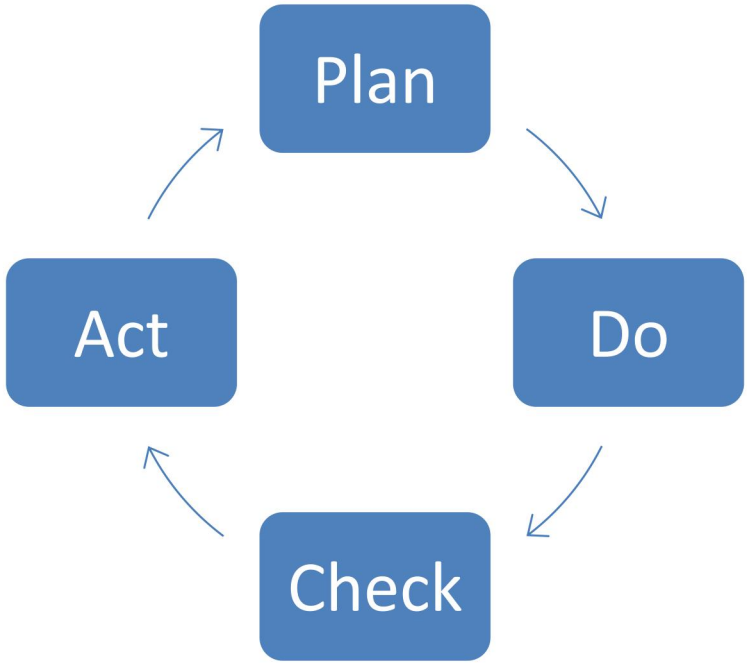

Figure 2.3: PDCA Control Cycle

Source: (Ozeki & Asaka, 1990)

The Control Cycle consists of:

Plan: Determine your goals and develop a process for achieving these goals

Do: Implement your plan

Check: Evaluate the result of your plan and its implementation

Action: Take the necessary action constituting quality control.

2.2 Benefits of Quality Control Management

There is a developing body between the appropriation of Quality Control Management and improved firm performance (Easton and Jarrell, 1998). Given the connection that exists between competitive advantage and performance, it may be not very astounding that it has been asserted that QCM or comparative quality management practices can be utilised to create competitive advantage. A significant long haul advantage of Quality Control Management identifies with consumer loyalty. QCM targets improving quality, and recognizes the best proportion of value as coordinating client desires as far as administration, item, and experience. QCM intercessions evaluate issues and mean to accomplish the best state characterized as far as such client desires. A few instances of the use of Quality Control Management to improve consumer loyalty incorporate; decrease of holding up time by changing the technique for arrangement booking or customer taking care of; making changes to the conveyance procedure with the goal that the item arrives at the client quicker; and better quality items requiring no fixes improving client steadfastness. Among the significant advantages of Quality Control Management is improvement in Organisational Development. QCM envoys an adjustment in the work culture by teaching all representatives on quality and making quality the worry of everyone, not simply the Quality Control office. The attention on quality prompts a proactive work culture planned for averting botches as opposed to revising botches.

Quality Control Management's emphasis on collaboration prompts the arrangement of cross-departmental groups and cross-practical information sharing. Such intercessions lead to numerous advantages, for example, improvement in relational abilities of individual workers and by and large authoritative correspondence; information sharing, bringing about extending and widening of information and range of abilities of colleagues, and the creation of a learning association; and adaptability for the

association in conveying faculty, adding to rightsizing, and guaranteeing cost competitiveness.

Another advantage of Quality Control Management is that QCM advances the idea of inside customer satisfaction. For example, the HR division considers representatives as inside customers and procedures their questions or demands inside the predetermined time limit. A significant utilisation of advantages of Quality Control Management identify with Human Resource Management. Utilization of QCM in an association achieves the accompanying advantages to the Human Resources of an association; it broadens the responsibility for business procedure to every representative engaged with the procedure by enabling them to amend botches on the spot without director audit or activity; it pushes on killing mix-ups and improving profitability adding to achievement of targets quicker; it pushes on quality prompts distinguishing aptitude lacks in workers and giving preparing and different mediations to extension such inadequacies. The upgraded profitability realized by QCM means better benefits for the association, and thusly better wages.

2.3 Quality Control Management (QCM) Practices

In theory, improved quality will increase the customer demand, which will lead to increased production sales and profit. The need for quality as a fundamental component in the formulation of strategies for institutions to implement QCM is clearly outlined by (Bilich and Neto, 2000) who stated that quality, as a macro function of institutions, must be present in the day-to-day running of an institution, in aspects such as establishment of policies, the decision process, selection of personnel, allocation of resources and service delivery to satisfy customer requirements. According to Djerdjour and Patel (2000), quality is no longer an optional extra; it is

an essential strategy to survive. QCM is therefore a solution for improving the quality of products and services. Kusaba (1995) observed that quality is a workmanship of various activities. In manufacturing activities, it is measured in terms of not only the product itself, but also the process of the production. In the case of sales, quality is not only the quality of the product, but also that of the services provided to the customer.

QCM critical success factors are practices within firms oriented towards quality, QCM links with customers, links with suppliers, process control and human resources (Fillipini and Forza, 1998). Jimenez and Costa (2009) categorize QCM elements in two categories which are technical and intangible elements. Technical elements are process control and problem-solving tools, and intangible elements are leadership, organisational culture, commitment and empowerment (Jimenez and Costa, 2009). Taylor and Wright (2003) mentioned that implementing TQM effectively requires that firms move away from inspection and towards approaches that are based on prevention and customer focus.

Achieving effective QCM requires top management commitment, training and education of employees, employee involvement, continuous process improvement, developing long-term relationships with suppliers, and a real focus on quality throughout the organization (Oakland, 2003). In line with this, Taylor and Wright (2003) describe that effective TQM practices include quality objectives in strategic planning processes and involvement of management and employees in implementation process. Furthermore, Kaynak (2003) mentions that the QCM practice management leadership is important for effective QCM.

2.3.1 Customer Focus

QCM is a belief system which is centered on the fulfillment of customer's need. Thus, most organisations attempt however much as could reasonably be expected to meet or surpass customer's desires in their day by day movement and furthermore their long haul plan (Andrle, 1994). Filippini and Forza (1998), clarified that is fundamental for associations to keep up a nearby connection with their clients so as to know their necessities and to gauge how it has been effective in meeting up to client's prerequisites. As indicated by Muffatto and Panizzolo (1995), a significant level of consumer loyalty is gotten exclusively by giving administrations or items whose highlights will fulfil customer's prerequisites or requirements. This is because of the way that clients decide the quality degree of administration conveyed (Jablonski, 1992)

.2.3.2 Training

Training helps in getting ready employees towards dealing with the QCM belief system during the time spent generation. Training outfits individuals with the important aptitudes and strategies of value improvement. It is contended to be an incredible structure square of business in the accomplishment of its points and targets (Stahl, 1995). Through training, employees can distinguish improvement open doors as it is aimed at giving vital aptitudes and information to all workers to have the option to add to continuous quality improvement procedure of production. Stahl (1995), contended that preparation and improvement program ought not be viewed as an onetime occasion yet a deep rooted procedure.

2.3.3 Teamwork

A well-organized group will help the powerful production of goods and services through the mix of activities engaged with the procedure of production. Dale *et al*. (1994), noticed that cooperation helps the responsibility of the workforce to the

authoritative objectives and destinations. The scientists accept that it is fundamental to have a group comprised of individuals with right attitudinal manner to working in gatherings to understand the additions of value the executives. Dale *et al.,* (1994), noticed that cooperation adds to the age of upgrades that are proposed by workers. To them, the proposed upgrades have a method for changing the attitudes of employees that are impervious to change.

2.4 Standard Organisation and Standard Quality codes

The Standards Organisation of Nigeria (SON) and the National Agency for Food and Drugs Administration Control (NAFDAC), are both responsible for ensuring that products being marketed in Nigeria are of required quality. While the SON generally develops and regulates standards for varying products that range from foods, drinks, and drugs to electrical and other engineered products, the FDB regulates and certifies only food, drinks, drugs, cosmetics, and other products which have health implications for the consuming public (SON, 2007). Both the NAFDAC and the SON regulate and certify sachet-water production and therefore there is some duplication of functions by the two authorities. However, while it is optional to have factory-produced sachet water registered with the SON, it is mandatory to have the products approved and registered with the NAFDAC. The main advantage of being registered by the SON is to build product reputation.

Products that have been certified by the SON, including factory-produced sachet water, bear the “Mark of Conformity”, also called the “Certification Mark” or the “Quality Mark”. The procedure for obtaining certification for sachet-water factories includes submitting a complete application form together with a registration certificate for the factory. An inspection of the factory is then carried out to assess its

Quality Management System and laboratory analyses of water samples taken. The sachet water is also inspected to assess the labelling requirements (Essien, 2014). According to the name of the product, the brand name or trade name if any, the net volume, name and address of manufacture, the batch code and the expiry date indicated by the words "BEST BEFORE". Sachet water companies that conform to all requirements are then issued with a license which authorizes them to use the Board's "Mark of Conformity". The license is valid for one year after which it can be renewed. The certified products are regularly audited by the SON, both at the factory and market, to ensure that the quality is maintained. The certification mark therefore generally serves as an assurance of quality in locally produced goods in Nigeria.

The NAFDAC enforces its own standards as well as those of the SON. The registration procedures for food products in Nigeria, including sachet water, involve completing an application form and submitting it together with supporting documents that include a business registration certificate, certificate of analysis, a site master plan of the company, and health certificates for all workers in the product line showing test results for tuberculosis, hepatitis A and E, typhoid and other communicable diseases.

2.4.1 Quality standards

The term "standards" as it is used in this context implies documented agreements containing technical specification or other precise criteria to be used consistently as rules, guidelines or definitions of characteristics, to ensure that materials, products, organisations developed quality standards that suit their own businesses since their activities were restricted, mainly, to the local economy. By the 1970s, the expansion of an organisation's activities at national level; result in replacing many firm-specific standards by national standards. However, in the 1990s, international competition and

the globalised marketplace made it imperative for international standards to play a role to facilitate international trade and to unify the international quality language particularly for the international contractual agreements (Peach, 1997).

2.4.1.1 ISO 9000

This is a widely recognised series of standards, introduced by the International Standard Organisation, that outline best practices to be adopted when implementing quality systems. It provides a framework whereby a business can assess where it is and where it wants to be in terms of quality, and involves detailed documentation of all processes and procedures. ISO standards are acceptable worldwide thus assuring traders that the company having the ISO certification has met certain criteria, like quality, of one national standard body from each one of the more than 140 member countries. ISO 9000 is one of a series of the ISO standards. ISO 9000 series of standards was first issued in 1987 and it qualifies "organisations" quality management system and it comprises of two basic kinds of standards (Peach, 1997), which are:

(a) Product standards (Quality assurance)
(b) Quality system (Management system)

Hence, ISO 9000:2000 family consists of four primary standards, namely:

(i) ISO 9000: Quality management system; fundamentals and vocabulary
(ii) ISO 9001: Quality management system requirements that demonstrate its capability to meet customer requirements and enhance customer satisfaction
(iii) ISO 9004: Quality management system; guidance for performance improvement to enhance satisfaction for interested parties

(iv) ISO 19011: Guidelines on quality and\or environmental management system auditing.

2.4.1.2 The MelcolmBaldridge National Quality Programme (MBNQP)

It was established in 1988 to recognise American organisations that excel in the quality management field (Arcaro, 1994). The criteria are designed to help organisations use an integrated managerial approach to improve organisational management performance system which results in:

(i) Deliver of ever improving valve o customer, contributing o market success.

(ii) Improvement of overall organisational effectiveness and capabilities.

(iii) Organisational and personal learning (NIST, 2001).

He applicant's quality management is reviewed based on a seven points criteria namely: leadership, Strategic planning, customer and market focus, information and analysis, human resource focus, process management and business results. However, each one of these criteria are broken down into several clusters.

2. 4.1.3 Deming prize

The Deming Prize is another award/recognition system. It was established in 1951 by the Union of Japanese Scientist and Engineers (JUSE) in honour of Deming who has introduced basic concepts of QCM to the Japanese in the 1950s and thereafter. It concentrated mainly on effective planning of organisational and operational aspects, (Su *et al.,* 2003). The Prize is an annual award given to individuals and groups that

demonstrate successful company wide quality control. Assessment is made in ten categories viz.: organisation, standardisation, policies, information, human resource, improvement, quality assurance, maintenance, effects and future plans.

2.4.2 Guidelines set by the national agency for food and drugs administration control

The National Agency for Food and Drugs Administration Control (NAFDAC, 2005) specifies guidelines for the establishment of food industries, which also applies to factory-produced sachet water. Applications for the establishment of sachet-water factories are submitted with supporting documents which include a site plan of the production premise and an environmental permit from the Environmental Protection Agency (EPA). Other requirements and relevant documentation are summarized as follows:

2.4.2.1 Personnel

The manufacturing premises are required to have, among other departments, a quality control and production department. Personnel in charge of production and quality control are required to have relevant training, experience and suitable qualifications in the production process. Specific personnel information required by the NAFDAC include the distribution of personnel as per departments and the responsibilities of each department, the key personnel and their responsibilities, the personnel health policy and the protective clothing policy of the industry being considered.

2.4.2.2 Premises and equipment

The NAFDAC requires documented information on the premise (nature of building) and equipment of sachet water companies. This includes general information on interior surfaces, drainage system, ventilation, water and electrical systems. The type and make of equipment used and the maintenance and standard operating procedures, quality control as well as the equipment validation and calibration information are also required. The design and placement of equipment used is checked to ensure that it can be easily cleaned and disinfected and properly maintained and used. Floor plans that show the positions of equipment and facilities are required. Other guidelines that relate to the premises include:

Smooth flooring with no cracks that can possibly harbour vectors;

(i) Fluorescent lights with shatter proof bulbs to contain the glass particles if the bulbs should break.
(ii) Walls coated or clad with washable material such as tiles or oil-based paints.
(iii) Wiring and electrical connections and devices covered by electrical cover plate.

2.4.2.3. Water, health, safety and hygiene

The workers of sachet water companies are required to undergo periodic health checks to ensure they are free of any communicable diseases. They are also required to have protective clothing, such as gloves. Other documented information required by the NAFDAC, as related to hygiene, includes the cleaning and disinfecting agents used, the pest management strategies, the disinfection standard operating procedure and, where applicable, the effluent discharge and treatment.

2.4.2.4 Record keeping

The NAFDAC requires production records documenting all batches of sachet water produced and the materials and processes applied at each stage of production. Records of complaints on product quality and the corrective actions taken are also required.

2.5 Organisational Performance and Quality Practices

Organisational performance (OP) entails the actual output of an organisation as measured against its intended output or goals. Organisational performance encompasses three thematic areas of firm outcomes: financial performance such as profits, return on assets and return on investment, also product market performance such as sales and market share. Lastly, shareholder return such as economic value added (Richard, 2009).

Many organisations have endeavoured to manage organisational performance engaging the balanced scorecard methodology where performance is tracked and measured in multiple dimensions such as financial performance e.g. shareholder return, customer service, employee commitment, social responsibility e.g. corporate citizenship, community outreach (Upadhaya, 2014).

The purpose of any business enterprise is to do better than its competitors, offer better returns to the owners and stakeholders (Richard, 2009). Organisational performance allows researchers to evaluate firms over time and compare them to rivals (Richard, 2009). Strategy scholars concern themselves with the implications of management decisions and its effect on the firm (Rumelt *et al.,* 1994). The concept of quality is now so widely used that it is no longer just an advantage to adopt it but a requirement for survival. With increased globalisation, come increased competitive pressures.

Businesses are forced to strive to be more efficient, more up-to-date with the changing technologies, more responsive to the markets. Adopting a management philosophy that has quality at its core makes it that much easier to succeed. Dale (2003) stresses the importance of quality in that it increases productivity, leads to better performance in the marketplace and improves overall business performance.

The idea of OP is based upon the possibility that an association is the will full relationship of beneficial resources and those giving hope to get value in return. The concept of organisational performance is based upon the idea that an organisation is the voluntary association of productive assets and those providing the assets expect to receive value in exchange (Berry, 1991). Hence the provider of the resource is the one who defines value as the essential overall performance evaluation criteria. OP is a multidimensional concept that encompasses aspects including financial performance and market performance (Richard, 2009).

2.5. 1 Organisational performance versus organisational effectiveness

Performance measurement tools can also be availed within the organisational framework. Activities around this area establishes the most important client needs, identifying specific quantifiable outputs and establishing targets against which results are to be scored. A variety of perspectives exists on the best approach to measure and quantify organisational performance depending on the dynamics of the industry Measuring profitability margins highlight the amount a given organisation has invested in its operations. Raw growth revenue is important as it highlights the organisational expansion capacity and the scope of potential economies of scale. The market share of an organisation can also be used to highlight its success relative to its immediate competition. In manufacturing organisations, brand loyalty can also be

used to gauge the consumer loyalty and overall retention. It is only through performance that organisations are able to grow and progress (Crosby, 1979). In a manufacturing setting, knowing the determinants of organisational performance is a key in predicting the future, considering the numerous economic crises and shocks that have hit the economic landscape in the globe. The factors that are of most impact is isolated and then treated with utmost interest so as to ensure superior performance (Zabel and Avery, 2002). Further on, knowing the factors that generate success and how they can be measured is of critical importance.

Operational performance, measurement can be grounded on the consumer's expectations within the manufacturing firm in terms of the sales data on what the clients order for most of the time and what is not ordered and the handling of complaints. Operational performance measurement can also be implemented on the employees through meetings and having appraisals. Through the Quality Cost Delivery (QCD) system, this is a capture of the seven key drivers of the manufacturing operations (Moore, 1994). The QCM measures include: not right first time (NRFT) which is a measure of the rate at which defective units are produced. Stock turns on the other hand gauges the number of times a business sells and replaces its inventory (Andrle, 1994).

Although organisational performance dominates the strategic management literature, not to mention economics, finance, and accounting, it is not unchallenged. Performance is one type of effectiveness indicator, with some advantages and disadvantages. Hence, we first need is to distinguish between organisational performance and the more general construct of organisational effectiveness (Venkatraman & Ramanujam, 1986). Organisational effectiveness is a broader construct that captures organisational performance, but with grounding in

organisational theory that entertains alternate performance goals (Philips, *et al.,* 1983). Management research in general, and strategic management research more specifically, has taken a much more limited empirical view, emphasizing the central role of accounting, financial and stock-market outcomes. To simplify this discussion and keep some consistency with the usage in the literature we will distinguish between the domains of organisational effectiveness and organisational performance.

Organisational performance encompasses three specific areas of firm outcomes: (1) financial performance (profits, return on assets and return on investment); (2) market performance (sales and market share) and (3) shareholder return (total shareholder return and economic value added). Organisational effectiveness is broader and captures organisational performance plus the plethora of internal performance outcomes normally associated with more efficient or effective operations and other external measures that relate to considerations that are broader than those simply associated with economic valuation (either by shareholders, managers or customers), such as reputation.

2.5.2 The direct relationship between quality and company performance

A major assumption in the quality and firm performance literature is that quality improves firm performance. The first stream was from empirical studies using the Profit Impact of Marketing Strategies (PIMS) database. Most studies found superior quality had a positive relationship with higher ROI (Buzzell and Gale, 1987; Phillips *et al.,* 1983). The second stream was from a series of studies on the American Customer Satisfaction Index (ACSI) model, which established the relationship between customer expectations, perceived quality, perceived value, customer satisfaction, customer complaints, and customer loyalty (Fornell *et al*. 1996). For

example, Ittner and Larcker (1996) reported a positive relationship between ACSI's customer variables and financial measures such as return on assets, market-to-book ratio, and price–earnings ratio.

The third stream was from studies that examined perceived quality data from the Equitrend Quality Assessment Database (EQA) of the Total Research Corporation. For example, Aaker and Jacobson (1994), found a positive relationship between stock return and perceived product quality in 34 companies traded on the U.S. Stock Exchange, which implies that quality is positively related to a firm's economic performance measures.

2.5.3 Findings of Quality on Firm Performance

Repeated findings on quality either measured by customer satisfaction or perceived quality, provide a growing body of evidence that the relationship between quality and firm performance is positive. Interestingly, research on quality predominantly used profitability rather than growth as a measure of firm performance. Here we have examined how quality and growth as well as profitability and market value are related to each other. Thus, the key findings as according to Cho and Pucik (2005), are that:

Finding A: The higher the quality, the greater the growth performance.

Finding B: The higher the quality, the greater the profitability performance.

Finding C: The higher the quality, the greater the market value performance.

2.6 Review of Related Literatures

Sadiq and Adeyemi (2012), carried out quality control of water packaging in Minna. The result also explained that, for the given period of investigation, the non-defective product is 93.57% of the total production output with the percentage defectives is

6.42%. The operating characteristics curve obtained from varying sample sizes and given constant acceptable defective, c = 2% proved the principle of sample size on producer's risk and consumer's risk. The research was carried out using only one sachet water company.

Abubakar and Nasir (2018), investigated analysis of pure water production. The production process control diagram screen and reduce process changeability, decide when a process needs adjusting and when it doesn't, build up process security and perceive process changes. As evidence from their result some of the processes used in the production of sachet water at times do not conform to standards led out for quality drinking water. They recommended that a measurable procedure control outline ought to be plotted intermittently profitability by improving the procedure, which the procedure creation scrap and modify toward the days' end production.

Inaddition, Anuonye, *et al.,* (2012) investigated that Minna city experiences intense drinking water shortage giving rise to many entrepreneurs of packaged sachet water. The results showed that sachet water would be a source of waterborne infection if not closely monitored by the authorities. The spread of contamination may even be more if sampling is to be extended to wholesalers, retailers and final consumers of sachet water. The results were indicative that the monitoring of the sachet water quality distributed in the metropolis may not be efficient and hence, may lead to significant compromise of the water quality as it moves from the manufacturer to the consumer through the retailers.

The results also revealed that heavy metals were not detected in the sachet water sold in the metropolis. It is therefore, concluded that while the mineral content of brands of sachet drinking water sold in the metropolis met regulated standards, contamination of some brands with fecal pathogens poses serious problem of quality. It is therefore

recommended that serious surveillance and monitoring by appropriate government agencies be carried out to avert outbreak of waterborne disease in the city.

According to Dada (2013), most packaged water apparently is of good quality, but some are contaminated. It should, however, not be automatically assumed that packaged water in sachets is generally safe. Although the technologies utilised in this water industry present barriers that prevent pathogen presence in the final product, the quality of the packaged water is compromised significantly as it moves from the manufacturer to the consumer. Regulatory activities that promote core hygiene values and a proper handling culture could produce the desired improvements rather than a tenacious focus on end-product monitoring, which does not always give a complete picture in terms of microbiological risk assessment. Thus, while seeking to protect public health in the developing world, there is need for regulatory and health agencies to maintain a balanced position that concurrently improves social welfare and access to drinking water. Obviously, in concert with international agencies such as the World Health Organisation, this would include impressive support for locally sourced initiatives such as the nation's packaged water, which apparently covers for institutional inadequacies in public water supply in Nigeria and other parts of the developing world.

The task of effectively regulating the myriads of sachet water producers in the nation given the expanse of the land, inadequate staffing capabilities among others remains a big challenge to NAFDAC. Opportunities exist for improvements in the current regulatory scheme, institutional capacity and collaborative partnership that could make efficient the regulation of the packaged water industry.

Yusuf *et al.,* (2017) conducted assess the physical, chemical and biological properties of sachet water in Zaria Area of Kaduna State. The outcomes from the research

facility investigation demonstrated that a large portion of the physical, compound and natural parameters adjust with World Health Organization (WHO) and Nigerian Industrial standard (NIS) principles aside from coliform tally which didn't fit in with the WHO standard, while 75% of the examples fit in with NIS standard. The t-test result uncovers that there was no huge contrast between the sachets water an incentive with the WHO standard. The general outcomes indicated that the sachet water created in the investigation region were moderately alright for drinking as indicated by the WHO norms for consumable water while 75% of the sachets water was ok for drinking as indicated by NIS. The biological quality of coliform check shows that every one of the examples are organically unfit dependent on WHO while just 25% were unfit dependent on NIS. Since the organic nature of water is a concealed quality that effects intensely on general wellbeing, it is appropriate to take note of that the different sachet water bundled in the investigation region could have some wellbeing suggestions relying upon the sort of coliform found and there is consequently the need to enhance their biological treatment.

Joshua *et al.,* (2019), investigated physiochemical parameters of sachet water, the findings from this study revealed all the physiochemical parameters of the sachet water brands sampled are within WHO acceptable limits for drinking water after four weeks. The Study showed bacterial contaminations in all sachet water brands sampled after four weeks of storage. To reduce the high incidence of sachet water contamination good and proper personal and environmental sanitary practices must be maintained in and around the factory and NAFDAC should ensure the presence of in-house laboratories in all factories as this will also go a long way in averting the danger of waterborne diseases.

Furthermore, Umar *et al.,* (2019), investigation deduced that 10% of the sachet drinking water samples analyzed is not potable for human consumption, and have not meet the required standards set by World Health Organisation for fecal coliform counts, which should be zero per 100 ml of sample (0/100 ml) in all water supplies. High temperature and pH were found to be related to the bacterial counts of the sachet drinking water analyzed. This may be due to lack of knowledge in sachet water production, and use of unclean production equipment. The government should therefore privatize the water manufacturing firms by encouraging them to undergo training on good manufacturing practices as well as on the need for safe drinking water production. Water distribution systems should be checked at regular interval for contamination of sewages, and operators of the water system should be skilled in the design and functioning of that equipment. Government agencies such as National Agency for Food and Drug Administration Control (NAFDAC) should frequently carryout quality control exercise in the study area in order to regulate and control the sale and production of this sachet water.

Based on Daramola (2019)**,** conducted assessment of packaged water in Ado Ekiti, the outcome of this study has demonstrated that some of the brands of commercial sachet water sold in the market may really be risky and along these lines unfit for human utilisation. It is therefore suggested that the appropriate regulatory agencies and ministries (NAFDAC and Ministry of Environment, in particular) should conduct unscheduled periodic visits to these water factories to review their production processes and premises with a view to forestalling the sale of unwholesome products to innocent.

Based on Musa (2018), the water quality parameters analyzed for the sampled water are within the threshold of the Standard Organisation of Nigeria (SON) except the

total hardness in sample D for sachet water and sample B for borehole water. The analyzed water quality parameters are significantly related to one another. However, the relationship varies between the parameters but strong positive relationship dominates. The study recommended that the sachet water vendors should improve the drinking water quality of their products and the officials of Standard Organisation of Nigeria should ensure strict adherence to regulations for drinking water quality.

