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Total Quality Management: A benchmarking study for improving the sewage and portable water system in Lagos state Nigeria using the case of Helsinki Region Environmental Service Authority

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The topic of this Bachelor's Thesis is Total Quality Management: A benchmarking study for improving sewage and portable water system in Lagos state Nigeria in the case of Helsinki Region Environmental Service Authority. The purpose of this research is to find a lasting solution to the deterioration of the environmental service of Lagos state with a focus on the sewage and portable water system through a benchmarking study of the Helsinki Region Environmental Service Authority's administration.

The theoretical section of this thesis describes the main components of total quality management (TQM), starting with definitions, different theories and historical views of TQM, and the principles of TQM. In addition, supporting methodologies and techniques, quality awards and excellence models are briefly discussed with an emphasis on process improvement, quality assurance and benchmarking theories- as these factors form a strong basis for this research.

In the section on research methods, the development of the empirical research method is presented, with detailed description of the data gathering techniques used to access information. Much of the data was collected through interviews, brochures and information on the case company's webpage. Qualitative research method was adopted for this study to ensure the authenticity, as the case company operates different department, hence quantitative approach may not be adequate.

The empirical section illustrates the application of theory in the improvement of the case company. In addition, a general overview of the case company's operation is described, showing the organization structure, strategy of operation and quality model. Finally, conclusions and recommendations for the improvement of the quality of the Lagos state environmental service are provided.

Findings indicated that the capital municipality environmental service was initially managed by 5 different companies, and in early 2010 the political decision was that this service will be managed by one company (Hsy). During this transition no major technical problem was recorded but administrative conflict on personnel orientation and management method to adopt emerged. Hsy planned to adopt the same system of environmental system in the capital municipality in the whole of Finland by 2014.

Key words Total quality management, Quality management, Improvement cycle, Benchmarking

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1 Introduction

This research is being conducted for the Lagos state ministry of environment, which comprises of the office of environmental services and drainage services. The main focus is on Sewage and water resource department under the office of drainage services. Sewage treatment, or domestic wastewater treatment, is the process of removing contaminants from wastewater and household sewage. It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a waste stream or treated effluent and a solid waste or sludge suitable for discharge or reuse back into the environment. This material is often inadvertently contaminated with many toxic organic and inorganic compounds. The objective of sewage treatment is to produce a disposable effluent, without causing harm or trouble to the communities and prevent pollution.

The supply of water to Lagos from the beginning, had been a Federal responsibility under the Federal Ministry of Works, but this great responsibility was transferred to Lagos State in 1967 when the state was created. In view of the fact that rapid population growth in Lagos has posed a heavy burden on the public water system, there has been a continuous demand and need for expansion of the Lagos water supply and distribution capacities.

1.1 Research Problem

The Lagos state government has encountered deterioration in the environmental services for decades, despite the effort of the government to ensure sanity through different innovative programs such as Kick against indiscipline (KAI), Lagos waste management authority (LAWMA), Lagos state signage and advertisement agency (LASAA). Large amount of money has been spent to this sector but with no or little improvement, however the government has decided to conduct further research to curb the menace.

The problem that generated the need for this research is set to investigate how the Lagos state environmental service can benchmark the activities of the Helsinki environmental service of the Helsinki region to improve the menace and decadence in the sewage and portable water system of Lagos state. Sewage Management is one of the most visible problems confronting Lagos state today, management of sewage in the state in times past essentially consisted of haphazard and uncoordinated responses to sewage challenges; it has been more of management of the crisis occasioned by inappropriate sewage management; sewage dumping rather than disposal, discharge of raw sewage at legal and illegal dump sites in the state, dilapidated dislodging trucks that discharge most of their contents on the road before getting to

disposal points or even breakdown along the way, contamination of surface and groundwater, devalued and degraded environment. Cumulative effects have been adverse.

1.2 Purpose of the Thesis with Research Questions

The purpose of the thesis is to benchmark the activities of the Helsinki environmental service authority otherwise called Helsingin seudun ympäristöpalvelut (Hsy), if answers are provided to the research questions, then Lagos State government will be able to benchmark Hsy and improve the basic quality of the environmental service in the State. Hsy is the regional authority providing environmental services for residents and companies in the Helsinki area and her main duties are water and wastewater management and providing regional information service for the inhabitants. The goal is to ensure that environmentally sound decisions and actions are enacted for all the populace in the region.

In the benchmarking study, the following areas have been of interest:

- What are fundamental issues undergone in the inception of the environmental services of the capital municipality?
- How does the municipality control the quality of their services?
- What techniques were used, by what resources, how often the quality follow-ups are conducted?
- What problems and barriers are faced, what are the values of this municipality in regards to environmental services, what are the demands the municipality have in regards to quality management today and in future?

This survey will be focusing on two aspects of the HSY environmental services, which are:

- Sewage system
- Portable water treatment and supply

1.3 Research Approach

The objective of this thesis is focusing on creating a platform through which the Lagos state environmental department is able to benchmark the HSY of the Helsinki capital region by providing relevant information of their management operation, and the optimum research approach is the use of case study. The case study is a way of doing research involving the empirical investigation of a particular phenomenon in the real life, using various sources of evidence. The case study involves qualitative data collection methods, such as interviews, ob-

servations and information from printed material of the case company. Case study might not be the optimum way of deducing new theory, but is good way of seeing how the theories created is applied to real life situation. Case study can also serve as gateways to new theoretical studies (Saunders, Lewis, Thornhill, 2003, 93-97). In this thesis the objective is to find what the HSY has done to improve the management quality of their sewage and portable water system and how it was done.

The research carried out is cross-sectional in order to show the current situation in the HSY sewage and portable water management. The cross-sectional study is also strengthened by the fact that most of the information gathered during the research is from interviews, which are more focusing on today rather what has happened in the past.

1.4 Theoretical Approach

Total quality management is generally understood as an integrated organization strategy for improving product and service quality (Waldman, 1994). Firms that focus on continuous improvement, involve and motivate employees to achieve quality output and focus on satisfying customers' needs are more likely to outperform firms that do not have this focus. Thus, we can expect that to the extent an organization implements TQM practices, performance should be enhanced (Brah et al., 2002) Total quality management theory is chosen to benchmark the activities of hsy for the purpose of improving the environmental service of Lagos state.

1.5 Framework of The Thesis

The framework of this thesis work describes the main components that interlink to make this research complete. Research purpose and problem describes the goals and explains the areas of interest in this work. The theoretical background elaborates on the theories of total quality management, additionally, approach to this work was discussed and empirical study revealed the finding that lead to the conclusions and recommendations of this thesis work.

The figure below is a general overview of the thesis; It explains what has already been deliberated.

