

**TOTAL QUALITY MANAGEMENT (TQM) AS A STRATEGY TO
IMPROVE THE PERFORMANCE OF SACHET/BOTTLE WATER
INDUSTRY IN GHANA**

by

KNUST

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ADMINISTRATION**

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DECLARATION

I hereby declare that this submission is my own work towards the Executive Masters of Business Administration and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the university, except where due acknowledgement has been made in the text.

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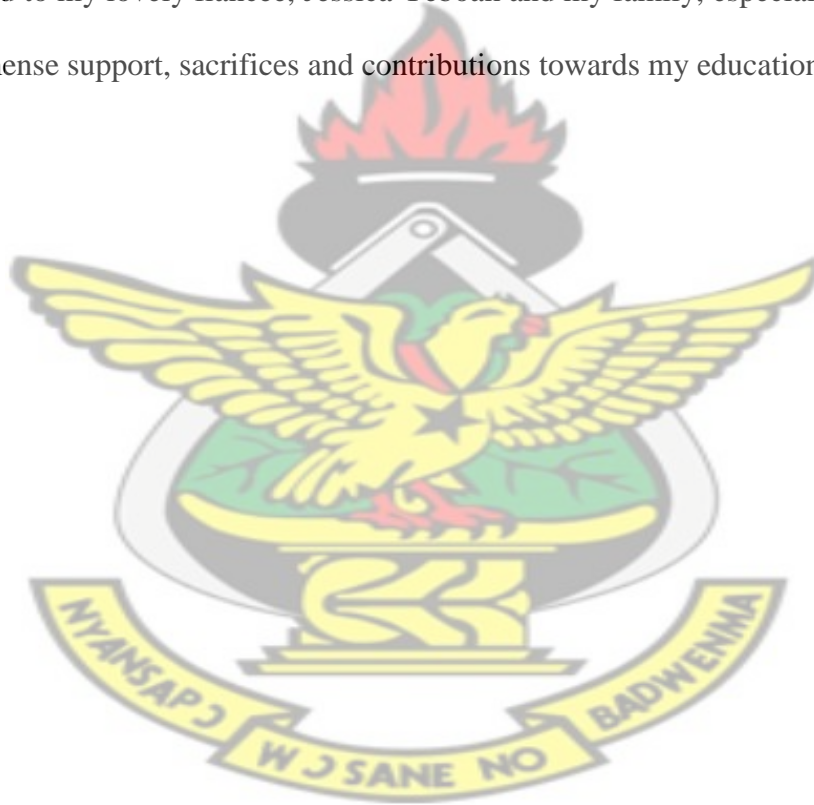
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Date

DEDICATION

This thesis is dedicated to my God and Creator, Jehovah Almighty who throughout out this program has always provided all my needs whenever I called out to Him in prayer. Secondly it is dedicated to my lovely fiancée, Jessica Yeboah and my family, especially my parents for all their immense support, sacrifices and contributions towards my education.



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ABSTRACT

Ghana's sachet/bottle water industry has over the years been confronted with several quality challenges that have undermined the success and market performance of companies within the industry. This study therefore sought to assess Total Quality Management (TQM) as an effective and appropriate quality management strategy to address these quality challenges and thereby improve the performance of the industry. In achieving this general objective therefore, a case study approach was adopted where the quality management systems and strategies of four (4) leading brands/companies were assessed and reviewed. The companies were selected on the basis of their sizable market share in the industry and are namely, Voltic Ghana Limited, SBC Beverages Limited, Everpure Ghana Limited and The Coca-Cola Bottling Company Ghana Limited. The study area involved the cities of Accra and Kumasi. Three (3) different sets of questionnaires as well as structured open-ended interviews were employed as the main data collection tools. In all two hundred and seventy (270) respondents were sampled in the study. A stratified random approach was utilized in the data collection process. SPSS, Excel, tables and graphs were utilized in the data analysis. Among others, the findings of the study established that quality mishaps in the industry were mostly caused by the small-scale sachet water producing companies, bottle water products are relatively better in quality than sachet water and finally, that there is a positive relationship between quality management and company performance. In view of these findings, the recommendations made included providing support for the sachet water producing companies, training of retailers/distributors, strengthening the industry regulatory agencies as well as the adoption of TQM by companies in the sachet/bottle water industry. The study concluded that TQM

strategy was the most appropriate quality management strategy to be adopted to turn around the quality fortunes of Ghana's sachet/bottle water industry.

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LIST OF ABBREVIATIONS

1. CFU: Colony Forming Units
2. FDB: Food and Drugs Board
3. GCS: Ghana Chemical Society
4. GSB: Ghana Standards Board
5. ISO: International Organisation for Standardization
6. QA: Quality Assurance
7. QC: Quality Control
8. QM: Quality Management
9. QMS: Quality Management System
10. SEI: Stockholm Environmental Institute
11. TQM: Total Quality Management
12. UV: Ultraviolet

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

In Ghana particularly, the nation has come a long way from the days of getting access to drinking water in public by purchasing water sold in plastic cups, to water sold in hand-tied plastic sachets. Today, the norm is to purchase water either in sachets or bottles produced in factories. In fact, since the early nineties, the Ghana government and the health agencies had actively encouraged the Ghanaian public to desist from consuming water sold in hand-tied plastic sachets and rather opt for factory-produced sachet or bottle water. This move was as a result of the numerous health hazards found to be associated with water in hand-tied plastic sachets. The campaign succeeded and now sachet or bottle water is the preferred choice of drinking water for most Ghanaians. So great is the acceptance and regard for factory-produced sachet and bottle water on the local market that people commonly refer to these products (especially sachet water) as “pure water”. Due to its relatively moderate price and accessibility, sachet water is highly patronized by most people whilst bottle water is sought after by mostly the middle and upper income section of the populace. Sachet water is also increasingly becoming the sole source of drinking water at home for most Ghanaian families.

The ready market for sachet/bottle water in Ghana and the relatively low start-up capital (especially for sachet water production) has motivated the springing up of a lot of businesses and local entrepreneurs going into the production of sachet and bottled water. The highly profitable packaged water business is also a major source of employment for thousands of

local people, both directly and indirectly. The industry aside from providing relatively better quality and safer drinking water to the populace also pays taxes to the government thereby contributing to public revenue much needed for national development.

Clearly, the success and market performance of the sachet/bottle water industry is critical to the health and economic well being of the nation. Unfortunately most of the companies in the industry are under-performing due to their inability to leverage quality and quality management strategies to achieve the desired market share, competitive advantage, growth and profitability. The industry continues to be challenged by numerous quality problems which threaten the survival of the industry and of much concern for the health of people who patronize packaged water products. There is therefore the need for the immediate adoption of a quality system which is sufficient to combat the quality problems of such an important industry.

1.2 Statement of Problem

The ever increasing proliferation of sachet/bottle water companies all over the country has given rise to all manner of packaged water products on the market; most of which are unregistered and not certified by the regulatory agencies. There is also widespread ignorance and sometimes blatant disregard for water quality standards by producers. Many of the companies not only lack qualified staff to oversee quality issues but also the appropriate technology to achieve quality output. Quality management systems are often subverted in favour of higher profits. Some operators do not see the essence of quality systems and continually fail to implement quality guidelines specified by the monitoring agencies, such as

the FDB and GSB. There is also inadequate screening and monitoring of distributors/retailers/vendors who sometimes compromise on quality of standards-complying products through improper handling, packaging, storage and distribution. According to Dodoo et al. (2006), some producers even package untreated water into bottles and sachets and sell them as purified water. Consumer confidence in the industry which used to be very high is gradually being eroded by these quality mishaps.

Perhaps most disturbing of all is the health risks associated with these quality problems. The recent cholera outbreak in the country in the early part of the year where the consumption of contaminated sachet water was identified as one of the major causes of the epidemic brought to the fore the unfortunate quality plight of the industry. Moreover the Ghana Chemical Society came out with the declaration to the effect that 85% of sachet water on the market is unsafe for public consumption (Tawiah, 2011). There seems to be no end in sight for the quality woes of the industry. The situation has become so bad that the government is even considering imposing a ban on the production and sale of sachet water products in the country (GhanaWeb.com, 2011). Ultimately it is feared that people who may not have access to the packaged water products of the very few performing companies may be forced to seek alternative sources of drinking water which may turn out to be detrimental to their health. It is in the light of these problems therefore that this study seeks to propose TQM as a strategy to address the quality mishaps confronting the sachet/bottle water industry.

1.3 Objectives of Study

This study mainly sought to assess TQM as an appropriate strategy to improve the performance of the sachet/bottle water industry in Ghana. In achieving this aim, the following specific objectives were employed as guidelines:

1. To assess the quality management systems/practices in the operations of the sachet/bottle water industry in Ghana.
2. To review the effects of the quality management systems utilized by the sachet/bottle water industry in Ghana.
3. To compare the performance (indicators) of the leading sachet/bottle water producing companies in the industry.
4. To review the distribution and marketing practices of the sachet/bottle water producing companies.

1.4 Research Questions

The major research questions to enable the researcher achieve the objectives of the study are outlined as:

1. What is the extent of integration of quality management practices in the operations of the sachet/bottle water industry in Ghana?
2. What are the effects of the quality management systems practiced by the sachet/bottle water industry?

3. What are the effects of the quality management systems on the performance levels of the leading companies in the industry?
4. How effective and efficient are the existing marketing and distribution practices in achieving optimum performance?

1.5 Significance of Study

The study will highlight the quality management shortcomings of the sachet/bottle water industry and devise strategies for eliminating these problems. The research would also contribute to academic knowledge of the packaged water industry since there is limited documentation on the industry.

The findings of this research would assist Government policy on regulation of quality management in sachet/bottle water industry. It would enable monitoring agencies and other stakeholders to realize the need for Total Quality Management as a strategy to improve performance of the water producers in order to achieve the envisaged objective of ensuring safe and acceptable drinking water for the populace. It would further assist the policy making bodies to come out with the needed or appropriate policies to effectively guide and manage the industry. The findings of this research would help the small-scale sachet/bottle water producers (cottage industry companies) to improve upon the overall quality of their output and contribute to their products being accepted on the market. Moreover, it would also guide the leading companies to leverage high quality management practices to increase their market shares, ensure profitability and ultimately achieve high performance. Most importantly the

study results would help ensure that sachet/bottle water producers only turn out quality products that would safeguard the health and safety of consumers.

1.6 Scope of the Study

Research scope refers to the boundaries of the research or the specific areas that the particular researcher wants to cover in the study. For this research, the scope included the following:

- The research covered only packaged drinking water producers in Ghana and therefore excludes other water suppliers such as the utility providers.
- The research was concerned with mainly the quality aspect of the management systems and the quality of sachet/bottle water products in Ghana.
- Finally, although the study was conducted in Ghana, data was collected only from respondents in Accra and Kumasi, because these two cities hold about 60% of the Ghanaian market for packaged drinking water. Accra being the national capital and the most populated city, with Kumasi as the second in terms of market size.

1.7 Limitations of the Study

Limitations mean the kind of restraints or obstacles that the study might have gone through during the period. The series of resource and practical limitations that constrained this research project are listed as:

- This study is limited to the knowledge and experience of known quality management systems.

- This study was also limited by time and resource constraints. This did not allow the researcher to include more companies in the case study.
- Furthermore, this study is limited to the information gathered or provided by the companies themselves, which was presented within the context of the case study methodology employed.

However it is worth noting that these limitations are not likely to affect the objectives and findings of this research work in any significant way.

1.8 Organisation of Study

The study comprises five chapters and each chapter explains a specific aspect of the research work. Chapter one consists of the introduction and basically provides an overview of the relevant concepts used, research objectives, significance and scope of the study as well as the outline of the study. Chapter two covers the literature review of the study. Relevant literature pertaining to the study is discussed. Chapter three is the research methodology and it describes the various research methods and techniques applied in the study. The presentation and analysis of collected research data is found in Chapter four. Finally, Chapter five gives a summary of the study findings, conclusion and possible recommendations of the research.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter consists of two parts. One part consists of a review of relevant literature pertaining to quality as well as a detailed discussion of Total Quality Management. It also covers discussion on the challenges of implementing TQM. The other part reviews some microbiological studies/literature on sachet/bottle water products in Ghana.

2.1 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”.

2.2 Importance of Quality

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 globalization, 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 importance of the quality of products or services in today’s business environment is paramount (Russell and Taylor, 1995). When the strategic aspects of quality were recognized in the 1970s and 1980s, top managers began to link quality to firm performance and included quality in a strategic planning process as a means to sustain competitive advantage. This brought changes in the definition of quality, from a manufacturer’s perspective to a customer’s perspective (Garvin, 1988). Since then, researchers in manufacturing, marketing, and consumer behavior have produced a plethora of definitions of and theories on quality (for example, Miller, 1996; Stone-Romero, Stone, and Grewal, 1997). Much of the literature on quality demonstrates that, over the years, depending on different academic disciplines, orientations, and economic sectors, different definitions and dimensions of quality have been

emphasized. However, regardless of these differences, quality is almost universally perceived as a dynamic threshold that a firm must meet to satisfy customers.

2.2.1 The Direct Relationship between Quality and Firm/ Company Performance

A major assumption in the quality and firm performance literature is that quality improves firm performance. We identified three major empirical studies in the literature. 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 (e.g., Buzzell and Gale, 1987; Phillips, Chang, and Buzzell, 1983), although Wagner (1984), found inconclusive results on the relationship between quality and ROI. 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.

2.2.2 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 & 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.

Source: Cho & Pucik (2005)

2.3 Quality Management

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 organization'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.

Four stages of quality management was treated by Dale et al (1994), these include:

- Inspection
- Quality Control (QC)
- Quality Assurance (QA) and
- Total Quality Management (TQM)

2.3.1 Inspection

According to ISO 8402 (1986), inspection can be defined as activities such as measuring, examining, testing, gauging one or more characteristics of a product or service and comparing these with specified requirements to determine conformity. It involves the examination, measurement, and testing of a product or service and the comparison to specified requirement (Dale et al. 1994). Inspection is an efficient and effective way of discovering defects in services and products. According to Deming (1986), inspection with the aim of finding bad product and throwing them out is too late, ineffective and costly. Quality to Deming comes from the improvement in the process rather than inspection.

2.3.2 Quality Control

Quality control is a conventional way that businesses use to manage quality. It is concerned with checking and reviewing work that has been done. This mainly achieved by inspection of products and services (checking to make sure that what is being produced is meeting the required standard) take place during and at the end of the

operations process. Juran (1988), defined quality control as the regulatory process through which we measure the actual quality performance, compare it with standards and act on the difference. It is a more sophisticated management tool that aims at preventing goods and services which do not conform to basic requirements from getting to the final consumer. Quality controls are operational techniques and activities that are used to fulfill quality requirements (ISO 8402, 1994).

As a measure of quality, quality control is costly when viewed in terms of tangible and intangible variable cost. It could also result in the production of substandard goods and services when conducted late in the process of production. Due to problems associated with quality control, businesses now focus on other avenues or means through which quality could be managed effectively. Dale et al. (1994), noted that the solving of a problem after a non conformance issue has been created is not an effective route towards eliminating the root cause of a problem.

2.3.3 Quality Assurance

This is a principle based on the designing of business process of production with a view to minimize the chances of producing substandard goods. According to Dale et al (1994), quality assurance is a preventive based system, which improves product and service quality with increased productivity by placing emphasis on product, service and process design. Quality assurance emphasis on defect prevention, unlike quality control that focuses on defect detection once the item is produced. Thus, it is a management

design aimed at controlling quality at all stages of production to prevent quality problems from emerging (Eriksson, 2002).

The quality assurance philosophy opined that quality is created in the design stage and not the control stage and that problems associated with quality are caused by poor process design. According to Lockwood et al. (1996), to be effective, quality assurance must involve the development of a new operating philosophy and approach that looks to be proactive rather than reactive, that includes motivating and involving people in the process across normal departmental barriers. Oakland (1995), defined quality assurance as the broad prevention of quality problems through planned and systematic activities, which include documentation.

2.3.4 Total Quality Management

This 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). Total Quality Management (TQM) involves the application of quality management principles to all aspects of the organization, 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. TQM 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.

2.4 ISO 9000

Another established approach to QM is ISO 9000. This is a widely recognised series of standards, introduced by the International Organisation for Standardisation (1987) 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. The latest ISO 9001:2000 standard integrates key clauses of previous standards into four new categories: Management responsibility, Resource management, Process management, and Measurement, Analysis and Improvement. (Source: ISO, 1994)

2.5 Hazard Analysis and Critical Control Point/HACCP

HACCP is another quality management method worth noting in this research. This is because it is a quality system which is practiced by Voltic Ghana Limited, one of the case study companies for this study. It is necessary therefore to gain some theoretical background of this system.

2.5.1 The Concept of HACCP

HACCP is a systematic preventive approach to [food safety](#) and pharmaceutical safety that addresses physical, [chemical](#), and [biological](#) hazards as a means of prevention rather than finished product inspection. HACCP is used in the food industry to identify potential food safety hazards, so that key actions can be taken to reduce or eliminate the risk of the hazards

being realized. The system is used at all stages of [food production](#) and preparation processes including packaging, distribution, etc.

2.5.2 The HACCP Seven Principles

Principle 1: Conduct a hazard analysis. – Plans determine the food safety hazards and identify the preventive measures the plan can apply to control these hazards. A food safety hazard is any biological, chemical, or physical property that may cause a food to be unsafe for human consumption.

Principle 2: Identify critical control points. – A [Critical Control Point](#) (CCP) is a point, step, or procedure in a food manufacturing process at which control can be applied and, as a result, a food safety hazard can be prevented, eliminated, or reduced to an acceptable level.

Principle 3: Establish critical limits for each critical control point. – A critical limit is the maximum or minimum value to which a physical, biological, or chemical hazard must be controlled at a critical control point to prevent, eliminate, or reduce to an acceptable level.

Principle 4: Establish critical control point monitoring requirements. – Monitoring activities are necessary to ensure that the process is under control at each critical control point.

Principle 5: Establish corrective actions. – These are actions to be taken when monitoring indicates a deviation from an established critical limit. The final rule requires a plant's HACCP plan to identify the corrective actions to be taken if a critical limit is not met. Corrective actions are intended to ensure that no product injurious to health or otherwise adulterated as a result of the deviation enters commerce.

Principle 6: Establish procedures for ensuring the HACCP system is working as intended. - Validation ensures that the plants do what they were designed to do; that is, they are successful in ensuring the production of a safe product. Plants will be required to validate their own HACCP plans. [Verification](#) ensures the HACCP plan is adequate, that is, working as intended. Verification procedures may include such activities as review of HACCP plans, CCP records, critical limits and microbial sampling and analysis. Both the monitoring agency and industry will undertake microbial testing as one of several verification activities.

