KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ART AND BUILT ENVIRONMENT

DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

THE IMPACT OF INSUFFICIENT STAFF ON PRODUCTION (TREATMENT) OF POTABLE WATER AT SELECTED TREATMENT PLANTS OF GHANA WATER COMPANY LIMITED IN THE VOLTA REGION

BY

DZORDZORDZI MARCUS WORLANYO

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DECLARATION

I hereby declare that this submission is my own work towards the Degree of Master of Science in Project Management 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.

Dzordzordzi Marcus Worlanyo (20544747)	……	…….....
Student Name I.D	Signature	Date

Certified by:

Dr. Godwin Acquah	……	…….....
Supervisor's Name	Signature	Date

Certified by:

Prof. B. K Baiden	……	…….....
(Head of Department)	Signature	Date

DEDICATION

Dedicated to my Mom AtitsogbeyEnyonam and Miss LovemarkSunu who have been very dear to me throughout, and will continue to be as long as we live. I deeply appreciate them all.

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This Academic work has been completed with the profound contribution of personalities who directly and indirectly encouraged us to achieve this aim. My initial goes to my supervisor

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ABSTRACT

The research which was carried out in the Volta Region of Ghana analyses the impact of insufficient staff on the production of potable water at selected Headworks in the Volta Region. The study acknowledges other researchers, scholars and authors who have suggested in relation to the topic under investigation. The research work deals with how a company can work with limited staff and what are the effects on the staff, the company itself and the factors are responsible for this situation. The researcher analyzed and explained how this will impact the company positively and negatively. The researcher used both primary and secondary methods of collecting data with the emphasis on the primary source. The primary data refers to information received expressly for the purpose such as questionnaires and interview while secondary data refers to information collected from other sources and the work of other researchers Such as internet journals and libraries. A total of 38 questionnaires were distributed among staff and the various Station Managers. The researcher used tables and charts to give and illustrate critically what the respondents had in mind in respect of the topic, impact of insufficient staff on the treatment of potable water in Ghana Water Company Limited in the Volta Region. Some of the effects of understaffing on the staff are work overload, higher susceptibility to workplace hazard due to multitasking, extends task completion time, effects on mental/emotional wellbeing, effects on task completion rate, etc. Whereas, the impact of understaffing on the GWCL is in order of importance include work overload, higher susceptibility to workplace hazard due to multitasking, extends task completion time, affects mental/emotional wellbeing, etc.

Keywords: Insufficient, staff, portable water, treatment plant, Ghana Water Company.

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CHAPTER ONE

INTRODUCTION

1.1 Background of Study

The Ghana Water company limited (GWCL) became set up on 1st July, 1999 following the conversion of Ghana Water and Sewerage corporation right into a state-owned limited liability company underneath the Statutory companies (Conversion to organizations) Act "461" of 1993 as amended by way of "LI 1648". An example of a fully owned utility company by the government is the GWCL, which ensures good and healthy water supply, which is estimated daily to produce 871,496m3 per day, approximately 192 million gallons per day. GWCL serves customers of about of about 550,654, which also consisted that 74% being metered and 26% not metered. The ministry responsible for formulating policy, and overseeing operations, coordination, external support and investment sourcing is the Ministry of Water resources Works and Housing (MWRWH). Act "461" of 1993 as amended by way of LI 1648. (GWCL) is a utility company, fully owned by the state. The company is accountable for potable water supply to all city communities in Ghana. GWCL currently operates eighty-eight (88) urban water supply systems throughout the country.

The Ministry of Water resources Works and Housing is responsible for formulating water supply policy, overseeing operations of GWCL, sourcing for investment from external support organizations and coordinating sector investment plans.

Under the general direction of the Ministry, GWCL is governed by way of a nine-member Board of directors which has overall responsibility for the placing of sector policies and manage of company.

The research study tries to solve the problem of the consequences of insufficient employees in the firms, which may affect the productivity. Productivity depends on efficiency on part of the employees and resources guide which help determine the success of the organization.

However, unlike the past where there were enough workers for most of the treatment plants in the selected Headworks to man various departments on the plant the story today is different thereby putting undue pressure on the current staff which is adversely affecting workers in various ways in terms of their health, output, family life, finances, leisure and so on .

A cursory look and examination of the of this spectacle helps the researcher to try on the effect of insufficient staff on production of water in selected headworks in Ghana Water Company Limited in the Volta Region as a survey. With respect to human resource, the primary challenges include inadequate staff, staff without the requisite skills to perform given functions or roles, and delays in staff promotions largely due to the non-availability of funds by the company.

1.2 Aims

The aim of this study is to determine the impact of insufficient staff on treatment (production) of potable water at selected treatment plants in Ghana Water Company in the Volta Region.

1.3 Objectives of the study

The main objectives of this work or study are:

1. To identify the impact of insufficient workers on treatment and production of potable water.
2. To determine the factors that contributes to insufficient staff at the various headworks
3. To identify the effect of insufficient staff on the staff of the organisations

1.4 Research Questions

The study seeks to answer the following questions:

1. What are the impact of insufficient workers on treatment and production of potable water at the GWCL?
2. What factors contribute to insufficient staff at the various headworks?
3. What effect does insufficient staff have on the operations of GWCL?
4. What actions should be put in place to enhance the staff capacity of the GWCL?

1.5 Significance of Study

1.5.1 Contribution to the Company

The study of impact of insufficient staff on the production of water in selected headworks is to aid staff at these headworks to manage their extra duties and responsibilities well and find a better way to reduce stress.

1.6 Scope of Study

The issue here is the staff of a junior rank or position. The study is to zero in on issue of insufficient staff at three Headworks where water is produced and treated in the Volta Region.

1.7 Research Methodology and Design

1.7.1 Study Area

The study will be conducted in selected Headwoks in the Volta Region. The region is made up of five different headworks a Booster Station and about eight Borehole Systems and these systems are manned by only few Technical Assistants and in most cases Artisans and General Workers

1.7.2 Research Design

The study will adopt a mixed approach of qualitative perspective with acceptance of quantitative data which are preferred because they help build a broader picture by adding depth and insights to numbers‘ through inclusion of dialogue and narratives; add precision to words‘ through inclusion of numbers tallying; offer more than one way of looking at the situation; facilitate capturing varied perspectives; facilitate planned minimum statistical analysis to enable quantitative summary of findings to add breath to the study and may even work towards making it more representative.

1.7.3 Population of the study

The population of the study is constituted to be all employees of the four Headworks and a Booter Station thus; Agordome Headworks, Kpeve Headworks, Hohoe Headwoks, Kpando Headworks and Anloga Booster Station.

1.7.4 Sample size

Four Headworks is to be selected for the study. They include AgordomeHeadworks, Kpeve Headworks, Hohoe Headworks and Kpando Headworks are to be sampled for the study; average of five samples from each of the Headworks. Questionnaires to be distributed to the Station Managers before distributing the questionnaires the relevant Technical Assistants.

1.7.5 Data collection methods and Instruments

Both primary and secondary data collection methods will be discussed:

Documentary Review: Under this method, existing documents such as company Organogram, journals, performance appraisals, training reports, training forms, and study leave forms are scrutinized to collect the required data. Interviews: Interviews are scheduled as a guide with both structured and open-ended questions.

Questionnaires: Questionnaires are to be employed to collect information from respondents in order to get a wide range of knowledge on opinions and views on the impact of insufficient staff on production and treatment of potable water supply in the Volta Region.

Data Analysis: Data collected through the questionnaire are analyzed by the use SPSS.