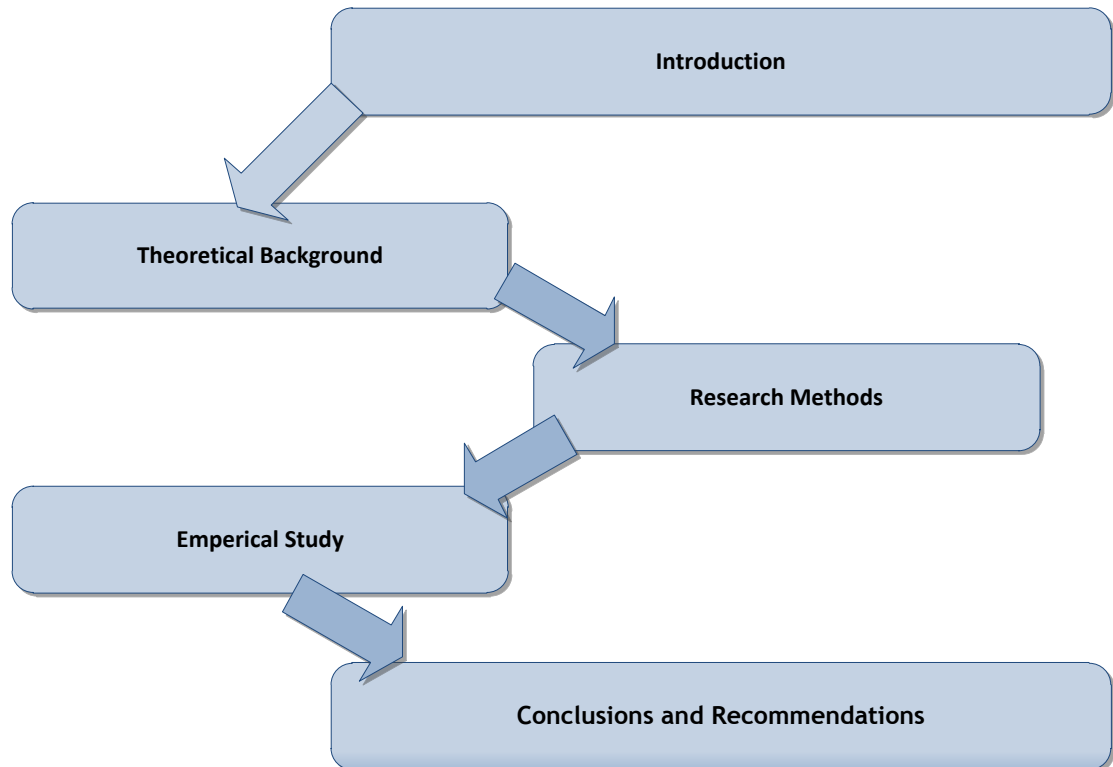


Figure 1. Structure of the study

2 Theoretical Background

2.1 Quality

Quality is literarily defined as a degree of excellence, superiority in kind, high standard or essential character. However more accurate and professional definitions are given to this term. According to Feigenbaum, one of the quality control pioneers define quality as Total composite product and services characteristics of marketing, engineering, manufacturing, and maintenance through which the product and service in use will meet the expectation of the customer. (Wadsworth et al 2001.15)

It is important to note that quality interpretation differs, depending on the author's point of view. Quality is generally considered as fulfilling of customers need. Customer satisfaction is

regarded as one important factor but development and maintenance of good quality requires continual improvement of performance, reduction of error margin and acting right to fulfill the customers and company's expectation. (Lecklin 1999)

Paul Lillrank analyze quality into six main perspectives

- Product Quality
- Production Quality
- Value Quality
- Competitive Quality
- Customer Quality
- Environmental Quality

(Lillrank 1990, 25)

Production department stresses on production and product quality development, marketing department emphasizes on customer quality, and financial department is interested in values and competitive quality. Environmental quality is increasing and it has become success factor in the business world, while customer quality however is in the key position because it revolves other dimensions. (Lecklin 1999. 25)

2.2 Introduction to Total Quality Management

Total quality management is a concept introduced by W. Edwards describing the basis of TQM as a concept to reduce manufacturing errors or service process, increasing customer satisfaction, streamline supply chain management and aim for modernization of equipment and ensure workers are well trained. (Juran 2001)

2.2.1 Definition

Total quality is a people-focused management system that aim at continual increase in customer satisfaction at continual lower real cost. Total quality is a total system approach (not a separate area or program) and in integral part of high- level strategy. It works horizontally across function and departments, involves all employees, top to bottom, and extends backward and forward to include the supply chain and the customer chain. TQ stresses learning and adaptation to continual changes as keys to organizational success. (R Evans & W Dean Jr. 2000)

Total quality management is the set of management process and system that creates delighted customers through empowered employees, leading to higher revenue and lower cost. (Juran 2001) Berry (1991) defined TQM process as a total corporate focus on meeting and exceeding customer's expectations and significantly reducing cost resulting from poor quality by adopting a new management system and corporation culture (Yusof 1999). Wolkins (1996) outlined TQM as a tool to integrate fundamental management techniques, existing improvement efforts and technical tools under a disciplined approach focused on continuous improvement.

2.2.2 Different Theories, Approach and Definition

Authors	Quality Definition	Philosophy	Approach	Mechanics
Crosby	Conformance to Requirement	Defect free	Motivate the People	Fourteen steps
Deming	Three corners of Quality: Product, user, Instruction for user	Consistency Of purpose: Statistical analysis	Statistical Techniques	Fourteen obligation Of management
Feigenbaum	What the customer Say it is	Full customer Satisfaction at Economical cost	Systems approach To total control	The nine "M"s
Ishikawa	Satisfactory to The customer	Company-wide Quality control	Talk with date	Seven statistical Tools
Juran	Fitness for use	Project approach: In order of Importance	Quality trilogy: Planning, Control, Improvement	Diagnostic and Remedial journey
ISO 9000	Conformance to Procedure and Specifications	Documentation Defines and Reflects practice	Self-audit with Independent Review	The ISO 9000 Standards And two guidelines

Figure 2. Comparison of ISO and quality Guru key elements (source: Richardson 1997)

Crosby (1979) stress motivation and planning and does not focus much on statistical process control and the problem-solving techniques of Deming and Juran. Like Deming, Crosby has his own fourteen points that he believes to be a good quality practice for organizations to adopt. He emphasized that quality is free because the cost of prevention is will be lower than cost of detection, correction and failure.

Deming is known for developing system statistical quality control, and his enormous contribution transcends those technical techniques (Saunders, 1995). His philosophical principle begins with top management but maintains that a company must adopt the fourteen points of this system at all levels. He introduced statistics as a management tool and relies on statistical process control as a means of managing variations in a process. He developed what he called Deming chain reaction: quality improves, cost will decrease and production will increase, which is the aim of TQM.

Feigenbaum focuses in total quality control approach. He defined TQC as an effective system for integrating the quality development, quality maintenance, and quality improvement efforts of different groups in an organization so as to enable production and services at optimum and economical level (Dale, 1994)

Juran defines quality as fitness for use in terms of design, conformance, availability, safety, and field use. Thus, his concept more closely incorporates the points of view of the customer. He advocated ten steps to quality improvement with a broader concept, which elaborates more on the responsibility of management to achieve total quality.