Principle 7: Establish record keeping procedures. – The HACCP regulation requires that all plants maintain certain documents, including its hazard analysis and written HACCP plan, and records documenting the monitoring of critical control points, critical limits, verification activities, and the handling of processing deviations. (Source: Wikipedia, 2011)

2.6 Seven Basic Principles of TQM

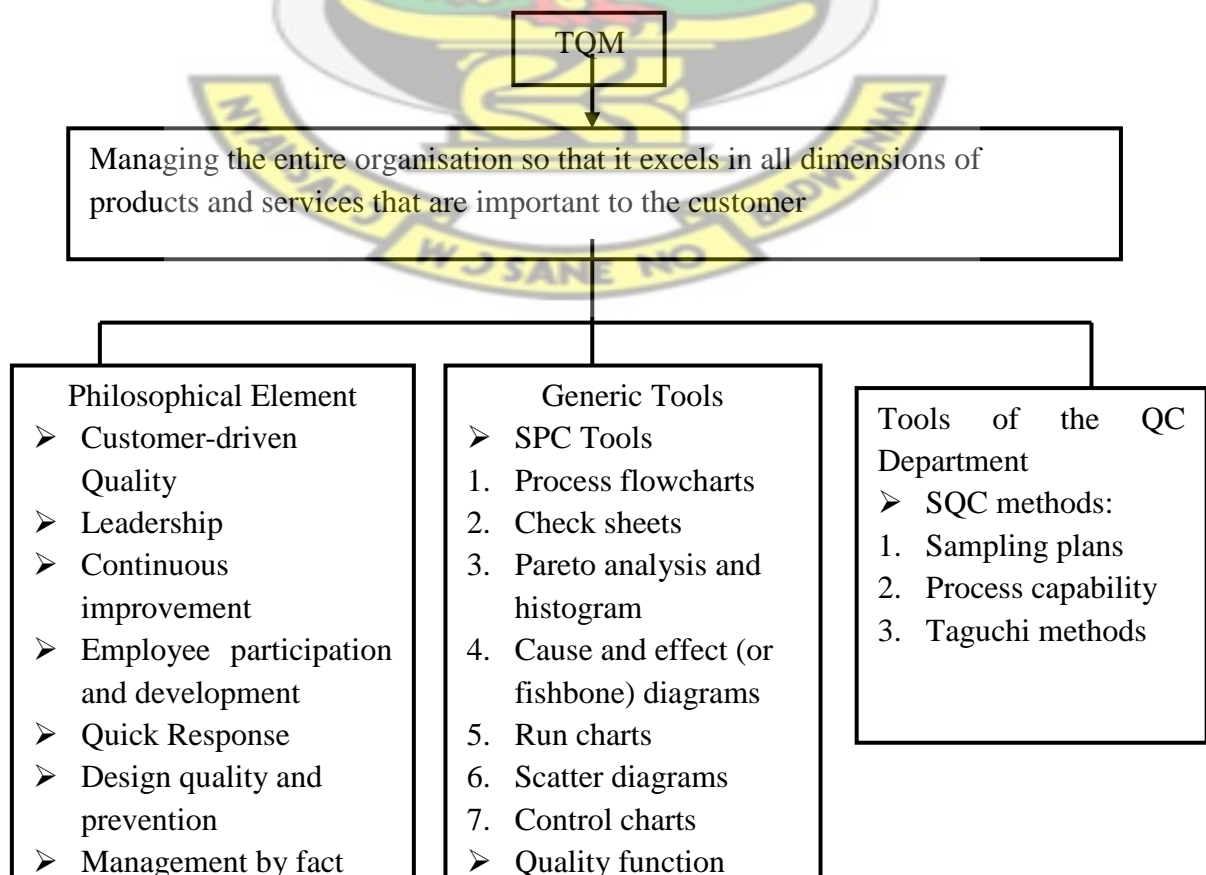
An extensive review of literature was carried out to identify the concept of TQM from quality gurus such as Deming (1986), Crosby (1979), Feigenbaum (1991), and Ishikawa (1985). Their propositions are the foundation for understanding the concept of TQM. Clear

guidelines for the implementation of TQM are provided usually on the basis of the seven principles. These principles are:

1. Top management support
2. Strategic quality planning
3. Customer focus
4. Training and recognition
5. Enhancing teamwork
6. Performance measurement and
7. Quality assurance

All these principles can be found in works by authors such as Deming, Juran, Crosby, Feigenbaum, and Ishikawa, etc. These TQM tools and principles are illustrated in **Figure 2.1**.

Figure 2.1: Elements of Total Quality Management



Source: Adapted from Chase et al. (2001), pg 261

2.7 Major Principles of TQM

TQM has several principles; however the major ones are discussed in this section.

2.7.1 Top Management Commitment and Leadership

TQM requires effective change in organisational culture and this can only be made possible with deep involvement/commitment of management to the organisation's strategy of continuous improvement, open communication and cooperation through the organisation. According to Oakland (2003), to be successful in promoting business efficiency and effectiveness, TQM must start at the top with the chief executive. Cooper and Ellram (1993), identified leadership as being critical in effecting organisational change most especially in the area of building effecting relationship with suppliers and others involved in the process of value delivery. Andrle (1994), noted that the implementation of TQM requires a clear long term leadership commitment.

2.7.2 Cultural Change

According to Oakland (1989), TQM is a way of managing the whole business process to ensure complete customer satisfaction at every stage, both internally and externally. Cultural change, according to Dale et al. (1994), implies an approach to changing the

cooperate culture of an organisation to be customer centered. The need for cultural change is stressed by the role it plays in the life of an organisation. Culture influences what the executive groups attend to, how it interprets information and the response it makes to changes in the external environments.

2.7.3 Customer Focus

TQM is an ideology which is focused on the satisfaction of customer's need. Thus, most organisations try as much as possible to meet or exceed customer's expectations in their daily activity and also their long term plan (Andrle, 1994). Filippini and Forza (1998), explained that is necessary for organisations to maintain a close link with their customers in order to know their requirements and to measure how it has been successful in meeting up to customer's requirements. According to Muffatto & Panizzolo (1995), a high level of customer satisfaction is obtained solely by providing services or products whose features will satisfy customer's requirements or needs. This is due to the fact that customers determine the quality level of service delivered (Jablonski, 1992).

2.7.4 Total Involvement

In the traditional sense, employee involvement was conceived to mean a feeling of psychological ownership among organisational members (Harvey and Brown, 1996). The TQM approach involves achieving broad employee interest, participation and contribution in the process of quality management (Dale and Cooper, 1993). Thus, employees are encouraged to perform functions such as information processing,

problem solving and decision making (Dimitriadis, 2000). This is supported by Omachonu and Ross (1994), who noted that intrinsic motivation is at the heart of TQM, where empowerment and involvement in decision making is viewed as essential for sustained result.

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2.7.5 Continuous Improvement

Continuous improvement means a commitment to constant examination of the technical and administrative process in the search of better methods (Fuentes-Fuentes et al. 2004). Turney and Anderson (1989), defined continuous improvement as the relentless pursuit of improvement in the delivery of value to customers. This was supported by Dean and Bowen (1994), who argued that customer satisfaction can be attained only through the relentless improvement of processes that create product or service. According to Stahl (1995), continuous improvement refers to the constant refinement and improvement of products, services and organisational system to yield improved value to customers.

2.7.6 Training

Training helps in preparing employees towards managing the TQM ideology in the process of production. Training equips people with the necessary skills and techniques of quality improvement. It is argued to be a powerful building block of business in the achievement of its aims and objectives (Stahl, 1995). Through training, employees are

able to identify improvement opportunities as it is directed at providing necessary skills and knowledge for all employees to be able to contribute to ongoing quality improvement process of production. Stahl (1995), argued that training and development program should not be seen as a onetime event but a lifelong process.

2.7.7 Teamwork

A well structured team will aid the effective production of goods and services through the integration of activities involved in the process of production. Dale et al. (1994), noted that team work aids the commitment of the workforce to the organisational goals and objectives. The researchers believe that it is essential to have a team made up of people with right attitudinal disposition to working in groups so as to realise the gains of quality management. Martinez et al. (1998), noted that teamwork contributes to the generation of improvements that are proposed by employees. To them, the proposed improvements have a way of changing the attitudes of employees that are resistant to change.

2.8 Types of TQM Implementation Strategies

According to the GOAL/QPC research committee report (1990), there are five different strategies/plans being used by U.S. organizations to implement TQM. They are as follows:

Strategy 1- The TQM Element Approach: This approach takes key systems, organizations, and tools of TQM and begins work on them. This method was widely used in the early 1980s by companies that tried to implement parts of TQM as they learned them. Examples of this

approach included use of specific elements such as Quality Circles, Statistical Process Control, Taguchi Methods, and Quality Function Deployment.

Strategy 2- The Guru Approach: This method takes the teachings and writings of one of the leading quality thinkers and uses them as a benchmark to determine where the organization has deficiencies and then to begin to make appropriate changes to remedy those deficiencies. For example, managers would attend Dr. W. Edwards Deming's courses and study his "Fourteen Points." They would then go to work on implementing them.

Strategy 3- The Company Model Approach: In this approach individuals or organizational teams would visit U.S. companies that were taking a leadership role in TQM and determine what successes they had and how they had accomplished them. The individuals or teams would then integrate these ideas with their own and thus develop their own organizational model which would be adapted for their specific organization. This method was used widely in the late 1980s and is exemplified by the initial winners of the Baldrige National Quality Award.

Strategy 4- The Japanese Total Quality Approach: Organizations utilizing this method take a look at the detailed implementation techniques and strategies employed by Deming Prize-winning companies and use this experience as a way to develop a five-year Master Plan for in-house use. This approach was used by Florida Power and Light to implement TQM and successfully challenge the Deming Prize.

Strategy 5- The Prize Criteria Approach: Using this model, an organization uses the criteria of the Deming Prize or the Baldrige Award to identify areas for improvement. TQM implementation under this approach is focused on Prize criteria benchmarks. This approach was being used by hundreds of organizations as the 1990s began. (Source: GOAL/QPC, 1990)

2.8.1 TQM Implementation Principles and Processes

A preliminary step in TQM implementation is to assess the organization's current reality. Relevant preconditions have to do with the organization's history, its current needs, precipitating events leading to TQM, and the existing employee quality of working life. If it has significant problems such as a very unstable funding base, weak administrative systems, lack of managerial skill, or poor employee morale, TQM would not be appropriate (Tichey, 1983).

People need to feel a need for a change. Kanter (1983), addresses this phenomenon by describing building blocks which are present in effective organizational change. These forces include departures from tradition, a crisis or galvanizing event, strategic decisions, individual "prime movers," and action vehicles. Finally, action vehicles are needed and mechanisms or structures to enable the change to occur and become institutionalized (Smith, 1993).

2.8.2 Steps in Managing the Transition

Beckhard and Pritchard (1992), have outlined the basic steps in managing a transition to a new system such as TQM: identifying tasks to be done, creating necessary management

structures, developing strategies for building commitment, designing mechanisms to communicate the change, and assigning resources. Task identification would include a study of present conditions (assessing current reality); assessing readiness, such as through a force field analysis; creating a model of the desired state.

The next step, designing transition management structures, is also a responsibility of top management. Cohen and Brand (1993), and Hyde (1992), assert that management must be heavily involved as leaders rather than relying on a separate staff person or function to shepherd the effort. To communicate the change, mechanisms beyond existing processes will need to be developed. Management of resources for the change effort is important with TQM because outside consultants will almost always be required. A collaborative relationship with consultants and clear role definitions and specification of activities must be established.

2.9 Impact of TQM on Organisational Performance

Until recently, there have been only a few attempts to empirically establish the link between TQM practice and organisational performance. Many studies have reported on the link between TQM practice and organisational performance. Bernowski (1991), studied quality practices of over 500 organisations and concluded that some of the quality practices such as process improvement methods, strategic plan deployment, and supplier certification programs, have a significant impact on performance regardless of type of industry and country of location. Garvin (1991), investigated the impact of TQM improvement strategies on the performance of 20 US companies that had performed well on the MBNQA (Malcolm Baldrige National Quality Award) in 1988/1989. He found a strong link between TQM

practices and organisational performance measured in terms of productivity, profitability, customer satisfaction and employee relations.

Studies showed that TQM was positively associated with performance outcome, such as financial performance and profitability (Cummings & Worley, 2001) as well as with human outcomes, such as employee satisfaction, employee relations, and customer satisfaction (Lawler et al. 1995). More empirical studies are needed to show the contribution of organizational variables such as structure, strategy, information technology, human resources, leadership, culture, and employee participation on the success of TQM programs (Tushman and O'Reilly, 2002).

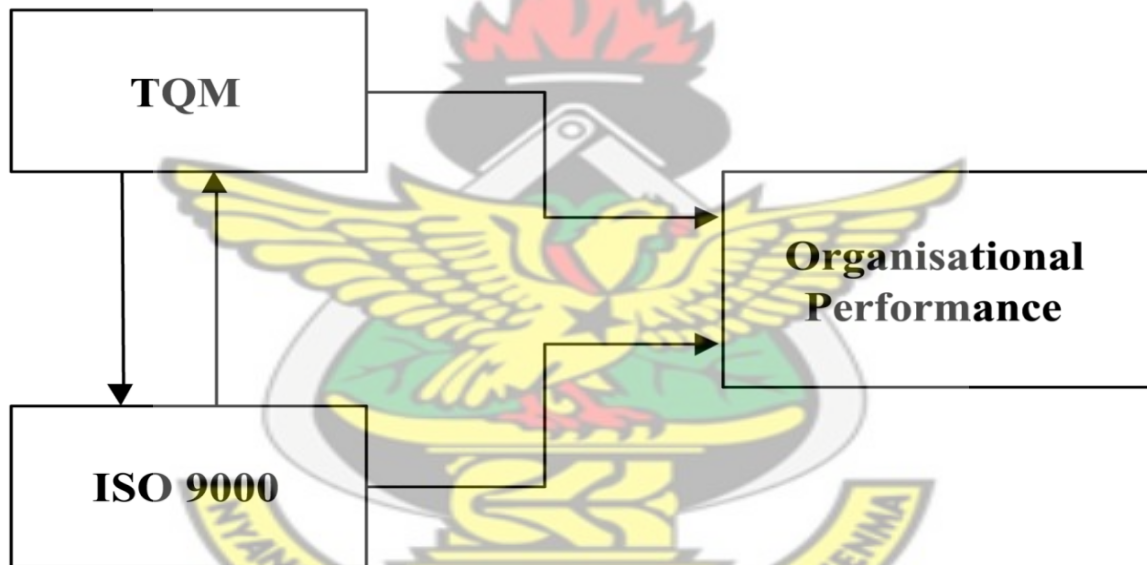
2.10 Impact of TQM & ISO 9000 on Organisational Performance

Many studies have been conducted to understand and assess the effectiveness of the ISO 9000 standards. The implementation of ISO 9000 has been found to improve customer satisfaction (Avery, 1994), gain competitive advantages (Vloeberghs and Bellens, 1996), increase profitability (Scotto, 1996) and improve product and service quality (Idris *et al.* 1996). Research also revealed that ISO 9000 certification can provide the building blocks for successful implementation of TQM (Askey and Dale, 1994).

It is evident from the literature that the implementation of both TQM practice and ISO 9000 standards has impacted organisational performance. However, there seems to be no general agreement on how ISO and TQM are to be linked. Some researchers support the idea of starting with ISO as the first step towards TQM (e.g. Bradley, 1994), while others prefer to

focus only on TQM (e.g. Taylor,1993), found that 33 per cent of organisations which had introduced ISO 9000 also had TQM in place and of those which did not, 43 per cent were either planning to introduce TQM or were considering it. On the other hand, 42 per cent of the organisations with TQM were planning to introduce ISO 9000. Based on these studies, a conceptual model is shown in **Figure 2.2** which makes explicit the links among three components: TQM, ISO 9000 and organisational performance.

Figure 2.2: Conceptual framework



Source: Rahman (2001)

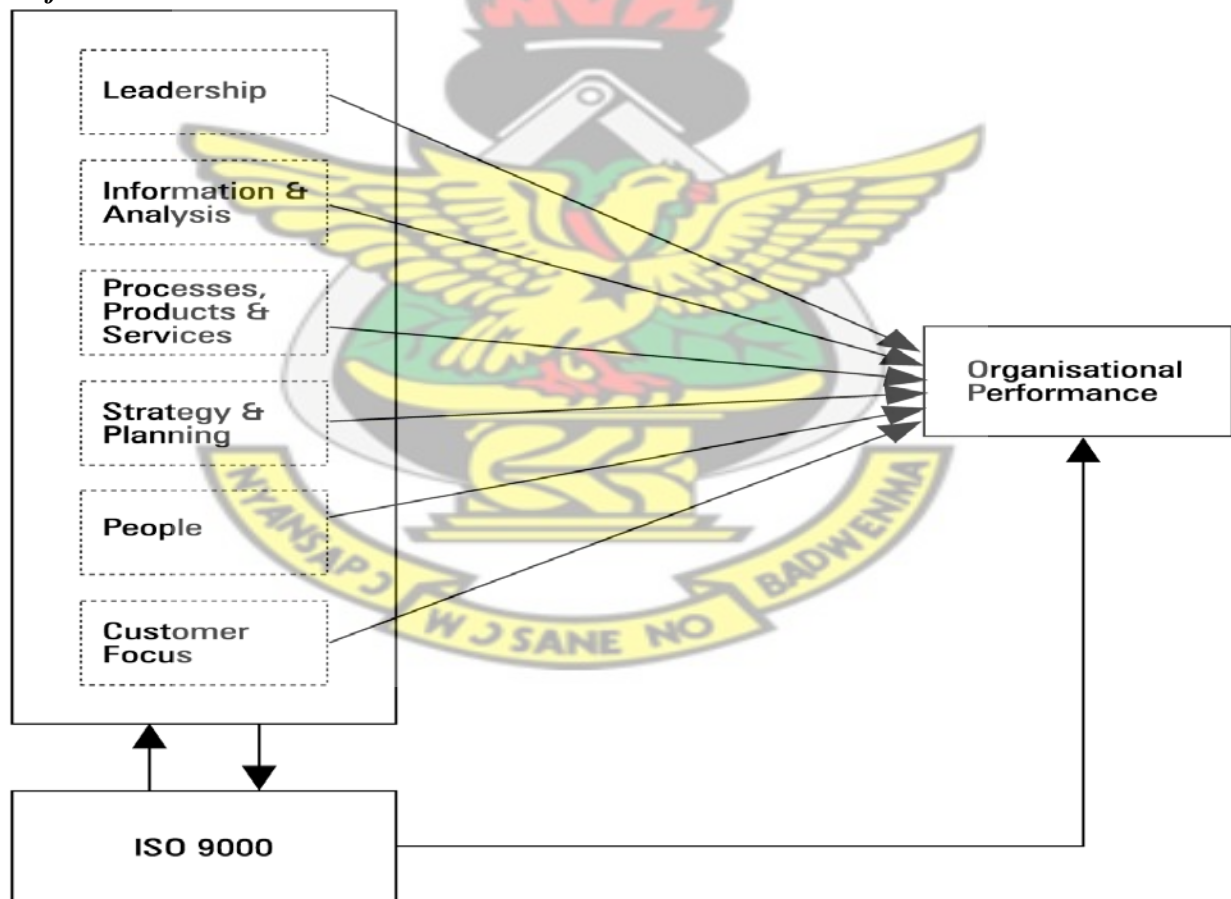
In this model, TQM philosophy is equated with various criteria of the Business Excellence (BE) framework and posited as a primary influence on an organisation's performance. (The extended version of the model is shown in **Figure 2.3.**)

The implementation of ISO 9000 enhances organisational performance directly and also indirectly through the implementation of TQM philosophy. Therefore, the evaluation of impact of quality management and quality standards can be seen in three different ways:

- (1) Impact of TQM practice on organisational performance.
- (2) Impact of ISO 9000 implementation on organisational performance.
- (3) Impact of TQM plus ISO 9000 (or ISO 9000-TQM) on organisational performance.

(Source: Rahman, 2001)

Figure 2.3: Proposed links between TQM criteria, ISO 9000 and Organisational Performance



Source: Rahman (2001)

2.11 Criticism of TQM

While total quality management remains a popular and widely used management practice (a 1997 United Kingdom survey indicated over two-thirds of the country's 500 largest companies had implemented TQM), it is subject to a variety of criticisms. Dr. Edward Lestrade, one of the leading critics of total quality management practices in the United Kingdom, describes the goal of total quality management (TQM) as being “designed to be motivational, in that it increases the responsibilities of the employees in the organization and widens the scope of their duties. However, the reality is that the natural outcome of the organisational total quality management system is to drive the employee to work harder and longer hours thereby increasing the potential for incidences of stress-related illness.” In Japan the term *karoshi* (death from overwork) is associated with the stress and demands made in organizations practicing TQM.

Other critics of total quality management such as author John Addey (2004), identified a variety of myths associated with quality systems, one of which is the idea that staff follow [quality control](#) procedures during their daily work. Another myth is that quality audits are a good way to find problems, and managers welcome auditors as a means of identifying opportunities to improve. He provides many other myths about quality management as well, including the statement, “If everything is controlled, all will be well.” Addey suggests instead that sometimes the best control is no control at all.

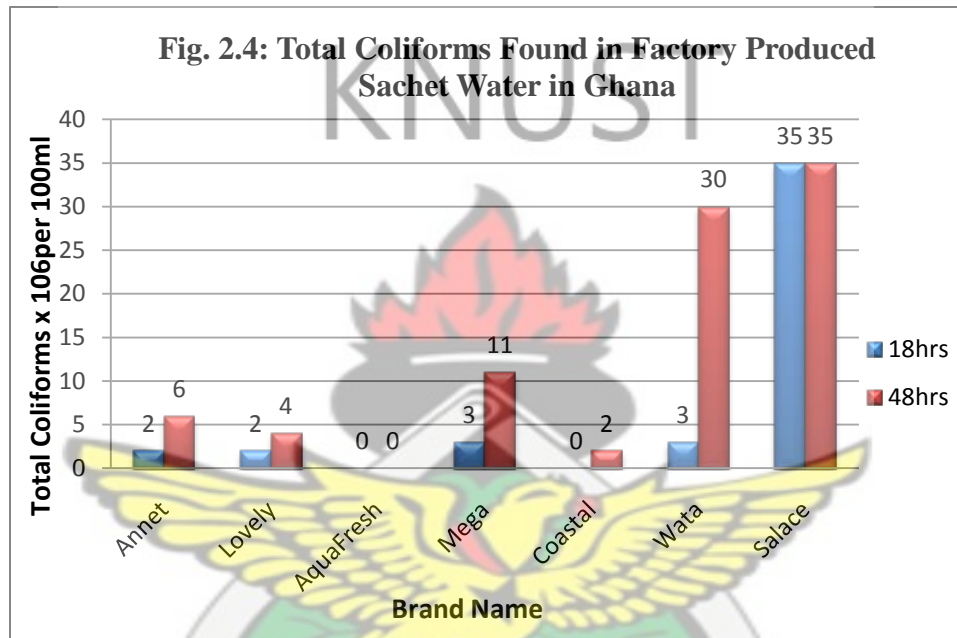
2.12 Previous Studies on Microbiological Quality of Sachet and Bottle Water in Ghana

Previous research works on the microbial quality of sachet water in Ghana include three separate studies in three locations: the Cape Coast Municipality of Ghana (in the Central Region), Kumasi (in the Ashanti Region) and the Greater Accra Metropolitan Area (GAMA). Results of these studies are discussed briefly in this section. **Appendix F** gives an overview of the indicator organisms used in microbial water quality testing, in addition to providing a background to microbial water quality.