Based on Izah (2016), potable water source often gets contaminated or polluted due to the anthropogenic activities and some extent of natural conditions. Some of the anthropogenic activities increase the release of heavy metals into water like burning of fossil fuels, mining, use of fertilizers and pesticides such as herbicides, insecticides, and fungicides. The heavy metals find its way in surface water runoff and or soil erosion. The concentration of heavy metals such as lead, chromium, cadmium, manganese, and iron exceeded the limit prescribed by WHO and SON in most of the Nigerian states, while copper, mercury, zinc, manganese were found in high concentration among few potable water sources. Human health disorders that can be caused by heavy metals include cardiovascular, respiratory, cancer, organ damage, poisoning, neurological, hematological etc. depending on their exposure. Based on the aforementioned literature review on heavy metal-related human health problems, we are recommending some suggestions for the conservation of water sources in Nigeria as follows:

(a) Packaged water factories should be planted far from industrial areas.

(b) Industrial wastes, especially effluents should not be discharged without proper treatment.

(c) Intensive monitoring of sachets water should be carried out by appropriate national agency to assure the quality for drinking purpose.

(d) Change of pipelines will be good initiatives to reduce the water contamination.

(e) Research works ought to be empowered.

Uche and Dapper (2017), investigated the connection between production quality control and the performance of sachet water firms in Bori. The result indicated that there is a noteworthy positive connection between the factors contemplated. Hence, it is inferred that while the advantages of production quality control is known, ignorance and absence of technical and budgetary abilities has upset numerous sachet water firms from augmenting these advantages.

2.7 Quality Framework in Manufacturing Firms

One of the first conceptual frameworks for QMS was developed by Dale and Boaden (1993). The authors focused on continuous improvement aspect by proposing series of questions. These questions were: what are the short term and long term objectives? How to measure performance? How to communicate opportunities for improvement? However, it failed to provide knowledge about quality tools and resource management (Yusof and Aspinwall, 2000). Another quality improvement framework focused on TQM philosophies was proposed by Dale (1995). But he stressed its limited application to only larger organizations with prior quality systems or quality oriented culture already in place.

A quality management model for larger organisations was proposed by Berry (1991). However, it failed to consider a need for early quality related training in his inner most models required for providing necessary improvement (Yusof and Aspinwall, 2000). Early training is necessary to educate the employees within the organisation and especially the top management, about QMS, its purpose, and efforts an organisation must dedicate to initiate the change in culture.

Conversely, there have been very few studies that focused on studying quality systems in small and medium sized industries. Although, some researchers have proposed the use of MBNQA and EQA for QMS implementation, particularly in small companies. However, these provide only QMS requirements and lack the information required to understand how these requirements should be fulfilled (Ghobadian and Gallear, 1997). Hewitt (1997) also argued that these models are more suitable for larger organisations that have already had a quality system in place. Another framework titled as a modified pyramid model was prescribed by Kanji (1996). However, it assumes an organisation to already have implemented a data collection system. But many smaller businesses lack expertise in order establish a fact-based decision making systems required to use Kanji's model. Thus, applicability of these conceptual frameworks to SMIs is a very limited due to above discussed prerequisites necessary to implement them successfully.

Majority of these frameworks are too complex for SMEs that do not possess fundamentals like a quality oriented culture, availability of data acquisition processes and knowledge of basic quality tools & techniques (Yusof and Aspinwall, 2000). They also concluded that QMS frameworks for smaller companies should be easily understood with a simple structure and provide a direction on 'how to' implement it successfully, unlike frameworks proposed by Dale and Boaden (1993), Berry (1991), Dale (1995), Kanji (1996) and Hewitt (1997).

A study focused on quality practices in small companies emphasised the need to understand the company culture, based on employee's perspective, before initiating any improvement plans (Watson and Gryna, 2001). Authors suggested that the difference between management perspectives and employee perspectives of achieving quality should be taken under consideration by building a positive quality culture

through sharing and training of quality management practices and their purpose. Thus, we strongly believe companies intending to implement QMS will benefit more from experiences during development and implementation. Quality and safety are very essential and critical; moreover, quality of products is essential for realizing customer satisfaction and as a weapon (strategy) for successes in the competitive environment nowadays. The quality assurance or system is related to the accreditation.

2.8 Development of Quality Framework

Several studies related to QMS implementation have been reported in the literature by quality gurus, quality practitioners, consultants and international organisations. Many survey analysis studies have reported experiences of organisations after QMS has been implemented. Some studies have also reported QMS implementation experiences in the form of case studies while others have only proposed conceptual frameworks. However, most of these studies are only related to large organisations and have limited applicability for small-medium companies (Yusof and Aspinwall, 2000).

One of the first conceptual frameworks for TQM implementation was developed by Dale and Boaden (1993). The author focused on continuous improvement aspect by proposing a series of questions an organisation needs to ask itself. These questions were: what are the short term and long term objectives? How to measure performance? How to communicate opportunities for improvement? However, it failed to provide knowledge about quality tools and resource management (Yusof and Aspinwall, 2000). Another quality improvement framework focused on TQM philosophies was proposed by Dale (1995).

Table 2.1 Comparison of Quality Management System Implementation Framework

S/N	Quality System Considered	Type of Study	Organisation Applicability	Implementation Motivation	Impact of QMS	Reference
1	ISO 9001	Case study	Large	Internal or external	QMS outputs	Bialy and Maruszewska (2015)
2	ISO 9001	Conceptual framework	Small-large	Internal or external	Insufficient information	Garza-Reyes *et al*., (2015)
3	ISO 9001	Case study	Small	External	QMS outputs	Valentina and Barnett (2012)
4	ISO 9001	Conceptual framework	Small-Large	Internal and external	QMS outputs	Sangwan, *et al.,* (2018)
5	ISO 9001	Conceptual framework	Small-large	Internal or external	Insufficient information	Kim *et. al.,* (2011)
6	ISO 9001	Case study	Small	Internal and external	Insufficient information	Mohamed and Sameh (2018)
7	ISO 9001	Case study	Small	Internal and external	QMS outputs	Bhuiyan and Alam (2006)

8	ISO 9001	Conceptual framework	Small	Internal or external	Insufficient information	Aldowaisan and Youssef (2006)
9	ISO 9000	Case Study	Large	Internal and external	QMS outputs	Aniyan (2002)
10	TQM and ISO 9000	Conceptual framework	Small-large	Internal	QMS assets	Talapatra *et al*., (2018)

From Table 2.1, Kim *et al.* (2011) compared a few QMS frameworks on the criteria of consideration of critical factors, motivational factors and clarification of links among QMS impacts. The authors also suggested that QMS implementation studies can be evaluated based on the type of impact on organisations. Having said that, authors also proposed that organisations can be classified to have 'zero impact' or impact with 'QMS assets' or impact by achieving 'improved QMS outputs' (Kim *et al.,* 2011). However, they did not provide comparison using this criterion. It is believe that an ineffective QMS might have some impact on the organisation. Hence, such impact is referred to as negative impact rather than zero impact. Thus, QMS implementation will have negative impact on organisations performance at any level if QMS is ineffective due to reasons like incorrect implementation methods and based only on external motivations.

However, QMS assets can be derived from an effective implementation of any quality system (Kim *et al.,* 2011). Such QMS assets have been achieved in the form of improved quality systems (Yahya and Goh, 2001; Magd, 2008; Poksinska *et al.,* 2016; Williams, 2004), Standardized process (Williams, 2004; Yahya and Goh, 2001; Zeng *et al*., 2007; Chen *et al.,* 2017), sustainable environment (Yahya and Goh, 2001; Zhang, 2016; Zeng *et al.,* 2007). Similarly, QMS outputs have also been achieved by efficient management of QMS assets, that facilitate improved operational

performance in the form of cost reductions related to waste and non-conformance's, timely deliveries of products and services, enhanced customer satisfaction levels of both internal and external customers, increased productivity through-out product realisation processes (from raw material receiving to product or service delivery), reliable, controlled processes and shorter cycle times. (Mezher *et al.,* 2005; Han *et al*., 2007).

A 24 steps QMS development program proposed by Aniyan (2002) was used to implement QMS at a large manufacturing company. The implementation was aimed at achieving both organisational benefits as well as ISO certification. The case study concluded that organisation achieved several benefits from successful implementation of QMS. The highlight of this study was the strong commitment from the top management of the company to provide necessary resources for successful implementation that was eventually achieved. However, the author does not comment if this framework can be utilized by smaller business.

Talapatra, *et al.,* (2018) developed an implementation framework for integrated management system based on total quality management in two different phases that was based on ISO 9001 standards. Implementation started with the training all staff levels of the organisation to ensure total commitment to quality followed by development of QMS documentation phase. This was followed by implementation, internal audits, preliminary assessment & QMS review, dry run and formal assessment. However, the case study failed to explain the basis of development of QMS and related documentation which can be achieved by using self-assessment techniques like 'Gap Analysis'. Despite the TQM and quality control circles (QCC) program already established at the company, motivation for the implementation of QMS was not well explained. So also, apart from the initial training, the framework

does not include any specific training program for new procedures and work instructions that were affected due to changes. The procedures were also made without understanding the needs of internal customers.

A step by step implementation approach proposed by Sarkar (1998) was implemented at a large textile mill. In an important step, continuous review of documentation was carried out internal customers for correctness and compliance. Outside experts were used to complete the documentation of entire organisation in just 8 months. However, the case study does not provide any information on how to perform initial assessment of the system and steps required to be taken after certification is achieved. Smaller organizations need a self-assessment tool to clearly understand its current quality status.

Garza-Reyes *et al.,* (2015) proposed a five-stage conceptual framework for implementing a quality system or improving a quality system. The first step is QMS and business process diagnostic followed by strategic planning, selection of right models, methods & tools, QMS implementation and Evaluation of QMS and business processes. However, we believe that the framework is very complex and assumes the organisation to have prior understanding of audits, quality models and quality methods. The approach might be useful for large organization rather than SME's where these limitations persist. The authors have also called for the validation of this framework before adopting it.

Also Mohamed and Sameh (2018) developed an integrated quality management conceptual framework for Six-Sigma, Lean manufacturing and TQM to eliminate the quality issues and to improve and modernize the quality system for manufacturing organisations. The study demonstrated that the integration of Six-Sigma, Lean

manufacturing and TQM is formulating a platform to manage the quality strategy and its vision and how to apply the operational mechanism to attain excellence performance. Nine step QMS implementation and certification process for small company in their case study. The authors advised to test its QMS for a small trial period before performing certification audits. Study reveals that external consultancy services were utilised to facilitate implementation. However, it does not provide any information or suggestions for other small companies that have financial limitations to hire outside experts.

Sangwan*, et al.,* (2018) developed a five level hierarchical conceptual framework for sustainability assessment if manufacturing organisations. The framework consists of performance measures to improve and assess the organisation policies, products, processes and performance from triple bottom line perspective. This study is limited to the truth that some of the aspects presented in the framework leads to improve and support assessment of some impact at different level.

2.8.1 Organisational Performance and Total Quality Management Framework (TQM)

Today, there exist more than hundred quality awards in many countries. However, these entire quality awards are basically derived from three (3) basic and prestigious awards which are: the Malcolm Baldrige National Quality Award 9MBNQA), the European Quality Award (EQA) and Deming Prize (Jha and Sunand, 2010).

This research shall adopt Oakland's (2003) framework of TQM. Whilst the award models provide frameworks for understanding quality and excellence, their non-prescriptive nature makes them unsuitable for bridging the quality gap, they are not

implementation models. This model is presented in figures and it addresses the hard and soft issues of quality.

It shows how performance may be improved through better Planning, and the management of People and the Processes in which they work. These three Ps are the keys to delivering quality products and services to customers and form a structure of "hard management necessities" for this framework. The core of this framework needs to be surrounded by Commitment to quality and meeting the customer requirements, Communication of the quality message, and recognition of the need to change the Culture of most organisations to achieve total quality. These are the "soft foundations" which must encase the hard necessities of planning, people and processes.

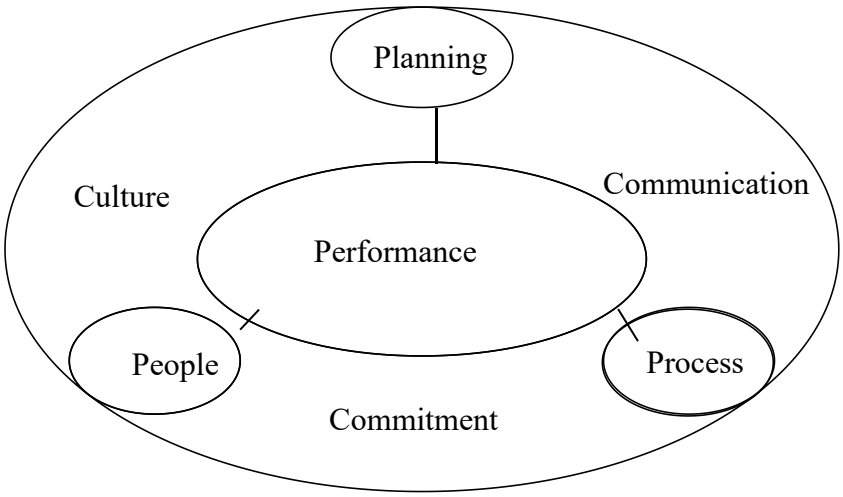

Figure 2.4: TQM framework

(Oakland, 2003)

2.9 Quality in Manufacturing

In manufacturing, quality is defined as a measure of excellence or a state of being free from defects, deficiencies, and significant variations, brought about by the strict and consistent adherence to measurable and verifiable standards to achieve uniformity of output that satisfies specific customer or user requirements. ISO 8402 (1986), standard defines quality as "the totality of features and characteristics of a product or service that bears its ability to satisfy stated or implied needs. In the manufacturing industry it is commonly stated that Quality drives productivity. Improved productivity is a source of greater revenues, employment opportunities and technological advances. Most discussions of quality refer to a finished part, wherever it is in the process. The best way to think about quality is in process control. If the process is under control, inspection is not necessary. Oakland (2003), goes on further to identify two aspects of quality: quality of design and quality of conformance to design. He defines quality of design as a measure of how well the product or service is designed to achieve the agreed requirements, and quality of conformance to design as the extent to which the product or service achieves the quality of design.

2.10 Quality Practices in Water Packaging Companies

Sachet water produced in SMEs is mainly treated by aeration, double or single filtration using porcelain molecular candle filters or membrane filters and in rare instances, disinfection is applied. The level of treatment generally depends on the source of water. However, sometimes water board is used without additional treatment and is sold in markets without clearance from the National Agency for Food and Drug Administration and Control or other bodies concerned with water quality (Dodoo *et al.*, 2006).

They are the most common industries located in cities, towns and even villages in Nigeria. These industries are great employers of unskilled or semi-skill worker in Nigeria in addition to providing Nigerian people with clean and safe drinking water. The quality of water supplied by these industries to their consumers is carefully monitored and maintained by the National Agency for Food and Drug Administration and Control (NAFDAC) by examining and certifying through quality water analysis, regular fumigations of factory and its environment, medical tests of factory workers, uses of correct water packaging polythene materials. Water packaging industries consist of water supply from boreholes or public pipe borne water. Water is the main source of raw material, usually stored in overhead storage tank. The water filtration section is made of particles/sediment filtration, reverse osmosis membrane filtration systems or cartridge fillers (of varying microns) and ultraviolet (UV) water sterilizer system. Water sachet production section is where the water is sealed in sachets using automatic liquid (water) packaging/sealing machine. Packaging storage sections is where sealed water sachets (containing 50cl of water) are packed in plastic bags. Each plastic bag contains twenty sachet and they are stored for sale. According to Sadiq and Adeyemi (2012), the only major sachet water production defect is water leakage from the sachets. The water leakages or defects are caused by:

(a) Incorrect use of machines sealing temperatures it under set or overset temperatures causes poor sealed sachets and burnt sealed sachets respectively that later result to water leakage.
(b) Electric power supply fluctuating causing vary set temperature.
(c) Variation of thickness of supplied polythene during manufacturing, requiring varying sealing temperatures to properly seal the plastic sachets.

(d) Damaged or pierced supplied caused by plastic roll during transportation or manufacturing.

(e) Sticky Teflon surfaces used for sealing sachets can result to leakage or product defects.

2.10.1 Production

Raw water to be processed is collected in tanks. A known quantity is pumped in to the above tank where the water is dozed with alum for coagulation with heavy metals or insoluble matters. The water after coagulation is allowed to settle for an hour. The impurities may be removed by reserved osmosis techniques also. The supernatant water is taken to the chlorination tank where primary disinfection is brought about by bubbling chlorine gas. The water is then passed through sand filters for trapping of undissolved impurities. The water after sand filtration is passed through carbon filters for removal of odour, colour and also for dechlorination. It is then passed through series of micro fillers comprising 5 micron, 1 micron and 0.4 micron filter followed by ultraviolet disinfection system for terminal disinfection. Packing is done in PET bottles of 1 litre capacity through an automatic rinsing, filling and capping machine fitted with an ozone generator. The water is processed with multi stage purification processes such as sand filter, activated carbon filter, ultraviolet disinfection, ultra filtration, Reverse Osmosis and Ozonisation.

2.10.2 Packaging and its attributes

Many companies view packaging as an important way to communicate with consumers and create an impression of the brand in their minds. In other instances, packaging can extend the brand by offering new use (Belch & Belch, 2003). Deliya and Parmar (2012) also defined packaging as an extrinsic element of the product.

Packaging is the container for the product. According to Agariya *et al.,* (2012), support this idea and define packaging as a container for a product- encompassing the physical appearance of the container and including the design, colour, shape, labelling and material used. Packaging includes the activities of designing and producing container for a product. The container is called the package, and it might include up to three levels of material (Kotler, 2002). Packaging involves designing and producing the container or wrapper for a product. Labelling printed information appearing on or with the package is also part of packaging. The package is the buyer's first encounter with the product and is capable of turning the buyer on or off (Kotler and Keller, 2006).

One function of packaging is to act as a surface upon which to apply the text and images of a design. The information to be communicated via packaging is a mixture of statutory information, such as weights and measures; general information, such as ingredients contained within a given product; and information that consumers are increasingly demanding, such as details about the recycled content and recyclability of the packaging, as well as about the ethical credentials of a brand (Ambrose and Harris, 2011). Many companies view the package as an important way to communicate with consumers and create an impression of the brand in their minds. In other instances, packages can extend the brand by offering new uses. Design factors such as size, shape, colour, and lettering all contribute to the appeal of a package and can be as important as a commercial in determining what goes from the store shelf to the consumers' shopping cart. Many products use packaging to create a distinctive brand image and identity. Packaging can also serve more functional purposes (Belch and Belch, 2003). Once the core product has been indicated, the tangible product

becomes important. This tangibility is reflected primarily in its quality level, features, brand name, styling, and packaging (Burnett, 2008).

The core elements of a product are its shape, quality, colour, quantity, packaging, price, and brand name differentiation (Khan, 2006). On the other hand, Brands are important symbols, often using more than one sign system to create meaning; the brand name, the logo, the colour and the design of the packaging all contribute (Blythe, 2005).The sachet water was packaged using sachet machines. Each sachet contained 50cl of water.

2.10.2.1 The sachet water machine

The sachet machine can be used to package different types of liquid products other than water, including sauces, soft drinks such as juice, milk as well as some chemical products. The plastic films used in the machine are bought as single sheet rolls. The main parts of the machine include:

(i) The bag forming devices that fold the polythene bags used for sachet water before the bags are heat-sealed

(ii) The sealing devices, which seal the bags first vertically and then horizontally after filling with water

(iii)The filling and metering devices that fill the bags with water and monitor flow

(iv)A UV disinfection bulb that disinfects the inner plastic film used to package sachet water, and;

(v) An automatic counter that registers the number of bags produced.

2.10.3 Distribution

There is high demand for packaged water, especially sachet water, hence most packaged water producers don't find it difficult selling their products. This is because factory produced sachet and bottle water have become the preferred mode of drinking water by most Nigerians both at home and in public. For sachet water, it is only available in 50cl sachets.

Sachet water factories usually sell products only in bulk to distributors, resellers, and retailers as well as directly to consumers. Here, the distributors refer to those who buy sachet water in bulk from the factories and sell them to other entrepreneurs rather than the consumers or ultimate buyers. Resellers refer to those who also sell the sachet water in bulk but to the end consumers, while retailers to those who sold individual sachets to the end consumers. For the bulk sales, individual sachets of water are packed in larger bags that contain 20 sachets. The main buyers are retailers and distributors and include gas stations, shops, mini-markets, and distribution trucks. The companies also have their own distribution trucks which go around distributing the packaged water products to known distributors or individuals who stop and buy directly from the trucks at factory (wholesale) prices. Most of the retailers are water vendors who normally sell the water in traffic, at road sides or at lorry stations.

2.11 Summary

There is no doubt that quality is a major determinant of competitive advantage and organisational performance. It is required for the survival of any modern day industry. Quality is a must and not a choice as consumers demand it. Also the adoption of the QCM approach is to ensure that organisations manage quality at all functional areas of operation without giving room for lapses in the inter functional processes

companies. QCM is a management strategy that is holistic and allows for the participation and contribution of everybody for the quality improvement drive in the organisation. All effort is targeted at satisfying customers and all stakeholders alike, as the QCM execution brings added value to the organisation. For an industry such as Minna's sachet water industry to benefit from the implementation of the QCM ideology, there is the need for the basic principles which form the core values of QCM to be aligned with the existing organisational culture as they serve as the bedrock through which performance through quality is achieved.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Research Design

It gives details in most suitable methods of investigating the nature of the research instruments, the sampling plan, and the type of data to be used, Chismall (1999) posits that, a research design forms the framework of the entire research process. The design allows researchers to hone in on research method that are suitable for the subject matter set up the studies up for success. Data collection and analysis design method was adopted in this research.

3.2 Target Population and Sample Size

The target population for the research comprised consumers of packaged water, producers, and distributors/retailers of sachet water as well as employees of the sachet

water company. Since it was practically impossible to include all members of the population in the research, representative groups were sampled to provide the primary information for the research.

According to Miles and Huberman (1994), when conducting research one cannot study everybody, everywhere, doing everything etc. Practically, it is sometimes not possible to collect data to cover the whole population. Compounding this is the problem of financial constraints. In order to prevent these challenges it is relevant to use a sample (n) to represent the entire population (304,905). The sample must however share or have the same characteristics of the population from which it was selected (Grazian and Raulin, 1997). Five (5) sachet water companies were selected in Minna for the purpose of the investigation. Data were collected from these companies and denoted by "A", "B", "C", "D", and "E" respectively.

3.2.1 Sample size

David (2002) approach was adopted for evaluating the sample size of this research.

$$n = \frac{N}{1 + N(\alpha^2)} \tag{3.1}$$

Where; N= sample frame, this is the total population of the study area; n = minimum sample size, the least number of questionnaires that must be distributed in the study area; α = error margin = 0.06, the proportion difference between 100% and confidence level (94) which is 6%.

$$n = \frac{304{,}905}{1 + 304{,}905(0.06)^2}$$

n = 278

Sample size (n) is estimated to be 278

The breakdown of the responsiveness for each of the questionnaires is shown in Table 3.1. In all the rate of responsiveness was high enough to validate the results of the study.

Table 3.1: Questionnaire Responsiveness Breakdown

Questionnaire	Total Number	Number Returned	Responsiveness
Managers	5	5	100%
Employees	20	16	80%
Retailers & Distributors	45	45	100%
Consumers	210	191	91%
Total	280	257	92%

Source: Field Survey, July, 2019

3.2.2 Sampling techniques

The five water sachet companies were randomly selected from available companies in Minna. However, the distributors, retailers, employees and managers were purposively sampled for the study. The managers and employees were selected based on their inclination to the subject matter.

Sample is a fraction or section of the total populace whose qualities is utilized to represent the whole populace. The way toward choosing various study units from a predefined study populace is called sampling (Eboh, 2009). The smallest unit of the populace from which sample can be made out of is called Elements. The essential information was acquired by serving questionnaires to respondents who were sample through stratified. Yin (2003), and Stake (1995), recognized six different ways to gather information for caser studies:

(i) Documents

(ii) Archival records

(iii)Interviews

(iv)Direct observation

(v) Participant-observation

(vi) Physical artifacts

Questionnaires were used as the data collection tool for the survey component of the research. Inaddition, direct observation, interviews, documents, and physical artifacts were used for data collection. Three (3) different stratified groups were identified and sampled, it included:

(a) Employees of the five case companies

(b) Retailers and distributors of sachet water products

(c) Consumers of sachet water products

3.2.2.1 Questionnaire

A questionnaire is a list of inquiries intended to elicit data from indicated target respondents. These serves as one of the significant researcher Instruments embraced by the analyst, which was utilised to gather data required. The investigation utilised three unique questionnaires to gather information from consumers, wholesalers and workers. The inquiries that guided the meeting were semi-organised. The questionnaires intended for the representatives looked to gather sees on brand highlights, accomplishments, the board staff relationship, and staff inclusion in brand advancement. The questionnaires intended for consumers centred on the impression of consumers on brands of sachet water. The questionnaire intended for the wholesalers and retailers planned for distinguishing a portion of the open level of reports and criticisms they had gotten from end consumers of sachet water. Also, Brand manager of the sachet water companies were met to acquire important data from the point of view of the management.

3.2.2.2 Interviews

This is a question and answer situated between the researcher and respondents with a view to eliciting relevant data for certain contradictory issues .It is done between the researcher and the Quality Control Managers of the case studies on one-on-one basis. The questions and the way they are asked are predetermined and follow a stereotyped pattern, therefore, it is structured. Additional data was obtained through interviews of brand/marketing managers of the case companies. The questions designed for the interview are open-ended.

3.2.2.3 Observation

This is the process of gathering data through direct notice and close watch. As a technique for gathering data, it is reputed for being the most difficult and most unreliable. Participant observation was used in gathering data, during production processes of sachet water.

3.3 Methods of Data Collection

The data used in this study was obtained from both primary and secondary sources. The secondary data was derived from books, journals and published literature. An extensive range of books and statistical data were used and are listed in full in the reference section. Also an extensive review of literature was undertaken to establish the definitions of quality, quality control management, and the influence of quality on organisational performance. The outcome of the literature review served as a theoretical basis for the development of the questionnaires used in the study.

The essential information for the study was gotten through questionnaires administered to managers, staffs of the investigation organisations and distributors/retailers of sachet water products. The surveys were planned in view of the targets of the study. The subsequent questionnaire was a consumers review that focused on consumer impression of the quality if the packaged water accessible available. In the organisation of the survey, consumers who couldn't peruse or compose English were helped in answering the questionnaire by translating it where conceivable. The third survey was focused at the distributors and retailers of the products of the selected case companies for the study. This was planned to give a proportion of the exhibition and market estimation of the products of these organizations. Likewise extra essential information was acquired through relational

meeting and personnel observations were different kinds of Primary information that was utilised.