2.2.3 Historical View of TQM

The evolution of TQM is in 4 stages: Quality inspection, quality control, quality assurance and Total Quality Management. (Dahlggaard et al., 1998) The characteristic of each stage is outlined on the table below.

During this era, products were made from non-standardized materials and using non-standardized method. The only standards used were measure of dimensions, weight and quality and the result was products of varying quality (Ross, 1998). The common quality control system was inspection made by customer whereby low quality products will be separated from good quality. This form of inspection took place mainly to ensure that the sorting of conformance and non-conformance product can be ascertained.

The second stage of TQM development and quality was controlled through supervised skills, written specification, measurement and standardization. The development of scientific management system by Frederick W. Taylor has emphasized productivity at the expense of quality such as work-study.

In the third stage of quality evolution, emphases were shifted from detecting defects to prevention of poor quality. The aim of quality assurance is to assure customer that product and services will satisfy the need by performance of system audit such as the failure mode and effect analysis, control cost.

The fourth stage which is the TQM involves implementation and understanding of quality management principles in all business activities. Effective implementation of TQM in this regards guarantees customer with best product and services at a reasonable price, time and location. Customer loyalty can be ascertained when continuous quality improvement efforts become a critical distinction. (Tang, 1995)

<u>Quality Management</u>	<u>Total Quality Management</u>
It involves only the production/designing department	It encompasses the whole organization
Quality management is a process and resources need to contrivance quality management	TQM Is a business management strategy
Focuses on product	Focuses on customer, product and the organization as a whole
Benchmarking is no longer possible nowadays	Benchmarking speed up the TQM process

Table 1. Difference between quality management and total quality management

Characteristic of Different Stages in TQM

<u>Stages</u>	<u>Characteristics</u>
QI (1910)	Salvage
	Sorting
	Corrective action
	Identify sources of non-conformation
QC (1924)	Quality manual
	Performance data
	Self-inspection
	Production testing
	Quality planning
	Use of statistics
	Paperwork control
QA (1950)	Third party approval
	System audit
	Quality planning
	Quality manual
	Quality cost
	Process control
	Failure mode and effect analysis
TQM (1980)	Non-production operation
	Focused vision
	Continuous improvement
	Internal customer
	Performance Measure
	Prevention
	Company-wide application
	Interdepartmental barrier
Management leadership	

Figure 3. Characteristics of different stages in TQM

2.3 Essentials of TQM

Some thoughts on the essential of Total quality as proposed by Soim (1999. 289) expatiating on the essence of total quality as it focuses on the process or the way rather than achieving result. This is called a thought revolution in management.

2.3.1 Quality First

Quality comes first in the aspiration of maintaining competitiveness and here are some important factors to be considered:

- Continuous improvement

This is one main fundamental concept of Total quality, striving for continuous improvement and aiming for perfection. This concept is predicted to be few or far between-hence continuous improvement must be encouraged to all processes, products and services. There is always an effort to drive at a continual improvement but when defects run at a very low level, then it is time to move up to the next dimension of quality - Attractive quality. (Soim 1999.289)

- Attractive quality

When defect levels are low, the need for providing more attractive quality arises. An example is found in the automobile industry when Japanese manufacturers kept ahead of the U.S and European manufacturers by providing high quality products which are almost defect free cars by 1990 the U.S and European competitors are catching up, but the Japanese have leaped ahead by focusing on attractive quality features such as ergonomics, extraordinary “touch and feel” feature, superior services and so on. This attractive quality is defined as the second dimension of quality. (Soim 1999. 289)

- Zero defect product and services

Low defect levels priorities should turn to providing more attractive quality features, which will apparently lead to service transaction increase. Then the low defect rate will multiply into a large number of customers complain. Expectation for zero defects in products and services are competitively increasing on daily bases as customers hope for a flawless products and services. The trend is such that organizations and company aim for a complete customer satisfaction, which is the key to securing customer loyalty that generates long-term superior financial performance. (Soim 1999. 289)

- Be mindful of quality

There are two ways of practicing quality maintenance: By focusing to achieve a goal based on direction, another dimension is to be mindful of it. Being mindful of quality makes it a nature for instance whatever is worth doing is worth doing well - managing business, running project, designing software - the need for perfection is the goal and it should be a nature. (Soin 1999 289)

2.4 Supporting Methodologies and Techniques

Some supporting methodologies and techniques include the PDCA cycle, the proactive PDCA cycle and within it, the quality function development and FMEA. Computer stimulation of products and processes, training and education, total product concept, customer complaints and feedback system, customer surveys, competitive benchmarking, postmortems, employee suggestion schemes and quality circle and team. (Soin 1999. 289)

2.5 Quality Award and Excellence Model

In 1988, a major step forward in quality management was made with the development of the Malcolm Baldrige Award. In the United States the model on which the award was based represented the first clearly defined and internationally recognized total quality management model. It was developed by the United States government to encourage companies to adopt the model and improve their competitiveness.

In response to this, a similar model was developed by European foundation of quality management in 1992 this (EFQM) Excellence model is the framework for the European quality award. While leading organizations compete to win awards the main purpose of these awards is to encourage more companies to adopt quality management principle. The models are practical tools; they help organizations to measure where they are now and where they want to be in the future, and the models also help organizations to create a plan to reduce the gap between these positions. Today hundreds of quality awards and several models exist all over the world.

2.5.1 Business Excellence

Total Quality Management models are often called business Excellence models, and also Total Quality Management itself is now often called Business excellence. This is to distinguish the new Total Quality Management from past work on Total Quality Management. As mentioned earlier, there was confusion as to what Total Quality Management was in the 80s and early 90s. This was because any business improvement program was becoming called Total Quality Management therefore, the name Total Quality Management became tarnished. Business excellence is really the same as Total Quality Management but with more clearly defined approach.

2.6 Process Improvement

According to Stevenson (2009, 434) Process improvement is a systematic approach to improve a process. It involves recording, measurement, and analysis for the aim of enhancing the function of a process. Typical goals of process improvement involve maximizing customer satisfaction, waste minimization, cost reduction, and high quality accomplishment, adding productivity and process time reduction.