Scope/Delimitation

This project covers Ghana Water Company Limited in the Volta Region, precisely at the four Headworks in the Region.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature on the impact of recruiting staff with the performance of the organization. It covers the definition of staffing; nature and importance of staffing; human resource management process; impact of understaffing; and the relationship between staffing levels and performance in organizations.

2.2 Defining Staffing

It is the function of manning the organization structure and keeping it manned. Staffing has assumed greater importance in the recent years due to advancement of technology, increase in size of business, complexity of human behavior etc. The main purpose of staffing is to put the right man on the right job i.e. square pegs in square holes and round pegs in round holes. According to (Kootz & O'Donell , 1972), "Managerial function of staffing involves manning the organization structure through proper and effective selection, appraisal & development of workers to fill the roles designed for the structure". Staffing is known to consist of recruitment, planning of manpower, training and development, performance compensation and appraisal and selection of best qualified.

2.3 Nature and Importance Of Staffing

Human resource planning plays a crucial role in the effectiveness of every firm since their actions and inactions, by way of recruiting and maintaining staffs ultimately have a

profound impact on productivity (Opoku & Arthur, 2015).Staffing plays an important role, therefore known to have a pervasive function. Managers are known to be performing the role of staffing that is, taking part in selection, training and evaluation of subordinates or followers. The following reasons have increased the need to execute the function of staffing:

a) Recognition of human relation: Behavior of humans are known to be complex, there the human section in a firm is a critical factor that needs to be considered. This then implies that, with employees are to be motivated, either financial or non-financial means, good working atmosphere to help achieve that objectives of the organization.
b) Technology advancement: The right type of staff recruitment must be done to help to choose the right person to help know the latest technologies.
c) Increasing size of organization: Science and technology in some ways have a pave a way for companies to recruit thousands of employees. The organization's performance relies on the quality and character of the employees, thereby, increasing the significance of staffing.
d) Long-range needs of manpower: Turn-over is known to be high in some companies. This makes the management to decide in requiring the use of manpower in advancement. This again makes the management to develop the existing employees for future. In this case, the duty of staffing has increased due to the shortage in acquiring the good managerial talent or skills.

2.3 The relationship between staffing levels and performance in organisations

Different staffing levels have different effects on the organisation performance. However, the literature has not reached an agreement on the relationship between workforce size and

performance of an organisation. On one hand, staffing theorists conclude that an organisation should be at a moderate understaffing level as this state improves organization performance(Ahmed, 2018);(Dwyer & Ganster , 1991) and(Treville & Antonakis, 2006). On the other hand, organisation researchers show that a slight overstaffing condition has a positive relationship with performance in an organisation(Chiu & Liaw, 2009);(Nohria and Gulati, 1997) and(Rafferty et al, 2006). There is, however, a common agreement that both extreme overstaffing and extreme understaffing conditions have negative effects on organisation performance (George, 2005); (Love & Nohria, 2005); (Tan, 2013)T. Hence this review focuses on moderate understaffing and slight overstaffing in organisations. Understaffing condition is known to be not having enough people to do all the jobs in the setting (Scott, 2005). Understaffed organisations have been reported to gain better efficiency, higher individual outputs, and higher worker motivation (Ganster and Dwyer 1995; Treville and Antonakis 2006).

This is because the understaffed condition puts pressure on the staff in the organisation, as the same jobs have to be done by fewer people. This means that staff must assume a greater share of jobs; they must do more things. Consequently staffs in an understaffed organisation are busier and more dependent upon one another than those in the overstaffing condition (Wicker, 2015).A moderately understaffed organisation may gain better performance compared to other conditions since employees in this state are likely to work more efficiently and to experience higher motivation. Treville and Antonakis (2006), for example, found out that in a slightly understaffed organisation, each participant is involved in a wider variety of tasks; hence they need to use varied skills to complete those tasks. Furthermore,

workers also need to find ways to combine similar tasks together in order to reduce wasted time from redundant activities. As a consequence, their efficiency is improved. Workers in understaffed conditions are also claimed to have more freedom for deciding the way to organise and complete their tasks. According to (Gansater and Dwyer, 1995), this, in return, increases their working motivation.

Output improvement may be due to the positive experiences on part of the staff in the organization, which may also lead to high performance. Negative impact maybe a result from understaffing in organization. Research has shown that, to compare understaffing and overstaffing, understaffed workers experience higher burnout and higher emotional distress. (Matteson & Ivancevich, 1987); (Brun & Cooper, 2010). Rafferty et al. (2007) added that, this may cause lower productivity, poor performance and demotivation among the workers in the organization. Effects causing high absenteeism which is also a negative effect include higher conflict with regards to balancing work-life issues and less job satisfaction (Camden et al, 2011); (Clements et al, 2008); (Schalk & Rijckevorsel, 2007). Other negatives include lost business opportunities, increasing error rate and lower level of aggregate organization's output. In contrast with the staffing theorists, organisation researchers argue that a slight overstaffing setting leads to improved organisation performance compared to a moderate understaffing condition. Numerous studies have shown that slight overstaffing is associated with better outcomes both for the individual staff members concerned as well as for the profitability of the organisations that they work for. At the staff level, employees in overstaffed groups are reported to suffer less from burnout, to have higher job satisfaction, to have better work–life balance; thus to work more productive and to provide a higher

quality of service (Rafferty et al. 2007). At the organisation level, the existence of excess staff stabilises operations and enables competitive advantages of the organisation. Excess staffs are considered as a resource cushion that buffers the organisation from environmental shocks as well as aids to the organisation for remaining flexible and being better prepared for unpredicted external threats (George 2005; (Welbourne et al, 1996). It is also suggested that organisations employ extra staff in order to create a pool of creative and innovative ideas, which give the organisation advantages when introducing new products entering new markets(Cheng and Kesner, 1997). Furthermore, these staff may provide organisations with a competitive advantage because competitors cannot obtain the same resource configurations and copy the organisation's strategies ((Mishina et al, 2004). Literature acknowledges that too many staff may inhibit the organisation performance. This is because of increasing in levels of management, times for making decisions, and costs. Hence researchers suggest that an organisation should not be greatly overstaffed (George, 2005; Tan, 2003).

As aforementioned, literature has two streams on staffing strategies: some scholars support understaffing, whereas other researchers advocate for overstaffing. Most of the understaffing proponents approach the staffing – performance relationship using a qualitative method, for example Dwyer and (Arbelo, 2012); and Treville and Antonakis (2006). These studies found that workers are more highly motivated when their organisations are understaffed so their performance improves. On the other hand, by Clements et al. (2008), studies supporting overstaffing can be found in both qualitative and quantitative forms. Qualitative research

points out that understaffing diminishes individual performance as workers in this condition have worse work–life balance and suffer from high burnout (Clements et al. 2008).

Scholars use a quantitative approach and show that the existence of extra staff helps to maximise the performance of an organisation (for example, George 2005; Tan 2003). It is possible that these different opinions result from looking at different time horizons. The advocates of understaffing see short term improvements from "stretching" people, while the advocates of overstaffing see long term problems resulting from the same "stretching".

2.4 Quantitative Models in Setting Staffing Levels

Establishing an appropriate staffing level for an organisation is a common issue to all managers. The issue occurs not only when a new organisation is formed but also when an organisation needs to be changed in size. Many mathematical models have been used to describe the relationship between workforce sizes and performance and then give suggestions on appropriate staffing levels. This includes Queuing models (Green et al, 2003); (Whitt, 2006); (Yankovic and Green, 2012), Markov processes (Easton and Goodale , 2002); (Ke and Cai , 2010); (Skulj et al. , 2008);(Wang et al, 2012), analytic centre cutting plane methods (Atlason et al, 2004), multi objective linear programming model ((Li et al. , 2007), real-time work schedule adjustment decisions (Hur et al, 2015), newsvendor-type analysis (Fry et al, 2006); Green et al. 2010), and heuristic models (Wang and Gupta, 2012) are among models used in literature.