3.4 Data Analysis (Attributes Control Charts)

A measurement by attributes mean taking samples and using a single decision, the item is good (acceptable) or it is bad (defective). The functional defective products (defects) in a sample or a day can be estimated by;

$$p' = \frac{c}{n} \tag{3.2}$$

Where c= the number of defectives in a sample

n= the sample size/the number of defective products produced in a sample

$$\overline{X} = \frac{\text{Total defective products}}{\text{Number of days}} \tag{3.3}$$

Moving Range (MR) can be defined as the absolute valve of the first difference (the difference between two consecutive data points) of the data.

$$S = \frac{\overline{MR}}{d_2} \tag{3.4}$$

$$\text{MR} = \left| x_i - x_{i-1} \right|$$

$$\text{Moving Range } (\overline{MR}) = \frac{1}{m-1}\sum_{i=2}^{m} \left| x_i - x_{i-1} \right| \tag{3.5}$$

From A factor, $d_2$can be determined as;

$$A_2 = 3/d_2\sqrt{n} \tag{3.6}$$

According to Douglas and George (2017), for individuals control limits for an observation n=2 and A_2= 1.880

Then; $d_2 = 3/ A_2\sqrt{n}$

$d_2 = 3/ 1.880\sqrt{2}$

$d_2 = 1.128$

Since average defective and moving range determined, control limit can be calculated from;

$$\text{Upper control limit (UCL)} = \overline{X} + 3\frac{\overline{\text{MR}}}{1.128} \quad (3.7)$$

$$\text{Control limit (CL)} = \overline{X} \quad (3.8)$$

$$\text{Lower control limit (LCL)} = \overline{X} - 3\frac{\overline{\text{MR}}}{1.128} \quad (3.9)$$

Where $\overline{X}$ is the average of all the individuals defective and $\overline{MR}$ is average moving ranges of two observations defective.

3.4.1 Operating Characteristic Curve

This refer to a graph of attributes of a sampling plan considered during management of a project which depicts the percent of lots or batches which are expected to be acceptable under the specified sampling plan and for a specified process quality. Analysts create a graphic display of the performance of a sampling plan by plotting the probability of accepting the lot for a range of proportions of defective (fraction defective) units. The specified sampling plan may be demands of the project and could yield the results of acceptance or rejection based on specified criteria. It helps in the selection of sampling plans:

(i) It aids in the selection of plans that are effective in reducing risks.

(ii) It can help in keeping the high cost of inspection.

A sample of material of size, N, is submitted for review, a sample of n things is chosen indiscriminately from the parcel and exposed to examination or testing for imperfections. In acknowledgment test by qualities every one of these n things is named good (acceptable) or bad (defective) after the assessment.

$$\text{P(defectives)} = f(d) = \frac{n!}{d!(n-d)!}p^d(1-p)^{n-d} \quad (3.10)$$

$$P_a = P\{d \leq \text{c}\} = \sum_{d=0}^{c} \frac{n!}{d!(n-d)!}p^d(1-p)^{n-d} \quad (3.11)$$

Where; P_a = Probability of Acceptance; P = Fraction defectives; c = Defective acceptable; n = sample size; d = serial number of fraction defectives.

3.4.1.1 Quality and risk decisions

Two levels of quality are considered in the design of an acceptance sample plan. The first is the producer's risk (α), also known as Acceptable Quality Level (AQL), which is set at 0.05 or 5 percent.

$$1 - \alpha = P\{d \leq \text{c}\} = \sum_{d=0}^{c} \frac{n!}{d!(n-d)!}p^d(1-p)^{n-d} \quad (3.12)$$

The second degree of value is the lot tolerance percentage defectives (LTPD), or the most noticeably awful degree of value that the buyer can endure. The LTPD is a meaning of terrible quality that the purchaser might want to dismiss. Perceiving the staggering expense of imperfections, activities administrators have turned out to be progressively wary about tolerating materials of low quality from providers. In this manner, inspecting plans have lower LTPD values than before. The likelihood of

tolerating a great deal with LTPD quality is the customer's hazard (β). A typical incentive for the purchaser's hazard is 0.10, or 10 percent.

$$\beta = P\{d \leq c\} = \sum_{d=0}^{c} \frac{n!}{d!(n-d)!} p^d (1-p)^{n-d} \quad (3.13)$$

3.4.2 Average outgoing quality (AOQ)

The AOQ curve gives the average outgoing quality (y-axis) as an element of the approaching quality (x-axis). It is to check the exhibition of the plan. The most extreme estimation of the AOQ curve is known as the Average Outgoing Quality Level (AOQL). Notwithstanding the approaching quality, the defectives or defect rate setting off to the customer ought to be no more noteworthy than the AOQL over an all-inclusive timeframe. Individual lots may be more awful than the AOQL however as time goes on, the quality ought not be more terrible than the AOQL.

The AOQ curve and AOQL accept rejected parts are 100% investigated, and is just relevant to this circumstance. They additionally expect the review is sensibly powerful at expelling defectives or defects, indicates how outgoing quality (y-axis) relies upon the incoming quality (bottom axis). AOQ is only applicable to the characteristics defects units, defects per unit, and defects per quality and accept rejected parts are 100% reviewed and all defectives/defects are evacuated. The AOQ curve at first increments as more defectives/defects are delivered, more are discharged. The equation for AOQ is;

$$AOQ = \frac{P\ x\ Pa\ (N-n)}{N} \quad (3.14)$$

Where; P = Fraction defective; Pa = probability of accepting the lot; N= lot size; n = sample size

3.5 Profile of the Sachet Water Company

Nigeria has both small and large scale industries that pack and machine-seal sachet water and also offers sachet water to consumers. This water is referred to as “pure water” by many of the locals. The sachet water industry in Nigeria is vibrant and highly profitable sector since there is always ready market demand for the products of the industry. There has been a proliferation of sachet water producing companies all across the country due to the relatively low startup capital required.

The companies usually produce between 6,000 sachets (300 bags) to 12,000 (600 bags) sachets every day. Anyway the enormous scale water companies have better innovation, assets and adequate logistics backing to deliver sachet water available to be purchased across the nation. A large portion of the enormous scale water companies likewise work water packaging companies and depots in several towns and urban areas. The business offers two kinds of packaged water to Nigeria consumers for example Filtered Water and Mineral Water. Filtered water is produced by passing water under high pressure through a progression of light water channels. Through this procedure the majority of the miniaturised scale particles or silt in the water is expelled. Anyway then again, Mineral water is produced by separating water acquired from regular springs which as of now contain follow components like calcium and magnesium. Mineral water can likewise be gotten misleadingly by passing separated water under strain through layers of rock and lime with the goal that the regular follow components contained these stones will be assimilated into the water.

Table 3.2: Statistics of the Companies Studied

Companies	Years Established	Staff Strength	Average Daily Production Capacity (bags)	Number of Machines	Operational Machines Units
A	2009	15	350	3	2
B	1997	20	600	8	5
C	2008	6	275	1	1
D	2008	8	375	2	2
E	2004	7	350	2	2

Source: Field survey, 20019

3.5.1 Sachet water production process

The main source of water used for sachet water production is water board from the Minna Water board. At the sachet-water factory, the water provided is treated by a point-of-entry (POE) system that utilizes filtration, and now and again ultraviolet (UV) purification. A typical sachet water industrial facility setting comprises of a storage system (tanks), a movement framework (piping), a decentralized water treatment framework (filters, UV sanitisation units), and a packaging system. The packaging is done by utilizing programmed fluid filling and packaging machines, additionally industrially known as automatic fluid packaging machines, form, fill and seal machines or basically sachet machines. A typical set up of a sachet water processing factory is shown in Figure 3.1 which shows two sachet machines, with the treatment framework included filtration and UV sanitisation units appended to the wall in the middle of the 2 sachet machines.

The storage tanks comprise of a tank or a progression of numerous tanks set outside, inside the production line compound or inside the processing plant building. To guarantee least re-contamination of treated water, piping from the POE system is connected straightforwardly to the packaging machine and last sachet water product. There is no pipe outlet given in the middle of, to avoid possible pollution. The sachet water is then packaged utilizing sachet machines. Every sachet contains either 50 cl of water.

Plate I: Sachet Water Processes (Source: Field Survey, July, 2019)

3.5.2 Plastic material used for sachet water production

The bags used for packaging factory produced sachet water are made of high-density polyethylene (HDPE), which is slightly opaque, has a higher tensile strength (more difficult to elongate), and can withstand higher temperatures. This type of plastic is made from the distillation of crude oil and the principal raw material is ethylene gas (monomer), (Okioga, 2007).

3.5.3 The sachet water machine

The sachet machine can be utilised to bundle various kinds of fluid items other than water, including sauces, soda pops, for example, juice, milk and some chemical products. The plastic movies utilised in the machine are purchased as single-sheet rolls. Figure 3.1 demonstrates a normal sachet water filling and fixing machine.

Figure 3.1: Sachet water Machine (Okioga, 2007)

Plate II: UV-bulb in Sachet Machine used to Disinfect Polythene roll

Most sachet machine models can deliver 1000 to 1500 packs of sachet water every hour. Another element is a programmed counter that monitors the quantity of sachets delivered. The sachet filling and bundling machines consequently print on the sachets, the bunch number of packs created along these lines making it simple to monitor the generation. The pressing limit (volume per sachet-sack) can be acclimated to the required volume, by and large 50centilitres, with a packaging exactness of ± 1%. The required volume can be acquired by either altering the length between the flat seal, or utilising a proper film width. The sachet machine can print the date of generation on sachets created. Prior to working the machine, the vertical fixing temperature is changed in accordance with 120ºC - 140ºC and the flat fixing temperature to 170ºC -

230ºC, contingent upon the kind of film material utilized and its thickness. The machine loads about 300kg and measures about 850mm (L) x 750mm (W) x1700mm (H)

3.6 Development of Proposed Quality Control Management Framework

Quality Control Management framework should be simple, logical and yet comprehensive enough to be successful in the implementation process and attain high operation performance (Yang, 2017).The information required for this study was obtained from various sources like formal and informal meetings with the managers and employees of the company, cross functional observation of processes and daily activities, other documents of the company like returns tracking, customer survey documents and also utilized.

The improvement of QCM quality control cycle and quality improvement integrated with DMAIC phases to enhance the process improvement by realizing of employee's participation and make everyone involved in the organization. Where D, M, A, I and C, denotes Define, Measure, Analyze, Improve and Control, respectively. Hence, Six-Sigma DMAIC improvement is adopted as the key strategy of the framework for identifying opportunities for quality improvement. DMAIC is used for projects aimed at improving an existing business process.

3.7 Structural Equation Modeling (SEM)

SEM is a combination of factor analysis and multiple regressions. Special cases of SEM include confirmatory factor analysis and path analysis. It is also known as analysis of covariance or causal modelling software. The SEM can be divided into two parts. The measurement model is the part which relates measured variables to latent variables. The structural model is the part that relates latent variables to one

another. Structural equation models are often used to assess unobservable constructs. (Schumacker, *et al.,* 2017) They often invoke a measurement model that defines latent variables using one or more observed variables, and a structural model. Two primary advantages of SEM are:

(i) SEM makes it possible to study complex patterns of relationships among the constructs in a conceptual model in an integrative fashion.

(ii) The measurement of unobserved (latent) variables by observed fallible indicators can be modelled explicitly, and the effect of measurement error (both random and systematic) on structural relationships can be taken into account.

3.7.1 Basic components of SEM

3.7.1.1 Latent variables (constructs/factors)

(i) The hypothetical constructs of interest in a study.

(ii) They cannot be measured directly.

3.7.1.2 Observed variables (indicators)

(i) Are the variables that are actually measured in the process of data collection by the researchers using developed instrument.

(ii) They are used to define or infer the latent variable or construct.

(iii) Each of observed variables represents one definition of the latent variable.

3.7.1.3 Endogenous variables (dependent variables): variables have at least one arrow leading into it from another variable.

3.7.1.4 Exogenous variables (independent variables): any variable that does not have an arrow leading to it.

3.7.1.5 Covariance: is a measure of how much two variables change together.

3.7.2 Model parameters

(a) Regression weights/Factor loadings

(b) Structural Coefficient

(c) Variance

(d) Covariance

(e) Each potential parameter in a model must be specified to be fixed, free, or constrained parameters

(f) Free parameters: unknown and need to be estimated.

(g) Fixed parameters: they are not free, but are fixed to a specified value, either 0 or 1.

(h) Constrained parameters: unknown, but are constrained to equal one or more other parameters.

3.7.3 Analysis of Moment Structures (AMOS)

AMOS is an added Statistical Package for Social Sciences (SPSS) module, and is specially used for Structural Equation Modelling, path analysis, and confirmatory factor analysis. AMOS is a visual programme for structural equation modelling (SEM). It implements the general approach to data analysis known as structural equation modelling (SEM), also known as analysis of covariance structures, or causal modelling. This approach includes, as special cases, many well-known conventional techniques, including the general linear model and common factor analysis. AMOS is statistical software and it stands for analysis of a moment structures.

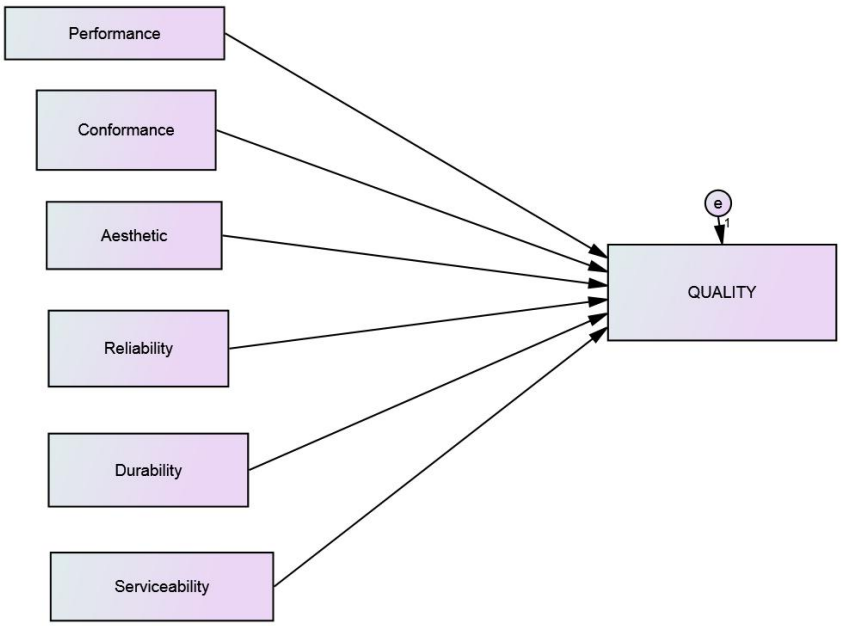

Figure 3.2: Path Diagram

The six critical dimensions (observed variables) of quality that served as a framework for strategic analysis are:

(a) Performance – The primary or main operating characteristics of a product or service.

(b) Conformance – This is how well a product or service corresponds to the customers' expectations.

(c) Aesthetic - This is the appearance of a product, that is, how a product looks, smells, or tastes.

(d) Reliability – This reflects the probability that the product will operate within a given period of time, i.e., consistency of performance.

(e) Durability – This refers to the useful or economic life of a product or service. Durability relates to the length of time a product can used before replacement is judged to be preferable to continued repair.

(f) Serviceability – The ease of repair, speed of repair, and competence and courtesy of the repair staff, is the service system efficient, competent and convenient? That is handling of complaints or checking on customer satisfaction.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

The data collected from the field is analyzed and explained under the following headings: Consumers, Retailers/Distributors of Sachet Water Products, Employees of Sachet Companies and Quality Management of Case Companies. This is followed by discussions of the research objectives and questions of the study. Qualitative and quantitative descriptive analyses such as frequencies, bar chart, pie chart and control charts were used in analyzing the data.

4.1 Consumers

This section concentrates on the perception of the quality of sachet water by consumers or the general public. The demographic characteristics of the consumers covered as well as the data collected on the consumer perception of sachet products are presented here.

4.1.1 Demographic Characteristics of Consumers

Two hundred and ten (210) questionnaires were distributed to consumers, however only 191 questionnaires were received and used in the data analysis. Table 4.1 shows the frequency distributions of both the gender and age groups of the respondents. From the table, it is seen that more males (52%) responded to the questionnaires than females (48%). The respondents were in the age groups of under 20 (10%), 20-29 (54.4%), 30-39 (16.2%), 40-49(11.5%), 50-59 (5.3%), and over 60(2.6%).

Table 4.1: Age Group & Gender Distribution of consumer Respondents

Age Group	Gender				Total	Percentage (%)
	Male	Percentage (%)	Female	Percentage (%)		
Under 20	3	1.6	16	8.4	19	10
20-29	54	28.2	50	26.2	104	54.4
30-39	18	9.4	13	6.8	31	16.2
40-49	15	7.8	7	3.7	22	11.5
50-59	3	1.6	7	3.7	10	5.3
Over 60	4	2.1	1	0.5	5	2.6
Total	97	50.7	94	49.9	191	100

Source: Field Survey, 2019

As shown in Figure. 4.1, 121 consumers representing 63% of the respondents were workers while the remaining 70 consumers representing 37% of respondents were students.

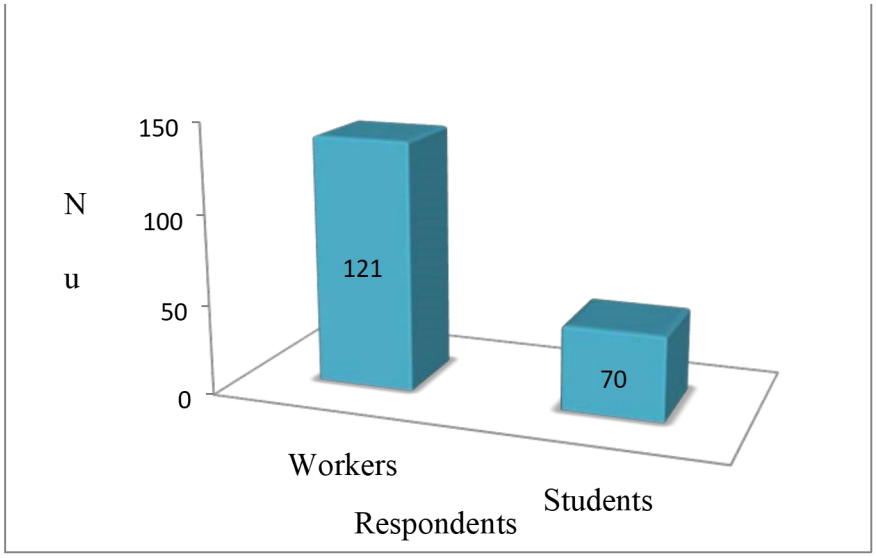

Figure 4.1 Worker/Student Distributions of Consumers

4.1.2 Consumer Brand Preference

Out of the 191 consumers surveyed, 157 (82%) respondents indicated one of the products of the five case companies as their preferred choice of drinking water. However 34 (18%) of the consumers said they preferred other brands other than the case study brands. Such brands mentioned included Golden Age Table Water,Dan Yabo Table Water, Ghalam Table Water, FaliliTable Water, Zagbayi Table Water and De happy day Table Water.

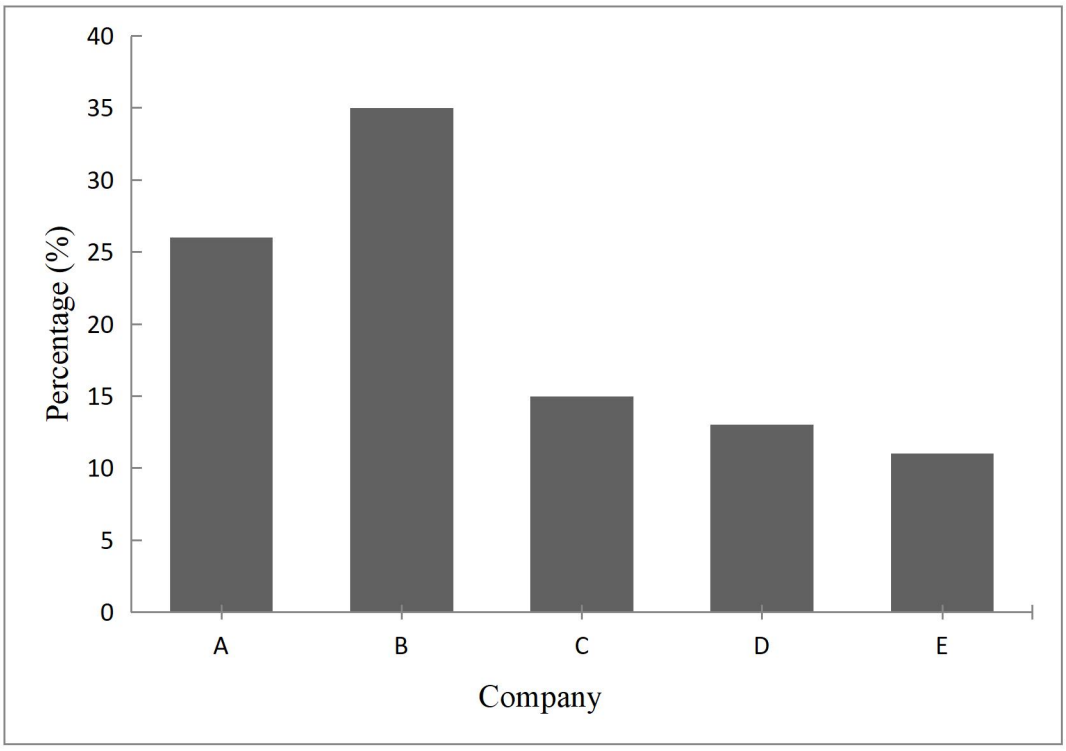

Figure 4.2: Consumer Brand Preference

Also as illustrated in Figure 4.2, 26% of respondents said they prefer Table Water A, 35% of respondents choose Table Water B as their preferred brand, 15% of the respondents indicated Table Water C as their preferred brand, 13% of the respondents answered Table Water D as their preferred brand while 11% of respondents said they prefer Table Water E. Base on consumer preference, this confirms Table Water B's position as the leading brand in the industry. Even more impressive is the position of Table Water A as the second most preferred brand (based on this survey) due to its relatively recent entrance into the industry as compared to the likes of Table Water C, Table Water D and Table Water E. This data is indicative that the companies who have Machineries, Equipment, Employee and sachet water production as their sole or core business have a relatively higher market share than companies whose packaged water products form only part of their portfolio of products.

4.1.3 Brand Availability

Majority, 92% (176) of respondents addressed "Yes" to the way that they in every case promptly get their preferred brand of package water to buy, while 8% (15) addressed something else. Furthermore 90% (172) of respondents said they buy some other brand accessible in occasion of the inaccessibility of their preferred brand while 10% (19) of respondents said they don't compromise on their preferred brand. This investigation prompts the end that Minna consumer dedication to sachet water brands is high since the top brands are effectively substitutable.

4.1.4 Brand Quality Experience

Minority (12%) of respondents demonstrated that they have encountered quality issues with the contextual investigations brands while the staying 87% (168) answered something else. Anyway of the 12%, just 5% reported the issue to the organizations concerned while the remaining 7% avoided revealing. Likewise of the 5% who announced the quality issues, just 2% had quick reactions while the remaining 3% got no reaction.

The investigation demonstrates that however the five brands are among the main brands in the business, despite everything they have some minor quality difficulties that ought to be tended to. These difficulties incorporate product defects (leakages), items/brand impersonations and bargaining of item quality by retailers/distributors/vendors through mishandling and bad storage techniques. In addition the information gathered demonstrates that consumers don't usually report quality issues.

The data also indicate the consumer feedback mechanisms of the five companies are either absent or ineffective. According to Filippini and Forza (1998), it is necessary for organisations to maintain a close link with their customers in order to know their requirements and measure how it has been successful in meeting up to customer's requirements. Therefore the sachet/bottle water industry needs to improve in the area of consumer feedback mechanisms.

4.1.5 Consumer Packaged Water Purchasing Habits

Table 4.2 shows the distribution of sachet water purchasing points by consumers. 70% of the respondents purchase package water from shops, 27% from vendors by the roadside and 3% from Lorry Parks and Stations.

Table 4.2: Distribution of Purchasing Points for Sachet Water

Purchasing Point	Frequency	Percentage (%)
Shops	133	70
Roadside Vendors	51	27
Lorry Parks and Stations	7	3
Total	191	100

Source: Field Survey, 2019

Majority (70%) of respondents also added that they often buy from shops because they believe they are assured of the quality of the packaged water due to more often than not, the hygienic and proper storage of the water products by the shop keepers. Respondents (27%) also indicated that they sometimes buy from street vendors when caught up in traffic and also from shops/vendors (3%) at lorry parks and stations when

boarding a car or when travelling. The marketing departments of sachet/bottle water companies should target more of their marketing efforts at shops since the bulk (70) of packaged water products are usually purchased from the shops.

4.1.6 Consumer Perception of Regulatory Agencies

From the data 60% (115) of respondents overviewed were of the supposition that the administrative offices, for example the SON and the NAFDAC are not doing enough to ensure quality of packaged water, while 40% (76) thought otherwise. Accordingly it is reasoned from the figures that there is a low degree of open trust in the administrative organisations.

4.2 Distributors/Retailers of Sachet

The questionnaires administered sought to determine the brand preference(s) of dealers/traders of sachet water, assess the marketing and distribution practices, as well as the quality of service provided to them by the water producers. Here a 100% responsiveness was achieved i.e. all 45 questionnaires were returned. Most of the data obtained from the questionnaires could only be analysed qualitatively while the remaining was analysed quantitatively.

4.2.1 Demographic Characteristics of Distributors/Retailers

The gender distribution of sachet/bottle water distributors who responded to the survey is as shown in Table 4.3. It is observed that the number of females (78%) is almost three times the number of males (22%). This is indicative of the fact that females are predominantly involved in the sale of sachet products in Minna than males. The percentages for the age distribution are shown in the Table 4.3. The

observation here is that the 30-39 age group is predominant in the retail and distribution of sachet water products.

Table 4.3 reveals that even within each age group, females are still more than males. It is wise therefore for sachet water companies to target their quality marketing/sensitization messages at females since they make up a larger number of the distributors/retailers.

Table 4.3: Age Group & Gender Distribution of Distributors/Retailers Respondents

Age Group	Gender				Total	Percentage %
	Male	Percentage %	Female	Percentage %		
Under 20	1	2.2	2	4.4	3	6.7
20-29	2	4.4	8	17.8	10	22.2
30-39	4	8.9	13	28.9	17	37.8
40-49	2	4.4	7	15.6	9	20
50-59	1	2.2	3	6.7	4	8.9
60 and above	0	0	2	4.4	2	4.4
Total	10	22.2	35	77.8	45	100

Source: Field Survey, 2019

4.2.2 Brand Choice of Distributors/Retailers

Although over 92% of the respondents disclosed that they sell more than one brand sachet water products they also indicated their preferred choice of packaged water which they often sell. These choices, they explained are as result of the high market demand for these brands by their customers. It is illustrated (in percentages) in Figure 4.3 the various brands often sold by retailers and distributors. Here again Table Water B tops with 27% of the distributors/retailers citing it as the brand they prefer and usually sell. Table Water B is followed by Table Water A with 20%, Table Water C with 13%, Table Water D and Table Water E with 9% and "Others" with 22% "Others" as used in the study represents brands on the market other than the case study brands. Such brands include Golden Age Table Water, Dan Yabo Table Water, Ghalam Table Water, Falili table water, Zagbayi Table Water and De happy day Table Water etc.

