



ISSN 2278 – 0211 (Online)

## Quality Delivery in the Construction Industry and Socio – Economic Development of Ghana: Evidence from Ve – Golokwati – Wli Road Construction Project

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### **Abstract:**

*Quality is one of the desirable characteristics by all stakeholders in the construction industry. Developing countries need to increase and improve infrastructure as a means to stimulating economic growth without compromising on the quality of projects. The challenge of quality delivery in the construction industry is a world phenomenon and the construction industry in Ghana is no exception. The objective of this study is to determine the effects of quality delivery in the construction industry on the socio – economic development of Ghana by evaluating the quality management practices and the measures put in place for quality assurance and also compare the ISO system in relation to sample selection in the Golokwati – Wli road construction to meet the dynamic concerns of emerging construction projects in Ghana. The results indicated that the project had a huge socio - economic influence on the beneficiary communities and Ghana at large. It was revealed that the contractor had an expert quality assurance and control department with good quality management practices, which did a good job and delivered a product to the required quality. The quality control standards of the contractor was found to be in conformity with ISO 9000:2008. It was also found that the project was awarded in parts instead of in full. The study therefore recommends that the Government of Ghana awards contracts in full in order to ensure total quality and value for money.*

**Keywords:** *Quality, Ghana, construction, socio economic growth, ISO, Project. Developing Countries*

### **1. Introduction**

The most desirable attribute of construction by all stakeholders is quality. The set of activities that are performed to ensure that an organisation meets all quality requirements is known as quality assurance (ISO, 2007). In order to inspire the confidence of stakeholders in meeting the quality requirements of projects, quality assurance activities must be carried out at each stage of the execution of projects. Quality assurance offers the opportunity for stakeholders to have enough confidence that a structure, component material or system meets pre-stated quality standards and will offer maximum satisfaction and benefits to users during its entire service life. Quality assurance was originally a concern for the manufacturing industry but it is now considered a very important concern for the construction sector whose clients increasingly demand quality certification (Chung, 2002). The main aim of construction quality assurance or quality control during the execution of projects is to provide the assurance that the activities of a specific project are being performed in accordance with all the specifications, codes and standards or government regulations as stipulated in the contractual agreement.

To boost the economic growth of developing countries by increasing and improving infrastructure, quality assurance issues must be taken seriously. People must be empowered through the creation of job in developing countries during the period of increase and improvement of infrastructure.

Major investments are not promoting the needed quality and quantity of the services demanded by many developing countries. (World Bank, 2004: 2). The main challenge is that many of the infrastructural development projects in these countries take a longer period to complete, exceeds budget, and do not meet the acceptable quality from initial construction and finally characterised with poor maintenance over the life of the constructed facility.

The cost associated with defects or failures in constructed facilities is both implicit and explicit in nature and can be very undesirable for all stakeholders. Minor defects require re-construction and this impairs the operations of the facility, which eventually results in increased costs and delays and may cause personal injuries or fatalities in some cases. It is the duty of project managers to make sure

that the job is done right the first time and that no major accidents occur on the project. Chapman, et al (2003), revealed that in order to cut cost, it is prudent to make the most important decisions regarding the quality of a completed facility during the design and planning stages rather than during construction. At these preliminary stages, component configurations, material specifications and functional performance are determined.

The specification of quality requirements in the design and contract documentation becomes extremely important with conformance as measure of quality during the construction process. For all parties in the project to understand the requirements for conformance, they need to be clear with the quality requirements and verify each requirement. The principal outcomes of a quality project are the satisfaction of customer requirements within the constraints of technical, cost and schedule objectives.

Given the enthusiasm with which project management is currently being embraced by so many organisations, it should be noted the same elements that make project management a special endeavour are also part of the reasons why successful project management is complex and difficult.

The pedigree of project management is by no means one of continuous success, in part because many companies face deep-seated resistance to the kind of changes needed to accommodate project theories. These challenges have made the construction industry especially road construction very dynamic in nature. The concept of project success has however remained ambiguously defined in the construction industry. Project success is the ultimate goal for every project even though it means different things to different people.

The problem of quality delivery in the construction industry is a global phenomenon and the construction industry in Ghana is no exception. Indeed the alarming rate at which construction projects and buildings are deteriorating and collapsing in Ghana few years after completion has become a source of worry to all stakeholders.