Queuing theory has been applied widely in the service industries. The applications of queuing models in setting appropriate staffing levels can be found in service systems such as banks, call centres, airlines, post offices, as well as in emergency systems like ambulances,

fires, police patrols, and so on ((Fomundam and Herrmann , 2007); Green 2006; (Koole and Mandelbaum , 2002); (Wright, 2006). The most popular queuing models used in the literature are M/M/c, M/M/c/K, M/G/1, and G/G/c (Green 2006; Koole and Mandelbaum 2002). A list of methods and applications of queuing models in identifying staffing levels can be found in (Defraeye and Nieuwenhuyse, 2011).

In call centres, for example, Green et al. (2003) use a series of Erlang-c queue models to identify staffing levels for different planning periods over a day of a call centre. Rather than identifying the required staffing size of a call centre, the approach focuses on estimating the appropriate numbers of staff in different work shifts in order to help the centre in providing a consistent target service level. In other words, the method presented in the paper can be applied for staff scheduling, not for staff hiring and firing.

In healthcare system, on the other hand, Yankovic and Green (2011) develop a two-dimensional queuing model from M/M/c model to estimate the demands of nurses in emergency departments. The model is applicable for identifying the appropriate staffing level of a hospital. However, the model assumes that the workforce is homogeneous; this is sometimes unrealistic as hospitals may use different professional levels of staff such as registered nurses and lower levels of training nurses. Hence the model might underestimate the required nurses in those cases. Green et al (2006) applied M/M/s queuing model to identify the optimum staffing levels that optimise the timely care of patients and reduce the number of patients who leave without being seen in emergency departments. However, the author did not have the required data to be used as inputs for the queuing model.

In particular, the processing time of providers and the waiting time of patients were not obtained whilst applying the model. Hence the approach might not give correct answers. Another application of a queuing model dealing with staffing issues can be found in Whitt (2006b). In this work, (White, 2006)employed the use of M/GI/s +GI queue to help maximise the anticipated returns from conditions due to absenteeism. The author includes the effects of staff absenteeism to performance into the model. Hence the required staffing level for a call centre is estimated more accurately. However, (Whitt, 2006) considers the service time and the time to abandonment as constant (based on the use of a "fluid approximation"). Consequently, the model cannot be applied widely since the service time of servers and reneging time of customers are random distributions in the real world. Other limitations of the aforementioned models are also presented in literature. For example, (Green et al. 2003) and (Yankovic and Green, 2011) assume that customers do not leave the system until they get service, whereas customers quitting the system without receiving service is quite common in the real world.

(Green et al. 2006), on the other hand, considers the effects of servers leaving the system temporarily. However, their method needs to calculate the effects of absenteeism separately as standard methods of solving M/M/s are unable to handle this situation ((Cole & Cole, 2008). The model used by (Whitt, 2006) already includes customer abandonments inside its structure.

However, the model assumes many approximations to make it tractable including constant service times, whereas random service times are usually more applicable.

Using Markov chain models to deal with organisation staffing issues is another popular approach in the literature. Markov chain models was employed to organisations where the different states in the model correspond to different structures of the workforce (Skulj et al., 2008). The authors first categorised types of military segments before using administrative data to estimate the transitions between those segments. Markov chains then were applied to predict the transitions in 5–, 10–, and 20–year periods. Results from those calculations gave suggestions for optimising the structure of the organisation.

The Markov process is also used for predicting the employee number required in an organization based on staff movement between departments within that firm (Ke&Cai, 2011). In their method, (Ke and Cai, 2011) calculated the average transfer probability of staff from a department to another department and used a transition matrix to describe those transitions. The required workers for the future were then calculated from historical data.((Buist et al, 2008) simulate a continuous time Markov chain model to optimise staffing whilst scheduling in large multi-skill call centres. By "uniform sing" the Markov chain and simulating the discrete-time version of the model, the authors proposed an intermediate solution, which was the trade-off between exact, but time consuming, models and simple, but inaccurate, models, to the staffing and scheduling optimisation problems in large call centres.

(Wang et al., 2012) use a Markov process for staffing optimisation in order to improve the efficiency of a healthcare system. Through applying a Markov chain, the patient length of stay and the staff utilisation of a medical centre were analysed. Different scenarios of

staffing structures were also investigated in order to find out the best manner of system performance. Recommendations then were given to the manager to assist decision-making on suitable staffing configuration.

The effects of absenteeism on optimising staff have also been examined in literature. (Easton and Goodale, 2002), for example, propose a combination of a Markov process and M/M/s queue with reneging model for labour staffing and scheduling decisions under stochastic demand and impatient customers. The model includes the effects of experience levels and random absenteeism of employees in maximising expected profit. A common point of the aforementioned models, however, is none of them deal with the problem of establishing the suitable staff size when a new organisation is formed or when an organisation is changed in size. The approaches of (Skulj et al,. 2008) and (Ke and Cai, 2011) focus on staff planning within an organisation.(Buist et al., 2008) and (Wang et al., 2012), on the other hand, optimise the numbers of staff in different work shifts. In addition, (Easton and Goodale, 2002) consider the effects of absenteeism when identifying workforce sizes.

However, they do it through the use of an effective arrival rate applied to a standard queuing model, rather than including absenteeism inside the structure of the model. Researchers also use other mathematical models, besides the popular models listed above, to identify the appropriate levels of staff inorganisations. (Atlason et al., 2004) apply analytic centre cutting plane methods to optimise the number of staff for a call centre based on minimising staffing costs while maintaining an acceptable level of service. The models aim to establish different staffing levels for different time periods in a working day of a call centre. This approach

goes into more details in staff planning than the aforementioned queue and Markov chain models.

(Li et al., 2007) propose an application of a multi objective linear programming model to deal with the staff sizing problem in organisations. The model is applied to optimise the number of employees with the integrated requirements between long–term staff planning and short–term staff scheduling. The model again focuses more on allocating staff in a shift to ensure satisfactory customer service in a call centre. Organisation staff sizing with the presence of absenteeism is also examined. (Hur et al., 2004) tried solving the issue with a real-time work schedule module. Although, providing a good method for optimising staff at front-line operations, the approach still has some limitations. Firstly, it does not consider profit maximisation in its objective function explicitly. Secondly, the negative effect of excessive schedule adjustment is not investigated fully in the paper. (Fry et al. 2006) determined the number of fire fighters to a train using the newsvendor-type analysis. This was to help allow for attrition and absences. The presents a method for optimising the workforce size of a fire department through doing the trade-off between staff costs and service level whilst including the effects of absenteeism. However, a drawback of the model is assuming that all fire fighters are the same and any staff can be used as a replacement for any vacancy left by any other staff. This assumption prevents the model from being applied to a multi-skill organisation since some positions in this type of organisations can be only filled by particular staff.