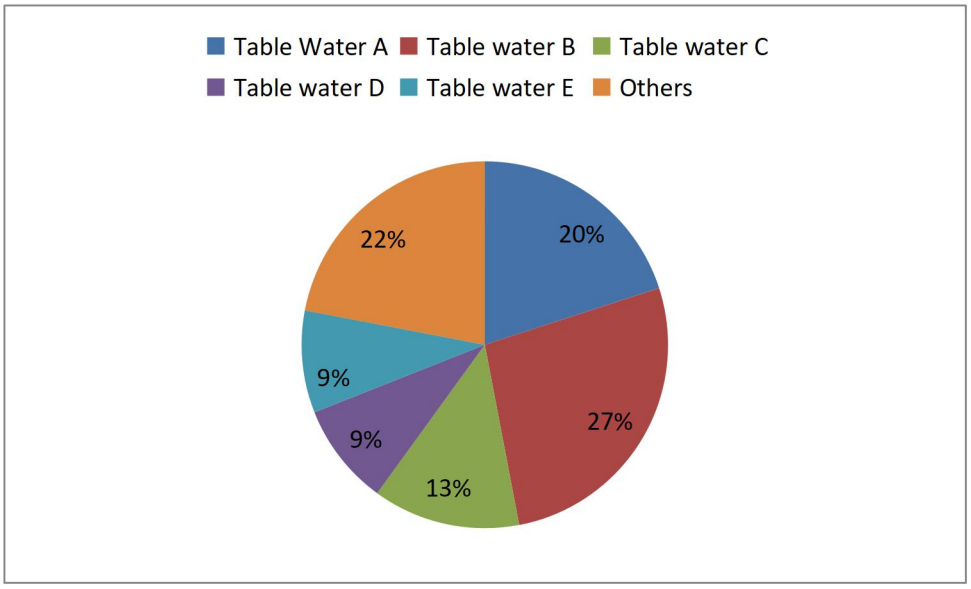

Figure 4.3: Brand Choice of Distributors/Retailers

4.2.3 Business Characteristics

Majority (95%) of respondents agreed that the sachet selling business was profitable. The average number of years the respondents had been in business was four (4) years. Close to 86% respondents disclosed “personal funds” as their source of startup capital while the remaining had their sources from loans and start-up stock from water producers. This reflects that it is relatively easy in terms of starting capital to venture into the package water selling business.

A small number of respondents (32%) indicated that no sachet water producer company had given them any form of education concerning proper packaged water storage and handling. Most of them did not know of basic best water storage practices and even those who knew did not really understand the quality implications of what they are doing. The lack of education by producers to sellers is a major contributor to the compromising of sachet quality at the point of sale.

Close to 25% of respondents revealed that their customers have complained or expressed quality concerns of their products on sale. This confirms the fact that consumers are still not satisfied with the quality of packaged drinking water on the market. The average number of bags of sachet water sold by the respondents a day was 7 bags with the lowest and highest being 2 and 15 bags per day respectively.

4.3 Employees of Sachet Water Company

This section focuses on the demographic features of employees of the case study companies, their level of involvement in quality management and finally their job satisfaction. The section also assesses Employee Training and Total Involvement, which are part of the major principles of Total Quality Management (TQM). According to these TQM principles employees’ job satisfaction can lead to high job

performance and subsequently improve quality of output and productivity (Stahl, 1995).

4.3.1 Demographic Characteristics of Employees

Twenty (20) questionnaires were administered to the five case companies. Sixteen (16) questionnaires out of the twenty were returned and were used for the study. The number of questionnaires received from employees of each of the case companies and used for the study is shown in Table 4.4.

Table 4.4: Breakdown of Employee Questionnaire Responsiveness

Company	Given	Return
Table Water A	4	3
Table Water B	7	5
Table Water C	2	2
Table Water D	3	3
Table Water E	4	3
Total	20	16

Source: Field Survey, 2019

Thirteen respondents (81%) were males and the remaining three (19%) were females. The indication here is that more males are employed in the sachet water industry than females.

4.3.2 Employee Perception of their Jobs

Table 4.5 summarizes the various responses given by employees to the questionnaires served to them. However over 75% of employees thought that their work in totality was between average and good while 81% responded same in terms of their working conditions. Concerning importance of job to them 25% responded very good while 43.8% responded good. Also for salary and welfare 25% responded average, 56.3% responded good and18.7% for very good. These responses point to the fact that although employees are satisfied with their conditions they are not too much enthused about their salary and welfare policies. Therefore efforts must be made to improve employee salary and welfare conditions to intrinsically motivate them to achieve quality objectives. This concept is supported by Omachonu and Ross (1994), who noted that intrinsic motivation of employees is at the heart of TQM.

Table 4.5: Responses to Employee Job Perception

Employee Job Perception Indicators	Very Good (%)	Good (%)	Average (%)	Below Average (%)	Poor (%)	Total (%)
Work in Totality	12.5	50	25	12.5	0	100
Working Conditions	0	25	56	19	0	100
Job Importance	25	43.8	18.7	12.5	0	100
Salary and Welfare	18.7	56.3	25	0	0	100

Source: Field Survey, 2019

4.3.3 Employee Involvement in Quality Management

Table 4.6 shows the percentage values of responses given by employees concerning their involvement in quality management. It is observed that a high percentage of the responses were in the ranges of Below Average, Average and Good

Table 4.6: Reponses to Employee Involvement in Quality Management

Employee Involvement in Quality Indicators	Very Good (%)	Good (%)	Average (%)	Below Average (%)	Poor (%)	Total (%)
Knowledge of Quality Practices	12.5	25	37.5	18.8	6.2	100
Regular Training on Quality	25	37.5	31.3	6.2	0	100
Involvement in Quality Programs	18.8	43.7	25	12.5	0	100
Incentives for Achieving Quality	18.8	31.3	31.3	12.5	6.2	100

Source: Field Survey, 2019

The responses in Table 4.6 highlight a deficit in the level of involvement of employees in quality management in the sachet water industry, yet not encouraging,

but here is an improvement. According to Dale and Cooper (1993), total employee involvement in quality management is required for the success of any quality management systems.

4.3.4 Employee Relationships

Going by the survey results given in Table 4.7, it seems employee relationship is on the high side in the sachet water company. For example, for relationship and communication with managers, almost 81% of the respondents chose "good" and "very good".

Table 4.7: Responses to Employee Relationship

Employee Relationship Indicators	Very Good (%)	Good (%)	Average (%)	Below Average (%)	Poor (%)	Total (%)
Relationship with Managers	43.7	37.5	18.8	0	0	100
Relationship with other Employees	31.3	43.7	18.8	6.2	0	100
Relationship with Customers	31.3	43.7	25	0	0	100
Company Policies and Administration	37.5	25	31.3	6.2	0	100

Source: Field Survey, 2019

However more needs to be done about the relationship with customers since 75% respondents indicated good or very good is not too encouraging. Customers focus is

one of the main principles of TQM and therefore it should be in no way taken for granted by the industry. According to Filipppini and Forza (1998), customer focus is an asset to the financial success of any organisation and as such organisations must maintain a close link with their customers in order to know and meet their requirements.

4.3.5 Career Advancement and Inclusion in Decision Making

As illustrated in Table 4.8, over 87.5% of respondents chose “good” or “average” when asked about the suitability of their jobs to their skills and qualifications. This shows that employees are being given the opportunity to apply their skills/skillset appropriately in the sachet water industry. However with regard to opportunities for promotion/career advancement a very high number, that is, 6.2% of respondents indicated poor while 12.5% and 31.3% rated it below average and average respectively. This is therefore an area that the Human Resource departments of companies in the industry have to look at if they desire to keep employees satisfied.

Table 4.8: Responses to Career Advancement Decision Making

Career Advancement & Participation in Decision Making Indicators	Very Good (%)	Good (%)	Average (%)	Below Average (%)	Poor (%)	Total (%)
Job Suitability to Skills	6.2	50	37.5	6.2	0	100
Promotion/Career Advancement	6.2	43.7	31.3	12.5	6.3	100
Participation in Decision Making	12.5	18.7	25	37.5	6.3	100

Source: Field Survey, 2019

Finally, respondents rated participation in decision making "good" (18.7%), average (25%), below average (37.5%) and poor (6.3%). This is to say that employees are barely made part of major decision making in the sachet water industry. This has to change since it does not agree with the almost all existing strategies for achieving quality. Moreover, the concept of Total Involvement in TQM calls for employee interest, participation and contribution to decisions affecting quality management (Anuonye, *et. al.,* 2012).

4.4 Quality Management of Case Study Companies

This section briefly presents data collected on the quality management practices of the case study companies. Most of the data presented here was obtained through structured interviews with the Quality Control Managers of the various case study companies and also through direct observation by the author of the quality processes during visits to the factories of the study companies.

4.4.1 Quality Management Systems

The case study companies practice a Quality Control System while Table Water A,B and C also practice a Quality Assurance System. It was observed that all the quality management systems of the case companies meet the guidelines set by the NAFDAC. The researcher observed that although the companies ascribed to other quality management systems other than QCM, there were traces of some of the principles of QCM in their operations and quality processes. Some of the principles included Total Involvement in Quality, Management Leadership and Commitment, as well as Training and Empowerment of Staff. It must be noted that though these principles were present, they were in varying degrees and were not being fully utilised for optimum benefit. It was also noted that employee training was mostly directed at capacity enhancement and work related issues, but did not support the personal career improvement ambitions of employees. Customer focus was a frequent slogan during the interviews, but in reality the companies were production focused as they were more concerned with meeting and exceeding production targets. The quality control managers interviewed could barely cite instances where customer input has been included in their production processes.

Some of the quality challenges the QC Managers cited included lack of management support towards continuous improvement strategies and also lack of employee understanding of quality practices. The managers said management most often frowned on continuous improvement activities such as acquisition of new (and better) equipment and systems to support quality processes, opting instead to favour financial considerations. Management of some of the companies was not interested in hiring more high-caliber professionals to enhance the quality output, thereby often leaving the QC Managers overwhelmed with the volume of work. Most of the employees followed quality processes because of company policy but basically lacked understanding of the quality implications of their actions. Some of the quality and safety features observed on the premises of the case companies' factories visited included:

(a) Every factory floor employee in protective gear consisting of uniforms/coats/overalls, hand gloves, nose mask, rubber shoes, plastic head cap.
(b) Good ventilation or air conditioning at production floors to prevent sweating.
(c) Display of production processes.
(d) Frequent recording of production activities and output.
(e) Absence of spillage or water on factory floors- quick clean up when occurs.
(f) Availability of toilet facilities for employees on premises at reasonable distance from the production floor.

4.5 Material Input-output Balance

The total quantity of material input must be balanced with the sum of non-defectives products, that is, useful output products, defectives on production floor and defectives

returns from sales. For the period of investigation covered, the percentage defective is 2.92%, while non-defective products accounts for 97.08% of the total production.

Table 4.9: Percentage Defectives and Non-defectives

Company name	% Defective	% non-defective
Table Water A	1.4	98.6
Table Water B	4.5	95.5
Table Water C	2.8	97.2
Table Water D	2.5	97.5
Table Water E	3.4	96.6

For the investigation period, the 2.9% defective indicates that for every 10000 bags, about 290bags are due to defective products caused especially by sachets leakage.

4.6 Control chart

The Figure 4.4, 4.5, 4.6, 4.7 and 4.8, show the plot of each selected sachet water company for 20 days.

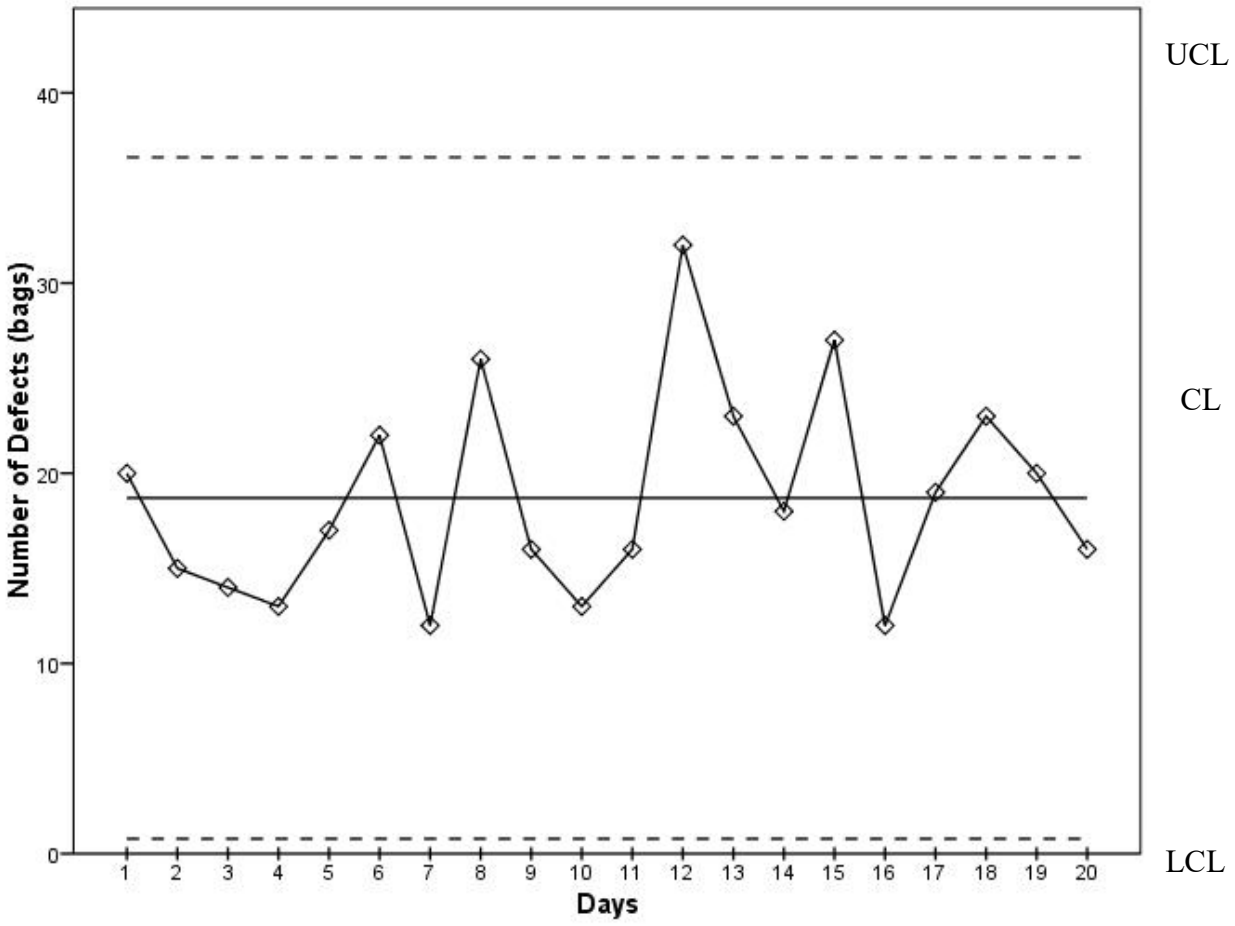

Figure 4.4: Table Water A Control Chart

Upper control limit, *UCL* = 37

Centre line, *CL* = 19

Lower control limit, *LCL* = 1

The process is in control since none of the plotted points fall outside either UCL or LCL.

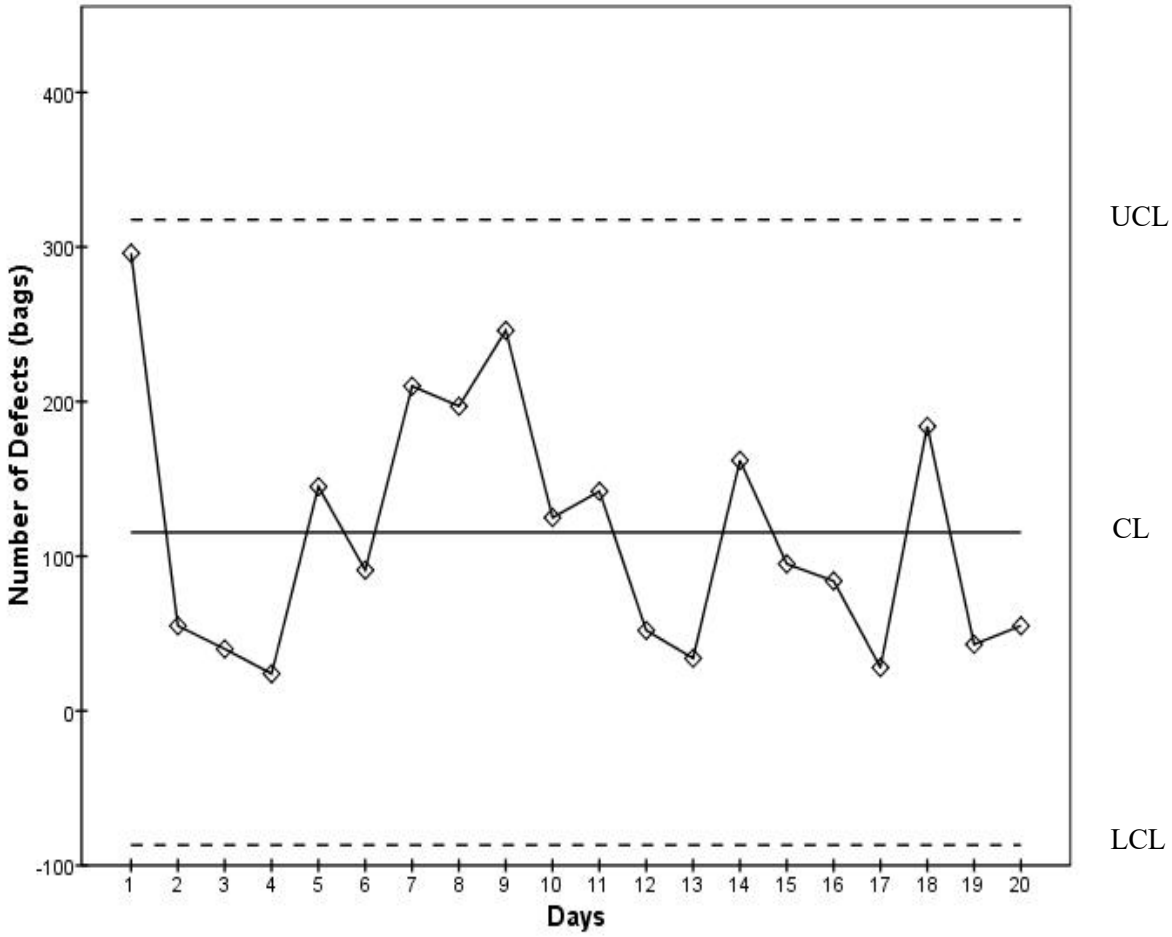

Figure 4.5: Table Water B Control Chart

Upper control limit, *UCL* = 318

Centre line, *CL* = 115

Lower control limit, *LCL* = -87

The process is in control since none of the plotted points fall outside either UCL or LCL.

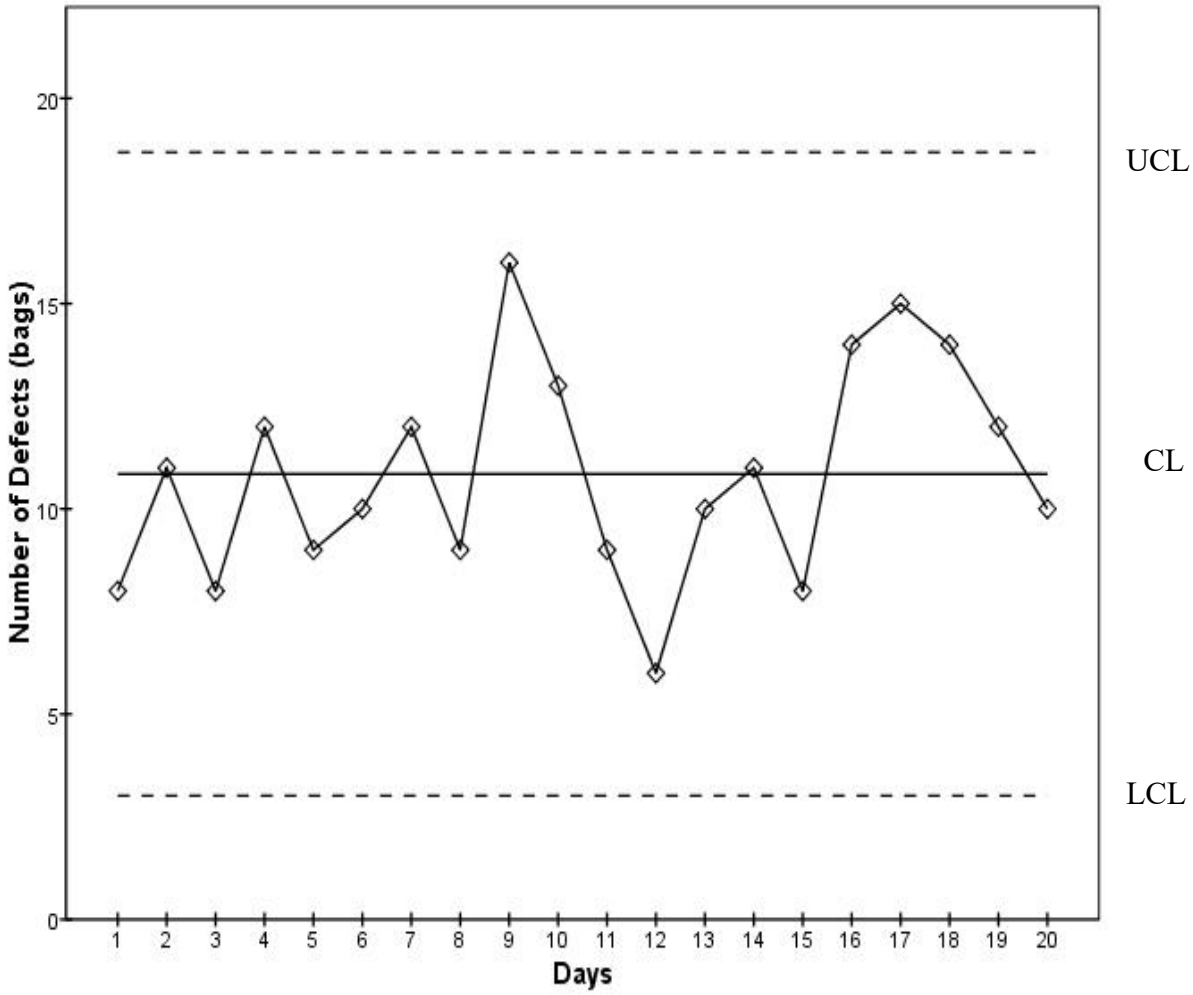

Figure 4.6: Table Water C Control Chart

Upper control limit, *UCL* = 19

Centre line, *CL* = 11

Lower control limit, *LCL* = 3

The process is in control since none of the plotted points fall outside either UCL or LCL.

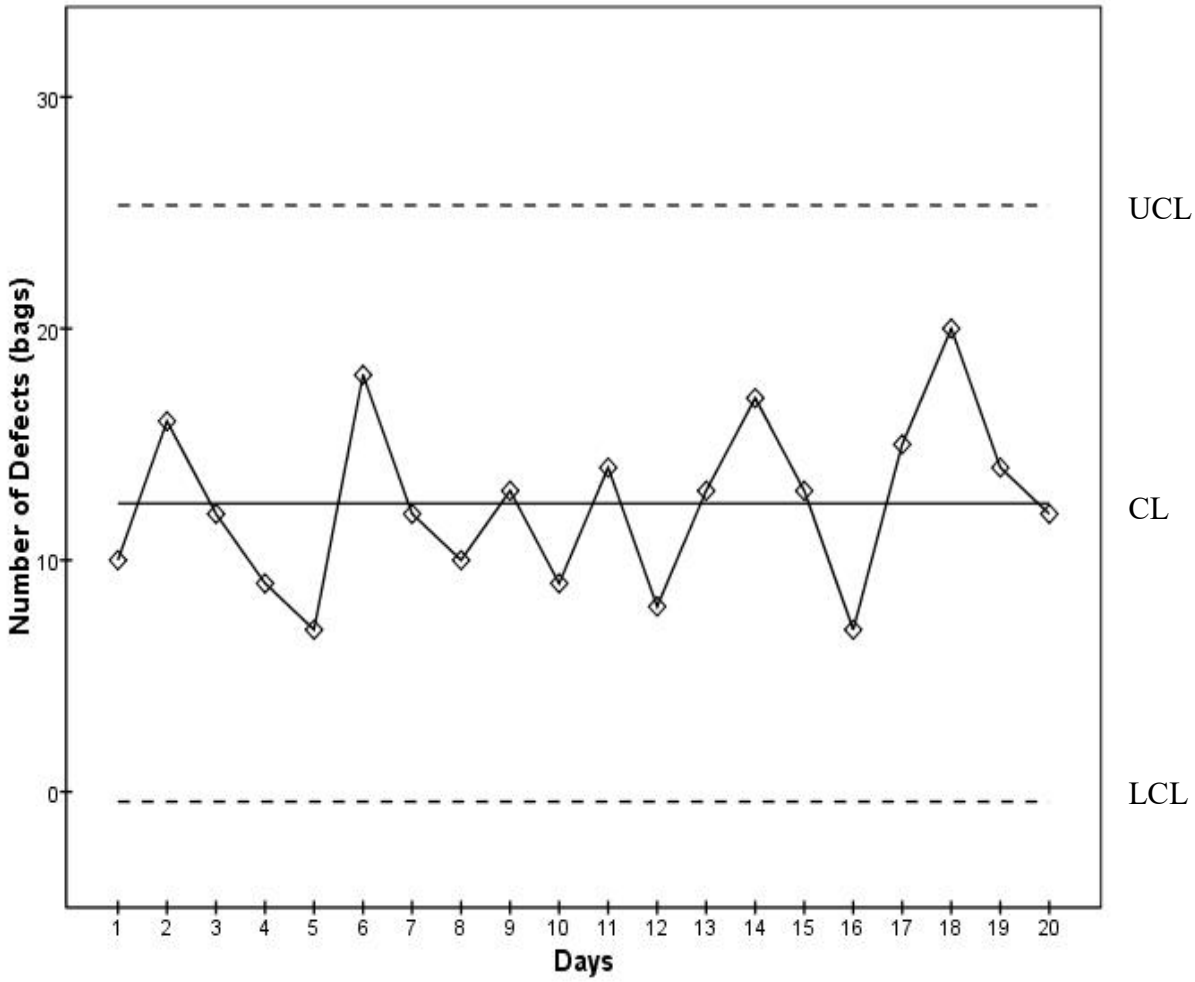

Figure 4.7: Table Water D Control Chart

Upper control limit, *UCL* = 25

Centre line, *CL* = 13

Lower control limit, *LCL* = 0

The process is in control since none of the plotted points fall outside either UCL or LCL.