2.12.1 Microbial Studies by Dodoo et al

Studies conducted by Dodoo et al. (2006), involved testing the quality of a total of 29 “brands” of factory-produced sachet water in the Cape Coast municipality of Ghana and using 180 random samples exposed to three different environmental conditions; the sun (40°C), room (28 °C), and in the laboratory (28 °C) . The water quality tests were carried out using the membrane filtration method with lauryl broth or algar medium, and/or by the multiple tube fermentation method. Results indicated that 45% of the brands of sachet water contained total coliform bacteria in at least one test. The total coliform counts ranged from 0 colony forming units (CFU)/100ml to 98 million CFU/100ml. Three out of seven brands returned positive results for *E.coli* in their analysis. **Figure 2.4** shows the maximum number of total coliform colonies counted for sachet water stored at a temperature of 40°C (sun exposure), that simulates the environmental conditions sachet water may be exposed to when sold in open air markets or on streets by roadside vendors.

The tests were run once per week over five weeks. Two counts, at 18 hours and 48 hours of incubation at 37°C, are shown. Only one brand out of the seven (Aqua Fresh) was free of total coliforms for tests run under the specified conditions. Two brands, Mega and Wata, incubated for 18 hours and 48 hours, showed the presence of *E.coli*.



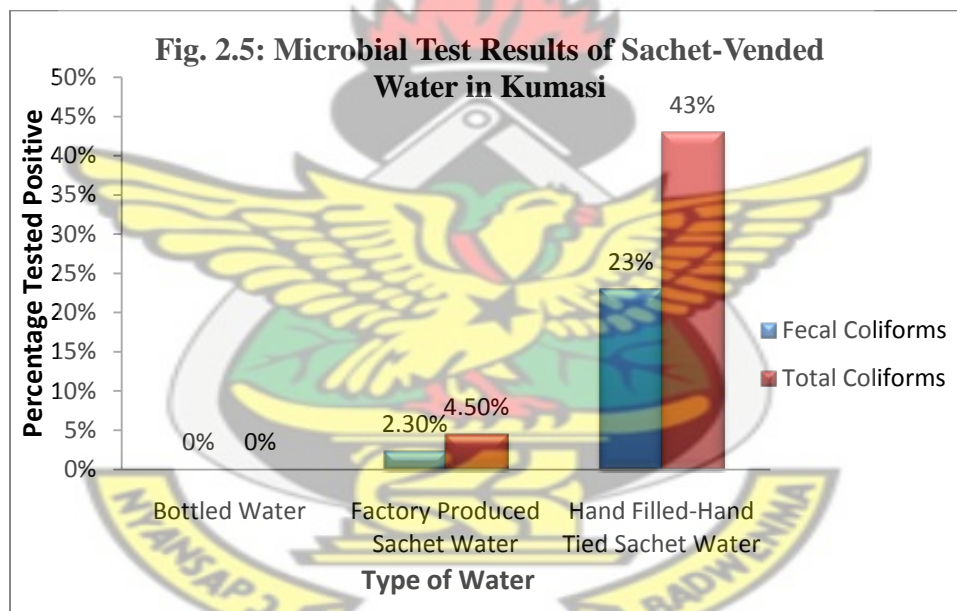
Source: Dodoo et al. (2006)

A result not shown in Figure 2.4, but relevant is that samples of the brand Salace stored at room and lab environments (28 °C) showed *E.coli* while samples of this brand that were exposed to the sun (40°C) did not.

2.12.2 Microbial Studies by Obiri-Danso et al

Obiri-Danson et al. (2003) analyzed the quality of bottled water, factory-produced and hand-tied sachet water sold in the streets of Kumasi in Ghana, using membrane filtration. The water samples they considered included eight samples of bottled water, 88 factory produced

sachet-water samples and 40 hand-tied sachet-water samples. While their results showed no presence of total coliforms in bottled water (0CFU/100ml), 4.5% of the factory-produced sachet-water samples showed total coliforms (counts ranged from 10 CFU/100ml to 13 CFU/100ml for positive results) and 2.3% had fecal coliforms (2 samples both 10 CFU/100ml). For the hand-tied sachet water 43% (17 samples) were positive for total coliforms (range from 10 CFU/100ml to 67 CFU/100ml). 23% (9 samples) showed presence of fecal coliforms (range from 10 CFU/100ml to 20 CFU/100ml). **Figure 2.5** shows the percentage of positive *E.coli* and total coliform results from the samples tested.



Source: Obiri-Danso et al. (2003)

2.12.3 Microbial Studies by the Stockholm Environment Institute (SEI)

In the Greater Accra Region, the quality of “ice-water” sold in the streets was analyzed by SEI (1993). Here, tests were conducted to obtain the numbers of total coliform, fecal coliform and fecal streptococci. Although no fecal coliforms were detected, 78% of total coliforms were found in the range of 11-100 CFU/100ml, and fecal streptococci, 33% in the

range of 11-100 CFU/100ml and 67% in the range of 101-1000 CFU/100ml, were found confirming the presence of fecal contamination (**Table 2.1**).

Table 2.1: Bacteria Concentration of Drinking Water from “Ice Water” Vendors

Counts/100ml	Total Coliform		Fecal Coliform		Fecal Streptococci	
	No.	%	No.	%	No.	%
0	0	0	42	100	0	0
1-10	5	22	0	0	0	0
11-100	18	78	0	0	14	33
101-1000	0	0	0	0	28	67
Total	23	100	42	100	42	100

Source: SEI (1993)

2.12.4 Survey by the Ghana Chemical Society (GCS)

Additionally a nationwide survey by the Ghana Chemical Society (2010), arrived at the conclusion that about 85 per cent of sachet water produced and sold in the country is not of standard quality. The survey, which was conducted last year, relied on specifications set by the Ghana Standards Board (GSB) which included raw material requirements, physical, bacteriological and chemical requirements, virological and parasitological qualities, as well as packaging and labeling requirements for the product.

2.12.5 Comparison of Previous Sachet/Bottle Water Microbial Research Results

Studies done by Obiri-Danson et al. (2003) indicated that all samples of bottled water tested were free of microbial contamination (0 CFU/100ml for both *E.coli* and total coliforms).

4.5% of the factory-produced sachet-water samples showed total coliforms, 43% of hand-tied sachet water were positive for total coliforms (range from 10 CFU/100ml to 67 CFU/100ml). Subsequent studies like that of Dodoo et al. (2003), SEI (1995) and the GCS (2010) as seen above, all arrived at similar results that agree with that of Obiri-Danso et al. (2003).

The various studies show that in terms of microbial properties, bottle water is the safest on the Ghanaian market, followed by factory produced sachet water. Hand- tied sachet water is consequently the least safe for drink.

2.13 Summary of the Literature

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 TQM 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. TQM 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 TQM implementation brings added value to the organisation.

For an industry such as Ghana's sachet/bottle water industry to benefit from the implementation of the TQM ideology, there is the need for the basic principles which form the core values of TQM to be aligned with the existing organisational culture as they serve as the bedrock through which performance through quality is achieved. While most

organisations have witnessed remarkable benefits with the adoption of TQM, others have failed due to their non compliance with the implementation procedures.

CHAPTER THREE

RESEARCH METHODOLOGY & PROFILE OF THE SACHET/BOTTLE WATER INDUSTRY

3.0 Introduction

This chapter presents the various methods and techniques used to collect and analyze the data collected for the study. It also gives an insight into the sachet/bottle water industry in Ghana. Consequently this section provides information such as the research design sample size, sample techniques, sources of data, method of data collection, field experience, the profile of the sachet/bottle water industry, as well as a brief profile of the case study companies.

3.1 Research Design

The study was both qualitative and descriptive in nature and specifically adopts an interpretive orientation, which seeks to understand phenomena. For this reason, the research problem was not stated in the form of null hypothesis which the research would aim to reject using statistical techniques, but was framed as a broad research objective and questions.

The study adopted a Case Study and Survey approach. For the case study, the following four (4) sachet/bottle water companies represented the case companies for the research:

- i. Voltic Ghana Limited, producers of Voltic Mineral Water

- ii. The Coca Cola Company, Ghana Limited, producers of BonAqua Drinking Water
- iii. Everpure Ghana Limited, producers of Everpure Drinking Water, and
- iv. SBC Beverages Ghana Ltd.(Bottler of Pepsi), producers of AquaSplash Drinking Water

These four companies were selected on the basis of them being the market leaders for sachet/bottle water products in Ghana. They control approximately over 80% of the market for sachet and bottle water across Ghana. It was part of the objectives of the study to review the quality management practices of these companies that have enabled them achieve competitive advantage over their competitors. However the Coca Cola Company opted not to have their quality control manager and other employees sampled, stating that it is against their internal policy to give out information concerning their quality management practices. Therefore the study information obtained for their brand of packaged water (BonAqua) was obtained mostly from their website and other secondary sources.

3.2 Target Population

The target population for the research comprised all consumers of packaged water, distributors/retailers of sachet/bottle water as well as employees of the sachet/bottle water industry. 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.

3.3 Sampling Method and Sample Size

The primary data was obtained by serving questionnaires to respondents who were sampled through stratified random sampling. Yin (2003), and Stake (1995), identified six ways to collect data for case studies:

- Documents
- Archival records
- Interviews
- Direct observation
- Participant-observation
- Physical artifacts

The sample area consisted of Accra and Kumasi. Stratified random sampling was employed as the sampling method. Questionnaires were used as the data collection tool for the Survey component of the research. Direct observation, interviews, documents, and physical artifacts were also used for more robust data collection.

Three (3) different stratified groups were identified and sampled and they included:

1. Employees of the four case companies - 10 respondents each
2. Retailers and distributors of sachet/bottle water products - 40 respondents
3. Consumers of sachet/bottle water products - 200 respondents

Additionally, a senior FDB official as well as the quality control/assurance officers of all the case companies were interviewed using a short structured interview approach in order to get detailed feedback. The information above is better represented in **Table 3.1**.

Table 3.1: Sample sizes of the Stratified Groups Sampled

Strata Type	Location		Total
	Accra	Kumasi	
Employees	10 x 3	-	30
Retailers & Distributors	20	20	40
Consumers	100	100	200
Total			270

Source: Field Survey, July, 2011

Hence it can be seen from **Table 3.1** that a total of two hundred and seventy (270) respondents were sampled for information used in the study.

3.4 Sources of Data and 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 management, the influence of quality on organisational performance, the influence of TQM on company performance, etc. The outcome of the literature review served as a theoretical basis for the development of the questionnaires used in the study.

The primary data for the study was obtained through questionnaires administered to employees of the study companies and also consumers and distributors/retailers of sachet/bottle water products. The questionnaires were designed with the objectives of the study in mind. Also additional primary data was obtained through personal structured

interviews (open ended) of quality control officers of the selected case companies (see **Appendix A**) as well as a senior official of the FDB (see **Appendix B**).

3.5 Questionnaire Development

For the purpose of the study, three different questionnaires were designed. The first questionnaire was designed for employees of the sachet/bottle water industry and focused on their job satisfaction and involvement in managing quality at their workplaces. This questionnaire consisted of twenty-eight (28) questions as shown in **Appendix C**. Some of the questions were adapted from the Minnesota Job Satisfaction Questionnaire while the remaining was added by the researcher.

The second questionnaire (seen in **Appendix D**) was a consumer survey that centered on consumer perception of the quality of the packaged water available on the market. This was based on the objective of the study that improving the quality of packaged drinking water products would boost the performance of the industry. In the administration of the questionnaire, consumers who could not read or write English were assisted in answering the questionnaire by interpreting it where possible. The third questionnaire (see **Appendix E**) was targeted at the distributors and retailers of the products of the selected case companies for the study. This was intended to give a measure of the performance and market value of the products of these companies.

3.5.1 Design of Questionnaires

All questionnaires were designed to be answered using a five-level Likert Scale type with responses ranging from “0” to “5”. The definitions for the responses are:

- 0 = Does not apply
- 1 = Very poor
- 2 = Below average
- 3 = Average
- 4 = Good
- 5 = Very Good

Before obtaining the final questionnaires used in the research, draft questionnaires were designed and pre-tested to look into their effectiveness also measure the most probable results of the study. The draft questionnaires were edited to obtain the final questionnaires upon successful completion of the pre-test.

3.5.2 Questionnaire Responsiveness

The average responsive rate for the three different questionnaires was 91%. The breakdown of the responsiveness for each of the questionnaires is shown in Table 3.2. In all the rate of responsiveness was high enough to validate the results of the study.

Table 3.2: Questionnaire Responsiveness Breakdown

Questionnaire	Total Number	Number Returned	Responsiveness
Employees	30	24	80%
Retailers & Distributors	40	40	100%
Consumers	200	186	93%
Total Responsiveness			91%

Source: Field Survey, July, 2011

3.6 Ethical Review

In the data collection and sampling procedure, ethical issues were taken into consideration, in that participants were made fully aware of the purpose of the study and also assured that individual respondents were not going to be identified and all the responses will be analyzed together.

3.7 Data Analysis

Completed questionnaires from the field were edited and coded appropriately to make effective meaning out of the data. Editing was done to correct errors, check for non responses, accuracy and correct answers. Coding was done to facilitate comprehensive quantitative analysis of the data. To arrive at the intended analysis, the respondents' responses were entered in to SPSS and Excel softwares and several sets of statistical analyses were performed to provide a basis for the research findings.

3.8 Profile of the Sachet/Bottle Water Industry

Ghana has both small and large scale industries that pack and machine-seal sachet water and also offer bottled water to consumers. This water is referred to as “pure water” by many of the locals. The sachet/bottle water industry in Ghana is vibrant and highly profitable sector since there is always ready market demand for the products of the industry. Producers and distributors/retailers/vendors usually make close to (sometimes even more than) 100% profit

on their sales (Okioga, 2007). There has been a proliferation of sachet water producing companies all across the country due to the relatively low start up capital required. However bottle water production is highly capital intensive and is therefore mostly undertaken by large companies that possess the required financial and technical resources.

The small scale industries usually have much smaller distribution coverage, more often distributing their products in and around the towns/communities where their factories are located. The factories usually produce between 15000 sachets (500 bags) to 45000 (1500 bags) sachets per day. However the large scale water companies have better technology, resources and adequate logistics support to produce both bottle and sachet water for sale nationwide. Most of the large scale water companies also operate water packaging factories and depots in several towns and cities across Ghana. They usually produce and supply over 5000 bags of sachet water per day.

The industry offers two types of packaged water to Ghanaian consumers ie. Filtered Water and Mineral Water. However filtered water is more common. Filtered water is produced by passing water under high pressure through a series of candle water filters (from the coarse filter to the fine filter). **Figures 3.1 and 3.2 (Appendix G)** show two types of candle filters which are commonly used. Additionally, schematic representations of these filters can be seen in **Figures 3.1a & 3.2a (Appendix G)**. Through this process most of the micro particles or sediment in the water is removed. However on the other hand, Mineral water is produced by filtering water obtained from natural springs which already contain trace elements like calcium, magnesium, etc Mineral water can also be obtained artificially by passing filtered

water under pressure through layers of granite and lime so that the natural trace elements contained these stones will be absorbed into the water.

3.8.1 Sachet Water Production Process

The main source of water used for sachet-water production is tap water from the Ghana Water Company. At the sachet-water factory, the water supplied is treated by a point-of-entry (POE) system that makes use of filtration, and in some cases ultra violet (UV) disinfection. A typical sachet-water factory setting consists of a storage system (tanks), a conveyance system (piping), a decentralized water treatment system (filters, UV disinfection units), and a packaging system. The packaging is done by making use of automatic liquid filling and packaging machines, also commercially known as “automatic liquid packaging machines”, “form, fill and seal machines” or simply “sachet machines”. For the purposes of this study, “sachet machines” is used. A typical set-up of a sachet-water factory is shown in **Figure 3.3** which shows two sachet machines, with the treatment system comprised of filtration and UV disinfection units attached to the wall in between the 2 sachet machines.

The storage tanks (not in the photo) consist of a tank or a series of multiple tanks placed outside, within the factory compound or inside the factory building. To ensure minimum re-contamination of treated water, piping from the POE system is connected directly to the packaging machine and final sachet-water product. There is no pipe outlet provided in between, so as to avoid possible contamination. The sachet water is then packaged using sachet machines. Each sachet contains either 500ml or 200ml of water.

Figure 3.3: Typical Sachet Water Factory Set-up



Source: Field Survey (July, 2011)

3.8.2 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 (Polyprint, 2007). This type of plastic is made from the distillation of crude oil and the principal raw material is ethylene gas (monomer), (Okioga, 2007).

3.8.3 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. **Fig 3.4** shows a typical sachet water filling and sealing machine.

Fig 3.4: Typical Sachet Water Machine

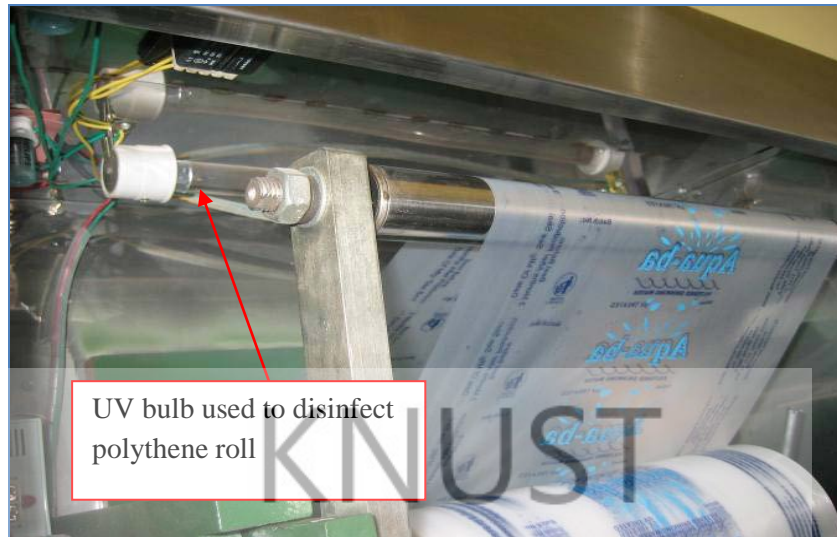


Source: Anhui Koyo Machinery Co. Ltd. (China)

The main parts of the machine include:

- The bag-forming devices that fold the polythene bags used for sachet water before the bags are heat-sealed.
- The sealing devices, which seal the bags first vertically and then horizontally after filling with water.
- The filling and metering devices that fill the bags with water and monitor flow;
- A UV disinfection bulb (see **Figure 3.5**) that disinfects the inner plastic film used to package sachet water, and
- An automatic counter that registers the number of bags produced.

Figure 3.5: UV-bulb in sachet machine used to disinfect polythene roll



Source: Okioga (2007)

Most sachet machine models can produce 1500 to 2100 bags of sachet water per hour. Another feature is an automatic counter that keeps track of the number of sachets produced. The sachet filling and packaging machines automatically print on the sachets, the batch number of bags produced thus making it easy to keep track of the production. The packing capacity (volume per sachet-bag) can be adjusted to the required volume, generally 200-500ml, with a packaging precision of $\pm 1\%$. The required volume can be obtained by either adjusting the length between the horizontal seal, or using an appropriate film width.

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 140°C -170°C and the horizontal sealing temperature to 200°C -250°C, depending on the type of film material used and its thickness. The machine weights about 300kg and measures about 850mm (L) x 750mm (W) x1700mm (H) (Hualian Machinery Co. Ltd, China, 2007).

3.8.4 Marketing and Distribution Features

There is high demand for packaged water, especially sachet water, on the Ghanaian market, 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 Ghanaians both at home and in public. Bottle water is available in different sizes (quantities) so to satisfy different consumer needs. The bottles water sizes commonly available are 0.5litre, 0.75litre, 1litre and 1.5litre. For sachet water, it is only available in 500ml and 200ml sachets. However the 500ml sachet is most common on the market.

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 25 or 30 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.