Green et al. (2010) perform a similar analysis for examining the relationship between absenteeism and nurse workload at the shift level. The research focuses on the nurse absenteeism rate and the factors that affect the rate. The effects of absenteeism rates on the organization performance, however, are not discussed in the paper. The study, like the work by Green et al. (2010), concentrates on predicting future absences of staff rather than analysing the relationship between staffing levels and performance in the presence of absenteeism. A comprehensive review of staffing literature that deals with absenteeism is the work by Aksin et al. (2007).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents an outline of the methods employed toward achieving the aim and objectives of the study. It provides the frame of the study, research instrument, data collection and analysis. It also provides information on the participants, that is, the criteria for inclusion in the study, who the participants were and how they were sampled. The researcher describes the research design that was chosen for the purpose of this study and the reasons for this choice. The instrument that was used for data collection is also described and the procedures that were followed to carry out this study are included. The researcher also discusses the methods used to analyze the data.

The population was made of staff of the Ghana Water Company at the various treatment plant, headwork's and booster stations who were selected by purposive non probability sampling technique. There was collection of both primary and secondary data. The prim ary data was obtained using questionnaires while the secondary data was gathered from the literature. In addition, this chapter also presents the questionnaire design, the different sections of the questionnaires, the scale as well as the pilot study that was conducted to ascertain the reliability of the questionnaire.

3.3 Research Strategy

(Dinnen, 2014), defines Research Strategy as a step-by-step plan of action that gives direction to a researcher's thoughts and efforts, enabling him/her to conduct research systematically and on schedule to produce quality results and detailed reporting. This enables the researcher to stay focused, reduce frustration, enhance quality and most importantly, save time and resources. The Research Strategy is the nuts and bolts of your application, describing the rationale for a research and the experiments the researcher will do to accomplish the desired goals. Two of the major types of research strategies are the quantitative and qualitative research. (Leedy, 2007) explains quantitative research methods as research methods dealing with numbers and anything that is measurable in a systematic way of investigation of phenomena and their relationships. It is used to answer questions on relationships within measurable variables with an intention to explain, predict and control a phenomenon. (Billings, 2012) defined quantitative research as a type of educational research in which the researcher decides what to study; asks specific, narrow questions; collects quantifiable data from participants; analyses these numbers using statistics; and conducts the inquiry in an unbiased, objective manner.

(Akinsulir, 2012)in studying the causes and effect of construction delays on project delivery from the stakeholders' viewpoint applied both strategies. (Hove et al., 2016)identified significant delay factors encountered by Gauteng's construction industry using quantitative approach. This study, just like in most of the literature reviewed adopts both qualitative and quantitative research strategy.

3.4 Unit of Analysis and Data Sources

The first step in deciding how a researcher will analyze the data is to define a unit of analysis (Trochim, 2006). The unit of analysis is the "who" or the "what" that you are analyzing for your study. Your unit of analysis could be an individual student, a group, or even an entire program. As explained in section 3.4, the primary data was obtained from treatment staff of the Ghana Water Company in the Volta Region of Ghana. These groups of individuals were identified as the unit of analysis.

3.5 Population

(Polit & Hungler, 2014)refer to the population as an aggregate or totality of all the objects, subjects or members that conform to a set of specifications. In this study the population was staff at five treatment plants or Headworks and Booter Station of the Ghana Water Company in the Volta Region, specifically AgordomeHeadworks , KpeveHeadworks, HohoeHeadwoks, KpandoHeadworks and Anloga Booster Station. The total number of staff at these headworks is as shown in Table 3.1 below.

Table 3.1: Number of staff at the various headworks and booster station under study

No	Headwork/Booster Station	Designation	Number of staff
1	Kpando Headwork	Station manager	1
		Technical assistants (Production)	3
		Technical assistants (Laboratory)	
		Technical assistants (Electricals)	1
		Technical assistants (Mechanical)	
		General works	2
2	Agordome Headwork	Station manager	1
		Water quality assurance supervisor	
		Technical assistants (Production)	3
		Technical assistants (Laboratory)	
		Technical assistants (Electricals)	1
		Technical assistants (Mechanical)	
		General worker	2
3	Hohoe Headwork	Station manager	1
		Water quality assurance supervisor	1
		Technical assistants (Production)	4
		Technical assistants (Laboratory)	2
		Technical assistants (Electricals)	1
		Technical assistants (Mechanical)	
		General worker	
4	Kpeve Headwork	Station manager	1
		Supervisor	
		Water quality assurance supervisor	1
		Technical assistants (Production)	7
		Technical assistants (Laboratory)	
		Technical assistants (Electricals)	1
		Technical assistants (Mechanical)	1
		General worker	2
5	Anloga Booster Station	Technical assistants	2
		Total	38

Source: Author's construct

3.4.1 Sample Frame

According to the Webster's Dictionary (Webster, 2018)defines sample frame as a set of information used to identify a sample population for statistical treatment. A sampling frame includes a numerical identifier for each individual, plus other identifying information about characteristics of the individuals, to aid in analysis and allow for division into further frames for more in-depth analysis. The sample frame subdivides the overall population being studied and this helps in getting information about the whole population (Devane, 1990). The sample frame for this study comprises staff at the four headworks and booster station comprising station managers, water quality assurance supervisors, technical assistants and general worker.

3.4.2 Sample Size

To determine the sample size needed for an experiment or survey, researchers take a number of desired factors into account. First, the total size of the population being studied must be considered -- a survey that is looking to draw conclusions about all of Ghana, for example, will need a much larger sample size than one specifically focused on Volta Region of Ghana. Researchers will also need to consider the margin of error, the reliability that the data collected is generally accurate; and the confidence level, the probability that your margin of error is accurate. Finally, researchers must take into account the standard deviation they expect to see in the data. Standard deviation measures how much individual pieces of data vary from the average data measured. For instance, soil samples from one park will likely have a much smaller standard deviation in their nitrogen content than soils

collected from across a whole country (Zanboni & Spafford, 2000). For the sake of this study, the sample size was estimated according to Table 3.2.

For the sake of this research, the population used for the study is 38 and the representative sample size is 32.

Table 3.3 Table for Determining Sample Size from a Given Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size.
S is sample size.

Source: (Krejcie and Morgan, 1970)

3.4.3 Sampling Technique

This study adopts a purposive non-probability sampling technique with focus on total population sampling. Purposive sampling involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest(Clark, 2011). In addition to knowledge and experience, (Bernard, 2002)(Gal et al., 1999), noted that the importance of availability and willingness to participate, and the ability to communicate experiences and opinions in an articulate, expressive, and reflective manner. According to(Patton, 1990), he described total population sampling as a type of purposive sampling technique where one chooses to examine the entire population that have a particular set of characteristics (e.g., specific experience, knowledge, skills, exposure to an event, etc.). In such cases, the entire population is often chosen because the size of the population that has the particular set of characteristics that the researcher are interest in is very small and are readily accessible.

3.4 Data Collection Instruments

Considering that this study adopts the quantitative as well as qualitative technique, structured questionnaire was used to collect the required data for analysis. The questionnaires were administered by hand where respondents responded accordingly.

3.5 Data Processing and Analysis

The data collected for this study was analyzed using the SPSS. SPSS stands for Statistical Package for the Social Scientists (SPSS) and is a data management and statistical analysis tool which has a very versatile data processing capability. In recent years, the use of SPSS for the data analysis in graduate papers is evaluated higher than the use of appropriate methodology for the data analysis(Paura and Arhipova, 2012). There is no question that business, education, and all fields of science have come to rely heavily on the computer (Arkkelin, 2014).

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

In this chapter of this thesis, an analysis of the empirical data collected through the structured questionnaire is conducted to answer the research questions outlined in the introductory chapter. These research questions are: what are the impact of insufficient workers on treatment and production of potable water at the GWCL? What factors contribute to insufficient staff at the various headworks? What effect does insufficient staff have on the operations of GWCL?