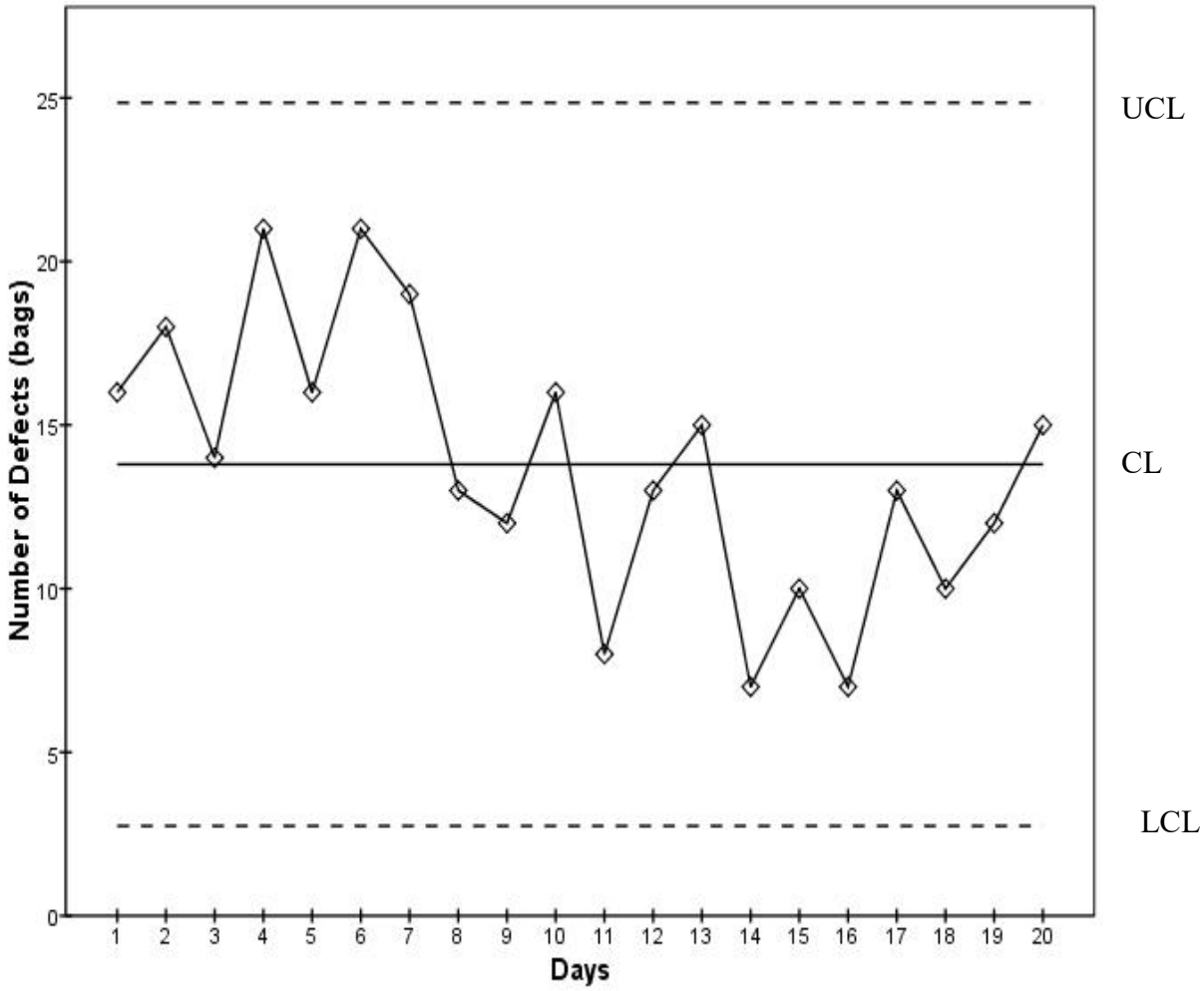

Figure 4.8: Table Water E Control Chart

Upper control limit, *UCL* = 25

Centre line, *CL* = 14

Lower control limit, *LCL* = 3

The process is in control since none of the plotted points fall outside either UCL or LCL.Sadiq and Adeyemi (2012), control chart for sachet water companies are not under control, mean some defects falls out the UCL and LCL, which indicate that there is need for quality control improvement.

4.7 Operating Characteristic Curve and Average Outing Quality

The OC curves for each case studied are shown in the Figures as follows;

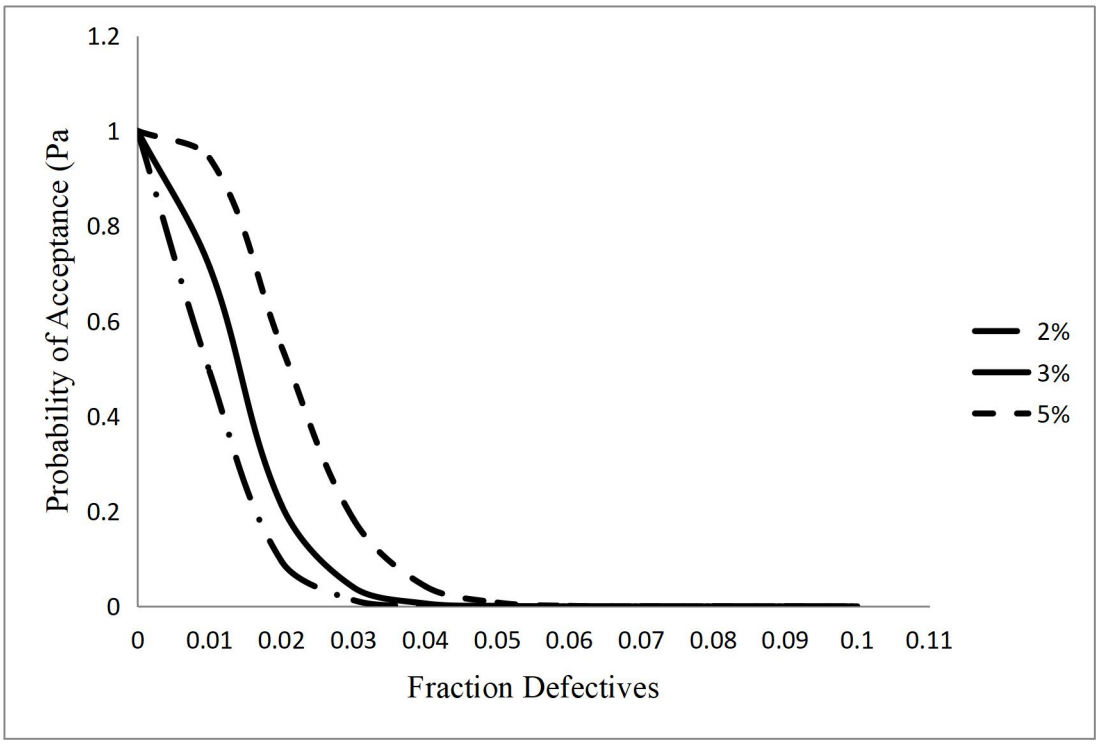

Figure 4.9: Operating Characteristic Curve for Table Water A

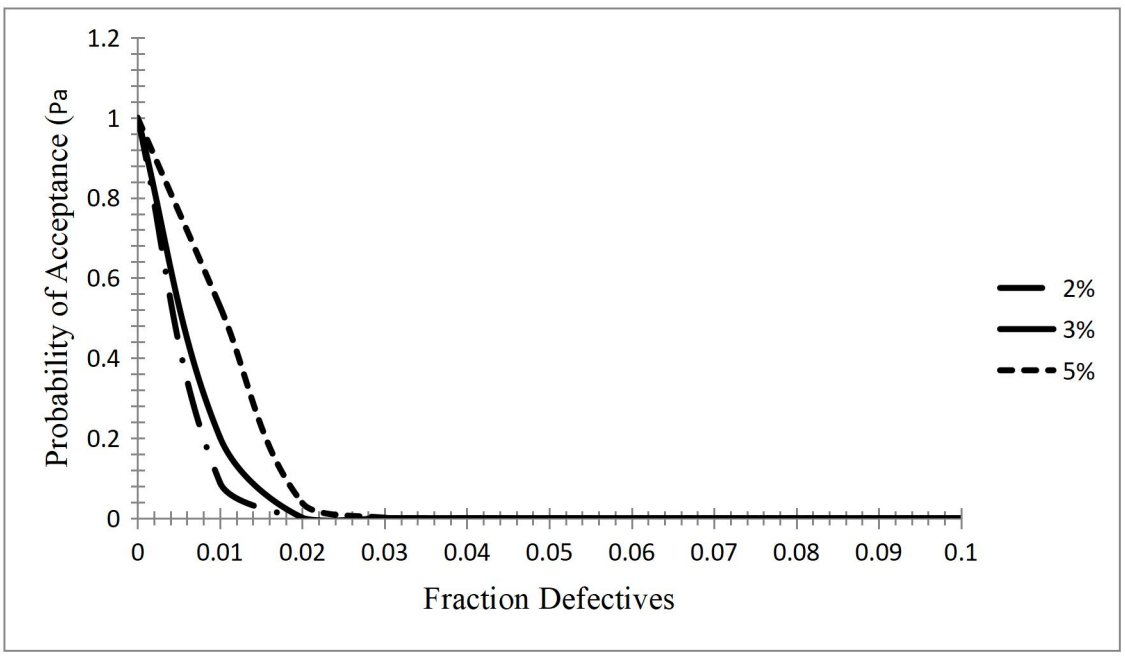

Figure 4.10: Operating Characteristic Curve for Table Water B

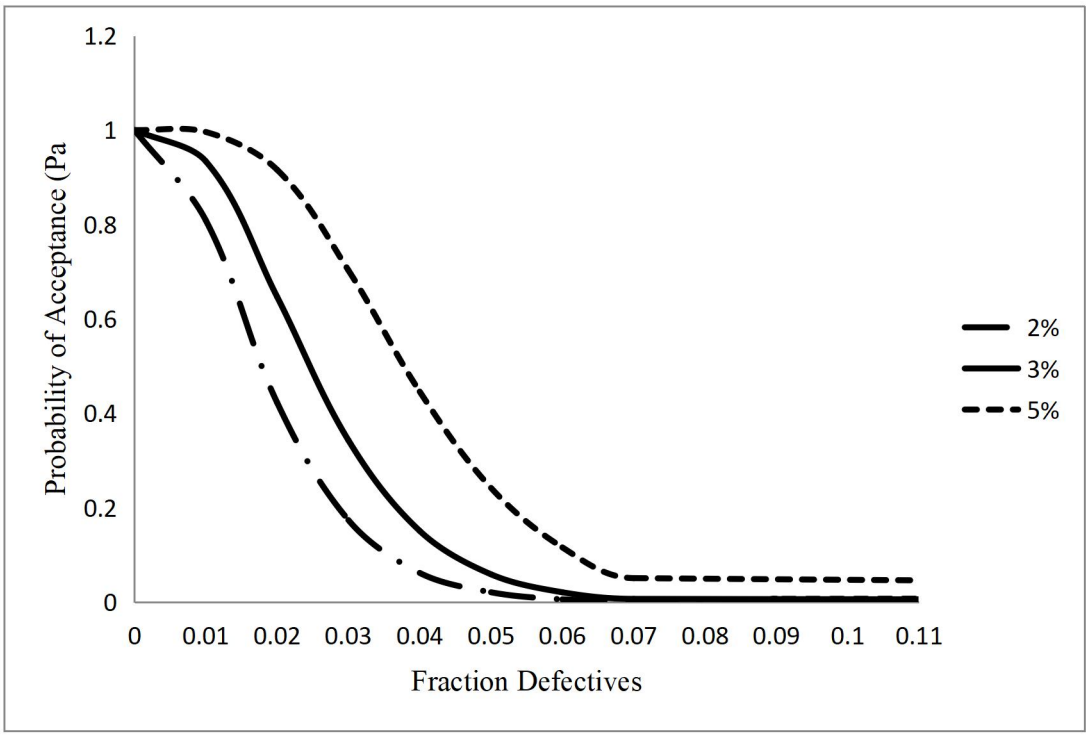

Figure 4.11: Operating Characteristic Curve for Table Water C

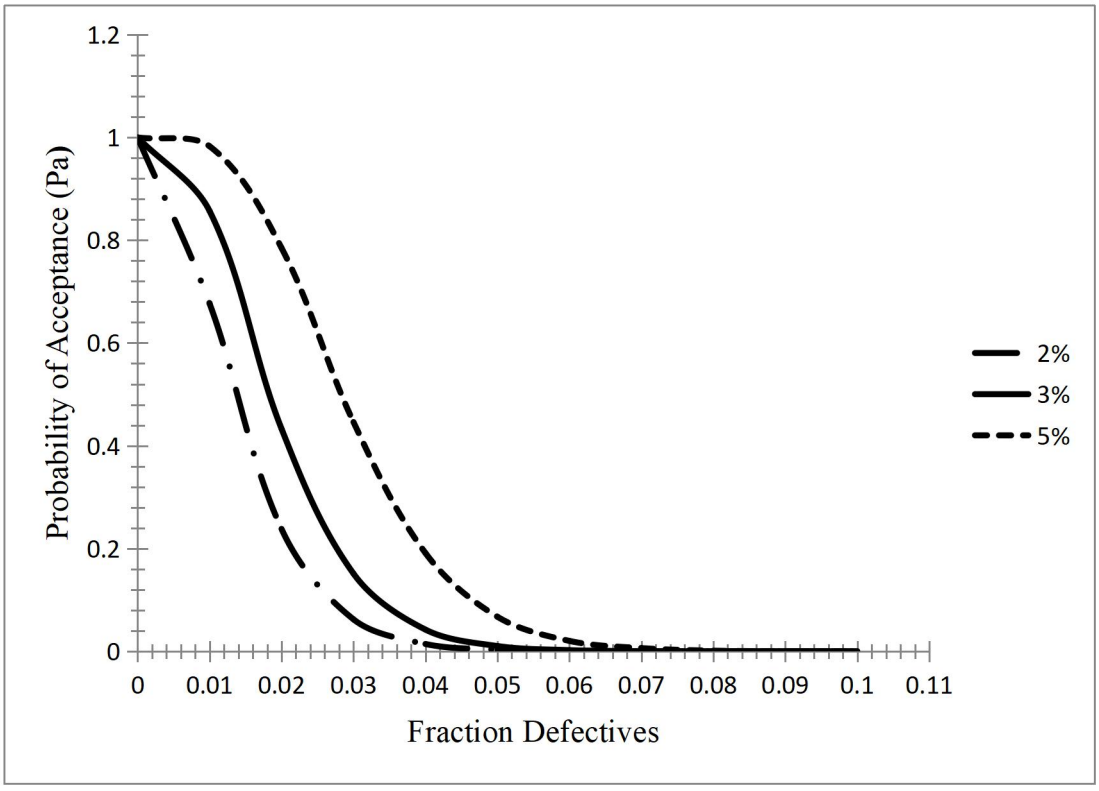

Figure 4.12: Operating Characteristic Curve for Table Water D

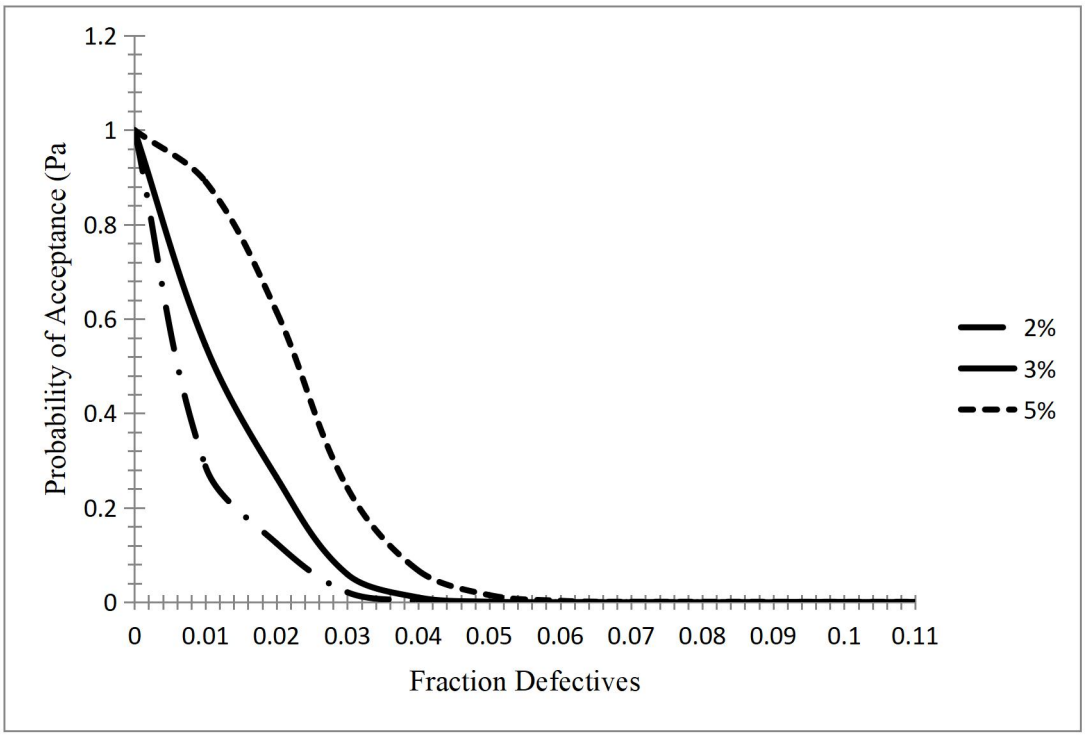

Figure 4.13: Operating Characteristic Curve for Table Water E

The plot of the AOQ values for each case studied company are shown in Figures

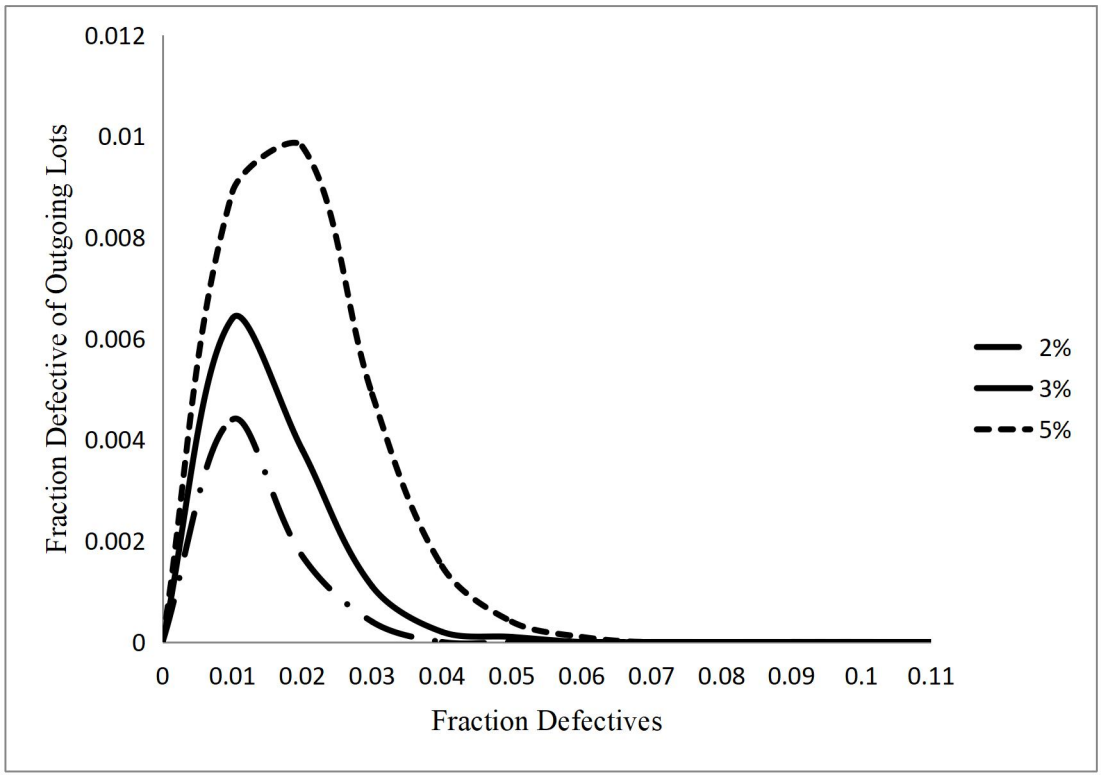

Figure 4.14: Average Outgoing Quality for Table Water A

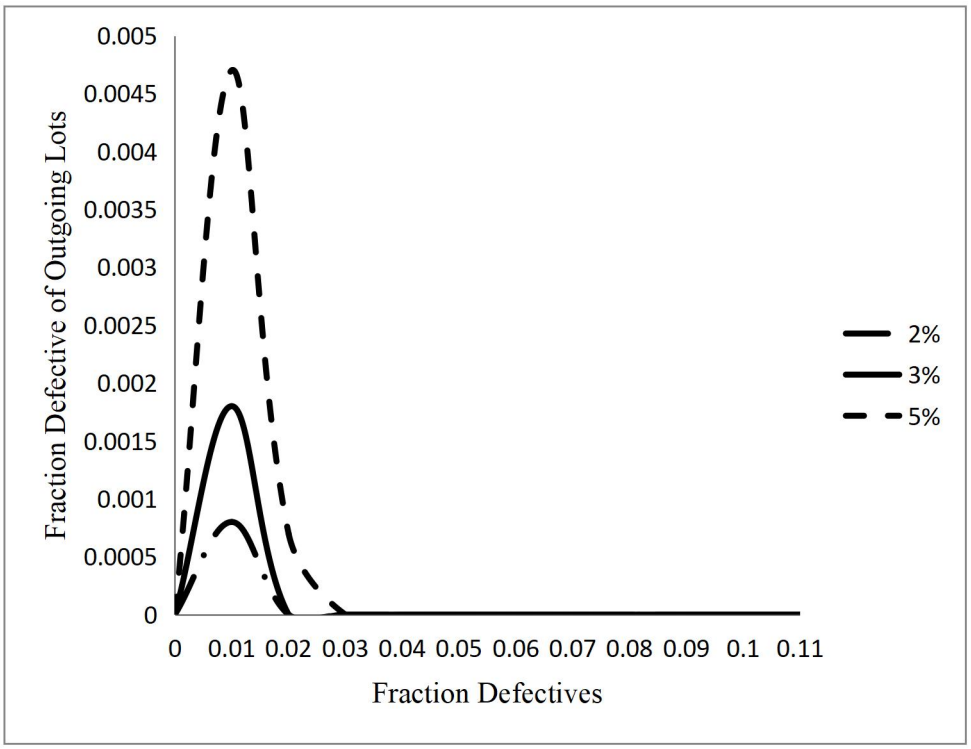

Figure 4.15: Average Outgoing Quality for Table Water B

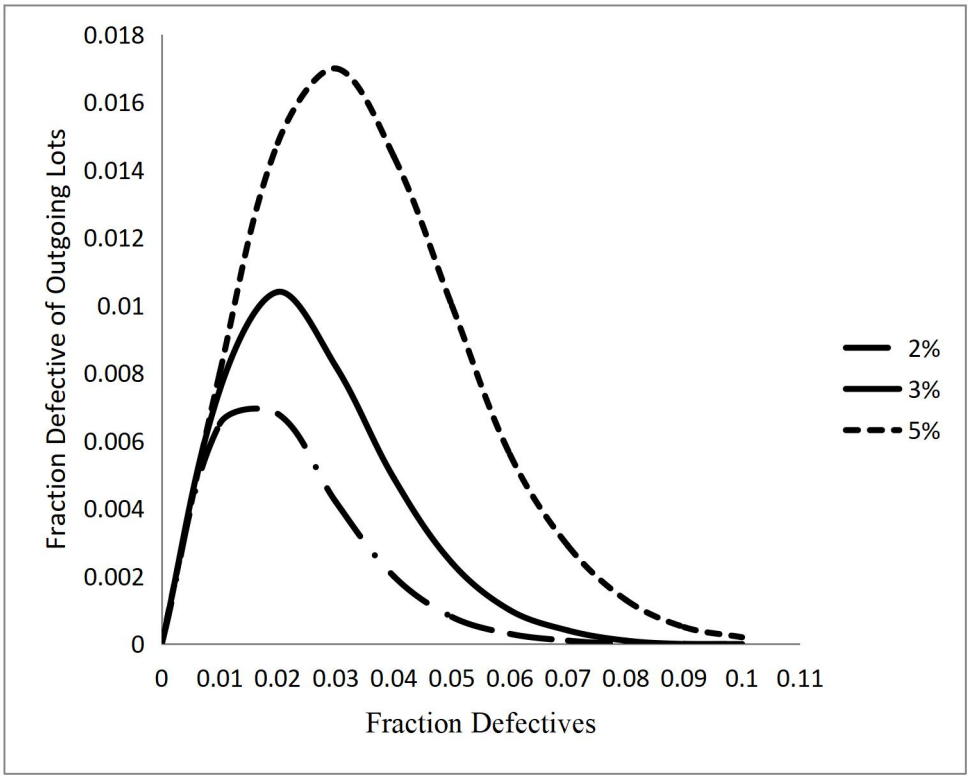

Figure 4.16: Average Outgoing Quality for Table Water C

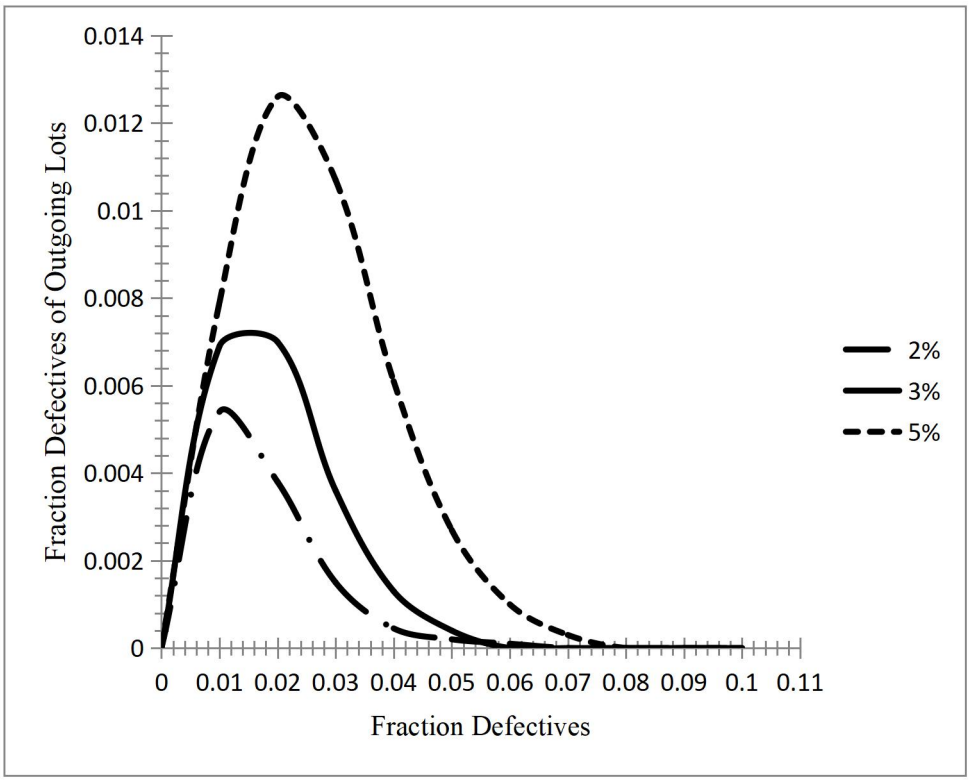

Figure 4.17: Average Outgoing Quality for Table Water D

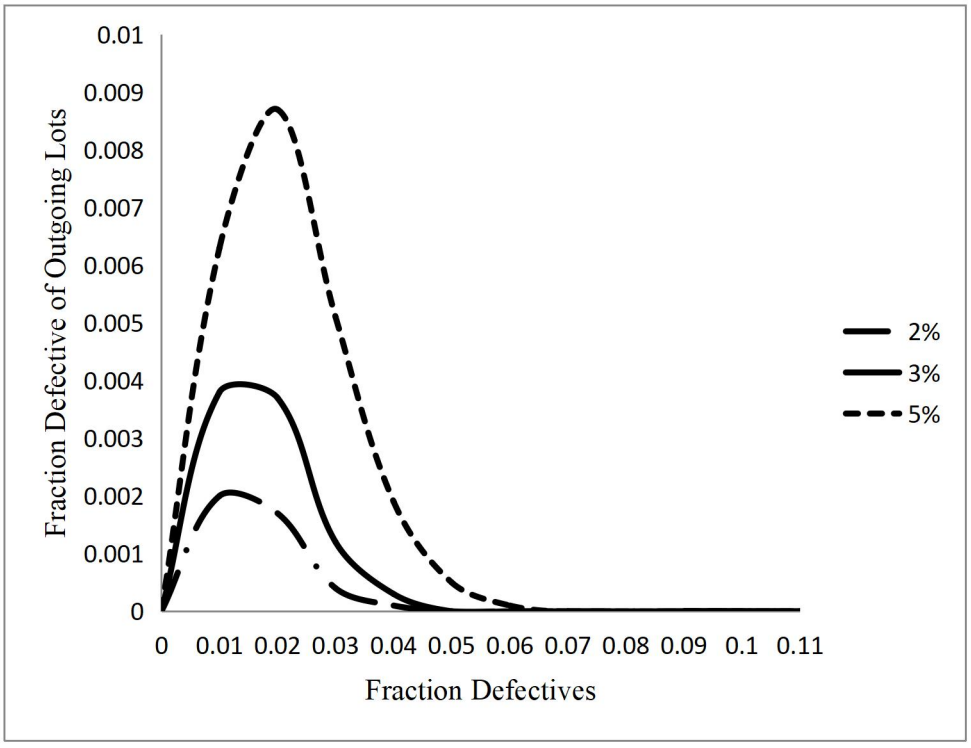

Figure 4.18: Average Outgoing Quality for Table Water E

Table 4.10: Parameters of Operating Characteristic Curve and Average Outgoing Quality