Against this backdrop, this study focuses on the quality management practices employed by the contractor on the Golo – Kwati – Wli road construction project and came up with recommendations to proactively resolve the outstanding quality issues by analysing the various factors that enhances the quality and success of the project and its socio economic benefit to society. This study will specifically answer the following question; first, what is the policy governing project management in the construction industry in Ghana? Secondly how well did the Contractor adhere to the quality management plan in the Golo – Kwati - Wli road construction project? Finally, is the project in conformity with ISO 9000 standard? If not, what are the missing features of the project?

The remainder of this study is organized as follows; section two reviews the relevant literature. Section three outlines the methodology employed in the study. Section four presents the results and discussions and the final section provides the summary and makes appropriate recommendations.

## 2. Brief Review of Literature

### 2.1. Quality Management

Steyn et al (2004) opined that quality never happens by itself because it is always the result of careful study into the requirements of the final products that will meet all the needs of the customers as well as expectations of other stakeholders involved. The major area in the construction industry that has to be looked into critically before a project is initiated is the issue concerning quality. Harris and McCaffer (1995) also revealed that the contractors have to guarantee the quality a project have to its client in order to compete effectively in the modern construction market and this is very crucial today because quality is becoming as determinant and discriminating a factor as price has traditionally been.

Zairi (1991) reckons that the Japanese were leading in the field of quality management in the 1970s. The strong motivation to succeed, strong leadership, total commitment and belief in continuous improvement were some of the basic factors that rekindle the desire for quality. Ishikawa (1985) described this strong motivation as the “Japanese spirit”. Americans are the major pioneers of quality movement even though the western world have had the same opportunity as Japan. However, the Japanese utilized the opportunity to the full hence had a better result compared to other countries. The desire for quality was triggered by the humiliation suffered by the Japanese during the Second World War, where they conceived the idea to rebuild a new Japan with massive industrialization, which would be respected worldwide. This consciousness brought about the zeal, enthusiasm, responsiveness and commitment by the Japanese in wanting to achieve high quality standards because Japanese products were suffering from poor quality and reliability standards.

British Standards (BSI) is the United Kingdom’s national standards organisation that produces standards and information products that promote and share best practice (Distributing BSI British Standards 2009). In 1900, the British Standards started as early at the time Sir John Wolfe-Barry, the man who designed London’s Tower Bridge, prevailed on the Council of the Institution of Civil Engineers on 22 January 1901 to form a committee to consider standardizing iron and steel sections (History of BSI group 2009). The first Commonwealth Standards conference organized by British Standards in London in 1946 gave birth to the idea of International Organization of Standardization. BSI published the world’s first management systems quality standard in 1979, BS 5750. The introduction of ISO 9000 series in 1987 superseded international standards, which BS 5750 inspired.

Oliver (1992) espoused the idea of quality assurance as: “any planned and systematic actions or tasks necessary to provide a reasonable assurance that a product or service will satisfy its specific quality requirements”. It is therefore a common knowledge that a quality assurance documents builds the confidence of both purchaser or client (customer) and the management. Clients have the assurance that products will meet their quality requirements while management is confident that the product meets their own requirement, that of the clients or customers and that of society at large. The group of activities aimed at providing confidence to a purchaser is called external quality assurance, while internal quality assurance comprises the activities aimed at providing confidence to the management of an organization

## 2.2. *Concept of Project Management*

According to (Womack 2003), project management began in its early form in the late 19th century, This in many cases were driven by government large scale coordinated projects that were under construction and the managers that organize the huge labour workforce at the site and at the same time coordinating another large production workforce and unprecedented raw materials in the factory. Project management processes were designed as a result of the complexities of projects by nature. In 1911, Fredrick Winslow Taylor began the analysis of his approach towards management, where he concentrated on employing scientific reasoning and subsequently applied it to the labour force to exemplify and analyzed how individual processes improvements could be made.

Henry Gantt's a close associate of Taylor, added an essential visual tool, the Gantt's chart, around 1917 that focused on the individual task, outlining and focusing on each element to produce a very useful analytical tool that has remained almost unchanged until today. The Gantt's chart has been very phenomenal in advancing the science of project management. The next major step forward in project management occurred after World War 2, specific techniques emerged for planning and managing huge budgets and workforce. The Pert (Program Evaluation and Review Techniques) and CPM (Critical Path Method) are the most well known and they eventually became synonymous for project scheduling techniques.