3.9 Industry Monitoring Agencies

Monitoring agencies refer to the institutions and authorities that regulate the sachet/bottle water industry and ensure that packaged water companies operate within laid down guidelines and quality specifications. The main identifiable monitoring agencies for the packaged water industry are:

- **The Food and Drugs Board (FDB) and**
- **The Ghana Standards Board (GSB)**

3.9.1 The Food and Drugs Board of Ghana and the Ghana Standards Board

The Ghana Standards Board (GSB) and the Food and Drugs Board of Ghana (FDB), established in 1965 and in 1992 respectively, are both responsible for ensuring that products being marketed in Ghana are of the required quality. While the GSB 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 (GSB, 2004).

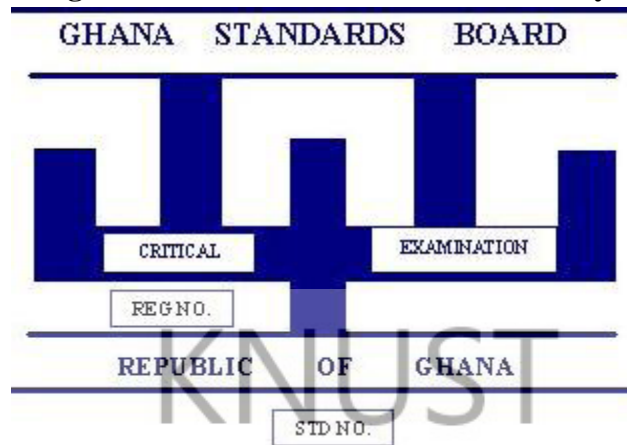
Both the FDB and the GSB regulate and certify bottle/sachet water production and therefore there is sometimes duplication of functions by the two authorities. However, while it is optional to have factory-produced sachet water registered with the GSB, it is mandatory to have the products approved and registered with the FDB. The main advantage of being registered by the GSB is to build product reputation.

3.9.2 The Ghana Standards Board (GSB)

Products that have been certified by the GSB, including bottle and sachet water, bear the “Mark of Conformity”, also called the “Certification Mark” or the “Quality Mark”. The procedure for obtaining certification for packaged 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 bottle/sachet water is also inspected to assess the labeling requirements (GSB, 2004). Bottle/sachet water factories 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. Certified products are regularly audited by the GSB, 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 Ghana. **Figure 3.6** shows the mark of conformity. The mark has a logo that bears a unique registration number for all products and a standard number that depends on the type of product.



Figure 3.6: The GSB Mark of Conformity



Source: GSB (2004)

3.9.3 The Food and Drugs Board

The FDB enforces its own standards as well as those of the GSB. Although the FDB was established in 1993, it became fully operational in 1997 (USDA, 2005). The registration procedures for food products in Ghana, including sachet and bottle 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 factory, and health certificates for all workers in the product line showing test results for tuberculosis, hepatitis A and E, typhoid and other communicable diseases. Water samples are analyzed to assess the quality before registration is approved. Once the sachet/bottle water is registered with the FDB, the registration is valid for three years and is renewable by the end of the third year.

The FDB is the main monitoring agency with oversight over the sachet/bottle water industry. According the FDB official website (accessed June 2011), there are currently 438 registered

sachet water companies across Ghana. Table 3.3 shows the number of registered sachet water companies in each of the ten regions of Ghana. But it is largely believed that this figure is much higher since more of the sachet water producers remain unregistered.

Table 3.3: Number of Sachet Water Companies Registered by the FDB in each Region

No.	Region	Registered Sachet Water Companies
1	Greater Accra	54
2	Ashanti	204
3	Brong Ahafo	21
4	Eastern	59
5	Northern	2
6	Upper East	Non
7	Upper West	Non
8	Volta	40
9	Central	Non
10	Western	58
TOTAL		438

Source: FDB Official Website – Accessed on June, 2011

3.9.4 Guidelines Set by the Food and Drugs Board (FDB)

The Food and Drugs Board of Ghana (FDB, 2005) specifies guidelines for the establishment of food industries, which also applies to factory-produced sachet/bottle water. Applications for the establishment of sachet or bottle water factories are submitted with supporting documents which include an environmental permit from the Environmental Protection Agency (EPA). Other requirements and relevant documentation, as obtained from personal

communication and literature provided by the FDB staff in Accra, are summarized as follows:

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.

2) Premises and Equipment

The FDB requires documented information on the premise (nature of building) and equipment of sachet/bottle water factories. This includes general information on interior surfaces, drainage system, ventilation, water and electrical systems. As described by the FDB employees, other guidelines that relate to the premises include:

- Smooth flooring with no cracks that can possibly harbor vectors;
- Fluorescent lights with shatter proof bulbs to contain the glass particles if the bulbs should break;
- Walls coated or clad with washable material such as tiles or oil-based paints;
- Wiring and electrical connections and devices covered by electrical cover plate.

3) Health, Safety and Hygiene

Staff working with sachet/bottle water production (or other food and drug products) 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 and hair covering and nose masks.

4) Record Keeping

The FDB requires production records documenting all batches of sachet/bottle 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.

5) Minimum Water Treatment Requirements

According to information given during the interview session with the FDB staff, the minimum water treatment requirements in sachet/bottle water production is filtration followed by UV disinfection. At least 5 filters and one UV disinfection unit are required for each sachet machine. The filter cartridges are required to be changed at least once every 3 months.

6) Water Quality Tests, Licensing and Certificates

According to interview responses by the FDB, two categories of licenses are issued and are described below:

Pre-licenses: Here, the FDB carries out water quality analysis on samples of sachet/bottle water produced by unregistered factories before they are allowed to produce and market the packaged water. Here, the factory owners pay for all costs incurred in carrying out the tests.

A certificate of analysis is then issued as one of the required documents for registration or renewal.

Post-licenses: This is carried out randomly on sachet/bottle water samples produced by registered packaged water factories to ensure that production of quality water is maintained. Post-licensing is carried out at the expense of the FDB. It is sometimes based on customer complaints. The FDB carries out punitive measures, such as license withdrawal, if samples tested are not of quality. A product certificate is issued for factories that meet the water quality requirements.

3.10 Profile of Case Companies

This section provides further information about the background of the companies selected for the study. The information presented here was obtained from a combination of data from the companies' websites and also through interviews with officials of the companies.

3.10.1 Voltic Ghana Limited

Voltic Ghana Limited, is the leading producer of both bottle and sachet water in Ghana. The company was formerly Indian owned and started operations in Ghana in 1995. It then became a subsidiary of SABMiller Plc of South Africa in April 2009. At the time Voltic was established there were then predominantly imported bottle water products on the Ghanaian market. The company capitalized on its location in the local market to effectively market and extensively distribute its products all across Ghana; eventually crafting for itself the position of its products becoming the number one preferred choice of packaged water among

Ghanaians. Today Voltic commands 65% of the market share of the bottle/sachet water market with production levels at its bottling plant exceeding 400 cartons of bottle water an hour.

Voltic Gh. Ltd. has implemented a Quality Assurance System and HACCP (Hazard Analysis and Critical Control Points- See Section 2.5 of Literature Review) as part of its quality management policy. Due to the established assurance and reliability of its quality systems, the name Voltic has virtually become synonymous with quality packaged drinking water in Ghana. The company has leveraged on its brand success to operate several franchises (over 20 in number) all across the country that predominantly produce Voltic sachet water (known as Voltic Cool Pack) to cater for the low end of the market who cannot afford bottle water. (Source: Voltic Ghana Limited, 2011)

3.10.2 Everpure Ghana Limited

Everpure Ghana Limited is a wholly Ghanaian company formed about two and half years ago by Ghanaian professionals from different fields. Though established not long ago the company has gained a reputation for consistently producing quality products and is fast becoming the second largest in terms of market share behind Voltic Ghana Limited. Everpure is based in Tema and does not produce only bottle and sachet water, but ice cubes as well. The company is currently the fastest growing sachet/bottle water company, and has embarked on a vigorous expansion drive, opening depots all across the country. It recently set up a factory in factory in Kumasi (its second in Ghana) to enable it meet the ever growing

demand for the company's products. Everpure practices Quality Control as its quality management system.

3.10.3 SBC Beverages Ghana Limited

SBC (Seven up Bottling Company) Beverages is a franchise under Pepsi International. However the company's packaged water brand, AquaSplash is an initiative of the company and not a franchise brand. As its name suggests beverage production is the core business of the company. The company not too long ago added the AquaSplash brand to its product portfolio in an effort to be part of Ghana's fast growing bottle water industry. It has capitalized on its already existing world class production and quality systems, marketing and distribution channels to build the AquaSplash brand as one of the leading brands in the industry. SBC produces only AquaSplash bottle water and employs Quality Control as its main quality management strategy.

3.10.4 The Coca-Cola Company, Ghana Limited

Like SBC Limited, the Coca-Cola Company is originally a beverage manufacturing company but has added bottle water BonAqua to its line of products. Coca-Cola has leveraged on its strengths as the leading global brand to effectively market and ensure the success of its BonAqua brand of bottle water on the Ghanaian market.

However not much is known about Coca-Cola's quality management systems and strategies in relation to its bottle water production, as the company refused to partake in the research.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter focuses on the descriptive analysis and the findings of the research write-up. The data collected from the field is analyzed and explained under four broad headings: (A) Consumers (B) Retailers/Distributors of Sachet/Bottle Water Products (C) Employees of Sachet/Bottle Water Companies and (D) 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 and pie chart were used in analyzing the data.

4.2 Consumers

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

4.2.1 Demographic Characteristics of Consumers Surveyed

Two hundred (200) questionnaires were distributed to consumers, comprising of hundred (100) questionnaires each for consumers in Accra and Kumasi. However only 186 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

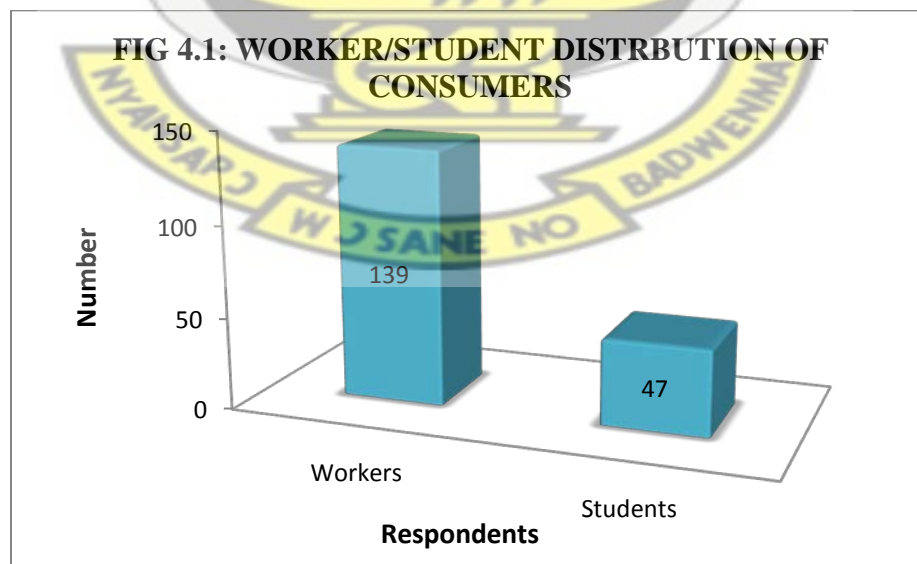
were in the age groups of under 20 (10%), 20-29 (57%), 30-39 (18%), 40-49(12%), 50-59 (0%), and over 60(3%).

Table 4.1: Age Group & Gender Distribution of Respondents

Age Group	Gender				Total	%
	Male	%	Female	%		
Under 20	3	1.6	16	8.4	19	10
20-29	54	29	52	28	106	57
30-39	21	11	13	7	34	18
40-49	15	8.2	7	3.8	22	12
50-59	0	0	0	0	0	0
Over 60	4	2.4	1	0.6	5	3
Total	97	52	89	48	186	100

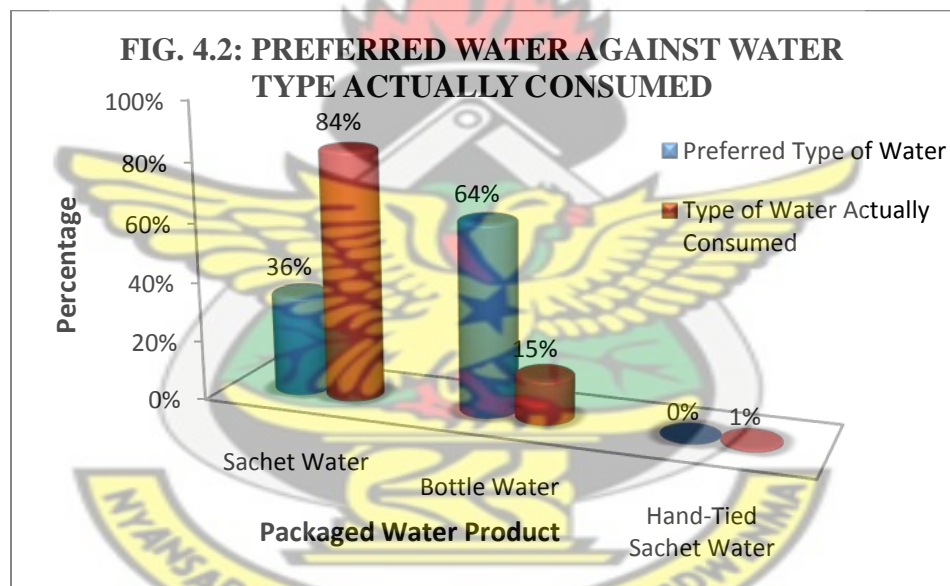
Source: Field Survey, July, 2011

As shown in **Fig. 4.1**, 139 consumers representing 75% of the respondents were workers while the remaining 47 consumers representing 25% of respondents were students.



Source: Field Survey, July, 2011

All the respondents (100%) indicated they drink sachet and/or bottle water. However, 121 (64%) respondents said they prefer bottle water, only 27 (15%) of them actually drink bottle water. Also 157 (84%) consumers drinks sachet (factory produced) water though only 65 (36%) of them said they prefer sachet water. Surprisingly 2 (1%) respondents indicated that they drink hand-tied sachet water. These figures are captured in **Fig. 4.2**. The reasons given for the high level of factory produced sachet water consumption was because factory produced sachet water is more affordable compared to bottle water, although bottle water would have been preferred due to the perception of high quality attributed to it.

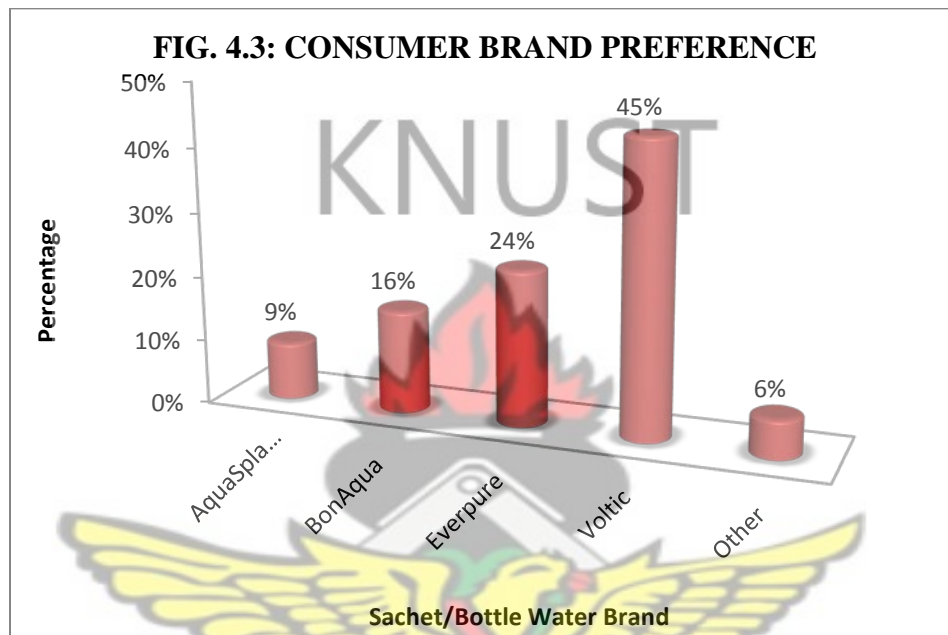


Source: Field Survey, July, 2011

4.2.2 Consumer Brand Preference

Out of the 186 consumers surveyed, 175 (94%) respondents indicated one of the products of the four case companies as their preferred choice of drinking water. However 11 (6%) of the consumers said they preferred other brands other than the case study brands. Such brands mentioned included Standard Water (predominantly among respondents in Accra), Ice Cool

and Mobile Water. However these brands were not included in the case study because they had lower market shares as compared to the study brands. Also the presence and visibility of these brands are limited to only certain parts of the country and not across the country.



Source: Field Survey, July, 2011

Also as illustrated in **Fig. 4.3**, 9% of respondents said they prefer AquaSplash, 16% of respondents chose BonAqua as their preferred brand, 25% of the respondents indicated Everpure as their preferred brand while 45% of the respondents answered Voltic as their preferred brand. This confirms Voltic's position as the leading brand in the industry. Even more impressive is the position of Everpure 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 BonAqua and AquaSplash. This data is indicative that the companies who have sachet/bottle 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.

4.2.3 Brand Availability

58% (107) of respondents answered “Yes” to the fact that they always readily get their preferred brand of packaged water to purchase, while 42% (78) answered otherwise. Additionally 80% (148) of respondents said they purchase any other brand available in event of the unavailability of their preferred brand while 20% (38) of respondents said they don’t compromise on their preferred brand. This analysis leads to the conclusion that Ghanaian consumer loyalty to sachet/bottle water brands is very low since the top brands are easily substitutable.

4.2.4 Brand Quality Experience

31% (57) of respondents indicated that they have experienced quality problems with the case study brands while the remaining 69% (129) replied otherwise. However of the 31%, only 5% reported the problem to the companies concerned while the remaining 26% refrained from reporting. Also of the 5% who reported the quality problems, only 2% had quick responses while the remaining 3% received no response.

The analysis indicates that though the four brands are the leading brands in the industry, they still have some minor quality challenges that should be addressed. These challenges include product defects (leakages), products/brand imitations and compromising of product quality by retailers/distributors/vendors through mishandling and bad storage methods. Moreover the data collected shows that consumers don’t usually report quality problems.

The data also indicate the consumer feedback mechanisms of the four 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.

4.2.5 Consumer Packaged Water Purchasing Habits

Table 4.2 shows the distribution of bottle/sachet water purchasing points by consumers. 60% of the respondents purchase package water from shops, 37% from vendors by the roadside and 3% from Lorry Parks and Stations.

Table 4.2: Distribution of Purchasing Points for Sachet/Bottle Water

Purchasing Point	Frequency	Percentage
Shops	111	60%
Roadside Vendors	69	37%
Lorry Parks and Stations	6	3%

Source: Field Survey, July, 2011

Majority (60%) 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 (37%) 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 (60) of packaged water products are usually purchased from the shops.

4.2.6 Consumer Perception of Regulatory Agencies

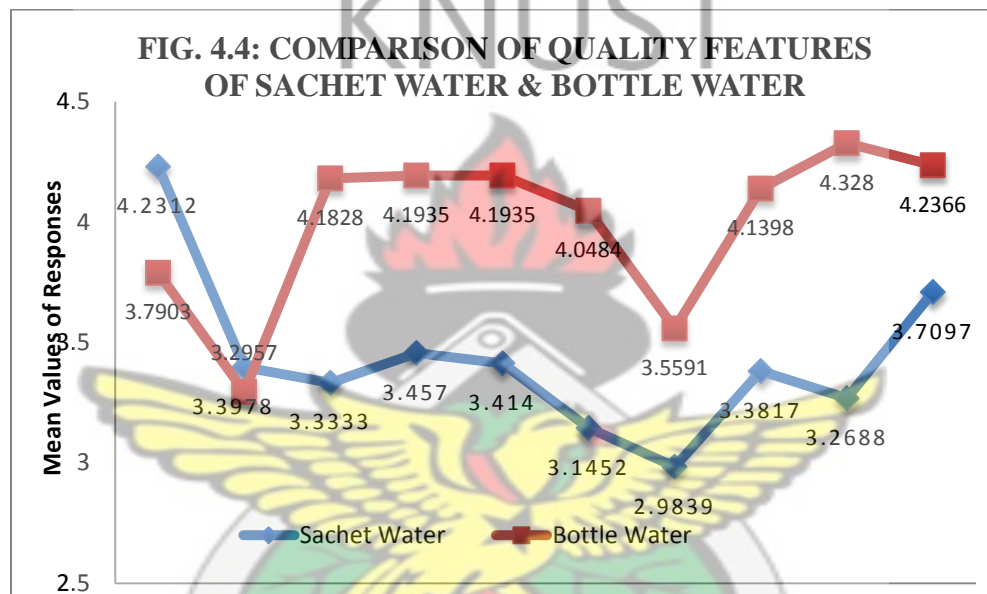
60% (111) of respondents surveyed were of the opinion that the regulatory agencies, ie. the FDB and the GSB are not doing enough to ensure quality of packaged water, while 40% (75) thought otherwise. Therefore it is deduced from the figures that there is a low level of public confidence in the regulatory agencies.