4.2 Respondents Profile (Demographic)

This section of the questionnaire involves questions pursuing basic information and some associated issues in order to provide detailed respondent characteristics. Data comprised of gender of the respondents, education, how long the correspondent has been working, the role they play, why do they work so long and do they work additional hours.

4.3 Gender

Table 4.1: Background Data

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	1	3.1	3.1	3.1
	male	31	96.9	96.9	100.0
	Total	32	100.0	100.0	

Table 4.1 shows the gender distribution of all the respondents developed for the research. It shows that 96.9% of the respondents for the research were males which indicate that more males were connected with the GWCL as compared to females who were 3.1%. this clearly expresses that there were a higher number of males than females in the company.

4.4 Education (The highest level of education completed)

Table 4.2: Education Background

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary school	3	9.4	9.4	9.4
	High school or vocational school	24	75.0	75.0	84.4
	College or polytechnic	4	12.5	12.5	96.9
	University	1	3.1	3.1	100.0
	Total	32	100.0	100.0	

The research similarly had interest in the academic status of the respondents and this is indicated in Table 4.2 thus the examination result reveals that 75% of the respondents are high school or vocational school, followed by 12.5% from college or polytechnic. Those that complete primary school formed 9.4% and the University graduates formed 3.1%. this analysis buttress the point that there is lack of finance to recruit the specialists to work in the company to maximise profit.

4.5 How long have you been working with the Ghana Water Company Limited?

Table 4.3: How long have you been working with the Ghana Water Company Limited?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5-9 years	18	56.3	56.3	56.3
	10-14 years	10	31.3	31.3	87.5
	15 and above	4	12.5	12.5	100.0
	Total	32	100.0	100.0	

The table above shows that 56.3% of the respondents have been working under stress between 5 to 9 years. This is followed by 31.3% who worked for 10 to 14 years whiles 12.5% have worked for over 15 years in the company

4.6 What is your role?

Table 4.4: What is your role?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Supervisors	2	6.3	6.3	6.3
	Manager	8	25.0	25.0	31.3
	General Workers	7	21.9	21.9	53.1
	Technical Assistance	15	46.9	46.9	100.0
	Total	32	100.0	100.0	

In the table 4.4 above, 46.9% of workers are technical assistants, whiles 25% are managers, 21.9 of the workers are general managers and 6.3% are working as supervisors.

4.7 How many hours per shift do you work?

Table 4.5: How many hours per shift do you work?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6-11 hours	8	25.0	25.0	25.0
	12-23 hours	24	75.0	75.0	100.0
	Total	32	100.0	100.0	

According to the table above, 75% of the respondents work for 6 to 11 hours whiles 25% respondents confirmed that they work for 12 to 23 hours. This shows that the staff of GWCL is understaff.

4.8 Why did you work these additional hours? Please select the influential reason.

Table 4.6: Why did you work these additional hours? Please select the influential reason.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Standing in for absent colleague staff	8	25.0	25.0	25.0
	Standing in for present but sick colleague staff	2	6.3	6.3	31.3
	Not enough staff	20	62.5	62.5	93.8
	Delay from staff on the next shift	2	6.3	6.3	100.0
	Total	32	100.0	100.0	

From the table above, 62.5% of the respondents agreed that there is not enough staff, this is followed by 25% of the respondents who have agreed that they are standing in for colleague staff. 6.3% of the respondents each says they standing in for present but sick colleague staff and delay from staff on the next shift.

In order to understand the impact of understaffing on the staff, the researcher demanded to know how many people currently performed the same role as the respondent in the treatment plant he/she works. Other questions in this section are: how many people do you think should perform the same role as you? How many nights in a week do you work? Ideally, how many nights a week are you supposed to work? How many days in a week do you work? Ideally, how many nights a week are you supposed to work? How many hours per shift do you work? Ideally, how many hours per shift are you supposed to work based on the contract or term of service? Putting the number of day and night shifts together, what is the total number of hours did you work in a week? Compared to your term of service, how many more hours did you work? Why did you work these additional hours? What is the current staffing level of the GWCL? With the last question, the respondents were required to rank their response based on a 5-point Likert scale from least to highest. The factors include: fatigue, ill health, feeling of exploitation, stressed, little or no time for family and friends, failure to produce/treat enough water to meet demand, quality of water produced compromised, mental/emotional wellbeing, exposure to physical danger, extend time requires to complete work, creation of additional tasks, etc.

Section C: Impact of understaffing on GWCL

Questions asked to determine the impact of understaffing on GWCL was based on ability to achieve set goals, output, quality, revenue generation, absenteeism, cost of production, medical expenses, organisational processes and management style, and time and opportunity for workers to upgrade themselves.

Section D — Factor that contribute to staffing level

Options provided to determining factors that contribute to current staffing level included insufficient finance to employ more staff, lack of qualified workers to undertake tasks, embargo on employment, lack of proper human resource planning, and advancement in technology.

4.9 Response Rate

Out of a total of 38 targeted respondents, 32 staff responded to the questionnaire. The 15.8% difference between the actual respondents and the proposed respondents can be linked to the following reasons:

- Leave: As at the time the data was collected, three of the workers from two headworks were on part leave.
- Absence from duty due to ill-health linked to stress and fatigue
- Absence due to attendance of workshop and seminars away from plant site
- Setback in the use of technology and network failure. Of the six targeted respondents, two were absent. Although they could have filled the forms online they admitted that they were not technologically sound and could not complete the questionnaire.

4.10 Review of Staffing Level at GWCL

Table 4.2 (a) and Table 4.2 (b) respectively indicate the ideal and existing staffing levels with regards to the GWCL in the Volta Region for the various treatment plants under study. From Table 4.2 (a), there were 70 staff in all four treatment plants, comprising station managers, supervisors, quality assurance officers (laboratory), technical assistants

(production, mechanical, and electricals) and general workers. Comparing both tables further, it can be seen that at the Kpeve treatment plant, there ought to be supervisors, but there is none; the number of technical assistants for production is 7 instead of 12, thereby short of 5 staff members; At the Agordome/Anloga (Booster) station, there is no supervisor, no water quality assurance officer, instead of 12 TAs there are only five both the headworks and booster stations, there is no technical assistant for mechanical. At the Kpando station, there are no supervisor, quality assurance officer and instead of 8 technical assistants, there are 3. No technical assistant electricals. At the Hohoe headworks, there is only 1 quality assurance officer instead of 4. And for the TAs, instead of 8, there are 4 and no technical assistant for mechanical.

Table 4.7 : Ideal Staffing Level

HEADWORKS	**Capacity of Plant (gallons/day)**	**STAFF**							
		Station Manager	**Supervisor**	**Quality Officer**	**Technical Assistant**			**General worker**	
					Production	**Electricals**	**Mechanical**		**Total**
Kpeve	4.50 million	1	1	1	12	1	1	2	**19**
Agordome/Anloga (Booster)	1.70 million	1	1	1	12	1	1	3	**20**
Kpando	1.50 million	1	1	1	8	1	1	1	**14**
Hohoe	0.15 million	1	1	4	8	1	1	1	**17**
		4	**4**	**7**	**40**	**4**	**4**	**7**	**70**

Source: Ghana Water Company Limited (2018)

Table 4.8: Existing Staffing Level

HEADWORKS	**Capacity of Plant (gallons/day)**	**STAFF**							
		Station Manager	**Supervisor**	**Quality Officer**	**Technical Assistant**			**General worker**	
					Production	**Electricals**	**Mechanical**		**Total**
Kpeve	**4.50 million**	**1**	**0**	**1**	**7**	**1**	**1**	**2**	**13**
Agordome/Anloga (Booster)	**1.70 million**	**1**	**0**	**0**	**5**	**1**	**0**	**2**	**9**
Kpando	**1.50 million**	**1**	**0**	**0**	**3**	**1**	**0**	**2**	**7**
Hohoe	**0.15 million**	**1**	**1**	**1**	**4**	**1**	**0**	**1**	**9**
		4	**1**	**2**	**19**	**4**	**1**	**7**	**38**

Source: Author's construct

The difference in the number of staff in both tables as explained clearly indicates that the GWCL with respect to the treatment plants under study is understaffed in the production department.