2.6.1 Measurement of Improvement Cycle

According to (Oakland 1993, 163) Performance measures and indicators were derived from cost accounting information. These principles are obsolete and haphazard, and it provides little motivation in the attempt to support TQM introduction. The lapses earlier mentioned actually hinder continuous improvement because they are unable to map process performance. In the cycle of endless improvement process, measurement performs an important role such as:

- Identifying opportunity for improvement
- Comparing performance against internal standard I.e. process control and improvement.
- Comparing performance against external standard. I.e. Benchmarking

2.6.2 Process Improvement Cycle

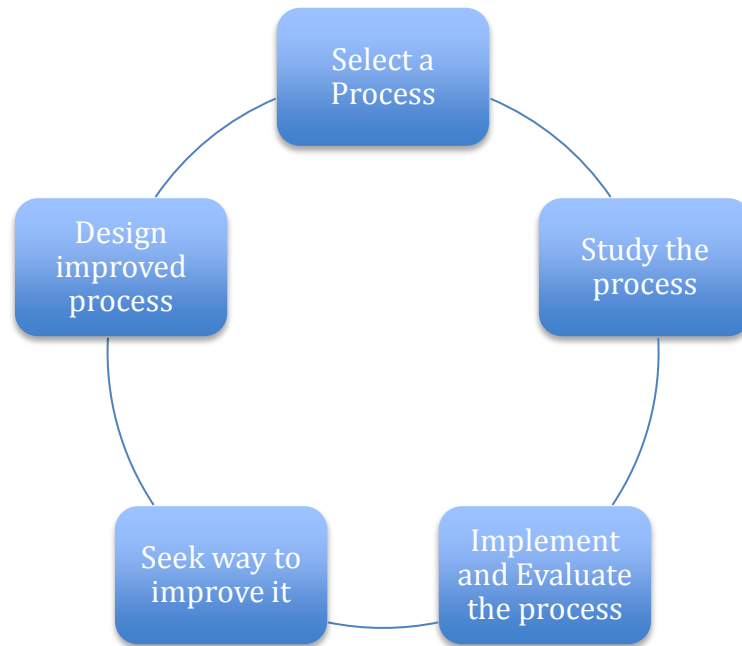


Figure 4. Process improvement cycle

2.6.3 Strategy for Process Improvement

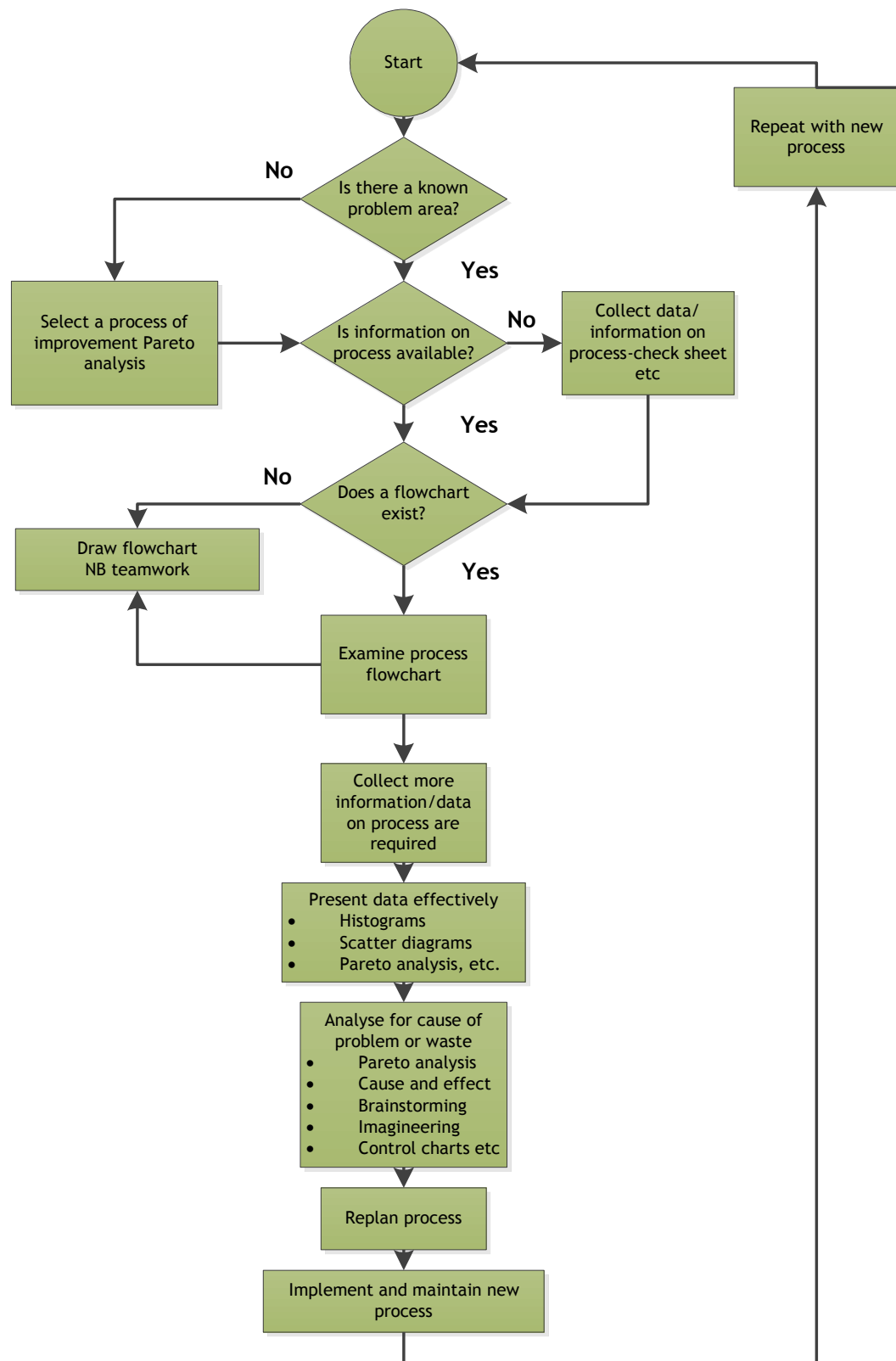


Figure 5. Strategy improvement process

2.7 Quality Assurance

The ISO 900 groups refer to Quality Assurance as part of quality management that guarantees that quality prerequisite will be observed. Every stakeholder in an organization need quality assurance, structure has to be formed to guarantee trust in product and services operations. (Hoyle 2007, 60)

2.7.1 Stakeholders Require The Following:

1. Enlightenment of what to supply
2. Knowledge of how the product/services are expected to be supply
3. Enlightenment that product/service will confirm to specification
4. Comprehension that declared intention will satisfy customer requirement
5. Knowledge that the declared intentions are actually being followed

According to David Hoyle, quality assurance activities will not be on control of quality, it guarantees the extent to which quality will be, is being or has been controlled (Hoyle 2007, 61)

The quality assurance department in organizations is created to provide all stakeholders what standard the content of the quality will adopt. However an alternative to Quality assurance is corporate Quality control. (Hoyle 2007, 61-62)

2.8 Benchmarking

The purpose of benchmarking is the continuous process of comparing and adopting company's strategy, product, services and processes with the world class organization in order to learn how the achieved excellence, and then adopting those steps to match up with or even surpass such organization. There is no point to reinvent if there is a process that could be adopted effectively at a low cost. Benchmarking could be regarded as a good component of TQM programs. (Ross, 1999)

2.8.1 The Purpose of Benchmarking

According to Ross (1999. 260) A benchmarking process properly designed and implemented will identify the position of the organization in the whole supply chain, considering both the upstream and downstream supplier and distribution channel to ensure the right organization

are being benchmarked and these processes are well integrated into the core business and values of the organization.

According to a conference board survey of 225 companies confirmed that an application within the information technology function is rated successful by almost 75 companies that practice it, Department of Energy in the public sector confirms that a savings of 15 to 25 percent could be expected on processes and activities.