4.2.7 Consumer Perception of Sachet and Bottle Water Quality

As part of the survey, respondents were required to give a rating for several physical quality features of sachet and bottle. Responses ranged from “0” to “5”. **Table 4.3** and **Table 4.4** (Appendix H) show the summary of the responses for sachet water and bottle water respectively using percentage values of the frequency of each rating. The mean values of the frequency of each rating are also provided at the extreme right of the tables. The two tables in **Appendix H** indicate that consumers have a more positive view of bottle water- with respect to quality features- than sachet water. This is shown in the observation that bottle water consistently had more positive responses/ ratings for most of the questions put to respondents.

This observation is made much clearer in the line graph in **Fig. 4.4** where the mean values of the responses obtained for each type of water are directly compared. Here the only areas sachet water had higher ratings than bottle water was in terms of availability and price, where

consumers were of the perception that sachet water was more easily available and much cheaper than bottle water. The results of the survey on consumer perception of the quality of sachet and bottle water is confirmed scientifically by the microbiological research results (section 2.12) of Obiri-Danso et al. (2003) and Dodoo et al. (2006), who all found bottle water to be of much higher quality than sachet water.



Source: Field Survey, July, 2011

4.2.8 Suggestions from Consumers

Consumers sampled in the survey suggested that the FDB and GSB should effectively enforce their mandate in firmly ensuring that the package water producers follow the laid down quality guidelines. Concerns were also raised about the unhygienic and unsafe handling of packaged water products by the sellers and it was recommended that such sellers should be screened (health screening) and furthermore educated on quality selling practices before being allowed to sell the water. Finally it was also strongly suggested that the

packaged water producers, especially sachet water producers should be trained in best quality practices to enhance their quality output.

4.3 Distributors/Retailers of Sachet/Bottle Water Products

The questionnaires administered sought to determine the brand preference(s) of dealers/traders of sachet/bottle 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 ie. all 40 questionnaires were returned. Most of the data obtained from the questionnaires could only be analyzed qualitatively (section 4.3.3) while the remaining was analyzed quantitatively.

4.3.1 Demographic Characteristics of Distributors/Retailers

The gender distribution of sachet/bottle water distributors who responded to the survey is as shown in Table 4.5. It is observed that the number of females (72.5%) is almost three times the number of males (27.5%). This is indicative of the fact that females are predominantly involved in the sale of sachet/bottle water products in Ghana than males. The percentages for the age distribution is as follows: Under 20(7.5%), 20-29(20%), 30-39(37.5%), 40-49(25%), 50-59(7.5%) and finally, 60 and above (2.5%). The observation here is that the 30-39 age group is predominant in the retail and distribution of sachet/bottle water products.

Table 4.5 reveals that even within each age group, females are still more than males. It is wise therefore for sachet/bottle water companies to target their quality

marketing/sensitization messages at women/females since they make up a larger number of the distributors/retailers.

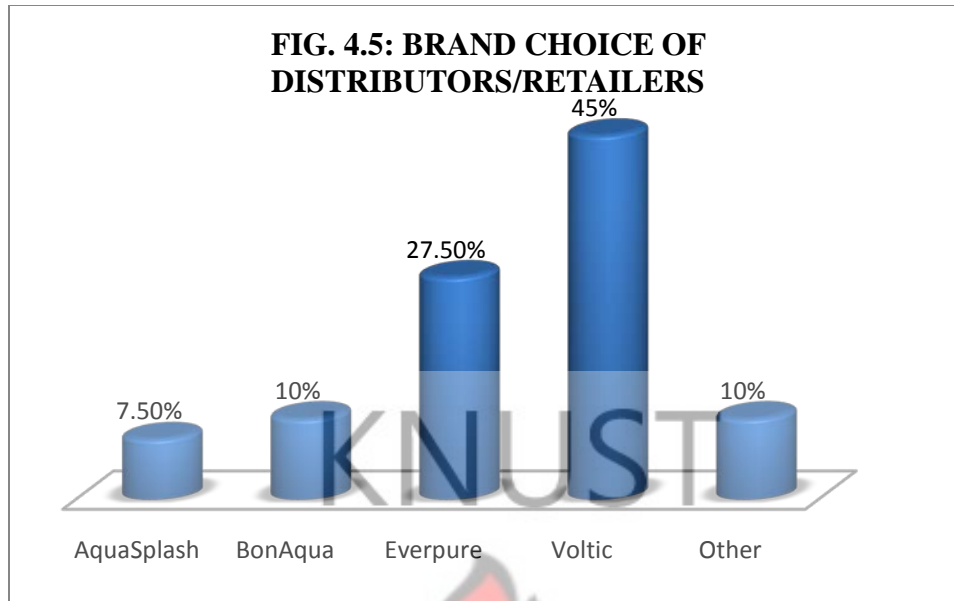
Table 4.5: Age Group & Gender Distribution of Respondents

Age Group	Gender				Total	%
	Male	%	Female	%		
Under 20	1	2.5	2	5	3	7.5
20-29	0	0	8	20	8	20
30-39	5	12.5	10	25	15	37.5
40-49	4	10	6	15	10	25
50-59	1	2.5	2	5	3	7.5
60 and above	0	0	1	2.5	1	2.5
Total	11	27.5	29	72.5	40	100

Source: Field Survey, July, 2011

4.3.2 Brand Choice of Distributors/Retailers

Although over 70% of the respondents disclosed that they sell more than one brand sachet/bottle 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 Fig. 4.5 the various brands often sold by retailers and distributors. Here again Voltic tops with 45% of the distributors/retailers citing it as the brand they prefer and usually sell. Voltic is followed by Everpure with 27.5%, BonAqua and “Others” with 10% and lastly AquaSplash with 7.5%. “Others” as used in the study represents brands on the market other than the case study brands. Such brands include Safina Water, Mobile Water, Standard Water, etc. More distributor/retailers in Accra chose “others” than those in Kumasi.



Source: Field Survey, July, 2011

It was also realized that distributors/retailers of other brands in Accra usually sold Standard & Safina water while those in Kumasi commonly sold Mobile & Ice-cool water.

4.3.3 Business Characteristics

95% of respondents agreed that the sachet/bottle water selling business was profitable. The average number of years the respondents had been in business was four (4) years. Close to 70% respondents disclosed “personal funds” as their source of start up 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 large number of respondents (65%) indicated that no sachet/bottle 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/bottle water quality at the point of sale.

Close to 40% of respondents revealed that their customers have complained or expressed quality concerns of their products on sale. This confirms the fact that Ghanaian 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 28 bags with the lowest and highest being 2 and 200 bags per day respectively. Also the average number of cartons of bottle water sold by the respondents a day was found to be 11 cartons with 1 and 40 cartons being the lowest and highest respectively. **Table 4.6** sums up the rest of the responses given by respondents to the survey.



Table 4.6: Summary of Responses to Distributors/Retailers Survey

Question	0	1	2	3	4	5	Mean
Q19	0	0	0	12.5	50	37.5	4.25
Q20	0	0	2.5	32.5	50	15	3.775
Q21	0	5	2.5	30	47.5	15	3.65
Q22	0	5	10	32.5	37.5	15	3.475
Q23	0	5	10	50	22.5	12.5	3.275
Q24	0	0	2.5	42.5	42.5	12.5	3.65
Q25	0	0	0	35	52.5	12.5	3.775
Q26	0	0	0	30	50	20	3.9
Q27	0	0	5	5	40	50	4.35
Q28	0	2.5	2.5	27.5	52.5	15	3.75
Q29	0	2.5	2.5	40	45	10	3.575
Q30	0	0	7.5	42.5	37.5	12.5	3.55
Q31	0	0	2.5	32.5	45	20	3.825
Q32	0	2.5	25	45	17.5	10	3.075

Source: Field Survey, July, 2011

Table 4.6 shows the frequencies and mean values of responses given to some questions in the distributors/retailers survey. The questions mainly covered the quality of services provided to the distributors/retailers by the packaged water producers. It can be deduced from the table above that sellers have a favorable view of the marketing and distribution services provided by producers, as most of them rated these services highly (average, good and very good) for most of the questions. The implication here is that majority of sachet/bottle water retailers/distributors/vendors are satisfied with the level of service provided to them by the packaged water producing companies.

4.3.4 Suggestions from Distributors/Retailers

The distributors/retailers surveyed recommended that non performing companies should learn and adapt for themselves the quality practices of the leading companies in the industry. Respondents also indicated that the regulatory agencies and the sachet/bottle water producing companies should address the problem of water producers who package their inferior quality products with the packaging of the leading companies and sell to unsuspecting people. Finally distributors/retailers recommended that water producers should do more to reduce the instances of product defects, especially leakages.

4.4 Employees of Sachet/Bottle Water Companies

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 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).

4.4.1 Demographic Characteristics of Employees

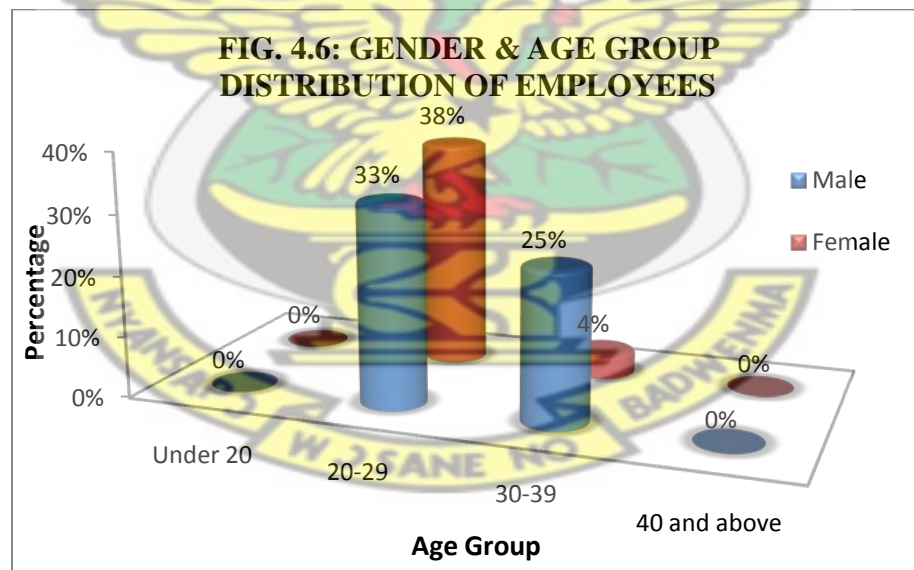
Thirty (30) questionnaires were administered to ten (10) employees each for the three case companies. Twenty four (24) questionnaires out of the thirty were returned and were used for the study. The number of questionnaires received from employees of each of the case companies and used for the study is shown in **Table 4.7**.

Table 4.7: Breakdown of Employee Questionnaire Responsiveness

Company	Number of Questionnaires Returned
Everpure Limited	8 out of 10
SBC Beverages Limited	10 out of 10
Voltic Ghana Limited	6 out of 10

Source: Field Survey, July, 2011

Fourteen respondents (58%) were males and the remaining ten (42%) were females as illustrated in **Fig. 4.6**. The indication here is that more males are employed in the sachet/bottle water industry than females. **Fig 4.6** also provides the age group distribution of employees who answered to the study questionnaire. None of the employees sampled were in the age groups of “Under 20” or “40 and above”. 29% of the employees were in the age group of 30-39 while the highest, 71% were in the age group of 20-29.

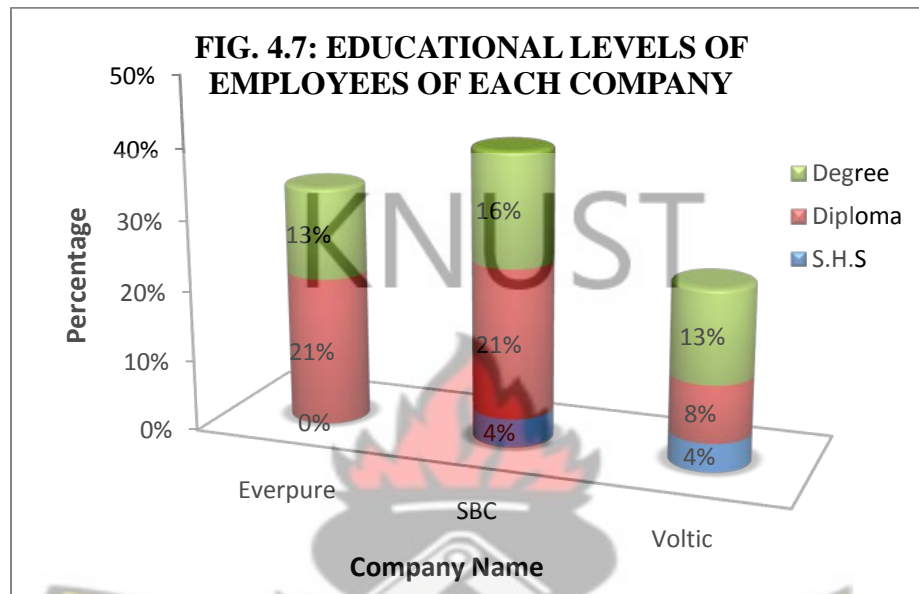


Source: Field Survey, July, 2011

4.4.2 Educational Level of Employees

All employees sampled possessed some form of education. As **Fig. 4.7** shows, 8% of respondents had S.H.S education; half of them (50%) had Diplomas and the remaining 42%

were degree holders. None of the employees sampled possessed only elementary or J.H.S education.



Source: Field Survey, July, 2011

Fig 4.7 also shows the educational qualifications of the employees of each of the case companies. For employees who responded to the questionnaires, Everpure had 5(21%) diploma holders and 3(13%) degree holders. SBC had just 1(4%) S.H.S leaver, 5(21%) diploma holders and 4(16%) degree holders. For Voltic, there was 1(4%) S.H.S leaver, 2(8%) diploma holders and 3(13%) degree holders. This data shows that some appreciable level of education is needed to gain employment in the sachet/bottle water industry. However producers can also further enhance the output of employees by providing regular training programs on quality. Stahl (1995), stresses that employee training and development programs should not be seen as a onetime event but a lifelong process.

4.4.3 Employee Perception of their Jobs

Table 4.8 summarizes the various responses given by employees to the questionnaires served to them. However over 80% of employees thought that their work in totality was between ‘average’ and “good” while 70% responded same in terms of their working conditions. Concerning importance of job to them 42% responded “good” while 29% responded “very good”. Also for salary and welfare 29% responded “poor”, 29% also responded “below average” and another 29% responded “average”.

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 4.8: Summary of Responses to Employee Job Perception Survey

Employee Job Perception Indicators	Very Good (%)	Good (%)	Average (%)	Below Average (%)	Poor (%)
Work in Totality	4.20	54.20	33.3	8.30	0
Working Conditions	0	16.70	54.20	16.70	12.50
Job Importance	29.20	41.70	20.30	8.30	0
Salary and Welfare	4.20	8.30	29.20	29.20	29.20

Source: Field Survey, July, 2011

4.4.4 Employee Involvement in Quality Management

Table 4.9 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 “Average”, “Below Average” and “Poor”

Table 4.9: Summary of Responses to Employee Involvement in Quality Mgt. Survey

Employee Involvement in Quality Indicators	Very Good (%)	Good (%)	Average (%)	Below Average (%)	Poor (%)
Knowledge of Quality Practices	16.7	37.5	29.2	4.2	12.5
Regular Training on Quality	8.3	20.8	16.7	41.7	12.5
Involvement in Quality Programs	8.3	16.7	66.7	0	8.3
Incentives for Achieving Quality	8.3	16.7	12.5	33.3	29.2

Source: Field Survey, July, 2011

The responses in **Table 4.9** are not encouraging at all and if they are anything to go by, they highlight a deficit in the level of involvement of employees in quality management in the sachet/bottle water industry. As reiterated in **section 2.7.4** of the literature review and also supported by Dale and Cooper (1993), total employee involvement in quality management is required for the success of any quality management systems.

4.4.5 Employee Relationships

Going by the survey results given in **Table 4.10**, it seems employee relationship is on the high side in the sachet/bottle water industry. For example, for relationship and communication with managers, almost 60% of the respondents chose “average and “good”.

Table 4.10: Summary of Responses to Employee Relationship Survey

Employee Relationship Indicators	Very Good (%)	Good (%)	Average (%)	Below Average (%)	Poor (%)
Relationship with Managers	12.50	37.50	20.80	16.70	12
Relationship with other Employees	16.70	45.80	8.30	20.80	8.30
Relationship with Customers	8.30	45.80	16.70	12.50	12.50
Company Policies and Administration	4.20	25	33.30	29.20	8.30

Source: Field Survey, July, 2011

However more needs to be done about the relationship with customers since less than 60% respondents indicated “good or” very good”. 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 Filippini 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.

4.4.6 Career Advancement and Inclusion in Decision Making

As illustrated in **Table 4.11**, over 70% 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/bottle water industry. However with regard to opportunities for promotion/career advancement a very high number ie. 46% of respondents indicated “poor” while 17% and 21% rated it “below average” and “average” respectively. This is therefore an area that the HR departments of companies in the industry have to look at if they desire to keep employees satisfied.

Table 4.11: Summary of Responses to Career Advancement Decision Making Survey

Career Advancement & Participation in Decision Making Indicators	Very Good (%)	Good (%)	Average (%)	Below Average (%)	Poor (%)	Very Poor (%)
Job Suitability to Skills	8.3	41.7	29.2	16.7	4.2	0
Promotion/Career Advancement	8.3	8.3	20.8	16.7	45.8	0
Participation in Decision Making	4.2	12.5	37.5	8.3	33.3	4.2
Achievement and Recognition	4.2	20.8	25	16.7	29.2	4.2

Source: Field Survey, July, 2011

Finally, respondents rated participation in decision making “good” (13%), “average” (38%) and “poor” (33%). This is to say that employees are barely made part of major decision making in the sachet/bottle 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 (Dale and Cooper, 1993).

4.4.7 Comparison of Employee Responses to Survey

Table 4.12 (seen in **Appendix I**) provides the mean and standard deviation values for the responses of employees for each of the case companies. **Table 4.13** also gives the frequencies and mean values of the combined responses provided by all the employees from the survey.

However a closer look at the results displayed in **Table 4.12** reveals that employees of Everpure had a relatively more favorable view of their level of empowerment and involvement in quality within the company. This is seen in the relatively higher ratings they gave concerning their working conditions with respect to quality. Employees of Everpure were closely followed by the employees of Voltic who had relatively more positive view of their working conditions (based on the survey) than the employees of SBC company.