4.11 Factors that Contribute to Understaffing Level

Six items were provided in the questionnaire for this section to determine factors that contribute to understaffing at the treatment plants. Respondents were required to indicate the level of importance for each of the items based on a Likert scale from 1 to 5, where 1 not important and 5 most important.

Table 4.9: Factors that contribute to understaffing level

	N	Sum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Lack of qualified personnel to undertake the task	32	136	4.25	1.414	-1.569	.414
Lack of proper human resource planning	32	118	3.69	.931	-1.868	.414
Insufficient finance to employ more staff	32	150	4.69	.931	-3.147	.414
Embargo on employment	32	122	3.81	.896	-2.192	.414
Lack of will management	32	97	3.03	1.555	-.055	.414
Advancement in technology	32	117	3.66	1.638	-.578	.414
Valid N (listwise)	32					

Based on the mean values in Table 4.3, it is clear that Insufficient finance to employ more staff was regarded the most significant factor followed by Lack of qualified personnel to undertake the task, Embargo on employment, Lack of qualified personnel to undertake the task, Lack of proper human resource planning and advancement in technology.

4.12 Impact of Understaffing on Production Staff

The impact of understaffing was considered in two sections. Whereas one section considered the impact on the staff, the other sections considered the impact on the company. The impact of understaffing on the staff is covered in this section. Respondents were required to select on a Likert scale from 1 – 5. Where 1 represents least, 2 represent lower, 3 represent high 4 represent higher and 5 represents highest. The following are the mean Table 4.4 shows the mean values of the impact of understaffing on production staff. These mean values were arranged in order to help produce Fig. 4.2. The order of importance are as follows: Work overload, Higher susceptibility to workplace hazard due to multitasking, Extends task completion time, Affects mental/emotional wellbeing, Affects task completion rate, Lower output level, Ill health due to fatigue, stress, etc., Greater chances of operational errors, quality of water compromised, little or no time for relaxation with family and friends, and disincentive to efficiency.

Table 4.10: Impact of understaffing on the production staff

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
I get tired always	Least	3	1.67	1.155	.667	-1.20	4.54	1	3
	Lower	1	3.00	.	.	.	.	3	3
	High	3	3.33	.577	.333	1.90	4.77	3	4
	Higher	20	4.00	.000	.000	4.00	4.00	4	4
	5	5	4.00	.000	.000	4.00	4.00	4	4
	Total	32	3.69	.780	.138	3.41	3.97	1	4
Ill health due to fatigue	Least	3	1.33	.577	.333	-.10	2.77	1	2
	Lower	1	4.00	.	.	.	.	4	4
	High	3	4.00	.000	.000	4.00	4.00	4	4
	Higher	20	4.00	.000	.000	4.00	4.00	4	4
	5	5	4.60	.548	.245	3.92	5.28	4	5
	Total	32	3.84	.884	.156	3.53	4.16	1	5
I feel overworked	Least	3	2.00	1.000	.577	-.48	4.48	1	3
	Lower	1	3.00	.	.	.	.	3	3
	High	3	4.00	.000	.000	4.00	4.00	4	4
	Higher	20	4.75	.444	.099	4.54	4.96	4	5
	5	5	5.00	.000	.000	5.00	5.00	5	5
	Total	32	4.41	.979	.173	4.05	4.76	1	5
I little or no time for family and friends	Least	3	1.33	.577	.333	-.10	2.77	1	2
	Lower	1	2.00	.	.	.	.	2	2
	High	3	3.00	.000	.000	3.00	3.00	3	3
	Higher	20	5.90	1.889	.422	5.02	6.78	3	8
	5	5	5.00	.000	.000	5.00	5.00	5	5
	Total	32	4.94	2.169	.383	4.16	5.72	1	8
Fail to produce/treat enough water to meet demand	Least	3	1.33	.577	.333	-.10	2.77	1	2
	Lower	1	2.00	.	.	.	.	2	2
	High	3	2.67	.577	.333	1.23	4.10	2	3
	Higher	20	3.35	.489	.109	3.12	3.58	3	4
	5	5	4.40	.548	.245	3.72	5.08	4	5
	Total	32	3.22	.941	.166	2.88	3.56	1	5
Quality of water to compromised	Least	3	5.00	.000	.000	5.00	5.00	5	5
	Lower	1	5.00	.	.	.	.	5	5
	High	3	5.00	.000	.000	5.00	5.00	5	5
	Higher	20	4.80	.894	.200	4.38	5.22	1	5
	5	5	2.80	1.304	.583	1.18	4.42	1	4

	Total	32	4.53	1.135	.201	4.12	4.94	1	5
Affect Mental And Emotional Wellbeing	Least	3	1.00	.000	.000	1.00	1.00	1	1
	Lower	1	2.00	.	.	.	.	2	2
	High	3	3.00	1.000	.577	.52	5.48	2	4
	Higher	20	4.05	.224	.050	3.95	4.15	4	5
	5	5	5.00	.000	.000	5.00	5.00	5	5
	Total	32	3.75	1.136	.201	3.34	4.16	1	5
Create physical danger	Least	3	4.00	.000	.000	4.00	4.00	4	4
	Lower	1	4.00	.	.	.	.	4	4
	High	3	4.00	.000	.000	4.00	4.00	4	4
	Higher	20	4.00	.725	.162	3.66	4.34	2	5
	5	5	1.20	.447	.200	.64	1.76	1	2
	Total	32	3.56	1.190	.210	3.13	3.99	1	5

From the table above, all the mean values are high and it shows that workers are under staff. This is because of the responses of the respondents who are workers in the company.

4.13 Impact of Understaffing on the Company

The impact of understaffing on the GWCL is shown in Table 4.4 below. Similar to the explanation given in the previous section, respondents were required to select on a Likert scale from 1 – 5. Where 1 represents least, 2 represents lower, 3 represents high, 4 represents higher and 5 represents highest.

Table 4.11: Impact of understaffing on the company

	N	Mean	Std. Deviation	Minimum	Maximum
Lower output	32	4.25	1.391	1	5
Increase medical expenses	32	2.72	.772	1	5
Decrease in revenue generation	32	4.16	1.273	1	5
Affect task completion rate	32	3.84	1.221	1	5
Quality of water compromised	32	4.22	1.338	1	5
Frequent breakdown of machine	32	3.97	1.513	1	5
Save cost of production	32	3.78	2.599	2	8
Affect Organizational process and management staff	32	2.72	1.276	1	5
Lagging behind goals	32	3.50	1.666	1	5
Increased absenteeism	32	2.75	.950	1	5
Greater chance of operational errors	32	4.06	1.268	1	5

The statistics shown above clearly shows that, there is lower output when it comes to service delivery. This followed by Quality of water being compromised which leads to Decrease in revenue generation, Greater chance of operational errors, Frequent breakdown of machine, Affect task completion rate, Save cost of production, Lagging behind goals, Increased absenteeism, Increase medical expenses and Affect Organizational process and management staff.