Table Water	LTPD			AQL			AOQL(Fraction Defect)		
	2%	3%	5%	2%	3%	5%	2%	3%	5%
A	0.001	0.006	0.042	0.506	0.286	0.057	0.0044	0.0064	0.0098
B	0.089	0.202	0.529	0.911	0.798	0.471	0.0008	0.0018	0.0047
C	0.001	0.002	0.02	0.191	0.066	0.004	0.0068	0.0104	0.0170
D	0.001	0.002	0.02	0.323	0.143	0.017	0.0055	0.0070	0.0126
E	0.003	0.01	0.067	0.712	0.456	0.109	0.0017	0.0037	0.0087

From Table 4.10, the optimum inspection acceptable defect plans so that the plan has to be accepted by both the producer and consumer of the supplied lot. The supplier's risk of rejecting good quality lots are called producer's risk (α). The producer's risk (α) is the risk that the acceptable plan will fail to verify a sampling lot's quality and, thus, most often the producer's risk is set at 0.05, or 5%. The probability of accepting a lot with LTPD quality is the consumer's risk (β). The set value for the consumer's risk is 0.10, or 10%.

The acceptable quality level (AQL) for quality supplied lots and the lot tolerance percentage defective (LTPD) for low quality acceptable defective are calculated and tabulated in Table 4.10, at different sample sizes, n = 270, 550, 150,200 and 250 for Table Water A, B, C, D and E, respectively. Table 4.10 results indicated that all

consumer's risk for all acceptable defectives falls within the common value, while the producer's risk for acceptable defective falls outside the common value except for Table water C and D at 5% acceptable defectives. The AOQL values are found to increase with increasing acceptable defectives at a constant sampling size.

According to Sadiq and Adeyemi (2012), both the AOQ and LTPD values decrease with increasing sample size at a constant acceptable defectives c. Also, AOQL values are found to increase with decreasing sample size at a constant acceptable defective.

4.8 Assessment of Sachet Water Production Flow

The researcher was afforded the opportunity to observe the procedures used by the case studies. It was found that the case studies basically used similar production processes with a few minor variations. The proposed framework developed thirteen (13) production process steps for QCM. These steps can be grouped under three stages which are; raw material, treatment and packaging.

4.8.1 Stage 1: Raw material

The raw material stage is further classified into the following;

Step 1: Water Source

This serves as the place where the raw water is gotten from, either be a well, borehole, water board and municipal supply. Common method of receiving water will be through stainless steel pipeline or tankers.

Step 2: Water Storage

Water from the source is been stored.

4.8.2 Stage 2: Treatment

This stage is classified into the following;

Step 3: Ozonisation

It is a chemical water treatment technique based on the infusion of ozone into water. Ozone is a gas composed of three oxygen atoms, which is one of the most powerful oxidants. Ozone is highly reactive form of oxygen used to disinfect water. It settles the germs.

Step 4: Activated Sand Filtration

These filters are typically used to remove suspended solid substances that cause turbidity from water. Their activity is basic and comprises in enabling water to pass through several layers of quartzite (sand) and, potentially, a layer of anthracite. The water goes through the sifting part, moving in the top-down direction, and during the procedure the substances held on the principal upper layer of sand increment filtration effectiveness in the subsequent layers. It helps to remove water particulars and Impurities.

Step 5: Activated Carbon Filtration

Normal carbon from different sources (natural or inorganic) can be actuated by methods for a procedure which comprises in making moment gaps inside granules. This procedure happens inside exceptional heaters with infusions of high temperature steam. The main advantages circumstances of this kind of carbon are retention through their porosity of specific sorts of particles and, as extra advantage, mechanical filtration with results like those acquired with sand filters. With such limit,

actuated carbon filters are utilized in different fields, especially in water purification. In this specific circumstance, their motivation is to:

(i) Remove chlorine

(ii) Eliminate undesirable smells and tastes

(iii) Remove organic pollutants

(iv) Take into consideration filtration as extra advantage.

Step 6: Reverse Osmosis

It is a process that uses a somewhat penetrable film to evacuate particles, undesirable molecules and big particles from drinking water. In reverse osmosis, an applied pressure is utilised to conquer osmotic pressure and colligative property that is driven chemical potential differences of the dissolvable. The outcome is that the solute is held on the pressurised side of the layer and the pure dissolvable is permitted to go to the other side. It Removes hard odour, that carbon filter can not remove.

Step 7: Ultraviolet (UV) Light

In UV water sterilisation systems, water goes through a reactor where a solitary or different UV lamp(s) are arranged. Any pathogens in the water are then deactivated by the UV energy that infiltrates the pathogen's external cell film, going through the cell body, disturbing the genetic core and eliminating its capacity to imitate. Sanitizing water with UV light is simple, effective and environmentally safe. UV treatment does not change water chemically. Nothing is included aside from vitality, which means it very well may be utilised over a scope of applications and industries. It removes germs and also sterilizes the film roll.

Step 8: Treatment Tank

Water is received into treatment tank for availability water and pump out into micro-filtration through the help of pumping machine. This is absent in Table Water E.

Step 9: Micro-Filtration

Microfiltration is a type of physical filtration process where a tainted liquid is passed through a unique pore-sized layer to isolate microorganisms and suspended particles from process fluid. It is usually utilized related to different other detachment processes. Micro-filters used are listed as follows in micro meters (μm):

(i) Five micro-filter, track and remove any particles that escape the sand filter.

(ii) One micro-filter, track and remove any particles that escape the five micro-filter.

(iii) 0.5 micro-filter, remove any particles that escape five and one micro-filters.

(iv) 0.5 micro carbon, remove any odour that escape from activated carbon filter.

There is absence of 0.5 micro carbon in all the case studies processes, Table Water C. Also must make use of 5 micro-filter and 1 micro-filter only to remove particles.

4.8.3 Stage 3 Packaging

Packaging stage is also further classified into;

Step 10: Sealing Machine

The sachet machine can be used to package different types of liquid products other than water, including sauces, soft drinks such as juice, milk, as well as some chemical products. The plastic films used in the machine are bought as single-sheet rolls.

The main parts of the machine include:

(i) The bag-forming devices that fold the polythene bags used for sachet water before the bags are heat-sealed;

(ii) The sealing devices, which seal the bags first vertically and then horizontally after filling with water;

(iii)The filling and metering devices that fill the bags with water and monitor flow;

(iv) A UV disinfection bulb that disinfects the inner plastic film used to package sachet water, and;

(v) An automatic counter that registers the number of bags produced.

The required volume can be obtained by either adjusting the length between the horizontal seal, or using an appropriate film width. The films can be purchased in varying widths of 180mm, 240mm, 320mm, or 360mm. The sachet machine is able to print the date of production on sachets produced. Before operating the machine, the vertical sealing temperature is adjusted to 120ºC -140ºC and the horizontal sealing temperature to 170ºC -230ºC, depending on the type of film material used and its thickness. Higher temperatures, than the given range, may damage the sealers. It is founded in the production room.

The machine preparation procedure, which involved loading the polythene rolls used for packaging. The machine preparation was done after backwashing the filtering units. The filter units are backwashed every day and the cartridges changed after 1 to 3 months. To operate the sachet machine, pre-printed films in the form of high-density polyethylene (HDPE) rolls were loaded to central shaft of the machine and secured in the “adjusting device for film roller”. The pre-printed rolls generally had the name of the sachet water product, product logo, registration numbers and authorization marks and other features to fit the labeling requirements. The rolls will

then be locked in place, and a small length pulled from the back to the front of the machine.

The extended length will be folded onto the base board of the bag-former. An additional length of roll, of about 0.5m, will be heat-sealed longitudinally as, and the lower end sealed transversely using the vertical sealing and horizontal sealing devices respectively. The length below the transverse seal will then be adjusted by trimming the ends manually with a pair of scissors. The machine will then be ready for use.

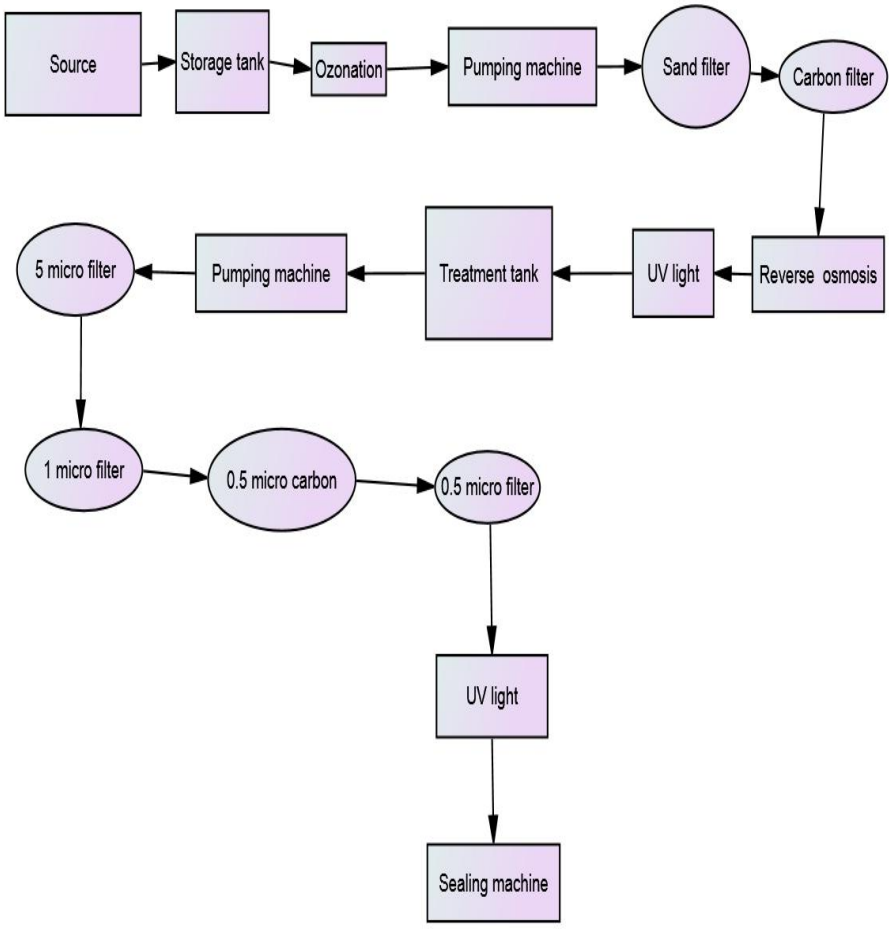

Figure 4.19 Proposed process flow-chart

4.9 Framework for QCM Improvement

The proposed framework consists of five main stages and they are broken down into sub-activities that are conducted to complete every improvement stage. Figure 4.20 shows a detail illustration of the main improvement stages and sub-activities.

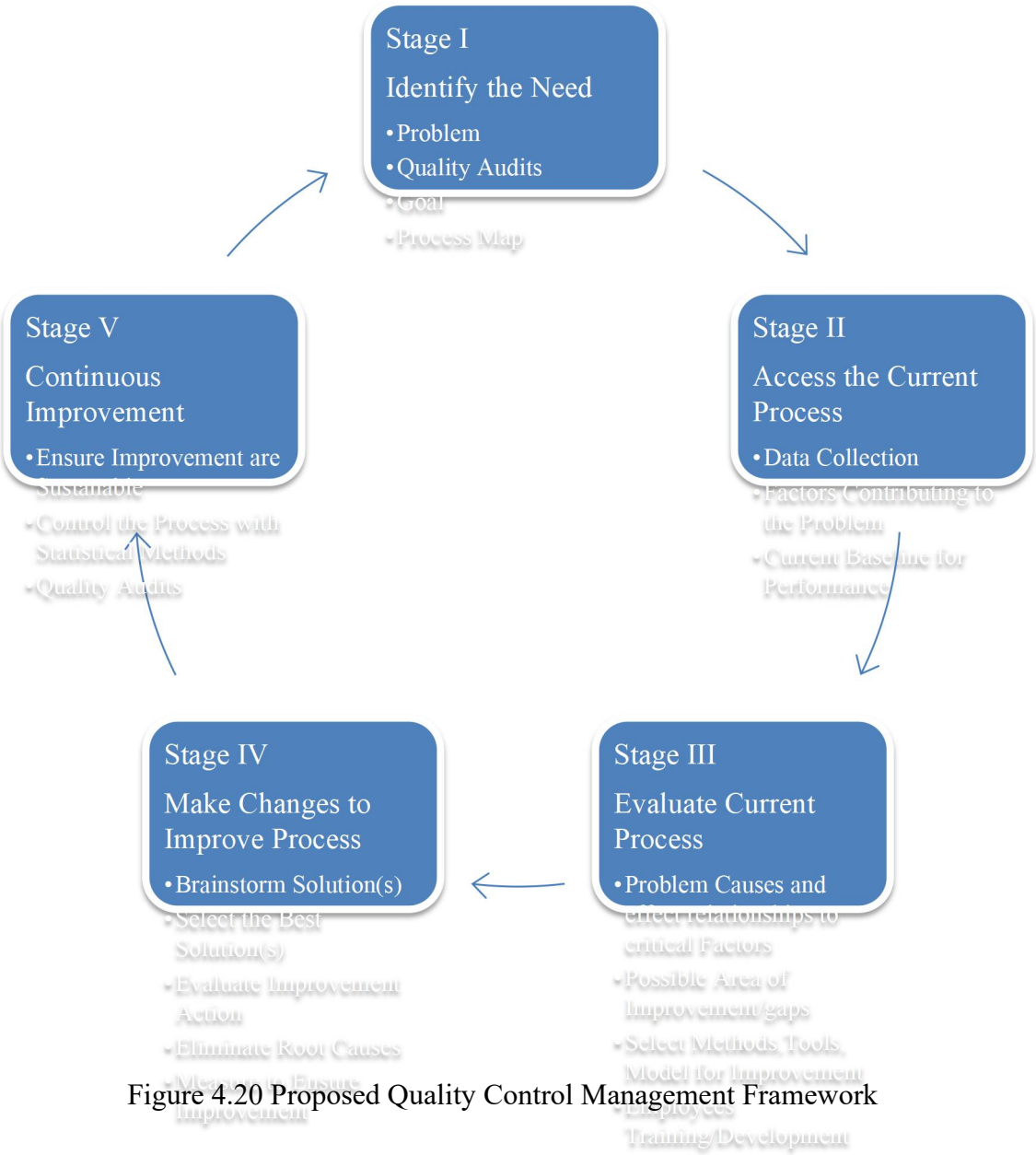

Figure 4.20 Proposed Quality Control Management Framework

4.9.1 Identify the need

This is the first stage of the framework, which aim is to identify the needs of an organisation with respect to quality systems. For this stage, an organisation should develop a clear understanding of QCM requirements and then compare them using gap analysis tool to determine organisational needs. During this stage an organization can assess the stronger as well as weaker areas within the organisation. It is based on the definition and understanding the level of company's QCM and the assessment and identify the important and opportunities for improvement in its core business processes. In this stage the project team creates a Project Charter, a high-level map of the process and begins to understand the needs of the customers.

The aim of this stage can be reached by first define the problem statement, guided by the voice of customer and current process. This is the first step of the processes improvement effort, problems that occurred in the company are clarified and made clear. Problems should be collected from three sections of the company that is the treatment section, production section and packaging section and also form consumers. This can be achieved through Quality Audits. Quality audits are a mandatory activity that needs to be performed in order to comply with requirements from customers. Quality audits help organisations to monitor and assure that a QCM is in place and working effectively. It provides further information about the QCM and organisation's business processes, particularly whether they comply with the required standards. The framework suggests first-party audits as the easiest and most efficient type of audit to perform when this activity is integrated into the QCM and business processes diagnostic. In addition, by the end of the quality auditing process, the

assessment team members would have acquired an overall picture of the status of the organisation's QCM and business processes. This will also facilitate the reporting and debriefing of such status to top management. Finally, a visual representation of the flow of process will be developed. It shows the series or sequence of events from start to end, for instance from raw material to final product.

4.9.2 Access the Current Process

This is the second stage of framework which quantify the problem. How does the process currently perform? Or in other words, what is the magnitude of the problem? Measurement is critical throughout the life of the project. As the team starts collecting data they focus on both the process as well as measuring what customers care about. The better the data, the better this system perform that means initially there are two focuses: reducing lead time and improving quality. In the Measure stage, the team refines the measurement definitions and determines the current performance or the baseline of the process.

Another important activity performed in this stage is measurement system analysis, which is used to find out the reliability of the data being used in process. After the process is over, the probable causes of error are then identified using different root cause analysis tools and techniques along with graphical analysis.

4.9.3 Evaluate Current Process

At this stage, current process is valued by identify the cause of the problem. What is causing the problem? Analyze the factors contributing to the problem in order to identify the root causes for the critical factors impacting performance and prioritize those root causes. The idea is for teams to brainstorm potential root causes (not solutions), develop hypotheses as to why problems exist and then work to prove or

disprove their hypotheses. The preferred Methods, Tools and Models for Improvement will be brainstormed. Models refer to those non-prescriptive standards that show organisations the criteria or characteristics of business excellence or those required in satisfying their customers' expectations. Examples of models include the EFQM, Malcolm Baldrige, Deming, or Quality Management Standard such as ISO 9000, British Standards, QS-9000, among others. On the other hand, those approaches that provide organisations with a philosophy for improving different aspects of their business operations and products are considered method. This category includes main approaches such as Lean manufacturing, Six Sigma and TQM, which explicitly indicate how organisations can improve different aspects of their businesses. Organisational factors such as needs, cost-benefit, resources, and capabilities should be consider as part of the selection criteria to choose the right models, methods and tools. To evaluate and select the right models, methods or tools and to perform a cost-benefit analysis, an organisation must have a strong and committed leadership who can make effective decisions.

The new development will be communicated to all employees and also the will be trained educated on it. This step of the framework proposed also focuses on the understanding of the resources that are required to improve the shortlisted approaches. An organisation's resources lie in their intangible and tangible assets such as production facilities, raw materials, cultures, technological knowledge, patents, and human capital.

4.9.4 Make Changes to Improve Process

Once the project teams have determined the root causes it's time to develop solutions. The Improve stage is where the team brainstorm solutions, pilots process changes,

implements solutions and lastly, collects data to confirm there is measurable improvement. A structured improvement effort can lead to innovative and elegant solutions that improve the baseline measure and ultimately, the customer experience.

Once identified, the implementation of the models, methods and tools that will form the QCM is of a major importance for organisations. The significance of improvement is also important from an organisation's strategy viewpoint. In the strategy making process, organisations also have to make sure that whatever strategy they are going to adapt must be well executed, as their organisational performance hinges on how well their strategy has been executed. With the understanding that proper execution is a much needed requirement for the intended benefit of QCM improvement. There are several factors that pose substantial challenges to the management of an organisation. For example, organisations need to have a decisive leadership who can take instant and effective decisions, as failure to do so can completely jeopardise the QCM improvement. Empowering employees, improving processes, instituting a quality-oriented culture, and promoting teamwork practices are also some of the other challenges that an organisation has to overcome.

4.9.5 Continuous Improvement

This is the final stage of the frame which is focus on progressive improvement on the solution, once the improvement program has been achieved. Now that the process problem is fixed and improvements are in place, the team must ensure that the process maintains the gains. In this stage the team is focused on creating a Monitoring Plan to continue measuring the success of the updated process and developing a Response Plan in case there is a dip in performance. QCM must be maintained to reap benefits. Organizations must devise a plan to successfully maintain the QCM. Regular customer satisfaction levels must be measured for both internal and external

customers (Quality Audit). QCM can also be maintained using corrective and preventive action procedures, internal audits and management review meetings. Every nonconformance identified during maintenance of QCM must be corrected before planning for QCM expansion to other company processes. Lessons learned during this stage should also be documented as a reference for future expansion.

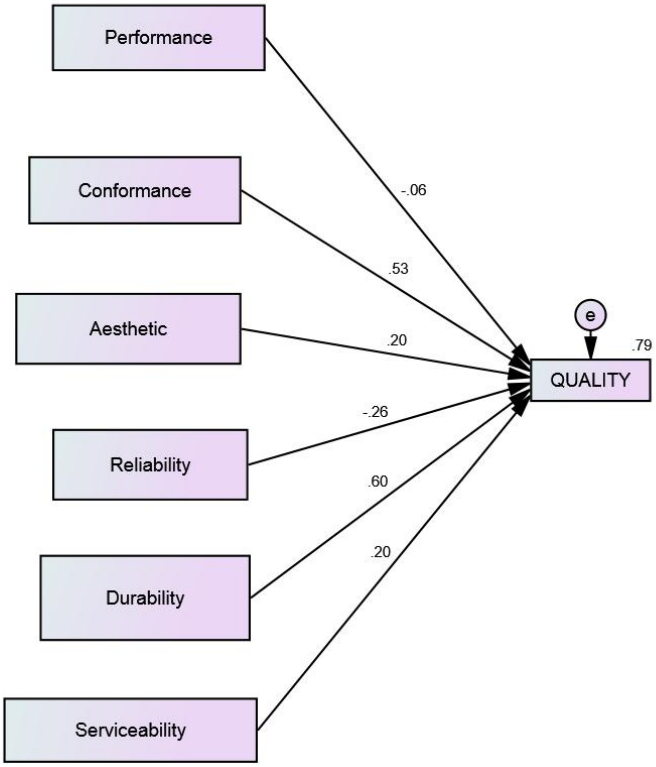

Figure 4.21 Structural Equation Modeling

Table 4.11: Computation of Parameters

Parameters	Values
Number of distinct sample moments	28
Number of distinct parameters to be estimated	13
Chi-square	25.5
Degrees of freedom	15
Probability level	0.041

The model show the Standardized Regression Weights, when each variable goes up by 1 standard deviation, Quality goes down by values corresponds to each variable by standard deviations. For example, when Performance goes up by 1 standard deviation, Quality goes down by 0.064 standard deviations. It is estimated that the predictors of Quality explain 79.5 percent of its variance. In other words, the error variance of Quality is approximately 20.5 percent of the variance of Quality itself. From the computation, the Probability level (p-value) is less than 0.05 (5%), indicated that the framework is accepted. The departure of the data from the model is significant at the 0.05 level. Based on Chi-square (X^2) value (25.5), which is within the table value, implies the framework is accepted.

4.10 Summary of Findings and Contribution to Knowledge

The research discovered the following;

(a) Based on consumers perception, Table Water B is perfered than others. They have larger market shares than other selected sachet water companies.

(b) Quailty Experience to sachet water companies about packaging is good

(c) Inadequate traning or education concerning quality control management of sachet water for employees and distributors/retailers.

(d) The quality control chart is under control, which indicate that there is improvement in QCM of sachet water in selected sachet water compamies.

(e) The percentage defectives products is 2.9%, while non-defectives is 97.1%.

(f) Customers requirement serve as Quality Auditing, for QCM Framework. They are very important in QCM framework.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

The study sought to assess QCM as an appropriate strategy to improve the performance of Minna's sachet water company. In achieving this aim, consumers, employees of sachet water companies and retailers/distributors of sachet water products were surveyed to investigate into the existing quality control management systems and make appropriate recommendations for enhancement in order to improve the performance of companies.

5.1 Conclusions

The result of this research has shown that:

The quality control management of the selected sachet water companies are good.

Quality control chart of defects are all under control, which showed that there is an improvement in packaging.

This study proposed a framework to improve quality control management system of sachet water companies.

5.2 Recommendations

In perspective on the findings of the study, the accompanying suggestions have been made to help improve quality control management within the sachet water company:

(a) The supervisory group must understand that the management of quality requires both spotlight on longer-term vital initiative and everyday operational management.