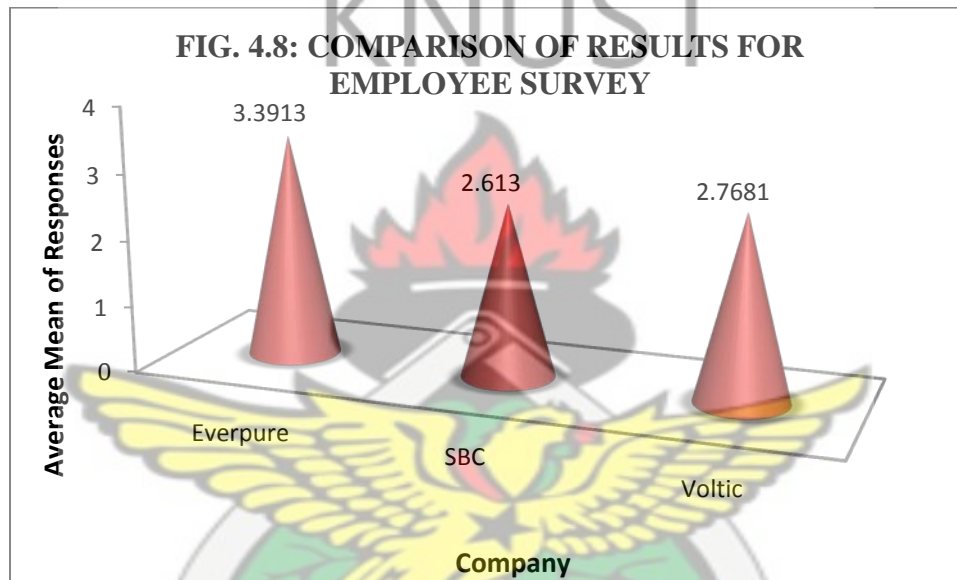
Table 4.13: Summary of Responses to Employee Empowerment and Involvement in Quality Survey

Question	0	1	2	3	4	5	Mean
Q6	0	0	8.3	33.3	54.2	4.4	3.5417
Q7	0	13	17	54	17	0	2.75
Q8	0	0	8.3	20.8	41.7	29.2	3.9167
Q9	0	29.2	29.2	29.2	8.3	4.2	2.2917
Q10	0	45.8	12.5	25	16.7	0	2.125
Q11	0	12.5	29.2	16.7	41.7	0	2.875
Q12	0	0	16.7	50	25	8.3	3.25
Q13	4.2	4.2	20.8	58.3	12.5	0	2.7083
Q14	0	12.5	4.2	29.2	37.5	16.7	3.4167
Q15	0	12.5	41.7	16.7	20.8	8.3	2.7083
Q16	0	8.3	66.7	16.7	8.3	0	3.1667
Q17	0	29.2	33.3	12.5	16.7	8.3	2.4167
Q18	8.3	37.5	16.7	25	8.3	4.2	2
Q19	0	12.5	16.7	20.8	37.5	12.5	3.2083
Q20	0	8.3	20.8	8.3	45.8	16.7	3.4167
Q21	4.2	12.5	12.5	16.7	45.8	8.3	3.125
Q22	0	8.3	29.2	33.3	25	4.2	2.875
Q23	0	4.2	12.5	16.7	54.2	12.5	3.5833
Q24	0	8.3	8.3	29.2	50	4.2	3.3333
Q25	0	4.2	16.7	29.2	41.7	8.3	3.3333
Q26	0	45.8	16.7	20.8	8.3	8.3	2.1667
Q27	4.2	33.3	8.3	37.5	12.5	4.2	2.3333
Q28	4.2	29.2	16.7	25	20.8	4.2	2.4167

Source: Field Survey, July, 2011

Fig 4.8 also presents a graph showing results of the average of mean values of the responses given by employees of the case companies. The graph supports the results of **Table 4.12**.

It can therefore be concluded from this data that of the three case companies, employee empowerment and involvement in quality management is highest for Everpure Limited, followed by Voltic Limited and then SBC Limited. However since most of the responses were in the ratings of “below average”, “below average” and a few “good”, the companies may have to do more to ensure a higher employee satisfaction.



Source: Field Survey, July, 2011

4.4.8 Suggestions from Employees

A significant portion suggested more training and motivation on quality issues to enable them contribute to the quality drive in the industry. Others reiterated higher remuneration and better conditions of service in order to motivate them to give off their best. Lastly some employees wanted management support in career advancement programs to help them improve upon their skills and performance.

4.5 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.

4.5.1 Quality Management Systems

Everpure Limited and SBC Limited practice a Quality Control System while only Voltic Ghana Limited practice a Quality Assurance System alongside HACCP. It was observed that all the quality management systems of the case companies exceeded the guidelines set by the FDB. Additionally all the companies had microbiological labs where water samples from the factory were frequently tested for compliance with standards. Also Voltic and Everpure send water samples monthly to the Water Research Institute in Kumasi for further and independent analysis.

The researcher observed that although the companies ascribed to other quality management systems other than TQM, there were traces of some of the principles of TQM 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 utilized 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 favor 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:

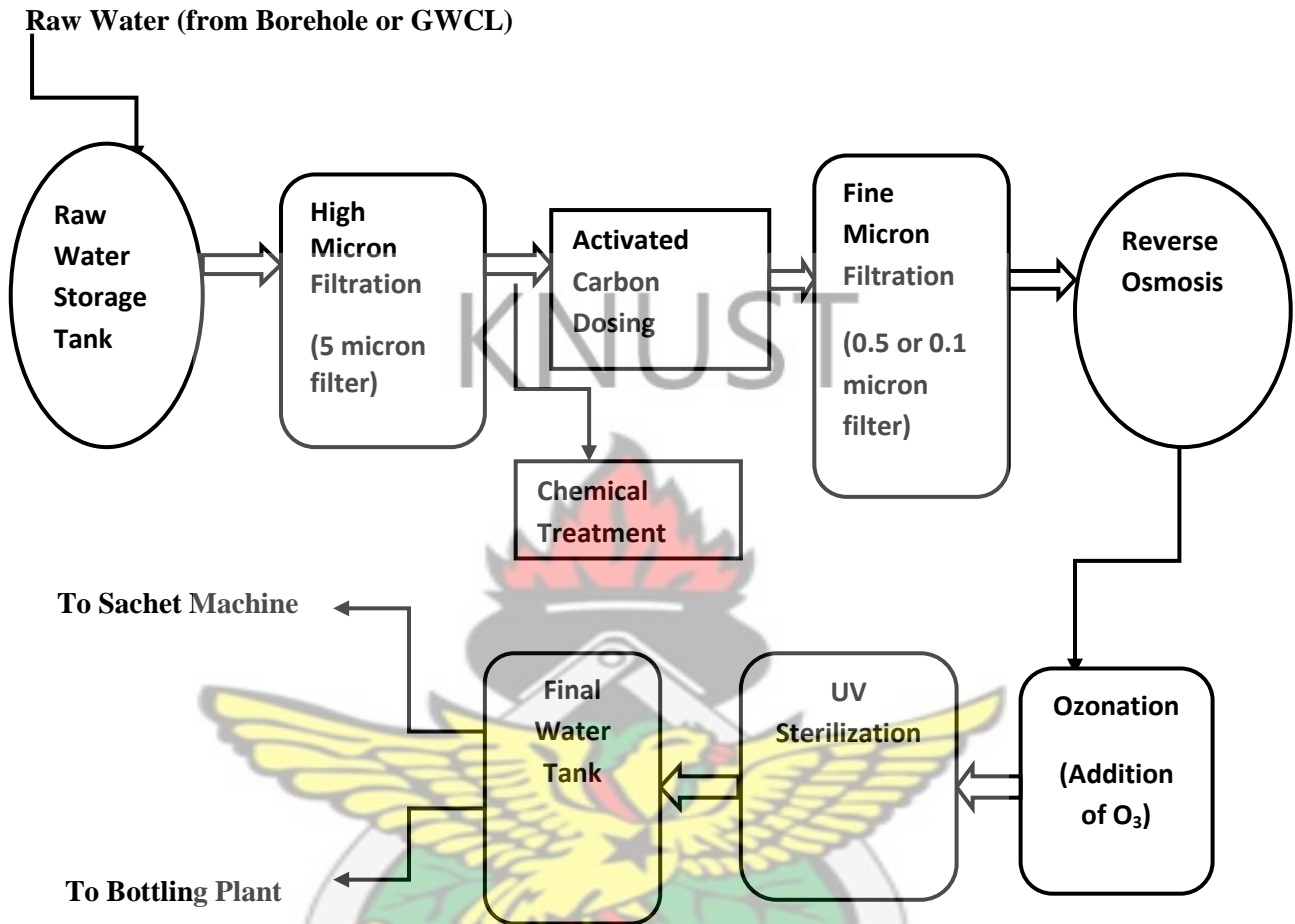
- Presence of electronic fly-trap at the entrances of factories.
- Every factory floor employee in protective gear consisting of uniforms/coats/overalls, hand gloves, nose mask, rubber shoes, plastic head cap, etc.
- Good ventilation or air conditioning at production floors to prevent sweating.
- Display of production processes.

- Frequent recording of production activities and output.
- Absence of spillage or water on factory floors- quick clean up when occurs.
- Presence of hand washes and hand sanitizers at entrance points of the factories.
- Availability of toilet facilities for employees on premises at reasonable distance from the production floor.

4.5.2 Water Treatment

The water treatment processes itself determines to a large extent the quality and safety of the packaged water produced. The researcher was afforded the opportunity to observe the procedures used by the case companies. It was found that the case companies basically used similar water treatment processes with a few minor variations. Modern technology was employed in these processes and minimal human contact was ensured. Water samples were also taken at each treatment stage and tested for conformance in laboratories located on the premises of the factories. **Fig.4.9** illustrates in a simplified flow diagram the water treatment processes utilized by the case companies. Some of the treatment process terminologies are also briefly described in **Appendix J**.

Fig 4.9: Water Treatment Processes of Case Study Companies

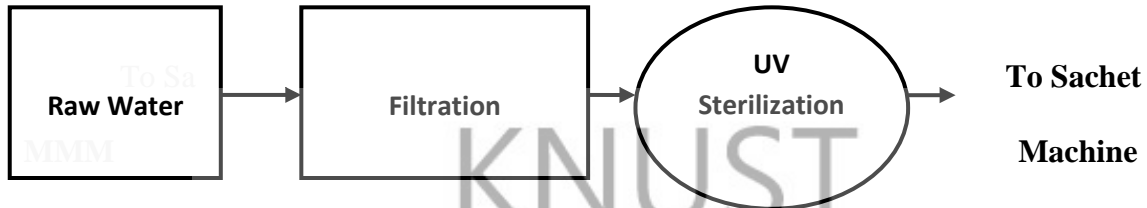


Source: Researcher's Field Observation, July, 2011

Fig 4.10 also shows the flow diagram the water treatment processes utilized by small-scale water companies in Ghana. From the two diagrams it can be observed that the processes for the study companies are more comprehensive and more value is added to the water than that of small-scale manufacturers. Hence based on the different water treatment processes utilized, the products of the case companies are differentiated from that of the small-scale companies in terms of quality, safety and value addition. The products of the case companies

are therefore relatively higher priced than that of other product, leading to higher profitability.

Fig. 4.10: Water Treatment Process of Small- Scale Companies



Source: Researcher's Field Observation, July, 2011

4.6 Performance Indicators of Case Study Companies

As discussed in the literature review, the performance indicators for any organization include:

- **Growth**
- **Market Share**
- **Productivity**
- **Profitability**

It was the intention of the study to quantitatively compare the performance indicators of the case study companies. However this could not be done as the quantitative data needed for the analysis were either not available or could not be provided by the companies. So the performance indicators were analyzed qualitatively using data obtained through observation and through interviews with the QC Managers.

4.6.1 Growth

All case study companies have recorded steady organizational growth within the past years after implementing their quality management strategies (according to the QC managers interviewed). For example Everpure Limited has recently opened a second factory in Kumasi to serve the middle and northern Ghana markets. This is evidently a mark of growth given that the company has been in the business for less than three years. Additionally, SBC at the time of the visit was in the process of expanding its production facilities and Voltic continues to see steady growth in its assets and number of franchises all the time. Voltic has also grown on the back of its quality management strategies and has over the years expanded to other regional markets such that there is now Voltic Togo & Voltic Benin.

The growth performance achieved by the study companies as a result of their quality management efforts corroborates the research finding (Finding A) of Cho and Pucik (2005), which states that “The higher the quality, the greater the growth performance”.

4.6.2 Market Share

It has already been established that all the case study companies have been able to acquire enviable market shares in the sachet/bottle water market by leveraging relatively better quality management practices. Moreover, the data collected for the study indicated that Voltic has 45% market share, Everpure 25%, SBC 9%, and finally Coca-Cola with 16%. These market share figures are relatively high and its attainment is no doubt an enviable feat for any company. Hence the high market shares of the case companies confirms Finding

C of the research findings of Cho and Pucik (2005), which states “The higher the quality, the greater the market value performance”.

4.6.3 Productivity

All the case study companies, it was observed, had high levels of productivity. Voltic had an average level of 400 cartons of bottle water per hour. At SBC and Everpure, it was observed that the demand far exceeded the supply though workers were producing at optimum levels. The QC Manager of SBC revealed that management was in the process of expanding the production facilities to enable the company meet the high market demand. These high levels of productivity of the case companies confirm the assertion made by Dale (2003), that “quality increases productivity and overall business performance”.

4.6.4 Profitability

The Quality Control managers interviewed indicated that their companies since implementing their various quality strategies have consistently recorded high levels of profit over the years. None of the companies visited by the researcher said they have recorded losses after implementing quality management systems. This result confirms the literature review data that quality management when properly adhered to improves levels of quality and ultimately improves profitability for organizations. Specifically it agrees with Finding B of research by Cho and Pucik (2005), which states: “The higher the quality, the greater the profitability performance”.

4.7 Comparison of the Quality Practices of Case Companies

The quality management systems and other quality measures implemented by the study companies were listed and ranked as shown in **Table 4.14**. The ranking was based on the researcher's observation of quality practices being utilized during visits to the companies' premises and also on information provided through structured interviews with the quality control managers of the study companies.

As shown in the analysis in Table 4.14, Voltic Ghana Limited was ranked 1st, Everpure Limited ranked 2nd and SBC ranked 3rd. This indicates that Voltic is has implemented and incorporated in to their operations more quality systems and measures than Everpure and SBC.

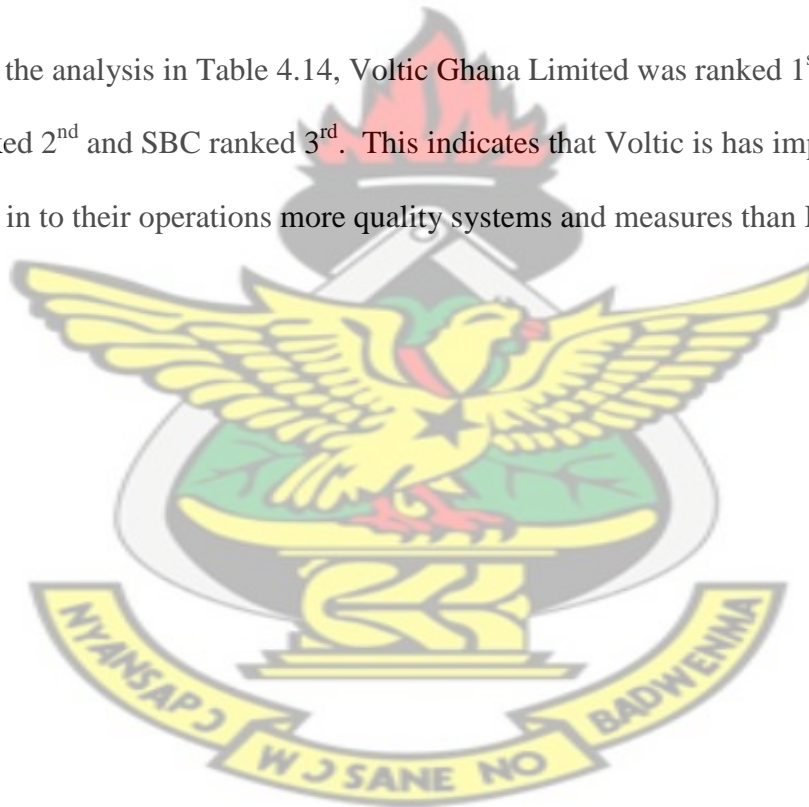


Table 4.14: A Matrix Showing the Various Quality Systems & Quality Measures Implemented by the Study Companies

Quality Measures	Quality Control	Quality Assurance	HACCP	Continuous Improvement	Efforts Toward ISO Certification	Customer- driven Quality	Process Flow Charts	Total Involvement	Top Management Commitment and Support	Single Product Concentration	Strategies to Reduce Production Costs	Support for Innovation	Regular Training on Quality	Employee Participation In Decision Making	Training of Retailers/Distributors	Number of Measures	% of Measures Implemented	Rank
Name of Company																		
Voltic		x	x	x	x		x	x	x	x	x	x	x			11	73	1 st
SBC	x						x				x		x			4	27	3 rd
Everpure	x			x				x	x	x	x		x			7	47	2 nd
Number of Measures	2	1	1	2	1	0	2	2	2	2	2	1	3	0	0			
% of Measures	67		33	67	33	0	67	67	67	67	100	33	100	0	0			
Rank	2 nd	3 rd	3 rd	2 nd	3 rd	4 th	2 nd	2 nd	2 nd	2 nd	1 st	3 rd	1 st	4 th	4 th			

Source: Researcher's Field Observation , July, 2011

CHAPTER FIVE

SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

Chapter Five summarizes the findings of the study, provides conclusions and recommendations for policy implementation based on the study findings. Suggestions are also offered for further research on the sachet/bottle water industry in Ghana.

5.2 Summary of Main Findings

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

5.2.1 Quality of Sachet/Bottle Water

The study uncovered the fact that the quality of most of the bottle water products on the market is far better than that of sachet water. Analysis of the research data from the consumer and retailers/distributors surveys point to the fact that sachet water products are mostly responsible for the quality problems being faced by the industry today. Though most consumers prefer bottle water to sachet water, due to its obvious advantages, most people drink sachet water than bottle water since they cannot afford to consistently drink the

relatively expensive bottle water. Consumers who cannot afford bottle water have thereby settled for sachet water products of companies that possess credible and consistently high quality ratings.

5.2.2 Sachet /Bottle Water Companies

The study found that on the basis of size, there are two types of sachet/bottle water companies in Ghana, namely the large-scale companies and the small-scale companies (cottage industries). The large scale companies are usually the market leaders and have used better resourcing and high quality as a leverage to promote consumer confidence in their products. The small-scale companies mostly lack the financial and human resources to compete on the quality front with the market leaders. This is evident in the fact that most of the small-scale companies visited as part of the study used of low grade technology and did not have any quality professionals on their payroll.

Most of them also lack the will and management commitment to implement basic quality management systems that is within their means. Some don't even follow basic quality guidelines provided by the regulatory agencies. Hence the result is that most of the quality problems in the industry are perpetrated by the small scale companies.

5.2.3 Quality Management Systems

One of the main objectives of the study was to assess the quality management systems of the leading companies in there industry. It was therefore realized that Quality Control and Quality Assurance are the two quality management systems mainly utilized by the study

companies. However the study found that these Quality Management systems are not sufficient by themselves in ensuring quality in the industry. This is because these systems are process or operationally based and only focused on product conformance to standards, defect prevention and defect detection. The systems do not take into account other pertinent areas outside the production processes such quality of suppliers, quality of distribution, quality of retailers/distribution as well as quality of handling and storage processes. Hence products from the factories may conform to standards but the quality is almost always compromised once they leave the factory premises. The study therefore concluded that Quality Control and Quality Assurance systems by themselves alone are not adequate in ensuring attainment of total quality in the sachet/bottle water industry.

5.2.4 Effects of Quality Management/ Quality Systems on Company Performance

The research findings support the fact that there is a positive correlation between effective quality management and company performance. This was evident in the high performance indicators of the quality leading companies studied. So in essence, the practice of effective quality management can lead to better company performance such as high profitability, rapid growth, high productivity, etc.

More so, effective quality management interlaced with sound marketing and distribution practices would tremendously improve the performance and success of companies within the industry.

5.2.5 Customer Satisfaction

The study discovered that although management of sachet/water companies subscribe to the customer focus concept, it is only a slogan to them and not practiced in reality. The companies were rather found to be more productivity and profitability focused rather than being focused on achieving customer satisfaction. From the companies studied there was no clear evidence to show that customer input was incorporated in production practices. The Quality Control managers interviewed in the study also could not provide any potent instance where the views of customers affected their production processes. Moreover it observed that there were either no existing or proper channels in the sachet/bottle water industry for receiving customer feedback which is essential in achieving customer satisfaction and hence quality.

5.2.6 Employee Motivation and Training

The findings of the study support the idea that most sachet/bottle water companies regularly conduct quality management training for their employees. However, according to the employees surveyed, almost all of the training is instructional in nature, ie, workers are only told what to do to ensure quality, and are not made to understand the quality implications of what they do. The purpose of complete ownership of quality is therefore defeated.

Also it was discovered that although most employees of sachet/bottle water companies are satisfied with their jobs, there was not adequate incentives for them to give off their best in terms of quality. This is supported by the analysis of the employee survey data, where it was

realised that employees are given incentive packages only for achieving production targets and not quality targets.

5.2.7 The Role of Management in Improving Quality

The study has found that management of sachet/bottle water companies have a pivotal role to play in improving the quality performance of the industry. This is evident in the quality leadership status of the case study companies which the Quality Control managers interviewed attributed to the support and leadership role of the management of the respective companies. Management sets the policy agenda for their companies. Therefore if they inculcate quality management and quality improvement strategies in their agenda, and also lead by example employees will be compelled to work alongside to improve quality. Management can also improve quality by making the necessary resources and logistics available for quality performance.

5.2.8 The Packaged Water Selling/Vending Business

95% of distributors and retailers of sachet/bottle water products disclosed that the business was highly profitable. Patronage was high and retailers could make as much as 100% profit from their sales. Moreover the start-up capital selling packaged water is very low. This makes the venture very attractive to most people, especially women. The study discovered that most shops sell packaged water as an addition to other products. Most retailers and distributors sell more than one brand of packaged water products in order to cater for the different brand choices of their customers.