2.8.2 Benefits of Benchmarking

- Cultural Change:

Benchmarking helps an organization to set a realistic goal with a credible proven process that helps to convince people about the reality of the target. This process changes the cultural syndrome of individualism and it helps the organization to be flexible to changes and adapt to a new system of doing things.

- Performance Improvement:

Benchmarking allows organization to analyze performance of an organization and to systematically review the process to conform to their values and goal. This process define specific gap in performance and to select the aspect to improve. The selected gaps are then analyzed for improvement plan.

- Human Resources:

The organization is able to provide the basis for training to close the gaps between what the personnel are doing and what they ought to do. The synergy between organization activities is improved through cross-functional cooperation to improve performance at all level.

2.8.3 Types of Benchmarking

There are basically three forms of benchmarking:

- Internal Benchmarking:

This form of benchmarking measures a part of an organization against the other. For instance, Nokia Finland could benchmark the activities of Nokia United States of America. This form of benchmarking identifies the best practice within an organization. Internal benchmarking those not reveal the position of an organization in relative to other companies in a given process, however it is less time consuming and cheap to adapt. Some of its limitation is that it those not reveal the potential insight to those already existing within the organization

- Competitive Benchmarking:

This form of benchmarking assesses the performance of an organization against its competitor. This can be across the entire spectrum of business comparators, i.e., finance, products and services, organization, technology, research and development, personnel policies and so on. World class benchmarking is where comparisons are made with organizations in different industries, with the object of being “best in class” for critically important activities which may influence market share, costs, employee motivation and effectiveness i.e. accounts receivable, standard costing etc.

- Universal Benchmarking:

This form of benchmarking is much preferable over competitive benchmarking. The aim is to improve product and services to the world-class level to gain a competitive edge over competitor. This measure allow organization to focus on top performers, irrespective of industry, the main factor is to obtain insight that will keep the organization ahead of competitors. Universal benchmarking scours for across sectors and industries for excellence, instigating goal to be set much higher.

2.9 Summary of Theoretical Discussion and Based on the Developed Framework

The theoretical framework and objective of this thesis is to analyze the effect of TQM in the development process and improvement in Hsy and to benchmark this process for the improvement of Lagos state environmental service with special focus on sewage and portable water system. Therefore the framework of this study is divided into several components, because the discussions from the theoretical section have been the basis for the empirical study, in which the presented idea was adopted accordingly as a key to facilitate solution and improvement suggestions to LASES.

The theoretical section of the thesis commenced with a general overview with special emphasis on theories, approach and definition. The historical view describe the origin of TQM while the characteristics of different stages in TQM clarify it development. Essentials of TQM were briefly discussed and supporting methodologies and techniques were described. Process improvement and strategy for process improvement were analyzed with the aid of diagram.

The concept of benchmarking is important in this context because it is the platform through which the organization will improve the activities of it operations, hence, the purpose and types of benchmarking were discussed

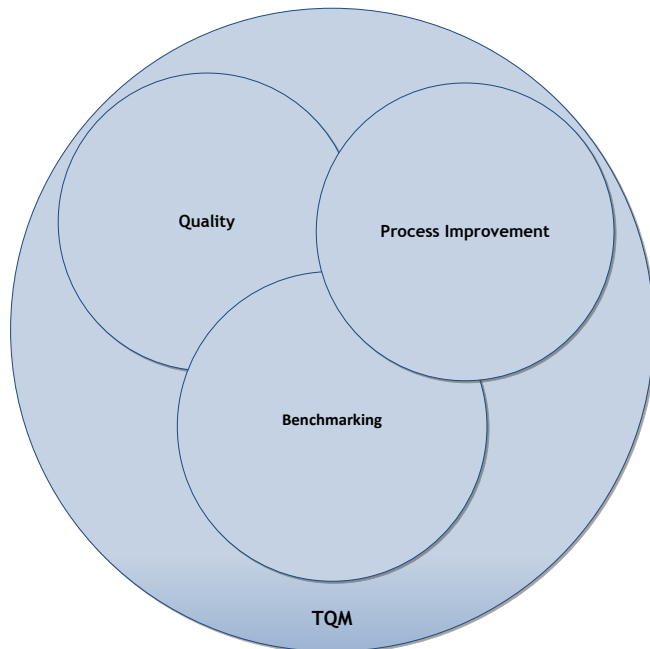


Figure 6. Theoretical framework

3 Research Methods

The word research can be referred to the search for knowledge. According to Dr. C R Kothari identified it as a scientific and systematic search for appropriate information on a specific subject. Rajendar Kumar explained research as an act of establishing facts or theory. Research could be generally considered to be as all methods or techniques that are used for conducting of research and the most important part of every research method used are to propose solutions to some identified threats or problems (Kothari 2008.2)

Research method could be examined from three group perspectives. Firstly, it is important to adopt the right method in the collection of data. These data will be utilized where the data already available are not enough to meet the required solution. Secondly group has the statistical techniques that could be used to create relationship between data and the unknown variable and the third group in subsists those methods utilized to eliminate the accuracy of results gathered, which is regarded analytical tools of research (Kumar 2008, 4)

Quantitative survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. From sample results, the researcher generalizes or makes claims about the population. Surveys allow gathering of extensive research material. There can be a great number of respondents and various things can be asked at the same time. Surveys are cost-effective and time saving. If the questionnaire is well designed the data can be easily stored and analyzed. Statistical analysis and reporting methods are already developed for this type of data collection, in addition, the research schedule and expenses can be estimated quite exactly. Surveys have disadvantages too, it is impossible to know how serious the respondents have taken the survey or how familiar they are with the research subject. Another thing not known is if they have tried to answer the questions as honestly and. Sometimes a low response rate can also be a problem. (John W. Creswell 2003: 153)

Qualitative research method emphasizes qualitative phenomenon, i.e. phenomena that emphasize on quality rather than quantity. This kind of research aims at discovering the underlying motives and desires, making use of depth interviews for purpose of searching solution to a problem. Quality research is a way to find fact about people's attitude or feeling and opinion towards specific subject. This method is always essential in behavioral sciences where the goal is to uncover the underlying motives of human behavior (Kumar 2008, 8)

Data collection methods in qualitative research are observation, interview, secondary data analysis and questionnaires in some case there could be a combination of the four mediums when required. The interview data collection could be individual or group interview of the

target group, which could be structure, semi-structured and unstructured interview. Observation could be through video, non-participants, semi-participant and participant observation. Qualitative research method will be used as a medium of data collection for this research work.