Below is the chart representing the responses for the impact of understaffing on the production staff of GWCL. These include work overload, higher susceptibility to workplace hazard due to multitasking, extends task completion time, affects mental/emotional wellbeing, affects task completion rate, lower output level, ill health due to fatigue, stress, etc., greater chances of operational errors, quality of water compromised, little or no time for family and friends and disincentive to efficiency.

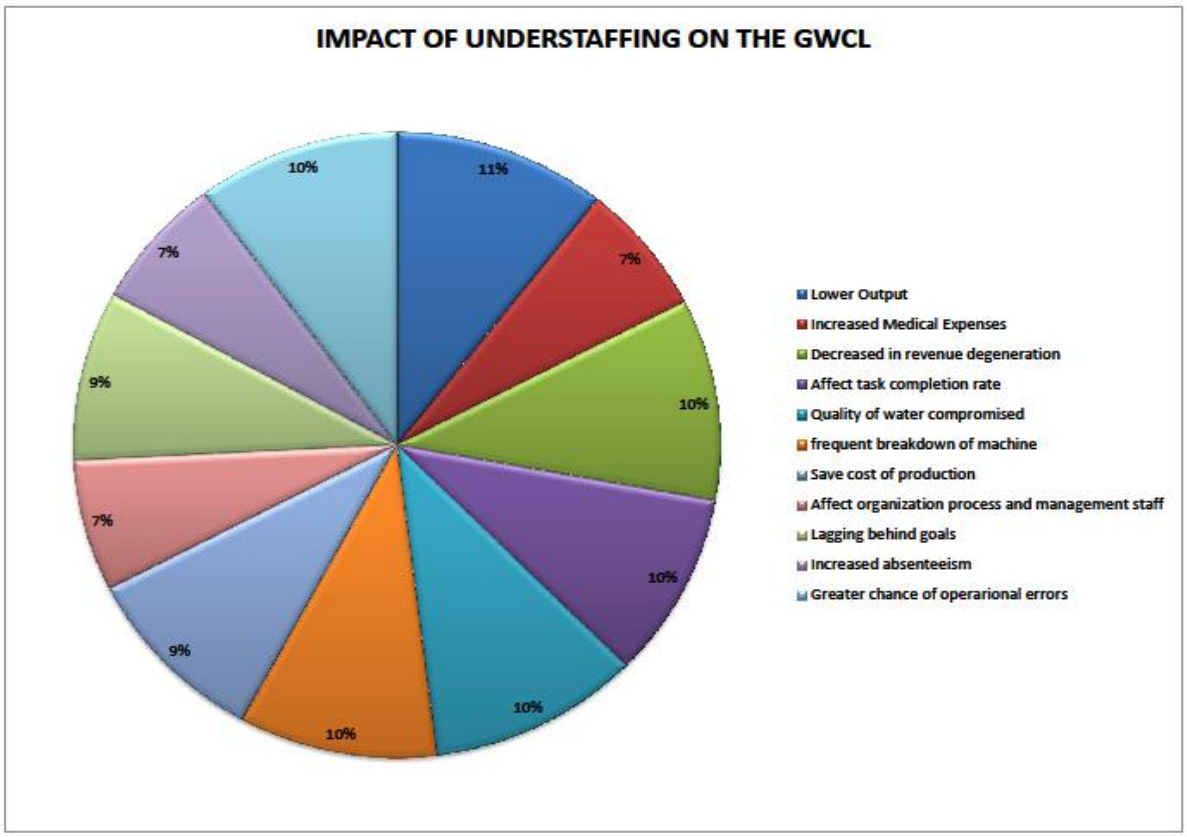

Figure 4.1: Impact of understaffing on the company

4.14 Conclusion on the Impact of Understaffing on the Company

With reference to Table 4.8, it is revealed that there is insufficient staff in GWCL that has led to work overload, higher susceptibility to workplace hazard due to multitasking, extends task completion time, affects mental/emotional wellbeing, affects task completion rate, lower output level, ill health due to fatigue, stress, etc., greater chances of operational errors, quality of water compromised, little or no time for family and friends and disincentive to efficiency, work overload, higher susceptibility to workplace hazard due to multitasking, extends task completion time, affects mental/emotional wellbeing, affects task completion

rate, lower output level, ill health due to fatigue, stress, etc., greater chances of operational errors, quality of water compromised, little or no time for family and friends and disincentive to efficiency.

4.15 Cronbach Alpha Reliability Test

The Cronbach Alpha Test was developed in 1951 by Cronbach Lee as a means to objectively measure how reliable a data collection instrument is. In most cases, it is used when there is the need for multiple-item measures of a concept. The Cronbach's Alpha index ranges from 0 to 1. A value closer to zero implies that there is little or no consistency in the measurement, whilst a value closer to 1 implies consistency in measurement (Warner, 2012). The generally acceptable range for the test is between 0.70 and 0.90 or higher depending on the type of research under consideration (Vinzi et al., 2010). The result of the test is shown in Table 4.1.

Table 4.12 summaries the result of the reliability test for all the sections**.**

SECTION	HEADING	Cronbach Index	Number of Items
B	Impact of Understaffing on Staff	0.760	13
C	Impact of Understaffing on GWCL	0.955	9
D	Factors that contribute to staffing levels	0.703	6

As can be seen in Table 4.1, the Cronbach indexes for all three sections are within the generally acceptable values of 0.7. This implies that the research instrument and the set of

questions asked to answer the research questions as stated the introductory chapter is highly reliable, consistent and reflected how well the multiple-question Likert scale asked elicited the right kind of responses with minimal covariance for each set of questions asked. The number of items indicates the number of questions asked under each section.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In this chapter of the thesis, an analysis of the empirical data collected through the structured questionnaire is conducted to answer the research questions outline in the introductory chapter. This chapter concentrates on the conclusions drawn to satisfy the topic the impact of insufficient staff on production (treatment) of potable water at selected treatment plants of Ghana Water Company Limited in the Volta Region.

5.2 Conclusions

5.2.1 Factors that Contribute to Understaffing Level

The six items that were provided in the questionnaire to determine factors that contribute to understaffing at the treatment plants were ranked as follows:

Insufficient finance to employ more staff was regarded the most significant factor followed by the lack of will from management to employ more staff, lack of proper human resource planning, advancement in technology, Lack of will from management, embargo on employment, advancement in technology and lack of qualified personnel to undertake tasks. Therefore, it can be concluded that there is insufficient staff in GWCL in Volta Region which affects production of water and this has been caused by many factors, the major one being insufficient finance to employ more staff.

5.2.2 Impact of Understaffing on Production Staff

The impact of understaffing on the staff is covered in this section. The order of importance are as follows: Work overload, Higher susceptibility to workplace hazard due to multitasking, Extends task completion time, Affects mental/emotional wellbeing, Affects task completion rate, Lower output level, Ill health due to fatigue, stress, etc., Greater chances of operational errors, quality of water compromised, little or no time for relaxation with family and friends, and disincentive to efficiency.

5.3 Impact of Understaffing on Staff Of GWCL

The impact of understaffing on the GWCL is in order of importance are as follows: work overload, higher susceptibility to workplace hazard due to multitasking, extends task completion time, affects mental/emotional wellbeing, affects task completion rate, lower output level, ill health due to fatigue, stress, etc., greater chances of operational errors, quality of water compromised, little or no time for family and friends, disincentive to efficiency.