(b) More experience quality control management professionals ought to be engaged with the basic leadership of the companies.

(c) There ought to be all the more training and advancement combined with workshop ought to be set up for the employees to make them progressively successful and proficient in their work.

(d) Government still needs to engage the SMEs in the nation by redirecting some fund to the industry with the goal that they will be increasingly productive.

(e) Quality management practice ought to be encouraged in all the organisations, with the goal that it will be notable to many individuals.

(f) Quality authorities from the NAFDAC should pay increasingly normal visits to the organisations and give direction to quality procedures.

5.3 Contribution of the study to Knowledge

The contribution to knowledge in this research is the proposed empirical quality control management framework for sachet water packaging company. And also determined the producer's and consumer's risk of selected sachet water company.

REFERENCES

Aaker, D. A., & Jacobson R. (1994). The Financial Information Content of Perceived Quality. *Journal of Marketing Research* 31(2), 191–201.

Abubakar, U., & Nasir, M.K. (2018). Statistical Process Control of Production: A case study of some Basic Chemical used in Pure Water Production. *Pakistan Journal of Nutrition*, 9(4), 387-391

Agariya, A. K., Johari, A., Sharma, K. H., Chandraul, U. N. S. & Singh, D. (2012),The Role ofPackaging in Brand Communication, *International Journal of Scientific & Engineering Research*, 3(2). 430-433

Aldowaisan, T. A. & Youssef, A. S. (2006). An ISO 9001: 2000-based framework for realizing quality in small businesses. *Omega*, 34(3), 231-235.

Ambrose G. & Harris P. (2011), *Pa c k a g i n g the Brand, The relationship between packaging design and brand identity*. South Africa: AVA Publishing.

Andrle, J. (1994). Total Quality Management in Public Transportation. *Research Result Digest,* 12(5) 1-32

Aniyan, S. (2002). Quality Management System Implementation at KELTEC-A Case Study. *Defense Science Journal*, 52(4), 393-402, doi:10.14429/dsj.52.2196.

Anuonye, J.C., Maxwell, O.M., & Caleb, M.Y (2012). Quality of sachet water produced and marketed in Minna Metropolis, North Central, Nigeria. *Africa Journal of Food Science*, 6(24),583-588, doi:10.589/AJFS12.164

Arcaro, J.S. (1994). The Baldrige Award for Education: How to Measure and Document Quality Improvement. Minneapolis, MN: National Minnesota. Retrieved from ERIC database (ED381076).

Belch E. G. & Belch A.M. (2003). *Advertising and Promotion, An Integrated Communication Perspective,(* 6th ed.). McGraw-Hill.

Berry, T. H. (1991). *Managing the Total Quality Transformation.* New York: McGraw Hill.

Bhuiyan, N., & Alam, N. (2006). A case study of a quality system implementation in a small manufacturing firm. *International Journal of Productivity and Performance Management*,54(3),172-186, doi:10.1108/17410400510584893.

Bialy, W., & Maruszewska, E. W. (2015). Improvement of Quality Management System, Case Study of a Metal Industry Company.

Billich, K. & Neto, A. A. (2000). Total Quality Management: Quality Macro function Model for Banks. *Total Quality Management,* 11(1), 5-15.

Blythe J. (2005), *Essentials of Marketing (*3rd ed.). Pearson Education Limited, London, England. 50-55.

Burnett J. (2008), *Core Concepts of Marketing,* The Global Text Project is funded by the Jacobs Foundation, Zurich, Switzerland. 28-32.

Buzzell, R.D., & Gale, B.T. (1987). *The PIMS Principles:* Linking Strategy to Performance. New York: Free Press. 105-117.

Chen, C.F., Hong, T. & Guo, H.Z. (2017). A Conceptual Framework for Industry 3.5 to Empower Intelligent Manufacturing and Case Studies. *Procedia Manufacturing,* 11(2), 2009-2017.

Chismall, P. M. (1999). *Marketing Research, Analysis and Management* (3rd ed.). USA: Warner Book, 423.

Cho, H., & Pucik, V. (2005). Relationship Between Innovativeness, Quality, Growth, Profitability, and Market Value. *Strategic Management Journal,* 26,555-575.

Crosby, P. B. (1979). *Quality Is Free:* the Art of Making Quality Certain. New York. American Library.

Dada, A.C. (2013). Package water: Optimizing local processes for Sustainable water delivering in Developing Nations. *Globalization and Health,* 7(24), 1-5

Dale, B. G. (1995). A Quality Improvement Framework: Application and comparative analysis. *Total Quality Management*, 6(4), 383-398.

Dale, B.G. (2003). *Managing Quality* (4^{th} ed.) London: Blackwell Publishing, 88.

Dale, B.G. & Boaden, R. (1993). Improvement framework. *The TQM Magazine,* 5(1), pp. 23-26.

Dale, B.G., Boaden, R.J. & Lascelles D.M. (1994). Total Quality Management An Overview*, Managing Quality*. New York: Prentice Hall.

Dale, B.G. & Cooper, C. (1993). *Total Quality and Human Resources in Executive Guide*: Oxford: Blackwell. 45-51.

Daramola, G.O., Kumoluyi, T.A., Edogun, A., Fadeyi, A., & Shittu, A.A. (2019). Evaluation of the Production Process of different Brand of Sachet Water Sold in the Open Market in Ado-Ekiti, Southwest, Nigeria. *Journal of Advances in Microbiology*, 19(1), 1-6, doi: 10.9734/JAMB/2019/v19;130180

David, V. (2002). *Analyzing Social Science Data*. London: SAGA Publication.

Deliya M. M. & Parmar B. J. (2012), Role of Packaging on Consumer Buying Behaviour-Pata District, *Global Journal of Management and Business Research,* 12(10), 49-68.

Deming, W.E., (1986). *Out of the Crisis.* MIT Centre for Advanced Engineering Study, Massachusetts: Cambridge Press.

Deming, W.E. (1994). The New Economics for Industry, Government and Education (4th ed). Prentice Hall. MIT Press.

Djerdjour, M. & Patel, R, (2000). Implementation of Quality Programmes Developing Countries: a Fiji island case study. *Total Quality Management*, 11(1), 25-44.

Dobyns, B. & Crawford, J. (1994) *Organisational Changes and Development:* A System View. California: Good Year Publishing Company.

Dodoo, D.K. (2006). Quality of Sachet Waters in the Cape Coast Municipality of Ghana. *Journal of Environmental Science and Health Part A Toxic/ hazardous substances and environmental engineering*, 41(3), 329-342.

Douglas, C.M. & George, A. (2017). *Introduction to Statistical Quality Control* (6th ed.). John Wiley and Sons Publishers, New York, U.S.A.

Easton, G.S. & Jarrell, S.l. (1998). The Effects of Total Quality Management on Corporate Performance: An Empirical Investigation, *Journal of Business,* 71 (2), 253-307.

Eboh, E. C. (2009). *Social and economic research:* Principles and methods. Enugu: African Institute for Applied Economics.

Eke, A.O. (2001). *SWOT Analysis and Managing Change, in Erurum UJT* (3rd ed.). Managing Service Quality in the Nigerian Public Sector. Enugu: Smart Link Publishers.383-398. doi:10.1080/09544129550035323.

Eriksson, H. (2002). Effects of in company Quality Awards on Organisational Performance. *Total Quality Management & Business Excellence*, 14(2), 235-242.

Essien, O.E. (2014) Comparative Pollution Contribution of Three Point Sources of Pollution to Urban Drainage Stream Degradation, Uyo. *American Journal of Water Resources*, 2(1), 10-17, doi: 10.12691/ajwr-2-1-2

Etuk, R.U., Ekuk, G.R., & Bagheho, M. (2015). Small amd Medium Scale Enterprises and Nigeria's Economic Development. *Mediterranean Journal of Social Sciences*, 5(7), 650-659.

Filippini, R., & Forza, C. (1998). TQM Impact on Quality Conformance and Customer Satisfaction: A Causal Model. *International Journal of Production Economics*, 55, 1-20.

Fornell, C., Johnson, M.D., Anderson, W. E.,Cha, J., & Bryant, B.E. (1996). The American Customer Satisfaction Index: Nature, Purpose, and Findings. *Journal of Marketing*, 60, 7-18.

Garza-Reyes, J. A., Rocha-Lona, L., & Kumar, V. (2015). A conceptual framework for the implementation of quality management systems. *Total Quality Management & Business Excellence*, 26(11-12), 1298-1310.

Ghobadian, A. & Gallear, D. (1997). TQM and organization size. *International Journal of Operations & Production Management*, 17(2), 121-163. doi:10.1108/01443579710158023.

Grazian, A. L & Raulin M.L (2007). A Process of Inquiry. *Journal of E-learning and informing Science.* 3(3), 145-156.

Han, S. B., Chen, S. K., & Ebrahimpour, M. (2007). The impact of ISO 9000 on TQM and business performance. *The Journal of Business and Economic Studies*, 13(2), 1-3.

Hewitt, S. (1997). Business excellence: does it work for small companies? *The TQM Magazine*, 9(1), 76-82.

Ishikawa K. (1985). *What is Total Quality Control? The Japanese Way.*Engelwood Cliffs NJ: Prentice Hall.

ISO, (1986). *Quality-Vocabulary, ISO 8402*. Geneva. International Organisation for Standardization.

ISO, (1994). *Quality Management and Quality Assurance – Vocabulary, ISO 8402*. Geneva. International Organisation for Standardization.

ISO 9001: 2005 Quality management systems. Fundamentals and Vocabulary.

Ittner, C.D., & Larcker, D.F. (1996). *Measuring the Impact of Quality Initiativeson Firm Financial Performance:* In Advances in the Management of Organisational Quality. Greenwich: JAI Press, CT, 1–37.

Izah ,S. C. (2016). A review of the Microbial Quality of Potable Water Sources in Nigeria. *Journal of Advances in Biological and Basic Research*, 1(1), 12-15

Jablonski, J.R. (1992). *Implementing TQM:* Competing in the Nineties through Total Quality Management. New York: Pfeiffer.

Jha, T.L., & Sunand, A.C. (2010). Learning from the Deming Prize Winners in India. *International Journal for Quality Research*, 8(3), 5-12

Jiménez, D. & Costa, M. (2009). The effectiveness of TQM: The key role of organizational learning in small businesses. *International Small Business Journal,* 27 (1), 98-125.

Joshua, Z.P., Joy, E., Goje, E.A., Faith, O., Bala, A.R., & Nafisat, A. (2019). Effect of Storage on the Quality of Selected Sachet Water Produced with Sabon Gari Local Government Area of Kaduna State. *Science World Journal*, 14(2), 131 -136

Juran, J.M. (1989). *Leadership for Quality*: An Executive Handbook: Juran on Planning for Quality. New York: Free Press.

Juran, J.M. (1992). *Juran on Quality by Design New Steps for Planning Quality into Goods and service.* 1st ed. The Free Press: New York. USA. 23.

Juran, J.M. (2010). *Quality Control Handbook* (6th ed.). New York: McGraw-Hill.

Juran, J.M. & Gryna, F.M. (1993). *Quality Planning and Analysis* (3rd ed.). McGraw-Hill, New York, USA.

Kanji, G. K., (1995). *Quality and Statistical Concepts, In Total Quality Management:* Proceedings of the first world congress, London: Chapman & Hill.

Kanji, G. K. (1996). Implementation and Pitfalls of Total Quality Management. *Total QualityManagement.* 7(3), 331-43.

Kaynak, H. (2003). The relationship between total quality management practices and their effects on firm performance. *Journal of Operations Management*, 21(4), 405-435.

Khan M., (2006), *Consumer Behaviors and Advertising Management,* New Delhi: New Age International (P) Ltd. 56-60.

Kim, D., Kumar, V., & Kumar, U. (2011). A performance realization framework for implementing ISO 9000. *International Journal of Quality & Reliability Management*, 28(4), 383-404. doi:10.1108/02656711111121807.

Kothari, I. (2004). *Research Methodology-Methods and Techniquies(* 2^{nd} Ed.). New Delhi: New Age International Limited. 45-88.

Kotler P. (2002). *Marketing Management, Millennium Edition*. New Jersey: Prentice Hall.

Kotler, P. & Keller K. L. (2006), *Marketing Management* (12^{th} ed.). New Jersey: Pearson Education.

Kusaba, I. (1995). *Zensha-tekiHinshitsuKanri to Genba no Yakuwari (Company wide quality management and the role of the frontline operations).* Tokyo: union of Japanese Scientists and Engineers.

Lockwood, G.R., Li P.C., O'Donnell M., & Foster F.S. (1996). Optimizing the Radiation Pattern of Sparse Periodic Linear Arrays, *IEEE Trans*. UFFC, 43(1), 7-14.

Magd, H. A. (2008). ISO 9001:2000 in the Egyptian manufacturing sector: Perceptions and perspectives. *International Journal of Quality & Reliability Management*, 25(2), 173-200. doi:10.1108/02656710810846934.

Manish, A.S. (2017). A Quality Management System Implementation Framework for Management*, Total Quality Management, 20,* 23-30.

Mezher, T., Ajam, M., & Shehab, M. (2005). The historical impact of ISO 9000 on Lebanese firms*. Quality Assurance*, 11(1), 25-42.

Moore, S. L. (1994). Alternative Quality Improvements Practices and Organisation Performance. *International Journal of Trend in Scientific Research and Development,* 12 (1), 27-44

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis*: An expanded sourcebook (2nd ed.). Thousand Oaks, CA: Sage

Mohamed, A.K. & Sameh, M.S. (2018). Development of an Integrated Quality Management Conceptual Framework for Manufacturing Organisations. *Procedia Manufacturing*, 17(8), 587-592

Muffatto, M. & Panizzolo, R. (1995). A Process-Based View for Customer Satisfaction. *International Journal of Quality & Reliability Management*. 12 (9), 154-169.

Musa, D.M., Garba, Y.I., & Ishaq, A. (2018). Assessment of Water Quality for Selected Boreholes and Sachets Water in Maigatari town, Jigawa State, Nigeria. *Bayero Journal of Pure and Applied Sciences,* 11(2), 122-125

NAFDAC (2005). Milk and Dairy Product Regulations. Research Committee Report, No. 90-12-02.

NIST (2001). The Malcolm Baldrige National Quality Award. Milwauke, WI, ASQ Quality Press.

Oakland, J.S., (1995). *Total Quality Management*. Oxford: Butterworth.

Oakland, J.S. (2003). *Total Quality Management text with cases (*3^{rd} ed.). Oxford,: Butterworth-Heinemann.

Okioga, T. (2007). Water Quality and Business: Aspects of sachet-vended water in Ghana. *International Journal of Water Resources Development*, 15(2),72-86.

Omachonu V. K., & Ross J.E., (1994). *Principles of Total Quality*. Delray Beach, Fla: St. Lucie Press.

Ozeki, K. & Asaka, T. (1990). *Handbook of Quality Tools (*1st ed.). Cambridge: Japanese Approach Productivity Press.

Peach, R. W. (1997). *The ISO 9000 Handbook* (3rd ed.). New York: John Wiley & Sons.

Phillips, L.W., Chang, D.R., & Buzzell R.D. (1983). Product Quality, Cost Position, and Business Performance: A Test of Some Key Hypotheses. *Journal of Marketing* 47(2): 26–43.

Poksinska, B., Eklund, J. A. & Dahlgaard, J. J. (2016). ISO 9001-2000 in small organisations. *International Journal of Quality & Reliability Management*, 23(5), 490-512. doi:10.1108/02656710610664578.

Richard, A. I. (2009). Measuring Organizational Performance: Towards Methodological Best Practice. *Journal of Management,* 23-25.

Rumelt, R.P., Schendel, D. & Teece, D. (1994). *Fundamental Issues in Strategy*. Cambridge: Harvard Business School Press.

Sadiq, I.O., & Adeyemi, M.B. (2012). Quality Control in a typical water Packaging Industry. *International Science Press,* 3(1),17-21**.**

Sangwan, S.K., Digalwar, A.K. & Bhakar, V. (2018). Sustainability Aassessment Framework for Manufacturing Sector. *Procedia CIRP*,69,248-253. doi:10.1016/j.procir.2017.11.101.

Sarkar, A. (1998). Implementation of ISO 9000 in a textile mill. *Total Quality Management*, 9(1), 123-131.

Saumyaranjan, S., & Sudhir, Y. (2018). Total Quality Management in India Manufacturing SMEs. *Procedia Manufacturing*, 21(8), 541-546, doi: 10.101/j.promfg.2018.02.155

Schumacker, R.E. & Lomax, R.G (2017). *A Beginner's guide to Structural Equation Modeling.* Mahwah, NJ: Lawrence Eribaum Associates.

Stahl, M.J. (1995). *Management: Total Quality in a Global Environment, Blackwell Business*. Cambridge, Massachussetts. 60-83.

Stake, R. (1995). *The Art of Case Research*. Thousand Oaks, CA: Sage Publications.

SON (2007). Nigerian Standard for Drinking Water Quality. Retrieved October 4, 2019 from https://www.son.gov.ng/son-mandate

Su, C. T., Li, S. C. & Su, C. H. (2003). An Empirical Study of the Taiwan National QualityAward Causal Model. *Total Quality Management Business Excellence*. 14, 875-893.

Talapatra, S., Uddin, M. K. & Rahman, M.H. (2018). Development of an Implementation Framework for Integrated Management System Based on the Philosophy of Total Quality Management. *American Journal of Industrial and Business Management*, 8, 1507-1516. doi.org/10.4236/ajibm.2018.86101.

Taylor, W. & Wright, G. (2003). A longitudinal study of TQM implementation: factors influencing success and failure. *Omega*, 31(2), pp.97-111.

Uche, G.A. & Dapper, E.M. (2017). The Nexus of Production Quality Control and the Performance of Sachet Water Firms in Bori, River State. *International Journal for Research in Business, Management and Accounting*, 2(3), 2455-2460

Umar, M., Kambai, J., Murtala, I., & Mohammed, I.B. (2019). Bacteriological Quality Assessment and Antibiogram Profile of Bacteria Associated with Sachet Drinking Water Sold at Zaria, Northern, Nigeria, *International Journal of Hematology*, 2(2), 2-7, doi: 10.9734/IJPR/2019/47384

Upadhaya, B. (2014). Association between Performance Measurement Systems and Organisational Effectiveness. *International Journal of Operations & Production Management, 34(7), 21-25.*

Valentine, S. & Barnett, T. (2002). Ethics Codes and Sales Professionals' Perceptions of Their Organizations' Ethical Values, *Journal of Business* 40, 191–200.

Venkatraman, N. & Ramanujam, V. (1986). Measurement of Business Performance in Strategy Research: A Comparison of Approaches. *Academy of Management Review,* 11, 801-814.

Watson, M. A., & Gryna, F. M. (2001). Quality culture in small business: four case studies. *Quality Progress*, *34*(1), 41.

Williams, J. A. (2004). The impact of motivating factors on implementation of ISO 9001: 2000 registration process. *Management Research News*, 27(1), 74-84.

Yang, C. (2017). *The Integration of TQM and Six Sigma INTECH.* London: Gen Access Publisher.

Yin, R. K. (2003). Case Study Research: Design and Methods (3^{rd} ed.). USA. Sage Publications, Inc.

Yusof, S. M., & Aspinwall, E. (2000). Total quality management implementation frameworks: Comparison and review. *Total Quality Management*, 11(3), 281-294. doi:10.1080/0954412006801.

Yusuf, Y.O., Jimoh, A.I., Onalapo, E.O. & Dapo, O.Y. (2017). An Assessment of Sachet Water Quality in Zaria Area of Kaduna State, Nigeria. *Journal of Geography and Regional Planning*, 8(7), 174-180, doi: 10.5897/JGRP2017.0501

Zabel, D., and Avery, C. (2002). *The Quality Management Source book*: An International Guide to Materials and Resources. London: Routledge.

Zeng, S. X., Tian, P., & Tam, C. M. (2007). Overcoming barriers to sustainable implementation of the ISO 9001 system. *Managerial Auditing Journal*, 22(3), 244-254.

Zhang, L. (2016). Developing A Model Of Quality Management Methods And Evaluation Their Effects On Business Performance, *Total Quality Management*, 11 (1), 129-137.

APPENDIX A

QUESTIONNAIRE

ASSESSMENT AND DEVELOPMENT OF QUALITY CONTROL MANAGEMENT FRAMEWORK FOR WATER PACKAGING INDUSTRY

These questions are designed to supply answer to research problems. The exercise is purely academic and answers given would be treated as confidential. Kindly indicate your answer by ticking a good in the box ☐

Thank you.

Yours faithfully,

Bolaji Tolulope James

A.1 ABOUT BRAND MANAGEMENT IN CASE STUDY COMPANY

SECTION A: Brand Management

1. Name _____
2. Sex: Male Female
3. Years of experience _____
4. Qualification _____
5. What is your current position in your firm? _____
6. Company name?
7. How many years has the brand been in existence?
8. Who initiated this particular brand?
9. What role was played by upper management in establishing and managing the brand of the product?

10. Were there any problems introducing the brand into the market?
11. What improvements have been made to the brand over the years?
12. How do employees view this brand among others?
13. Describe the impact of the brand on company's overall performance i.e. competitive advantage, growth, productivity, profitability, production cost, customer satisfaction, loyalty and perception, market share, etc.
14. Do you think the regulatory agencies (SON and NAFDAC) are doing enough to ensure sustainability of quality best practices in the packaging industry where sachet water sector is identified?

Employee Relations

15. How many people does your company employ?
16. Describe the relationship between management and employees.
17. What incentives and welfare policies have been put in place for employees?
18. Are they adequate and, what more do management intend to do for employee welfare?

Employee Training and Empowerment

19. What specific programs are organized and how often?
20. Are employees made part of decision making?
21. Are employees adequately compensated?

Business Model

22. Who are your target customers?

23. Do you employ the services of distributors and retailers?

24. If yes, what criteria do you use in selecting your distributors?

25. What is the relationship between the company and the distributors?

26. Do you monitor the distributors and retailers?

27. Do you organize training programs for the distributors, retailers and vendors?

28. If yes, how often and how effective are these training programs?

SECTION B: Effective Quality Control Management Practices

Indicate the level of satisfaction for each question with the following descriptions **(**Please Tick (√) the correct answer)

Very Good [VG], Good [G], Average [A], Below Average [BA], Poor [P], Very Poor [VP]

Table A.1: Effective Quality Control Management Practices

	QCM Factor	**VP**	**P**	**BA**	**A**	**G**	**VG**
	Executive Commitment						
1.	A top executive decision to commit fully to quality programme						
a 2.	Planning & implementing improvement techniques						
3.	Focus on product quality rather than yield						
4.	Company has an effective quality improvement plan						
5.	Policies and plans are well						

Table A.1: Continued

	QCM Factor	VP	P	BA	A	G	VG
	communicated to the employees						
6	Company has a clear quality policy						
	Customer Focus and Satisfaction						
1.	Inclusion of customer feedback						
2.	Techniques to determine customer satisfaction						
3.	Program to implement customer service						
4.	Actually seeking customer inputs to determine their requirement						
5.	Top management involvement in planning quality						
	Relationship With Suppliers						
1.	Requiring supplier to meet stricter						
	Quality specifications						
2.	Requiring supplies to adopt a quality program						
	Performance Measurement/Benchmarking						
1.	primary consideration of quality in product design						
2.	Getting feedback from technical experts						
3.	Inclusion of customer feedback						
4.	Multi-functional review of product design						
5.	Ensuring benchmark activities						

Table A.1: Continued

	QCM Factor	VP	P	BA	A	G	VG
6.	Company application for recognition						
7.	Utilisation of quantitative techniques in production design						
8.	Utilisation of quantitative techniques in process						
	Employee Empowerment						
1.	Organisation of regular meeting						
2.	Encouragement of employee						
3.	Training on problem solving techniques						
4.	Presence of quality circle						
5.	Incentives to employees						
6.	Integration of training lessons to work processes						
	Continuous Improvement						
1.	System in item segregation						
2.	Records management system						
3.	Cleanliness						
4.	Sign boards and labels						
5.	Programs on waste elimination						
6.	Periodic quality audits						
7	Review of department targets market share						
	Market Share						
2.	Our market share is higher than our competitors after implementation of						

Table A.1: Continued

	QCM Factor	VP	P	BA	A	G	VG
	QCM						
3.	Our customers are more satisfied with our products after implementation of QCM						
	Product Quality						
1.	Before implementing QCM, our firm's level of product quality was high compared with our competitors						
2.	Demand for products has been growing rapidly in the past.						
3.	After implementing the QCM program, our firm's level of product quality is higher compared with other competitor						
	Customer Satisfaction						
1.	After implementation of QCM, customers are loyal, they rarely switch to new firms or competitors						
2.	Before implementing the QCM program, our firm's customers were satisfied.						
3.	After implementing the QCM program our firm's customer satisfaction has improved						

A.2 ABOUT EMPLOYEE EMPOWERMENT AND INVOLVEMENT IN BRAND QUALITY

This questionnaire is for investigating the involvement of employees in achieving product quality. I would greatly appreciate if you would answer these questions which forms part of a graduate student thesis. Thank you very much for your help.

A. (Please tick (√) the correct answer as pertaining to you.)

Personal Information

1. Age:

2. Gender: [Male] _____, [Female] _____.

3. Educational background: [No Education] ____, [Elementary] _____, [N.C.E], _____, [Diploma] _____, [Degree] _____.

4. Company Name: _____

5. Job position (please specify): _____.

Indicate the level of satisfaction for each question with the following descriptions (Please tick (√) the correct answer).

Very Good [VG], Good [G], Average [A], Below Average [BA], Poor [P], Very Poor [VP].

Table A.2: Employees View About Quality

FEATURE	VP	P	BA	A	G	VG
The work in totality						
Working conditions						
Importance of job to you						
Salary and welfare						
Management praise and punishment policies						
Safety conditions and Health insurance						
Possibility of layoff and transfer						
Knowledge of brand promotion practices						
Personal involvement in brand promoting programs						
Incentives for achieving quality targets						
Incentives for creativity and innovation						
Relationship and communication with managers						
Relationship with other employees						
Relationship with customers						
Company policies and administration						
Ability and skill of supervisor(s)						
Assistance by managers with difficult problems						
Suitability of job to your skills/ability/qualifications						
Opportunities for promotion/career advancement						
Participation in making decisions Achievement and recognition						

A.3 ABOUT CONSUMER PERCEPTION OF SACHET WATER

This questionnaire is for investigating consumer view of sachet water products. I would greatly appreciate if you would answer these questions which forms part of a graduate student thesis. Thank you very much for your help.

A. (Please Tick (√) the correct answer as pertaining to you)

Personal Information

1. Age:

2. Gender: [Male] _____, [Female] _____.

3. Occupation: _____ , If a student, please specify level of education: _____

4. Location: _____

Packaged Water Consumption & Purchasing Habits

5. Do you drink sachet water? Answer: YES [ ] NO [ ]

6. Which one of these do you prefer? Answer: [Sachet Water] ____, [Bottle Water] _____, Hand-Tied Sachet Water _____.

7. Which one of these do you normally drink? Answer: [Sachet Water] ____, [Bottle Water] _____, Hand-Tied Sachet Water _____.