In semi-structured interviews, the interviewer has prepared a list of questions or topics they want to cover during the interview. However the questions might vary between respondents, even if they perform similar functions within an organization. The semi-structure interview also gives adaptability to the interviewer, as the respondent is likely to give answers that will lead to further questions and topic that might not have been covered in the list of questions prepared by the interviewer. Usually data is recorded by hand or using tape recorder. Semi-structured interview also avail the interviewer the ability to shape question into a form that is best suitable for the respondent. Semi-structured interview is less formal as structured interview, making the respondent more at ease as they are not bombarded with questions but can explain about the topic in a more narrative way. The big problem with semi-structure interview is that the entire interviews are different so finding the common issue might be difficult. Furthermore, the interviewer should have enough knowledge base to know which questions are important and which of the respondent answers should be delve deeper. (Saunders, Lewis, Thornhill, 2003, 245-247)

Participant observation is a method of doing research whereby the researcher investigates the topic by actively taking part in the environment. The study about flow of information would be a good example within an organization where the researcher would act as part of the organization and doing the same task as others while observing how everybody communicates and within whom. The researcher could either observe openly or covertly. The benefit of covert observation is that the observed are not afflicted by the fact that they are observed. However this might cause problems later and has its ethical issues as well. One-way to reduces the effect of affliction is to observe long enough so the observed become used to been observed. Furthermore, the observation should be conducted on different weekdays and months to reduce the possibility of time related errors (imagine a researcher who will visit to observe the behavior of Finns only during summer to make a conclusion, such researcher will get incorrect impression that Finns are extroverts not realizing that the season affect their mood) (Saunders, Lewis, Thornhill, 2003, 221-237)

3.1 Chosen Method

The primary objective of research is usually to solve a certain problem, the problem might however, be based on any type of topic, research can be divided into two major parts, theoretical and empirical research. Meanwhile, the theoretical research may be called a desk research, because it is mainly based on the utilization of literature that has been analyzed by someone other than the researcher. The empirical research is divided into two parts, qualitative and quantitative research, which however depends on the research objective and the author to apply the most appropriate approach. However the approaches are not enemies, thus are synonymous, but both approaches require different conclusions, in a qualitative approach the results are analyzed without the use of any statistical instruments, while contrary in a quantitative method.

This research was conducted by the use of qualitative method in a logical way that generated several ideas for the researcher which was appropriate for a significant result, furthermore, the researcher understands that qualitative research is more suitable for benchmarking the activities of the case study because HSY is a big organization and the role of different personnel differs, therefore the feedback from a questionnaire may not be accurate.

The author contacted Lagos state environmental and Helsinki region environmental service authority to introduce the concept of the research and solicited for contact person from both organizations. Interview was conducted with the contact person from Lagos state environmental service to determine the scope of the study.

The researcher target group was the personnel of HSY, according to the information gathered, HSY deal with private customer, companies and the government. Some key staffs of the organization were interviewed randomly during a visit to the plant in Viikinmäki, while some interviews were conducted by phone and email, which gave them the opportunity to tell their experience and various opinions. The major part of the information about the case organizations were gathered from both HSY and LAGSES's website.

3.2 Validity and Reliability

Validity and reliability are the cornerstones of scientific research. Reliability means that the result derived from the study can be repeated and that the results are always same. The results should not depend on who conduct the observation, and there should be connection between the data and the conclusions. In ensuring the reliability of this study, the results gathered from respondents were compared with information on website and brochure, further-

more the accuracy of respondents were compared with each other, which ascertain the results were reliable.

Validity means truthfulness or the extent to which certain inferences can be made from test scores or other measurement. For instance if the subject was the amount of ice cream eaten during summer, and then the study focus on the number of sunny days and drowned people during the summer time would be invalid, as it does not cover the ice cream eaten. There has to be casual effect between the two main variables. There should be a cause and effect relationship between ice cream eaten and sunny days, and between sunny days and drowning: no relationship exists between ice cream eaten and drowning. In ensuring validity of this research, the questions for the interview were semi-structured and they were sent ahead to the respondents to have knowledge of points to be discussed, and previewed by the supervisor to ensure they are accurate for the research. This attested that the results are valid. (Saunders, Lewis, Thornhill, 2003, 101-102)

One factor affecting the reliability of this thesis is that main information is gathered through interviews. This method is highly sensitive to time they are conducted and the mood of the interviewer and the respondent. The attitude of the respondent has a big impact on the answer they give, which implies that if they are stressed and busy, their response may not be accurate, as it ought to be, and this will affect the result of the research. (Saunders, Lewis, Thornhill, 2003, 93-97)

4 Empirical Study

4.1 Introduction to Lagos and its Environmental System

According to the information gathered from the Lagos state homepage, history revealed that prior to the Portuguese name (Lagos) was adopted; it was originally called Eko, which has its origin from the Awori's for over 650 Years ago. The dominant vegetation of Lagos is the tropical swamp forest consisting of the fresh water and mangrove swamp forest, which are influenced by the double rainfall pattern, which makes the environment a wetland region, hence, the reference of Lagos as an environment of aquatic splendor. Lagos has two main climate seasons: Dry (November - March) and wet season (April - October). The Drainage system is characterized by a maze of Lagoons and waterways, which constitutes approximately 22% or 787 sq. Km of its total landmass. The major bodies are the Lagos and Lekki 8 lagoons, Yewa and Ogun River. Others are Ologe Lagoon, Kuramo, waters and Badagry, Five Cowries and Omu Creeks. (www.lagosstate.gov.ng)

Lagos state has a population of approximately 17.5 Million people out of the national estimate of 150 Million. Lagos has 356,861 hectares of which 75,755 hectares are wetland, which is the smallest state and yet has the highest population. According to united nation's estimation based on the present growth, Lagos will be the third largest mega city of the world by 2015. Due to the rapid growing population in the state, the need for sound sewage and portable water system became paramount. (www.lagosstate.gov.ng)

4.2 Activities of The HSY

Helsinki region environmental services authority otherwise called Helsingin seudun ympäristöpalvelut (HSY) is the regional authority providing environmental services for residents and companies in the Helsinki area and her main duties are water and wastewater management and providing regional information service for the inhabitants. The goal is to ensure that environmentally sound decisions and actions are enacted for all the populace in the region. (www.hsy.fi)

The immense quality contributions of the Hsy are vivid:

- World leading water quality
- Reliable wastewater purification
- Exemplary waste collection and transport
- Information on air quality and environmental matters that is made available to all

4.3 Hsy Organization

The organization is divided into departments:

4.3.1 Waste Management

The waste management department is responsible for waste-related guidance and preventing waste generation, collecting recyclable and hazardous waste, collecting and composing organic waste, arranging waste transportation for residential buildings, managing the after-care of decommissioned landfills and preparing waste management regulations. The operational area acquires waste transport services from companies through competitive tendering process. The operation of the waste management is divided into:

- Handling services
- Transport services

- Regional services (Sortti stations and regional collection points)
- Construction management services
- Services by economic and administrative unit and the consultation unit

(www.hsy.fi)

4.3.2 Water Service

The water service of the hsy is a member of organizations such as:

- International Water Association (IWA), an international organization operating in the water supply and sewage section
- The Finnish Water and Waste Water Works Association (FIWA)
- Hsy water department participates in the operations of the Baltic sea Action Group (BSAG) and the Baltic Sea Challenge initiated by the cities of Helsinki and Turku

Hsy is known for a world-class quality drinking water and her efficient water treatment plant. The water pipe and sewer network's length is over 7000 kilometers with top quality international standard water treatment plant. (www.hsy.fi)