Therefore, based on the various data analysed, it is clear that the GWCL is understaffed and it has taken a greater toll on the workers where medical expenses are high due to frequent break down of health conditions, whereby they fail to produce enough water to meet the demands of the customers and even the quality of the water produced is being compromised. Moreover, revenue generation and collection are very low due to insufficient staff. This has increase the cost of production because there is wastage in the system.

In order to address this challenge of insufficient staff, then the company must seek for financial clearance where funds are made available for the recruitment of the various staff to augment the existing staff.

5.4 Recommendations

Based on the findings of the study, the following recommendations are proffer:

- Since insufficient funding to employ more staff was regarded the most significant factor that contribute to the current understaffed level, the GWCL should seek more innovative ways to collecting revenue from customers
- The GWCL should reduce to a minimal wastage of treated water by acting responsively to calls to fix broken pipes
- The GWCL should reduce 'nonrevenue' water. Nonrevenue water as used here simply means volume of water distributed but cannot be accounted for and also reduces physical losses.
- The GWCL should pay more attention to staff in the production department and adequately compensate them for the extra hours they work.
- New plants to be built in the future and should be automated to reduce the work load on the staff, whilst the existing plants should also be automated as at when there is need for drastic whole or part replacement or upgrade.

5.5 Limitations of the Research

As with every research survey there are bound to be limitation which needs to be resolved. In this research there were some limitations that caused certain inconveniences during the survey. Meeting with the targeted staff of the GWCL was quite difficult because they often breakdown in health. The researcher needs to go to the medical centres to administer the questionnaire. Therefore, some of the questions were answered haphazardly. That is the reason why the last question in the questionnaire which demands the view of the respondent "In your opinion, what is your recommendation to the authority in charge to tackling challenges with staffing level? Please state as brief as possible" was not answered by any of the respondent.

5.6 Direction for Future Research

The researcher proposes that further studies should be conducted to determine the staffing level and its impact on the staff, especially for bigger plants.

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APPENDIX

Appendix I: Introductory Letter

P.O .Box

Sogakope

Dear Respondent,

COLLECTION OF DATA

I am pursuing a Masters' degree in Project Management at the Kwame Nkrumah University of Science and Technology, KNUST. As part of the requirement for the award of the degree, I am undertaking a research on:

IMPACT OF STAFFING LEVEL ON TREATMENT (PRODUCTION) OF POTABLE WATER AT SELECTED TREATMENT PLANT IN GHANA WATER COMPANY LIMITED IN THE VOLTA REGION

I'm therefore seeking your assistance to fill the questionnaires attached. The response you will provide will be used for research purpose only and your identity will remain confidential.

Your co-operation will be appreciated.

Yours faithfully,

Marcus WorlanyoDzordzordzi

Appendix II: Questionnaire

SECTION A: BACKGROUND DATA

1. Gender [ ] Female [ ] Male

2. Education*(The highest level of education completed)*

[ ] Primary school -- BECE

[ ] High school or vocational school− WASSCE/SSCE/NVTI

[ ] College or Polytechnic −DBS/HND/CERTIFICATES

[ ] University

[ ] Something else, please specify _____

3. How long have you been working with the Ghana Water Company Limited?

[ ] 0 - 4 years [ ] 5 - 9 years [ ] 10 - 14 years [ ] 15 years and above

4. What is your role?

[ ] manager

[ ] supervisor

[ ] technical assistant

[ ] general worker

Something else, please specify_____

SECTION B: IMPACT OF STAFFING LEVEL

5. How many people currently perform the same role as you in your station?

   [ ] None [ ] One [ ] Two [ ] Three [ ] Four

6. Based on your experience, how many people do you think should perform the same role as you in your station?

   [ ] None [ ] One [ ] Two [ ] Three [ ] Four

7. How many nights in a week do you work?

   [ ] One [ ] Two [ ] Three [ ] four [ ] Five [ ] four [ ] Five

8. Ideally, how many nights a week are you supposed to work?

   [ ] One [ ] Two [ ] Three [ ] four [ ] Five [ ] four [ ] Five

9. How many days in a week do you work?

   [ ] One [ ] Two [ ] Three [ ] four [ ] Five [ ] four [ ] Five

10. Ideally, how many nights a week are you supposed to work?

   [ ] One [ ] Two [ ] Three [ ] four [ ] Five [ ] four [ ] Five

11. How many hours per shift do you work?

   [ ] Fewer than 6 hours

   [ ] 6 – 11 hours

   [ ] 12 – 23 hours

   [ ] 24 – 47 hours

   [ ] 48 – 77 hours

   [ ] 78 or more

12. Ideally, how many hours per shift are you supposed to work based on the contract or term of service?

[ ] Fewer than 6 hours

[ ] 6 – 11 hours

[ ] 12 – 23 hours

[ ] 24 – 47 hours

[ ] 48 – 77 hours

[ ] 78 or more

13. Putting the number of day and night shifts together, what is the total number of hours did you work in a week?

[ ] Fewer than 78 hours

[ ] 78 – 95 hours

[ ] 96 – 119 hours

[ ] 120 – 143 hours

[ ] 144 hours or above

14. Compared to your term of service, how many more hours did you work?

[ ] Fewer than 6 hours

[ ] 6 – 11

[ ] 12 – 23

[ ] 24 – 47

[ ] 48 – 77

[ ] 78 more hours or higher

15. Why did you work these additional hours? Please select the most influential reason.

[ ] Could not finish specific assignment on time

[ ] Standing in for absent colleague staff

[ ] Standing in for present but sick colleague staff

[ ] Not enough staff

[ ] Delay from staff on the next shift

[ ] Something else, please specify _____

16. In your opinion, what is the current staffing level of the Ghana Water Company Limited?

    [ ] over staffing

    [ ] Under staffing

    [ ] right staffing level

    [ ] I am not sure

17. If your answer to question 14 is such that you work extra hours than required, how does this impact on you? Please indicate the level of by ticking the appropriate boxes.

1= Least 2 = Lower 3 = High 4 = Higher 5 = Highest

	1	*2*	*3*	*4*	*5*
Ill health due to Fatigue, stress, etc.					
Little or no time for family and friends					
Quality of water is compromised					
Affect Mental And Emotional Wellbeing					
Lower output level					
Extends task completion time					
Work overload					
Affects task completion rate					
Disincentive to efficiency					
Greater chances of operational errors					
Higher susceptibility to workplace hazard due to multitasking					

If others (please specify)					

SECTION D — FACTORS THAT CONTRIBUTE TO STAFFING LEVEL

11) Based on your experiences, what do you think contributes to the current staff level?

1=not important, 2=less important 3= moderately important, 4 =important, 5=most important

	1	2	3	4	5
Insufficient finance to employ more staff					
Lack of qualified personnel to undertake tasks					
Embargo on employment					
Lack of proper human resource planning					
Advancement in Technology					
Lack of will from management					

IMPACT OF UNDERSTAFFING ON THE COMPANY

1=Least, 2= Lower 3= High , 4 =Higher, 5=Highest

	1	2	3	4	5
Lower output					
Increase medical expenses					
Decrease in revenue generation					
Quality of treated water compromised					
Frequent breakdowns of machine					
Save cost of production					
Affect Organizational processes and management staff					
Insufficient time for workers to upgrade themselves					

Increased absenteeism					
Affect task completion rate					
Lagging behind goals					
Increased absenteeism					
Greater chance operational errors					

In your opinion,what is your recommendation to the authority in charge to tackling challenges with staffing level? Please state as brief as possible.

Thank you for taking the survey