However retailers and vendors often compromise on the quality of packaged water through improper storage and handling practices. Most retailers and vendors lacked education on quality and safe handling sachet/bottle water. The survey data even showed that 65% of respondents indicated that no sachet/bottle water producer/company had given them any form of education concerning proper packaged water storage and handling. Some of the vendors lack personal hygiene and often store the water in insanitary environment.

5.2.9 Role of Industry Regulatory Agencies

By law, the main regulatory agency for the sachet/bottle water industry is the Food and Drugs Board (FDB). Since water falls into the food category, all sachet and bottle water producers are required to register with and be monitored by the FDB. Registration with the Ghana Standards Board (GSB) by packaged water producers is therefore optional.

The study found that most producers, especially sachet water producers, have failed to register and be regulated by the FDB. **Table 3.3** shows that in an industry of over a thousand companies, only 438 companies had registered with the FDB as at June, 2011. Such unregistered companies are usually responsible for quality mishaps in the industry since their products and processes are unmonitored and uncertified. Moreover, the FDB is facing several challenges in ensuring sanity and quality in the industry as it is more often than not understaffed, under resourced and constrained in terms of adequate logistics.

5.2.10 Practice of TQM in the Sachet/Bottle Water Industry

The study discovered that although TQM is not being directly practiced by sachet/bottle water companies traces of the basics and principles of TQM can be found in the quality management practices of some companies in the industry. Some companies, such as the study companies observe TQM principles such as Customer Focus, Employee Training and Empowerment, Management Support for Quality, etc. These companies have also adopted some of the techniques of TQM as part of their quality management philosophy. Though present, these principles are not being fully and adequately exploited to ensure industry performance.

5.3 Recommendations

In view of the findings of the study, the following recommendations have been made to help improve quality management within the sachet/bottle water industry:

5.3.1 Support for Sachet Water Producing Companies

The study recommends that government and the FDB support the small-scale companies to improve on their quality performance by providing quality guidance/advisory services to them and supporting them financially in acquiring the technology needed to achieve quality. Quality officials from the FDB should pay more regular visits to the companies and provide guidance for quality processes.

5.3.2 Customer Focus

Industry players in the sachet/bottle water sector should seek a more customer focused approach instead of the prevailing solely productivity and profit-driven approach. There should be more avenues for listening to the voice of Ghanaian consumers. Customer satisfaction can in turn lead to increased revenue for companies in the sachet/bottle water industry and hence improved performance.

5.3.3 Training and Empowerment of Staff

Staff should be empowered through effective training to enable them work efficiently.. Training and empowerment of staff is imperative to improve the performance of the sachet/bottle water sector. Regular education will not only help improve their capacity to solve quality related problems, but enable them to better understand and implement quality strategies as well as improve upon their motivation to excel on their job.

5.3.4 Management Support

Management of companies in the sachet/bottle water industry should not only pay lip service to quality management but make available funds and other resources to their quality management departments to enable them achieve the quality objectives. They should include the quality management agenda in all their decision making activities. Management should also lead by example by setting the pace for observing quality guidelines for other employees to follow. This when done, will undoubtedly lead to improvement of the performance of the sachet/bottle water industry.

5.3.5 Sharing the Cost of Quality Implementation

Small-scale companies (cottage industries) in the sachet/bottle water sector may find it difficult raising the necessary capital/funds to acquire high-caliber quality management professionals or purchase quality enhancing tools or equipment. This problem can be overcome if the companies as a union (such as the ASPWP- Association of Sachet and Packaged Water Producers) employ quality management consultants to advise them on quality best practices and share the cost amongst them. This will go a long way to reduce the cost burden on individual companies. Being in a union will also enable the company to get access to funding sources such as banks, so that they will be financially empowered to purchase the necessary tools and equipment needed to enhance their quality output.

5.3.6 Training of Distributors/Retailers/Vendors

The quality management efforts of the packaged water sector will be in vain if the distributors/retailers/vendors – who are the interface between producers and consumers- are not adequately trained to handle water products safely. Companies should screen and train distributors/retailers/vendors on good hygiene and proper storage of the products so that the quality of the products from the factories will be conserved.

5.3.7 Strengthening of Regulatory Agencies

The industry regulatory agencies, especially the FDB, should be strengthened and motivated by government to enable them to effectively carry out their mandate and ensure the safety of packaged water products on the market. This can be achieved through resourcing these institutions through the provision of adequate human resource and logistics needed to

effectively carry out their duties. Additionally the FDB should be more firm and take a tougher stance against unregistered and quality non-complying producers.

5.3.8 Adoption of the TQM Concept

Companies in the sachet/bottle water industry, especially the case study companies stand a better chance to improve upon both their quality and market performance through adoption and implementation of Total Quality Management. This is necessary because the study has found that the already existing systems (ie. Quality Control and Quality Assurance) are not adequate in meeting the quality needs of the industry. However TQM has the capacity to involve all the quality areas not catered for by the existing Quality Management systems.

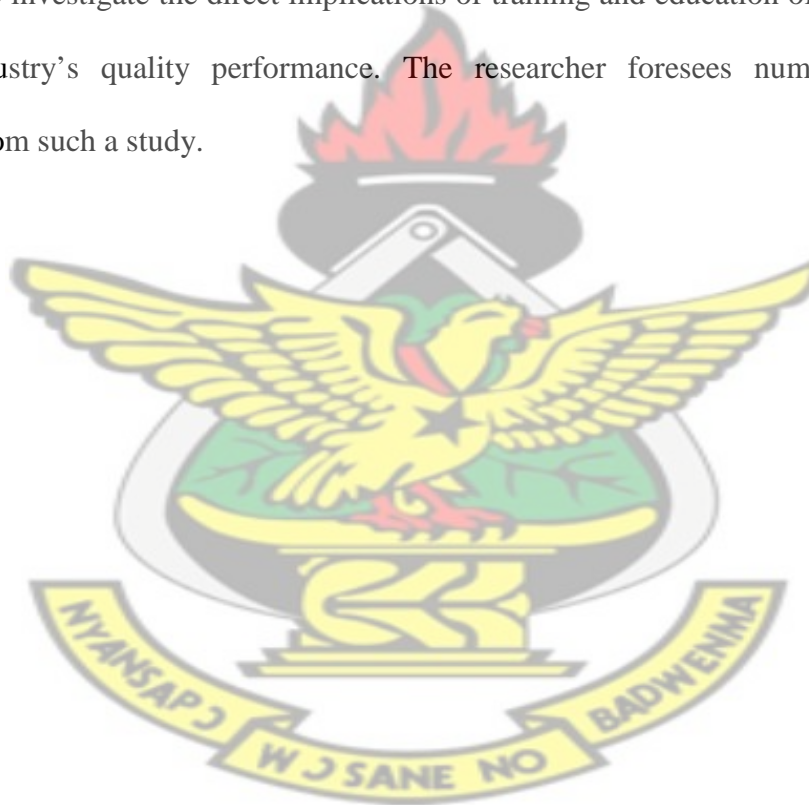
5.4 Conclusion

Sachet/bottle water companies, irrespective of their size, location or years of operation often face several challenges when seeking means of competing favorably on the quality front in order to sustain their business. Hence, it has become imperative that packaged water companies seek alternatives that extend beyond their old management paradigms. The companies are now presented with innovative concepts and strategies proven successful in other sectors of the manufacturing industry. These strategies are ones that they are capable of adopting and tailoring to meet their specific requirements. It is proposed that the concept of Total Quality Management can be utilized by sachet/bottle water companies to effectively manage quality of output and achieve company performance. The study has established TQM as the best quality management strategy for Ghana's sachet/bottle water industry. Though companies may face several initial challenges with the implementation of the TQM strategy,

the benefits when adopted successfully are enormous. Utilization of TQM as a quality strategy for the sachet/bottle water industry has the potential to drastically reduce quality problems confronting the industry and ensure sustainable industry success and performance.

5.5 Further Research

This study has established TQM as an appropriate strategy for combating quality shortcomings in Ghana's sachet/bottle water industry. However further research can be conducted to investigate the direct implications of training and education of retailers/vendors on the industry's quality performance. The researcher foresees numerous interesting outcomes from such a study.



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APPENDIX A

STRUCTURED INTERVIEW

ABOUT QUALITY MANAGEMENT IN CASE STUDY COMPANY

The purpose of this interview is to understand the business profile of your company and also establish and review the type of quality management systems being used.

Interview Questions:

Company profile

1. Tell us about your company with emphasis on company's history, mission, vision and business model.

Quality Management

2. Who is responsible for ensuring product quality?
3. Which quality management guidelines does your company use? ie. WHO, ISO, FDB, etc.
4. Describe the challenges involved in implementing these guidelines.
5. What quality management system(s) do you employ?
6. How many years have you been using this system?
7. Who initiated this particular quality management system?
8. What role was played by upper management in establishing the quality system?
9. Were there any problems in implementing the quality system?
10. What improvements have been made to the system over the years?
11. How do employees view this quality system?
12. Describe the impact of the quality system on company performance ie. competitive advantage, growth, productivity, profitability, production cost, customer satisfaction, loyalty and perception, market share, etc
13. Do you think the regulatory agencies (GSB, FDB, and ASPWP) are doing enough to ensure sustainability of quality best practices in the industry?

Employee Relations

14. How many people does your company employ?

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

Employee Training and Empowerment

18. Do you organize training programs to improve the capacity of your employees?
19. What specific programs are organized and how often?
20. Are employees made part of decision making?
21. Are employees adequately compensated?

Customer Relations

22. What kind of relationship exists between customers and the company?
23. What do you do to keep your customers satisfied?
24. Do you receive complaints and feedback from your customers?
25. How are the complaints and feedback handled?
26. How has consumers' feedback/opinion specifically affected operations or processes?

Business Model

27. Who are your target customers?
28. Do you employ the services of distributors and retailers?
29. If yes, what criteria do you use in selecting your distributors?
30. What is the relationship between the company and the distributors?
31. Do you monitor the distributors and retailers?
32. Do you organize training programs for the distributors, retailers and vendors?
33. If yes, how often and how effective are these training programs?

Any other comments:

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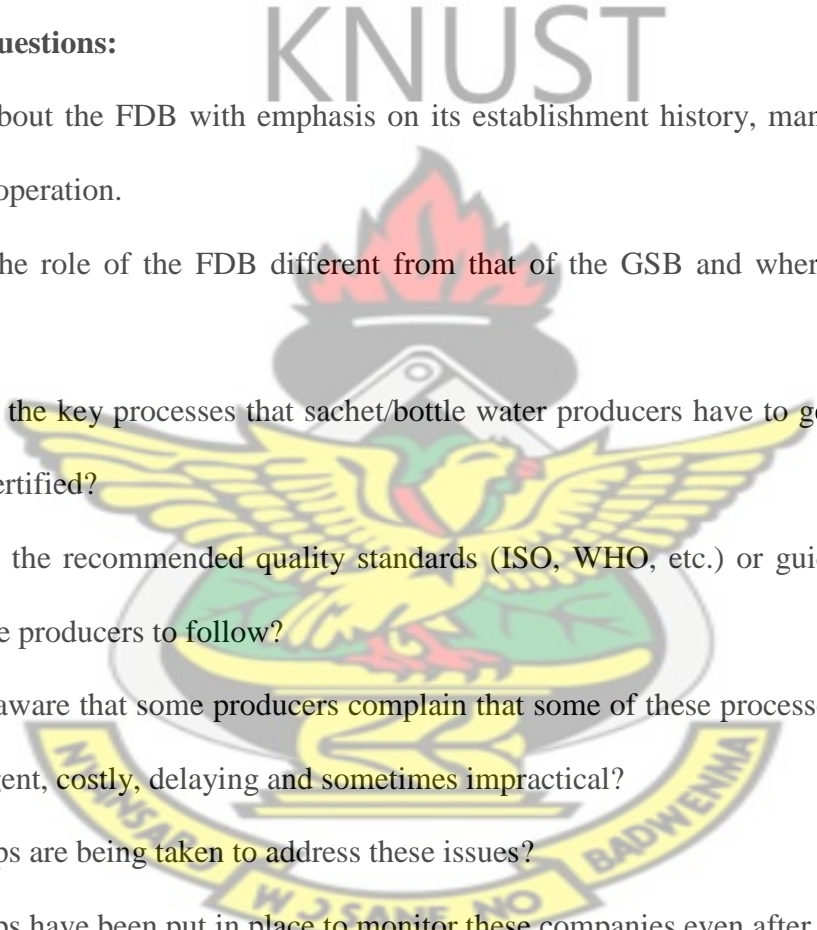
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APPENDIX B
STRUCTURED INTERVIEW

ABOUT THE REGULATORY ROLE OF THE FDB

The purpose of this interview is to understand the efforts and operations of the FDB in effectively regulating the sachet/bottle water industry in Ghana.

Interview Questions:

- 
34. Tell us about the FDB with emphasis on its establishment history, mandate, vision and mode of operation.
35. How is the role of the FDB different from that of the GSB and where do these roles overlap?
36. What are the key processes that sachet/bottle water producers have to go through before getting certified?
37. What are the recommended quality standards (ISO, WHO, etc.) or guidelines the FDB expect the producers to follow?
38. Are you aware that some producers complain that some of these processes/guidelines are too stringent, costly, delaying and sometimes impractical?
39. What steps are being taken to address these issues?
40. What steps have been put in place to monitor these companies even after certification?
41. How effective have these steps been?
42. Do you have an idea of the total number of sachet/bottle water producers in Ghana?
43. Do you know the actual proportion of the population employed both directly and indirectly by the industry?

44. What steps are being taken to check unregistered companies and also other companies/individuals who are imitating the registered and products of some well known companies?
45. How will you assess the performance of the FDB in carrying out its mandate so far?
46. What are some of the operational challenges confronting the FDB?
47. What can the government and also ordinary citizens do to make the activities of the FDB more effective?



APPENDIX C

SURVEY QUESTIONNAIRE

ABOUT EMPLOYEE EMPOWERMENT AND INVOLVEMENT IN QUALITY

This questionnaire is for investigating the involvement of employees in achieving 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: [Under 20] ____, [20-29] ____, [30-39] ____, [40 and above] ____.
2. Gender: [Male] ____, [Female] ____.
3. Educational background: [No Education] ____, [Elementary] ____, [J.H.S], ____, [S.H.S] ____, [Diploma] ____, [Degree] ____.
4. Company Name: _____
5. Job position (please specify): _____.

Indicate the level of satisfaction for each question with the following descriptions. (Please circle the appropriate number). Very Good [5], Good [4], Average [3], Below Average [2], Poor [1], Very Poor [0].

	V	P	B	A	G	V
6. The work in totality	0	1	2	3	4	5
7. Working conditions	0	1	2	3	4	5
8. Importance of job to you	0	1	2	3	4	5
9. Salary and welfare	0	1	2	3	4	5

10. Management praise and punishment policies	0	1	2	3	4	5
11. Safety conditions and Health insurance	0	1	2	3	4	5
12. Steadiness of job	0	1	2	3	4	5
13. Possibility of layoff and transfer	0	1	2	3	4	5
14. Knowledge of quality practices	0	1	2	3	4	5
15. Regular training on quality issues	0	1	2	3	4	5
16. Personal involvement in quality programs	0	1	2	3	4	5
17. Incentives for achieving quality targets	0	1	2	3	4	5
18. Incentives for creativity and innovation	0	1	2	3	4	5
19. Relationship and communication with managers	0	1	2	3	4	5
20. Relationship with other employees	0	1	2	3	4	5
21. Relationship with customers	0	1	2	3	4	5
22. Company policies and administration	0	1	2	3	4	5
23. Ability and skill of supervisor(s)	0	1	2	3	4	5
24. Assistance by managers with difficult problems	0	1	2	3	4	5
25. Suitability of job to your skills/ability/qualifications	0	1	2	3	4	5
26. Opportunities for promotion/career advancement	0	1	2	3	4	5
27. Participation in making decisions	0	1	2	3	4	5
28. Achievement and recognition	0	1	2	3	4	5

Suggestions

1. In your opinion, what more can be done by employees and other stakeholders to improve upon the quality of sachet/bottle water products in Ghana?

2. Any other comments: _____

APPENDIX D

SURVEY QUESTIONNAIRE

ABOUT CONSUMER PERCEPTION OF SACHET/BOTTLE WATER

This questionnaire is for investigating consumer view of sachet/bottle water products in Ghana. 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: [Under 20]____, [20-29] ____, [30-39] ____, [40-49] ____, [50-59]____, [60 and above] ____
2. Gender: [Male] _____, [Female] _____.
3. Occupation: _____, If a student, please specify level of education: _____
4. Location: [Accra] _____, [Kumasi] _____.

Packaged Water Consumption & Purchasing Habits

5. Do you drink sachet and/or bottle 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 packs do you normally drink in a day? Answer: 1[] 2[] 3[] 4[] 5[] 6[]
Over 6[] – Please Specify: Sachets [], Bottles{ 1.5litre [], 1litre [], 750ml [], 500ml
[] }
9. Where do you normally drink sachet/bottle water? Answer: [At Home] _____, [In
Public] _____, [Both at home & in public] _____.
10. Where do you normally purchase sachet or bottle water? Answer: [From shops] _____,
[From vendors by the roadside] _____, [At lorry parks and stations] _____.
11. Which of brand of sachet/bottle water do you normally prefer and purchase? Answer:
AquaSplash ____, BonAqua ____, Everpure ____, Voltic ____, Other (pls specify)
_____.
12. Do you always readily get your preferred choice/brand of sachet/bottle 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/bottled 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 [] N/A []
16. If you reported the problem, what response did you get and how quick was the response?
.....
.....
17. Do you think the regulatory agencies (GSB and FDB) are doing enough to ensure quality
of packaged water products? Answer: YES [] NO []

B. Indicate your level of satisfaction with each of the following features of sachet/bottle water products. (Please circle the appropriate number). Very Good [5], Good [4], Average [3], Below Average [2], Poor [1], Very Poor [0].

Never [5], Few times [4], Sometimes [3], Less often [2] More often [1], Always [0]

Sachet Water

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	V	P	B	A	G	V
18. Easy availability of sachet water	0	1	2	3	4	5
19. Price of sachet water	0	1	2	3	4	5
20. Taste of sachet water products	0	1	2	3	4	5
21. Water colour of sachet water products	0	1	2	3	4	5
22. Clarity of labeling on sachet water products	0	1	2	3	4	5
23. Overall quality of sachet water products on the market	0	1	2	3	4	5
24. Performance of the regulatory agencies (FDB & GSB) in ensuring sachet water quality	0	1	2	3	4	5

Always [0], More often [1], Less Often [2], Sometimes [3], Few times [4], Never [5]

Have you ever experienced any of the following?

	A	M	L	S	F	N
25. Presence of impurities/particles in sachet water	0	1	2	3	4	5
26. Presence of bad smell or odour in water	0	1	2	3	4	5
27. Dust particles on the sachet water packaging/sachet	0	1	2	3	4	5

Bottle Water

	V	P	B	A	G	V
28. Easy availability of bottle water	0	1	2	3	4	5
29. Price of bottle water	0	1	2	3	4	5
30. Taste of bottle water products	0	1	2	3	4	5

31. Water colour of bottle water	0	1	2	3	4	5
32. Clarity of labeling on bottle water products	0	1	2	3	4	5
33. Overall quality of bottle water products on the market	0	1	2	3	4	5
34. Performance of the regulatory agencies (FDB & GSB)in ensuring bottle water quality	0	1	2	3	4	5

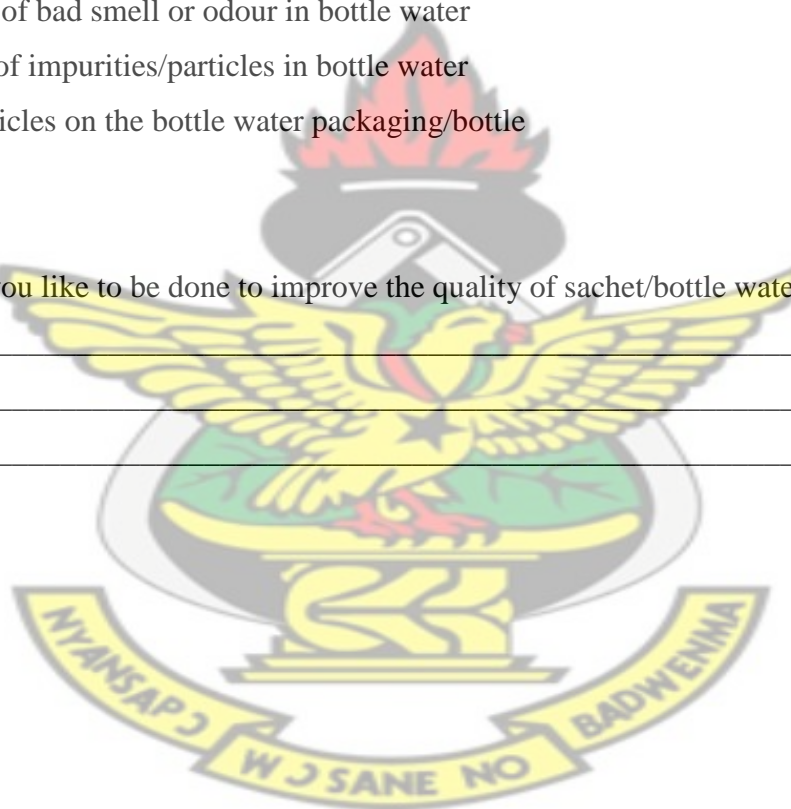
Always [0], More often [1], Less Often [2], Sometimes [3], Few times [4], Never [5]

Have you ever experienced any of the following?