4.3.3 Regional and Environmental Information

The regional environmental information produces reliable information to improve urban environment. Her task includes:

- Monitoring air quality
- Carrying out strategy work on the mitigation and adaptation to climate change
- Producing and improving the quality of information and providing information-related services

The regional and environmental information has three main tasks, which are divided to the following units

- I. Economic
- II. Administrative
- III. Communications services

Air protection unit is responsible for monitoring air quality, research, planning, training and information dissemination relating to air protection. The climate unit is in-charge of joint

strategy work of the Hsy to mitigate climate change and adapt it to promote and monitor the realization of climate-related and energy efficiency goals. The information cooperation unit produces, assembles and improves regionally cohesive register and location information, and regional development information, on population, housing, employment, business activities, urban structure and land use. (www.hsy.fi)

4.3.4 Administrative Services

The administrative service is in responsible of general administration such as meeting arrangement, Board of directors meeting, inspection committee and implementing decisions. It's also in-charge of personnel and information management and dissemination, communication and office services. (Yrjö Lundström, 2 May 2012)

The political decision of the Finnish government is that environment services, port authority and Power sectors are handled by so called non-profit private oriented companies. The decision is made to foster environmental development and make life easy for average person living in the capital area. Hsy originated as a result of the decision that one body should manage the environmental sector of the capital region and Hsy operation focus on water, wastewater, and solid waste. Two parts of the Hsy's operations are slightly outsourced, which are transportation of solid waste and sludge management, basically Hsy do not have equipment in the treatment process and transportation of the sludge. (Yrjö Lundström, 2 May 2012)

4.4 Strategy of Operation

Hsy operates privately, she has to generate income from the service charges provided to the resident of the municipality, in other word she has no allocation from the government annual budget, and however the government oversees the operation through stringent regulations. The capital municipality basically owns Hsy, and the concept is that they should provide the best environmental service possible at the cheapest price, thereby reducing the pressure of profitability on the staffs and thereby directing focus on quality at minimum cost. (Mari Heinonen, 3 April 2012)

4.4.1 Challenges in the Inception of Hsy

Five different companies initially manage the environmental service of the capital region, one taking care of solid waste, and another company water treatment etc. The main challenge was ammonizing the activities, staff and ideologies of these five companies together to function as one. Questions as who is responsible for what? Issues with hierarchy and management

system to be adopted became paramount. The merger of this company resulted in too many staffs, and it was politically decided that no one would be retrenched as a result of the merger, which resulted in conflict of interest and against concept of good quality and low price. The management body decided that the high number of staff would be automatically resolved over few years, as some officers are close to retirement. However the Hsy do not face any technical challenge in the inception, as they have low population of 1.2 million people to cater for. Administration problems are the main challenges. (Yrjö Lundström, 2 May 2012)

4.4.2 Administrative Control and Service Structure

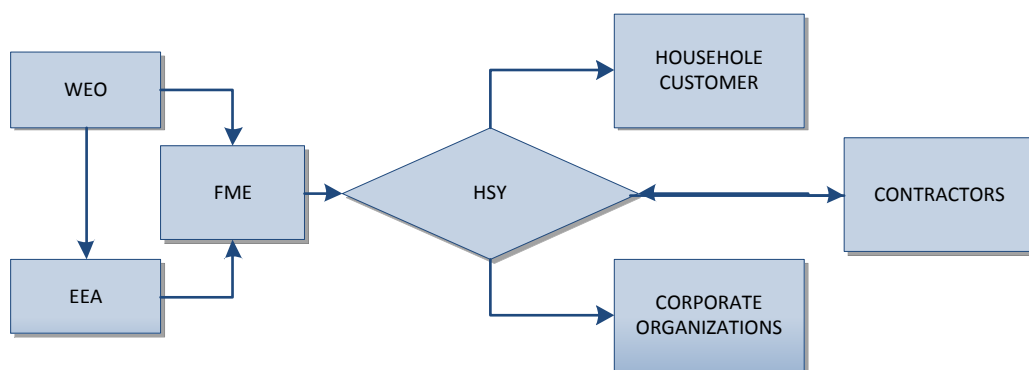


Figure 7. Administrative control structure

Control from World environment organization

Control from European environmental agency

Control from Finnish ministry of environment

Internal control by Hsy (Yrjö Lundström, 2 May 2012)

4.4.3 Management Quality Structure

The Hsy started operation 2010 and has a target to operate the same kind of system in the whole of Finland by 2014. Analysis are conducted internally three times a year through the process improvement cycle and report is given at the end of each process to ensure an improvement in the next phase and joint annual report is given once a year to facilitate the supervisory authorities and city residents with an overview of the operation and treatment efficiency of the wastewater treatment plant in a year. (Yrjö Lundström, 2 May 2012)

4.4.4 Wastewater Quality Structure (Sewage)

Plant-specific environment permits govern the operation of the wastewater treatment plants. The Viikinmäki and Suomenoja wastewater plants has to comply with all the regulations of the environmental permit conditions, with biological and chemical oxygen demand as well as nitrogen, phosphorus and solid content and removal efficiency of treated wastewater has to meet the permit conditions. For nitrogen and phosphorus, the plants have to reach the Hsy internal target, which is stricter than the permit conditions. Although the operation of the treatment plant and wastewater pumping station has been difficult, as a result of defrost ice from the winter and high records of rainwater from the old Helsinki city area, however improvement plan has been structured to separate rain water sewage from domestic sewage in the future.

In addition to enhance the wastewater treatment process, Hsy's development projects are focusing more attention to the improvement of energy efficiency and adaptation to climate change. At Suomenoja, steps are taken to improve energy efficiency including developing the control of aeration, whereas Viikinmäki enhanced its heat recovery and started an extensive research project to remove nitrogen from water separately by centrifugation.

In connection with adaptation to climate change and higher than predicted increase load on plants, Hsy board of directors decided to forward the Viikinmäki plant expansion project and implementation planning of the project started in 2011. The intention is to commission the ninth line at Viikinmäki by 2014. The new underground treatment plant Blominmäki was at the general planning stage in 2011, and the Blominmäki wastewater treatment plant is scheduled to start its operations in 2020 and replace the Suomenoja plant. (Yrjö Lundström, 2 May 2012)

4.4.5 Portable Water Quality Structure

Hsy conduct over 33,000 water analyses annually in its process laboratory to monitor the quality of raw water, the water purification process and the domestic water leaving the plants. In addition the quality of water in the distribution system is monitored. One liter of clean water cost approximately one cent, which includes the entire water supply process: acquisition, purification and distribution of water. The price also covers the extremely important process for future nature and our living environment: sewage and water treatment.