8. How many sachets do you normally drink in a day?

9. Where do you normally drink sachet water? Answer: [At Home] _____, [In Public] _____, [Both at home & in public] _____.

10. Where do you normally purchase sachet water? Answer: [From shops] ____, [From vendors by the roadside] _____, [At lorry parks and stations] _____.

11. Which of brand of sachet water do you normally prefer and purchase? Answer: FUTMIN ___, Top Supreme ____, Mutunci ____, Pepper ____, COE Consult _____, others (pls specify) _____.

12. Do you always readily get your preferred choice/brand of sachet water to buy? Answer: YES[ ] NO [ ]

13. In case of non-availability of your preferred choice at the purchase point, do you purchase any other brand available? Answer: YES [ ] NO [ ]

14. Have you ever encountered quality problems with any of the above named brands of sachet water products? Answer: YES [ ] NO [ ]

15. If you answered yes to the above, did you report the problem to the employees of the company concerned? Answer: YES [ ] NO [ ].

16. If you reported the problem, what response did you get and how quick was the response?

……

B. Indicate your level of satisfaction with each of the following features of sachet water products. (Please Tick (√) the correct answer).

Very Good [VG], Good [G], Average [A], Below Average [BA], Poor [P], Very Poor [VP].

Favourite Brand……

Table A.3: Consumers View Favourite Brand Quality

FEATURE	VP	P	BA	A	G	VG
Easy availability of your favourite brand of sachet water						
Price of your favourite brand of sachet water						
Taste of your favourite brand of sachet water products						
Water colour of your favourite brand of sachet water						
Clarity of labelling on your favourite brand of sachet water products						
Overall quality of sachet water products on the market						

Have you ever experienced any of the following?

FEATURE	VP	P	BA	A	G	VG
Presence of bad smell or odour in your favourite brand of sachet water						
Presence of impurities/particles in your favourite brand of sachet water						
Dust particles on the sachet of favourite brand						

A.4 ABOUT BRAND PREFERENCE OF

DISTRIBUTORS/RETAILERS/VENDORS OF SACHET WATER

This questionnaire is designed to determine the rationale behind the choice or trade of certain brands of sachet water by distributors, retailers and vendors. I would greatly appreciate if you would answer these questions which form part of a graduate student thesis. Thank you very much for your help.

A. (Please Tick (√) the correct answer as pertaining to you.)

Personal Information

1. Age:

2. Gender: [Male] _____, [Female] _____.

3. Venture/Business Name: _____

4. Business Type: [Distributor] ____, [Retailer] _____, [Distributor & Retailer] _____ [Vendor] _____, (Other- Please Specify) _____.

5. Location: _____.

Business Aspect

6. How many years have you been in this business?

7. What motivated you to start this business?

_____.

8. How did you raise the start-up capital? Answer: [Personal Funds] ____, [Loan] ____, [Sachet/bottle Water Company Start-up Credit/Stock] _____, [Other- Please specify] _____.

9. How many bags of sachet water do you usually sell in a day? Answer: [Please Specify] _____.
10. Is the sachet water selling business/venture profitable? Answer: YES [ ] NO [ ]
11. Do you sell more than one brand? Answer: YES [ ] NO [ ].
12. Which of these brands do you sell? Answer: FUTMIN ___, Top Surpreme ____, Mutunci ____, Pepper ____, COE Consult _____, Othesr (pls specify) _____.
13. Why do you sell this particular brand(s)? Answer: [High customer demand] _____, [Contract restrictions] _____, [Favourable Purchase Terms from supplier]_____, [Other- please specify] _____
14. Has the company whose products you sell ever given you education or training on hygienic and safe handling of the water products? YES [ ] NO[ ]
15. {For those already in a contract with a particular supplier/producer} Do you also wish to deal in other brands? YES [ ] NO [ ]. Please Explain:

……

16. Have your customers ever complained or expressed quality concerns about the packaged water you sell? YES [ ] NO [ ]
17. If YES, how did you handle the complaint(s) and what was the result? Answer:

……

B. Indicate how you view the following features of sachet water producers and their products. (Please Tick (√) the correct answer). Very Good [VG], Good [G], Average [A], Below Average [BA], Poor [P], Very Poor [VP].

Table A.4: Distributors/Retailers Assessment

FEATURE	**VP**	**P**	**B**	**A**	**G**	**VG**
Frequency of supply of sachet water products						
Frequency of supply of most selling brand						
Relationship with suppliers/producers						
Absence of product defects (e.g. leakages)						
Continuous improvement in products quality over the years						
Producer's response to complaints						
Profitability of business/venture						
Producer's efforts against counterfeit products(imitations)						

Suggestion

1. What would you recommendation that sachet water companies do to improve upon the quality and brand of their products?

……

APPENDIX B

STRUCTURED INTERVIEW

1. What kind of relationship exists between customers and the company?
2. What do you do to keep your customers satisfied?
3. Do you receive complaints and feedback from your customers?
4. How are the complaints and feedback handled?
5. How has consumers' feedback/opinion specifically affected operations or processes?
6. Do you organize training programs to improve the capacity of your employees?
7. Your production processes?
8. What brand quality management strategies do you employ?

APPENDIX C

RECORDS OF DAILY PRODUCTION AND DEFECTS

Table C1: Table Water A

Days	Daily production(bags)	Number of Defects(bags)	$\lvert MR \rvert$
1	1442	20	
2	1527	15	5
3	1640	14	1
4	1530	13	1
5	1342	17	4
6	1340	22	5
7	1000	12	10
8	925	26	14
9	1300	16	10
10	1204	13	3
11	1355	16	3
12	1521	32	16
13	1313	23	9
14	1426	18	5
15	1400	27	9
16	1009	12	7
17	1401	19	7
18	1500	23	4
19	1406	20	3
20	192	16	4
Sum (Σ)	26563	374	120
Mean ($\overline{X}$)	1328	18.7	$\lvert\overline{MR}\rvert = 6.3$

Source: Field survey, 2019

Table C2: Table Water B

Days	Daily production (bags)	Number of Defects	$\lvert MR \rvert$
1	3905	296	
2	939	55	23
3	245	40	15
4	220	24	16
5	3671	145	18
6	3865	91	7
7	3097	210	5
8	3097	197	2
9	4245	246	9
10	824	125	5
11	484	142	17
12	5972	52	3
13	4656	34	6
14	2132	162	2
15	1403	95	4
16	550	84	1
17	4332	28	13
18	3483	184	3
19	775	43	8
20	3984	55	2
Sum (Σ)	51879	2308	159
Mean ($\overline{X}$)	2594	115.4	$\lvert\overline{MR}\rvert$ = 8.37

Source: Field survey, 2019

Table C3: Table Water C

Days	Daily Production (bags)	Number of Defects	$\lvert MR \rvert$
1	410	8	
2	340	11	3
3	317	8	3
4	405	12	4
5	355	9	3
6	420	10	1
7	391	12	2
8	358	9	3
9	412	16	7
10	570	13	3
11	398	9	4
12	380	6	3
13	316	10	4
14	336	11	1
15	294	8	3
16	402	14	6
17	360	15	1
18	439	14	1
19	387	12	2
20	413	10	2
Sum (Σ)	7703	217	56
Mean ($\overline{X}$)	385.15	10.85	$\lvert\overline{MR}\rvert = 2.95$

Source: Field survey, 2019

Table C4: Table Water D

Days	Daily production (bags)	Number of Defects	$\lvert MR \rvert$
1	561	10	
2	514	16	6
3	612	12	4
4	527	9	3
5	408	7	2
6	532	18	11
7	501	12	6
8	602	10	2
9	493	13	3
10	443	9	4
11	543	14	5
12	464	8	6
13	500	13	5
14	515	17	4
15	591	13	4
16	451	7	6
17	396	15	8
18	523	20	5
19	412	14	6
20	509	12	2
Sum (Σ)	10097	249	92
Mean ($\overline{X}$)	504.85	12.45	$\lvert \overline{MR} \rvert =$ 4.84

Source: Field survey, 2019

Table C5: Table Water E

Days	Daily of production (bags)	Number of Defects (bags)	$\lvert MR \rvert$
1	550	16	
2	460	18	2
3	430	14	4
4	580	21	7
5	350	16	5
6	650	21	5
7	510	19	2
8	450	13	6
9	300	12	1
10	542	16	4
11	396	8	8
12	450	13	5
13	470	15	2
14	316	7	8
15	302	10	3
16	184	7	3
17	408	13	6
18	269	10	3
19	312	12	2
20	281	15	3
Sum (Σ)	8210	276	79
Mean ($\bar{X}$)	410.5	13.8	$\lvert\overline{MR}\rvert$ = 4.16

Source: Field survey, 2019

Table C6: Probability Acceptance for Table Water A

Fraction defectives	Probability of Acceptance		
	2%	3%	5%
0.000	1.000	1.000	1.000
0.01	0.494	0.714	0.943
0.02	0.095	0.213	0.546
0.03	0.013	0.040	0.183
0.04	0.001	0.006	0.042
0.05	0	0.001	0.008
0.06	0	0	0.001
0.07	0	0	0
0.08	0	0	0
0.09	0	0	0
0.1	0	0	0

Table C7: Probability Acceptance for Table Water B

Fraction defectives	Probability of Acceptance		
	2%	3%	5%
0.000	1.000	1.000	1.000
0.01	0.089	0.202	0.529
0.02	0	0.001	0.038
0.03	0	0	0.001
0.04	0	0	0
0.05	0	0	0
0.06	0	0	0
0.07	0	0	0
0.08	0	0	0
0.09	0	0	0
0.1	0	0	0

Table C8: Probability Acceptance for Table Water C

Fraction defectives	Probability of Acceptance		
	2%	3%	5%
0.000	1.000	1.000	1.000
0.01	0.809	0.934	0.996
0.02	0.423	0.647	0.916
0.03	0.174	0.343	0.703
0.04	0.062	0.151	0.446
0.05	0.021	0.059	0.242
0.06	0.006	0.021	0.116
0.07	0.002	0.007	0.051
0.08	0.001	0.002	0.020
0.09	0	0.001	0.007
0.1	0	0	0.003

Table C: Probability Acceptance for Table Water D

Fraction defectives	Probability of Acceptance		
	2%	3%	5%
0.000	1.000	1.000	1.000
0.01	0.677	0.857	0.983
0.02	0.238	0.433	0.785
0.03	0.062	0.151	0.446
0.04	0.014	0.042	0.191
0.05	0.003	0.010	0.067
0.06	0.001	0.002	0.020
0.07	0	0	0.006
0.08	0	0	0.001
0.09	0	0	0
0.1	0	0	0

Table C10: Probability Acceptance for Table Water E

Fraction defectives	Probability of Acceptance		
	2%	3%	5%
0.000	1.000	1.000	1.000
0.01	0.288	0.544	0.891
0.02	0.125	0.265	0.616
0.03	0.021	0.059	0.242
0.04	0.003	0.010	0.067
0.05	0	0.001	0.015
0.06	0	0	0.003
0.07	0	0	0.001
0.08	0	0	0
0.09	0	0	0
0.1	0	0	0

Table C11: Average Outgoing Quality for Table Water A

Fraction defectives	Fraction Defective Outgoing Lots		
	2%	3%	5%
0.000	0	0	0
0.01	0.0044	0.0064	0.0085
0.02	0.0017	0.0038	0.0098
0.03	0.0004	0.0011	0.0049
0.04	0	0.0002	0.0015
0.05	0	0.0001	0.0004
0.06	0	0	0
0.07	0	0	0
0.08	0	0	0
0.09	0	0	0
0.1	0	0	0

Table C12: Average Outgoing Quality for Table Water B

Fraction defectives	Fraction Defective Outgoing Lots		
	2%	3%	5%
0.000	0	0	0
0.01	0.0008	0.0018	0.0047
0.02	0	0.0002	0.007
0.03	0	0	0
0.04	0	0	0
0.05	0	0	0
0.06	0	0	0
0.07	0	0	0
0.08	0	0	0
0.09	0	0	0
0.1	0	0	0

Table C13: Average Outgoing Quality for Table Water C

Fraction defectives	Fraction Defective Outgoing Lots		
	2%	3%	5%
0.000	0	0	0
0.01	0.0065	0.0075	0.0080
0.02	0.0068	0.0104	0.0148
0.03	0.0042	0.0082	0.0170
0.04	0.0020	0.0049	0.0144
0.05	0.0008	0.0024	0.0100
0.06	0.0003	0.0010	0.0056
0.07	0.0001	0.0004	0.029
0.08	0	0.0001	0.0013
0.09	0	0	0.0005
0.1	0	0	0.0002

Table C14: Average Outgoing Quality for Table Water D

Fraction defectives	Fraction Defective Outgoing Lots		
	2%	3%	5%
0.000	0	0	0
0.01	0.0054	0.0069	0.0079
0.02	0.0038	0.0069	0.0126
0.03	0.0015	0.0036	0.0107
0.04	0.0004	0.0013	0.0061
0.05	0.0001	0.0004	0.0027
0.06	0	0	0.001
0.07	0	0	0.0003
0.08	0	0	0
0.09	0	0	0
0.1	0	0	0

Table C15: Average Outgoing Quality for Table Water E

Fraction defectives	Fraction Defective Outgoing Lots		
	2%	3%	5%
0.000	0	0	0
0.01	0.0020	0.0038	0.0063
0.02	0.0017	0.0037	0.0087
0.03	0.0004	0.0012	0.0051
0.04	0.0001	0.0003	0.0019
0.05	0	0	0.0005
0.06	0	0	0.0001
0.07	0	0	0
0.08	0	0	0
0.09	0	0	0
0.1	0	0	0

APPENDIX D

PRODUCTION PROCESSES

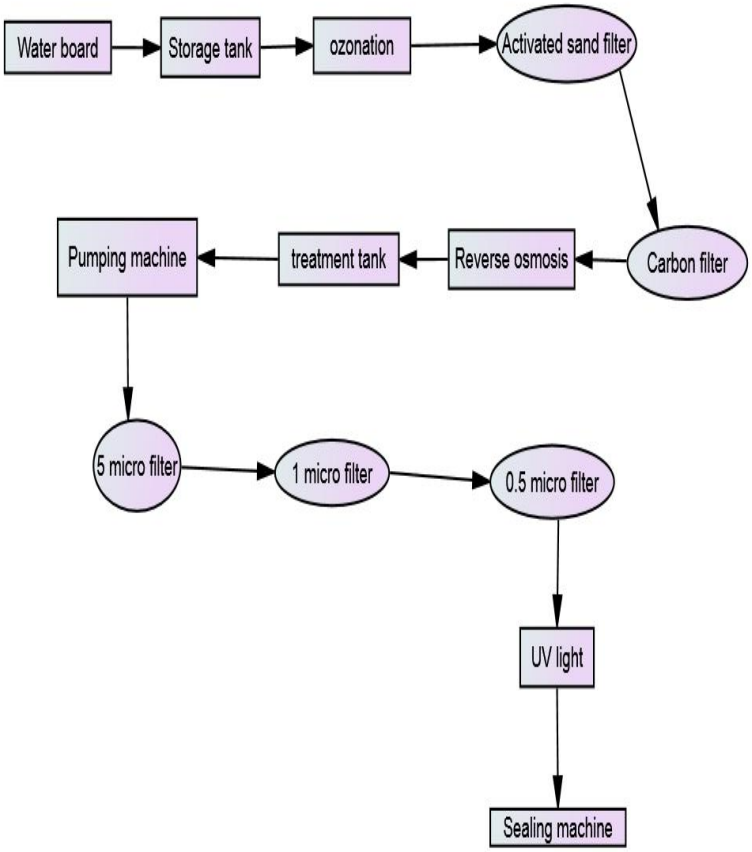

Figure D1: Table Water A production processes

Source: Field survey, 2019

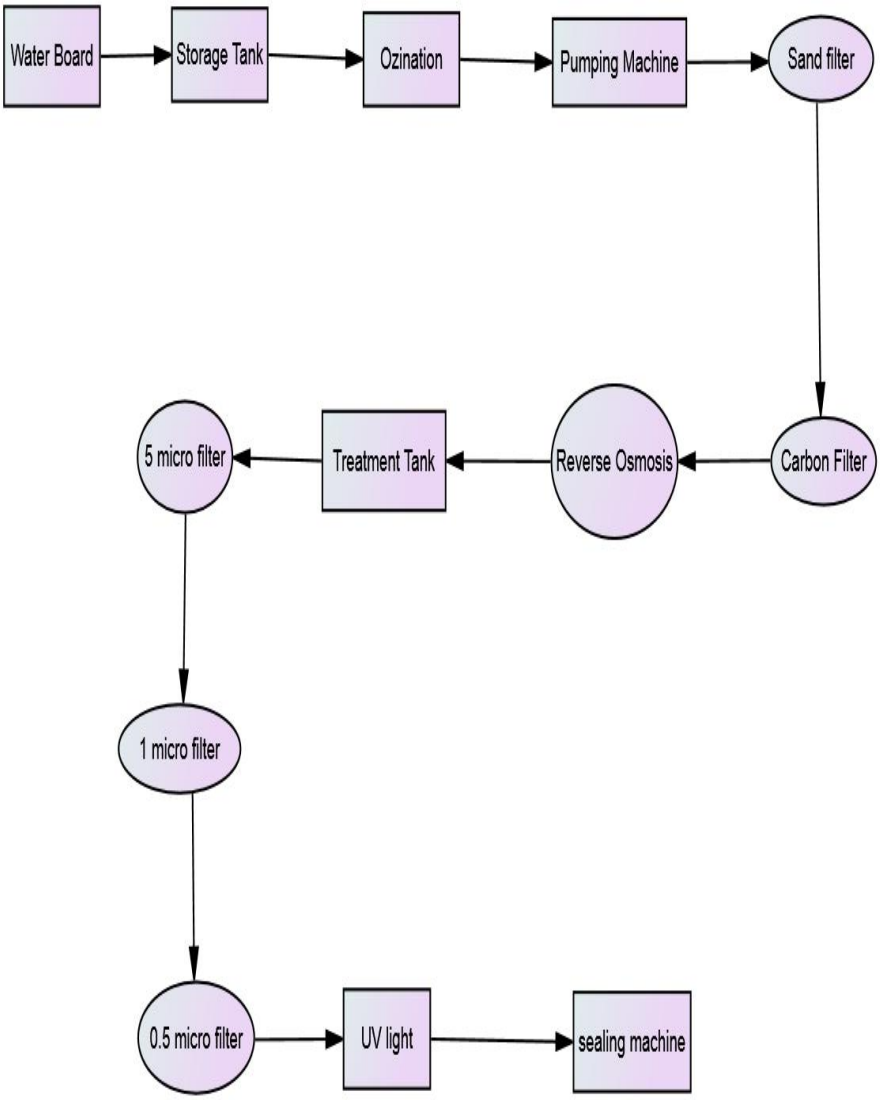

Figure D2: Table Water B production processes

Source: Field survey, 2019

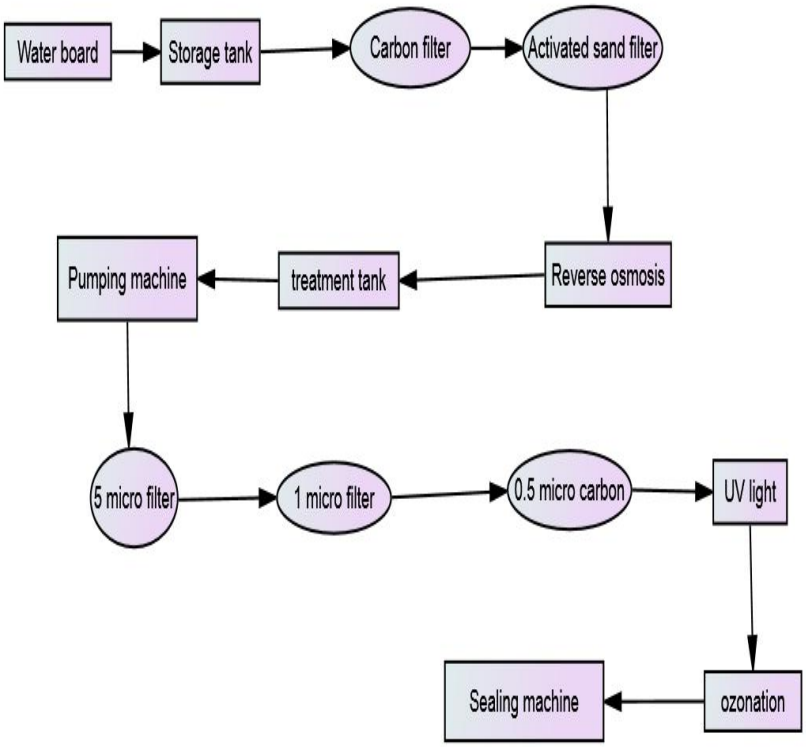

Figure D3: Table Water C production processes

Source: Field survey, 2019

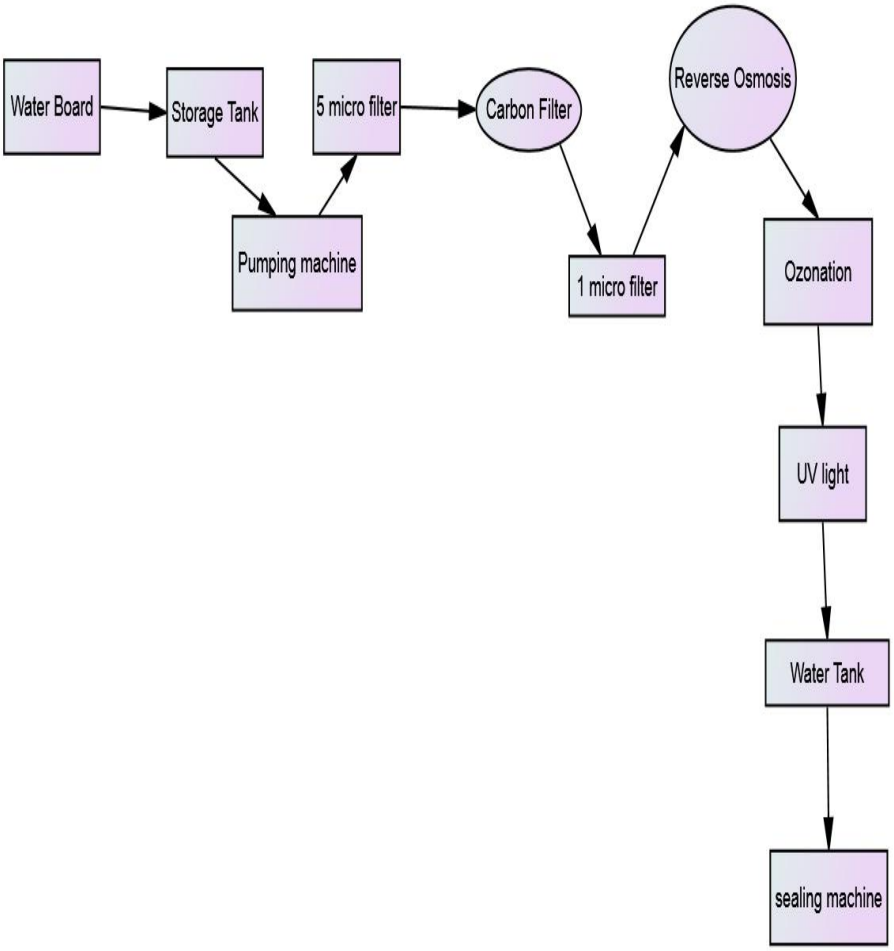

Figure D4: Table Water D production processes

Source: Field survey, 2019

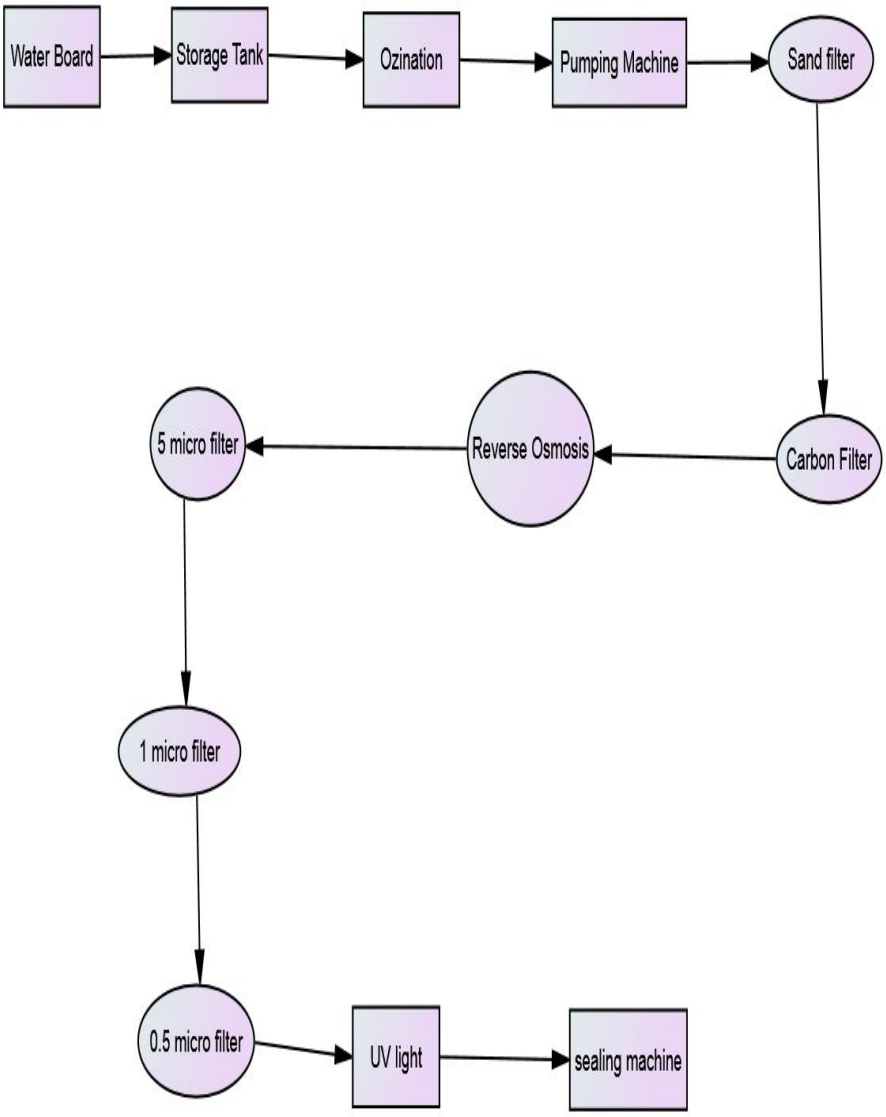

Figure D5: Table Water E production processes

Source: Field survey, 2019