	A	M	L	S	F	N
35. Presence of bad smell or odour in bottle water	0	1	2	3	4	5
36. Presence of impurities/particles in bottle water	0	1	2	3	4	5
37. Dust particles on the bottle water packaging/bottle	0	1	2	3	4	5

Suggestion

What would you like to be done to improve the quality of sachet/bottle water products?



APPENDIX E

SURVEY QUESTIONNAIRE

ABOUT BRAND PREFERENCE OF DISTRIBUTORS/RETAILERS/VENDORS OF SACHET/BOTTLE WATER

This questionnaire is designed to determine the rational behind the choice or trade of certain brands of sachet/bottle 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: [Under 20]____, [20-29] ____, [30-39] ____, [40-49] ____, [50-59]____, [60 and above] ____.
2. Gender: [Male] _____, [Female] _____.
3. Venture/Business Name: _____
4. Business Type: [Distributor] ____, [Retailer] ____, [Distributor & Retailer] _____
[Vendor] _____, (Other- Please Specify) _____.
5. Location: [Accra] _____, [Kumasi] _____.

Business Aspect

6. How many years have you been in this business? Answer: 1 yr [], 2 yrs [], 3 yrs [],
4yrs [], 5 yrs [], Over 5 yrs []
7. What motivated you to start this business? Answer:
_____.

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 and/or cartons of bottle water do you usually sell in a
day? Answer: [Please Specify] _____.
10. Is the sachet/bottle water selling business/venture profitable? Answer: YES [] NO []
11. Do you sell more than one brand? Answer: YES [] NO []
12. If _____ yes _____ for _____ above, _____ please _____ provide _____ reason(s):
_____.
13. Which of these brands do you sell? Answer: AquaSplash ____, BonAqua ____, Everpure
_____, Voltic ____, Other (pls specify) _____.
14. Why do you sell this particular brand(s)? Answer: [High customer demand] _____,
[Contract restrictions] _____, [Favourable Purchase Terms from supplier] _____,
[Other- please specify] _____.
15. Has the company whose products you sell ever given you education or training on
hygienic and safe handling of the water products? YES [] NO []
16. { For those already in a contract with a particular supplier/producer } Do you also wish to
deal in other brands? YES [] NO []. Please Explain:
.....
.....
....
17. Have your customers ever complained or expressed quality concerns about the packaged
water you sell? YES [] NO []

18. 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/bottle water producers and their products. (Please circle the appropriate number). Very Good [5], Good [4], Average [3], Below Average [2], Poor [1], Very Poor [0].

	V	P	B	A	G	V
19. Frequency of supply of sachet/bottle water products	0	1	2	3	4	5
20. Relationship with suppliers/producers	0	1	2	3	4	5
21. Supplier assistance with problems	0	1	2	3	4	5
22. Supply of sachet/bottle water storage and display facilities	0	1	2	3	4	5
23. Absence of product defects (eg. leakages)	0	1	2	3	4	5
24. Continuous improvement in products quality over the years	0	1	2	3	4	5
25. Producer's response to complaints	0	1	2	3	4	5
26. Payment scheme/methods	0	1	2	3	4	5
27. Profitability of business/venture	0	1	2	3	4	5
28. Consumer patronage	0	1	2	3	4	5
29. Consumer view on quality sachet/bottle water product(s)	0	1	2	3	4	5
30. Producer's efforts against counterfeit products(imitations)	0	1	2	3	4	5
31. Maintenance of water quality by distributors/retailers/vendors	0	1	2	3	4	5
32. Monitoring role of regulatory agencies (eg. FDB, GSB)	0	1	2	3	4	5

Suggestion

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

.....
.....

2. Any other comments:

.....
.....
.....

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APPENDIX F

Water Quality Notes: Indicator Organisms

In testing the microbial quality of water, it is difficult to analyze the numerous pathogenic species that may be present, each of which requires a specific and technically difficult analysis. The difficulties and complex nature of tests involved therefore makes it impractical to test for bacteria directly and instead, indicator organisms are used. Indicator organisms are bacteria whose presence in water signals the presence of pathogens. Indicator organisms are usually not pathogenic but are “present in water when other pathogens present and absent when pathogens are absent” (HACH, 2003). Indicator organisms should have the following characteristics:

- They should be present when the pathogenic organism concern is present and absent in clean water.
- They should be present in fecal material in large numbers.
- They should behave in a manner similar to the respective pathogens and respond to the environment in a similar way, for example, have the same growth and death rate
- They should be easy to isolate, identify and count.
- They should come from the same source as the pathogen (Vigneshwaran and Visvanathan, 1995).

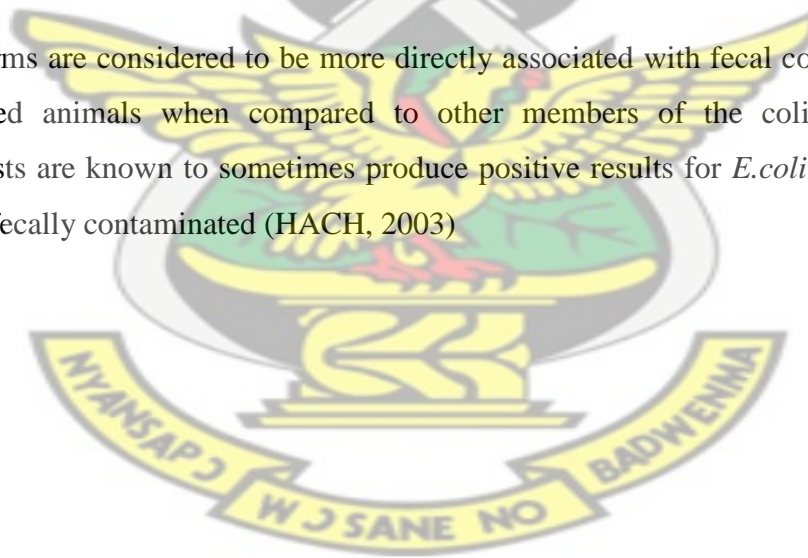
Total Coliform Bacteria

Total coliform bacteria are often used as indicator organisms for water quality testing. They include a wide range of aerobic and facultative anaerobic, Gram-negative, nonspore-forming bacilli (rod shaped bacteria) capable of growing in the presence of relatively high concentrations of bile salts with the fermentation of lactose and production of acid or aldehyde within 24 hours and at 35 to 37 °C. Traditionally, the total coliform group belong to the Enterobacteriaceae family, which generally include genera *Escherichia*, *Citrobacter*, *Klebsiella* and *Enterobacter*.

Fecal Coliforms (Thermotolerant Coliforms).

Fecal coliforms are a sub-group of total coliforms, which can ferment lactose at higher temperatures that range from 44 to 45 °C. The predominant genus in most water bodies is thermotolerant forms of *Escherichia*, *Citrobacter*, *Klebsiella* and *Enterobacter*. A characteristic that makes *Escherichia coli* (*E.coli*) unique from the other thermotolerant coliforms is the ability they have to produce indole from tryptophan or by the producing enzyme β -Glucuronidase. Though there is some evidence of *E.coli* growth in tropical soils, they are rarely found in the absence of faecal pollution, and occur in very large numbers in human and animal faeces. Most strains of *E.coli* are themselves harmless and live in the intestines of healthy humans and animals. An example of a harmful strain is *E. coli* O157:H7, which produces a powerful toxin and can cause severe illness (US EPA, 2006b). Generally, the presence of *E.coli* is not a health threat in itself but rather an indication that there may potentially be a harmful bacteria present in the water tested. While water can contain total coliforms without *E.coli*, *E.coli* cannot be present in water without total coliforms.

Fecal coliforms are considered to be more directly associated with fecal contamination from warm-blooded animals when compared to other members of the coliforms. However, microbial tests are known to sometimes produce positive results for *E.coli* in water samples that are not fecally contaminated (HACH, 2003)



APPENDIX G



Fig 3.1: Yarn filter (Used)
(Used)



Fig 3.2: Matrix Carbon Filter

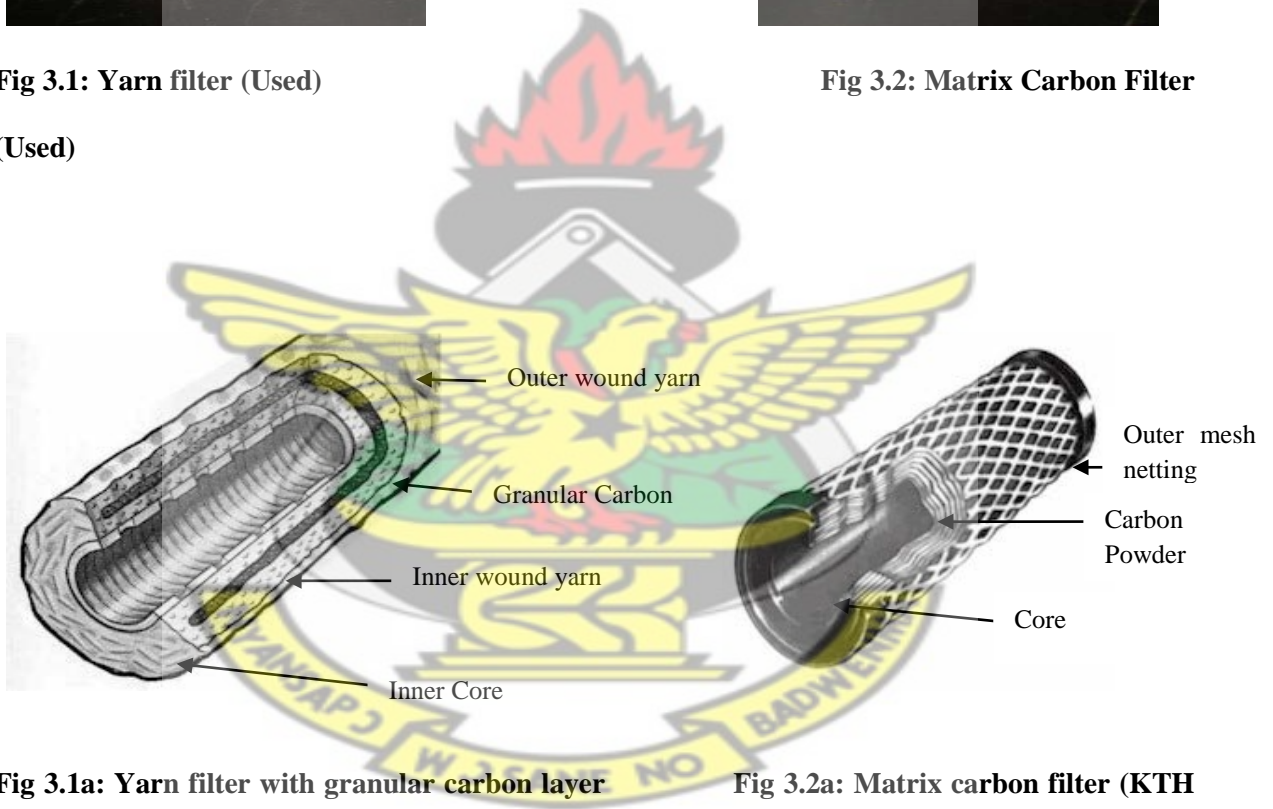


Fig 3.1a: Yarn filter with granular carbon layer
(KTH Sales, Inc.2007)

Fig 3.2a: Matrix carbon filter (KTH

APPENDIX H

Table 4.3: Responses to Quality Features of Sachet Water

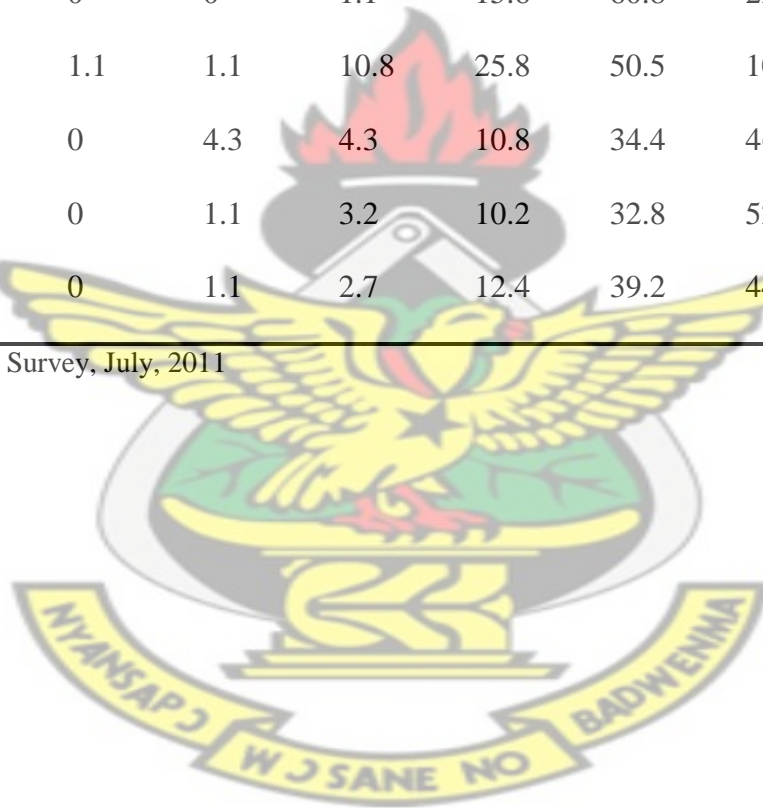
Question	0	1	2	3	4	5	Mean
Q18	3.8	2.2	1.1	7	32.3	53.8	4.2312
Q19	1.1	7	12.4	29	31.7	18.8	3.3978
Q20	1.1	2.2	11.3	44.1	30.6	10.8	3.3333
Q21	2.2	2.2	9.7	33.9	38.2	14	3.457
Q22	2.2	2.2	9.7	36.6	37.1	12.4	3.414
Q23	2.2	6.5	12.4	43.5	24.5	10.8	3.1452
Q24	3.2	11.3	17.2	30.6	27.4	10.2	2.9839
Q25	3.2	7	7	30.1	36.6	16.1	3.3817
Q26	2.2	6.5	10.8	38.7	26.9	15.1	3.2688
Q27	1.1	9.1	6.5	22	23.7	37.6	3.7097

Source: Field Survey, July, 2011

Table 4.4: Responses to Quality Features of Bottle Water

Question	0	1	2	3	4	5	Mean
Q28	3.2	5.4	3.8	11.8	48.4	27.4	3.7903
Q29	0	9.1	12.4	32.8	31.2	14.5	3.2957
Q30	1.1	0	1.1	9.1	54.8	33.9	4.1828
Q31	1.1	1.1	1.1	10.2	47.3	39.2	4.1935
Q32	0	1.1	0	13.4	49.5	36	4.1935
Q33	0	0	1.1	15.6	60.8	22.6	4.0484
Q34	1.1	1.1	10.8	25.8	50.5	10.8	3.5591
Q35	0	4.3	4.3	10.8	34.4	46.2	4.1398
Q36	0	1.1	3.2	10.2	32.8	52.7	4.328
Q37	0	1.1	2.7	12.4	39.2	44.6	4.2366

Source: Field Survey, July, 2011



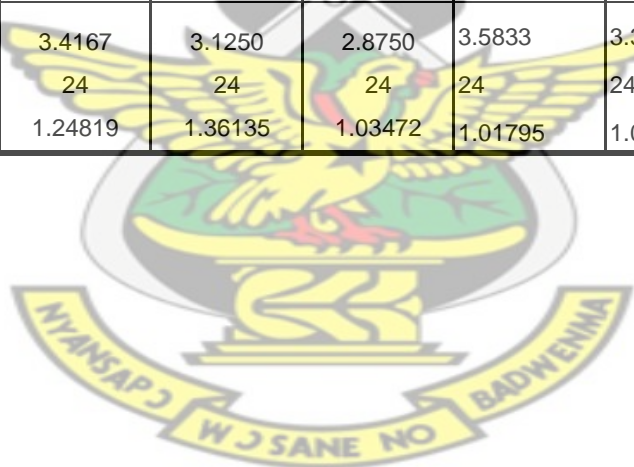
APPENDIX I

Table 4.12: Mean and Standard Deviation Values for Responses to the Employee Survey

Company		Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17
Everpure	Mean	4.0000	3.1250	3.8750	2.8750	2.6250	3.5000	3.6250	2.7500	4.0000	3.5000	3.2500	2.7500
	N	8	8	8	8	8	8	8	8	8	8	8	8
	Std. Deviation	.53452	.64087	.64087	.99103	1.18773	.75593	.74402	.70711	.75593	1.19523	.46291	1.16496
SBC	Mean	3.0000	2.3000	3.7000	2.0000	1.6000	2.7000	2.7000	2.9000	3.1000	2.3000	3.3000	2.0000
	N	10	10	10	10	10	10	10	10	10	10	10	10
	Std. Deviation	.66667	1.05935	1.15950	1.24722	1.07497	1.25167	.67495	.87560	1.37032	1.05935	1.15950	1.24722
Votlic	Mean	3.8333	3.0000	4.3333	2.0000	2.3333	2.3333	3.6667	2.3333	3.1667	2.3333	2.8333	2.6667
	N	6	6	6	6	6	6	6	6	6	6	6	6
	Std. Deviation	.40825	.63246	.81650	.89443	1.21106	1.03280	.81650	1.21106	1.32916	1.03280	.98319	1.63299
Total	Mean	3.5417	2.7500	3.9167	2.2917	2.1250	2.8750	3.2500	2.7083	3.4167	2.7083	3.1667	2.4167
	N	24	24	24	24	24	24	24	24	24	24	24	24
	Std. Deviation	.72106	.89685	.92861	1.12208	1.19100	1.11560	.84699	.90790	1.21285	1.19707	.91683	1.31601

Company		Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28
Everpure	Mean	2.6250	3.5000	3.3750	4.1250	3.6250	3.8750	3.8750	3.6250	3.1250	2.7500	3.6250
	N	8	8	8	8	8	8	8	8	8	8	8
	Std. Deviation	1.06066	1.19523	1.18773	.64087	.91613	1.35620	.35355	.74402	1.24642	1.03510	.91613
SBC	Mean	1.7000	3.1000	3.4000	3.1000	2.3000	3.5000	2.7000	3.1000	1.6000	2.2000	1.8000
	N	10	10	10	10	10	10	10	10	10	10	10
	Std. Deviation	1.25167	1.37032	1.50555	1.10050	.94868	.84984	1.15950	1.19722	1.26491	1.39841	.91894
Votlic	Mean	1.6667	3.0000	3.5000	1.8333	2.8333	3.3333	3.6667	3.3333	1.8333	2.0000	1.8333
	N	6	6	6	6	6	6	6	6	6	6	6
	Std. Deviation	1.63299	1.26491	1.04881	1.47196	.75277	.81650	.81650	1.03280	.98319	1.54919	1.47196
Total	Mean	2.0000	3.2083	3.4167	3.1250	2.8750	3.5833	3.3333	3.3333	2.1667	2.3333	2.4167
	N	24	24	24	24	24	24	24	24	24	24	24
	Std. Deviation	1.31876	1.25036	1.24819	1.36135	1.03472	1.01795	1.00722	1.00722	1.34056	1.30773	1.34864

Source: Field Survey, July, 2011



APPENDIX J

Explanation for Water Treatment Processes

1. Activated Carbon Dosing

This utilizes granulated activated carbon in tanks and acts on the water being treated through adsorption. The process removes unwanted dissolved chemicals in the water such as chlorine and also gives the water a good taste.

2. Reverse Osmosis

This is a [membrane technical filtration](#) method that removes many types of large [molecules](#) and [ions](#) from solutions by applying pressure to the solution when it is on one side of a selective [membrane](#). It utilizes the principle of osmosis in the opposite sense-that is this time, the water moves from an area of high concentration to low concentration. The process removes minute particles from the water.

3. Ozonation

This is a method employed to give a better taste and odour to the water. It is done by injecting ozone (O₃) into water. Ozone also has greater disinfection effectiveness against bacteria and viruses compared to chlorination. In addition, ozonation (through oxidization) can also reduce the concentration of iron, manganese, sulfur and reduce or eliminate taste and odor problems.

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