The capital region has the second longest rock tunnel in the world. The raw water travels to the metropolitan area in over 120 kilometers long tunnel from Lake Paijanne, which has excellent water quality. (Yrjö Lundström, 2 May 2012)

4.4.6 Water Treatment Process in Hsy

The water treatment plants of Vanhakaupunki and Pitkakoski have similar water purification processes. The humus contained in the raw water is precipitated with ferrous sulphate. The resulting precipitate is stirred and mixed in order to improve clarification, and then it is separated from water in settling tanks and sand filters water flows gravitationally through a sand bed. Any possible microbes remaining in the water are killed with ozon, which improves the odor and taste of the water. Ozon is processed from oxygen with the help of electric discharge in ozonizers. The gas mixture is added into the water as small bubbles. Then, carbon dioxide is added to the water to increase its alkalinity and, reduces corrosion. The remaining organic matter is removed by leading the water into activated carbon filtration system. Water from the activated carbon filter is disinfected with UV light. Finally, bound chlorine, i.e. chloramine, is added to the water in order to limit microbial growth in the distribution network. The pH of the water is adjusted with limewater to 8.5. After water purification, the water is directed to into portable water basins from where it is pumped in to the distribution network with the help of high-pressured pumps. A total of 245,000 cubic meters of water per day is pumped into the network round the clock in the Hsy region. (Heli Harkki, 7 May 2012)

4.4.7 End Customer Quality Check

There may be disturbance in water quality if the water pipe network has to be locally closed in order to renovate pipelines, fix leaks or carry out network flushing. Notice is always given in advance of interruption in use, and after repair works, precipitates and rust might appear in the water pipes, which causes temporary changes in the water quality such as brown color and turbidity. In this situation tap water should be run for about 10 minutes until the water is colorless and clear. If this does not improve the water quality, the maintenance company should be contacted and the quality of the water supply to the building will be analyzed. The Hsy has 60 points where they collect sample from different points in the city to check and if quality of water pumped into the pipeline network is the same available to the end user, and if there is a problem they try to check where the problem has emerged. Technically the water quality is analyzed in the laboratory.

Companies have regulations that guide the quality of wastewater disposed into the sewage; the regulations state that companies have to hire wastewater Treatment Company to treat their wastewater before directing it to the sewage. They have to outsource control from a certified company. The Ministry of environment conducts checks on a regular basis to ensure that water disposed to the sea fulfills the regulation. The Hsy pay for this control service but the regulatory authority conducts the check, as the Hsy members are not allowed to do it themselves. (Heli Harkki, 7 May 2012)

5 Conclusions and Recommendations

5.1 Conclusions

The basic concept of TQM is to ensure quality in the entire operation sphere of the organization and this has been described through the operation of Hsy for the purpose of benchmarking. The organization responsible for the environmental service of the capital region is owned by the cities comprising, Helsinki, Espoo, Vantaa, Kauniainen city which was formulated following the concept of continuous improvement which is one of the components of TQM. According to the interview Hsy was not formed as a result of any major problem in the formal system of management but as a drive for excellence.

The operation and management system is structured to enable a continual improvement. Hsy conducts over 33,000 water analyses annually in its process laboratory to monitor the quality of raw water, which implies that they follow a systematic process improvement cycle to analyze quality and recommendations and actions are taken at the end of every phase to improve on quality, moreover it is important to note that internal auditing and reports are taken in every quarter and a final annual report is prepared once in a year to show the current situation and also allow the opportunity for amendment in the coming year. Additionally, surveys are conducted on a regular basis to seek the opinion of the entire municipality population on quality of services provided to them.

The municipality has a master plan which they follow and target is set while checks are conducted regularly to ensure they are on track. The current project to build the ninth line and construction of an underground treatment plant in Blominmäki depicts continuity in plan to eliminate errors and to attain excellence.

The case company has four levels of legislative controls, which are control from the World Environmental Organization, European Environmental Agency, Finnish Ministry of Environment and also Hsy's own internal control. From the information gathered, it was noted that the case company has stricter internal measures and this has resulted in the current level of excellence in the municipality. The cities were able to reflect their values in the decision regarding major standards of life necessities by focusing the efforts of staff in providing the best possible services to the people, while profitability is of no relevance, however accountability to services remains a major priority. The case company is also saddled with the responsibility to manage all financial issues, as the government is not responsible for giving allocations.

The case region is able to cut costs through the privatization of this sector. Everyone is responsible to pay for his or her own consumption without the government subsidizing any part

of it, those decisions made in the time past has resulted in restructuring the sector which is vivid in the sphere of the Hsy Company, and portray the theory of TQM in it operation.

Some of the landmarks of Hsy are:

- World leading water quality
- Reliable wastewater purification
- Exemplary waste collection and transport
- Information on air quality and environmental matters that is made available to all
- The raw water travels to the metropolitan area in over 120 kilometers long tunnel from Lake Paijanne, which has excellent water quality.

The adoption of TQM by the case company has made it what it is today and as TQM is regarded as continual process, hence the standard of living in the municipality will keep moving higher.

5.2 Recommendations

It is recommended that the Lagos state government should adopt the introduction of a non-profit making private oriented company to take over the environmental service of the state and regulation should be imposed not to allow any profit making organization in this sector in order to enhance and guarantee environmental sound system. The concept is to prevent profit making organization from ruining the effort of the government in this regards, because corporate organization are mainly interested in making money.

The system of the Hsy should be adopted in such a way that the government will be the owner of environmental management company, but they should be given autonomy to have their own management system, consequently their affairs should be strictly regulated by the state government. Moreover, comprehensive environmental master plan should be drawn and strictly adhered and this system will improve the menace overtime.

Orientation program should be in operation to sensitize people of the importance of cleanliness, ways to maintain healthy environment through all available media at all time, through this both adult and children will be groom psychological to follow hygienic and safety measures. Lagos state should adopt the theory of TQM in it operation to foster development and quality in managerial decisions.

Further research is recommended to cross check if this benchmarking study will be applicable in Lagos state because of the following factor:

- **Population:** The case company caters for a total population of 1.2 million people living in the capital region while Lagos state has over 17.5 million people. Further survey should be conducted to verify if the concept of the case company will be applicable.
- **Climate condition:** Lagos state is rain forest region with seven month heavy rain season during the year while Helsinki is snow region
- **Legislation of the Country:** The system of government practice in both countries should be considered, proper investigation should be conducted to know the effect on these decisions on the people, because the case region has different orientation, values and background which forms the norms and culture of the people.
- **Technical information regarding every process is not conducted,** as the research focus mainly on managerial issues. Technical information will require further research.

Finally, the concept of TQM has identified continuous improvement as an important component, as described in the operation of Hsy. TQM focus on the development of an entire organization's activities. According to Yrjö Lundström, the introduction of the Hsy to manage the environmental service of the capital municipality is an effort to upgrade the system. Lagos state is advised to benchmark the Hsy to ensure total quality in the management of the environmental service of the state.

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Appendices

Semi-structured questions

- What are fundamental issues undergone in the inception of the environmental services of the capital municipality?
- How does the municipality control the quality of their services?
- What techniques were used, by what resources, how often the quality follow-ups are conducted?
- What problems and barriers are faced, what are the values of this municipality in regards to environmental services, what are the demands the municipality have in regards to quality management today and in future?