Although some changes and minor shake-ups were made, much has not changed until the 1990's. Project Management until this point had been very useful mainly on large government projects like the nuclear weapons race. Project management tools became easier to use, more readily available and quicker to use and more suitable for smaller projects and different disciplines with the advent of computers and software. Each project in modern terms in the construction industry employs a project manager, who puts together a team and manages them effectively to ensure proper integration and communication of the workflow across same levels in different departments and organizations (Owen et al 2005).

## 2.3. *Challenges Associated with quality delivery in the Construction Industry*

O'Brien et al (2001), reckons that project management involves organizing various aspects of a project in order to achieve a positive outcome. This organization most of the time include elements such as personnel, materials, processes, procedures and facilities. The science of project management is one that is not devoid of challenges and over the past decades, the challenges of project managers have been on the increase. Quality, cost and schedule are some of the aspects of project management that are particularly very challenging even though there are various other mitigating factors as well as other influences that Project Managers do not have any control over. Sometimes these external factors can have as much impact on project management as the factors that Project Managers can control. The area of quality is the first aspect of project management that can be extremely problematic if care is not taken.

A major challenge to any project according to Nunnally (2004), is the initial contracting of work. Bidding for contracts can increase project costs in environments where labour resources are scarce and there is lack of competition.

This lack of competitiveness in the bidding environment also points to the fact that parent companies do not all the time get the best contractors for the job. Parent companies sometimes settle for less than they were hoping for and these results largely in increase costs, longer schedule times and possibly increase the number of injuries on the project. In many instances, reimbursable contracts provide little or no incentive for contractors to get the work done in a timely and efficient manner and companies before setting up contracts should carefully consider these factors. For the project to be delivered on schedule and budget by contractors, owners should consider using lump sum or unit rate contracts as much as possible in to shift all responsibilities to the contractors in case of all delays and budget overruns.

Systemic corruption is another hindrance to the quality of delivery in the construction industry as evident in the case below. A standard 'tip' was \$20, a source said, and it could grow if a plumber was in a bind of some kind. "A lot of it would occur when a plumber would need to close an excavation hole where they had buried pipe, and it could not be closed until an inspector approved it, "the source said." So you could stand around with your crew waiting, or you could page a quality inspector and get him out there really quick, and thank him for it." The payments to inspectors have been suspected for years but that they were hard to crack since those paying the bribes were happy for the speedy service. (Philadelphia Daily News, March 14, 2001).The case above reveals how quality regulations to obtain an inspector's approval induced corruption. The case also shows at the same time that simple blue prints for cracking down on government quality regulations are not feasible. It is important to undertake inspection so as to guarantee the delivery of proper quality. However their abandonment is likely to do more rather than less harm and may even worsen the canker of corruption.

The combinations of many events and interactions, planned or unplanned over the life of the facility, changing participants and processes in a constantly changing environment are some of the many hurdles that contractors will have to overcome before successful completion of projects. Peurifoy et al. (2006), concludes that projects with set hours of work and isolated location of project site can also lead to difficulties in attracting workers. Quality delivery suffers with insufficient workforce which makes the project delay and cost increases.

The literature for this study has been written on quality management, the concept of project management and the challenges associated with project management in the construction industry. There is also a need to establish the relationship between quality management and how it is applied especially in government projects. The survey of literature on quality delivery in the construction industry revealed that even though much has been done in the construction industry, further studies is required into the quality standards and its contribution to the socioeconomic development of communities around the world.

### 3. Methodology

The project is a 23km road construction that spans across 5 communities. The project started from Ve Golokwati in the Afajato South constituency and ended at Wli in the Hohoe constituency all in the Volta region of Ghana. The beneficiary communities include, Golokwati, Teikrom, Torganu, Torgbadza Fodome and Wli. So far 13km stretch of the road has been completed and that ended between Torganu and Torgbadza. The construction of the remaining 10 km will soon. The project execution period was from 2012 to 2014.

This research investigates the quality management of construction projects in Ghana, which demands a high level of quality with the Golokwati – Wli road construction project as a case study. The approach to this research is purely descriptive. The major players in the supply chain were interviewed in order to obtain data and information for perusal and analysis. The data employed include the quality management plan, method statement and other quality assurance documents of the contractor on the project.

To establish compliance of the project with the International Organization for Standardization (ISO) 9000, a benchmark was used in comparing the main output of the project to the expected output specified. The project was compared with the eight quality management principles on which the ISO 9000:2008 series is based to establish the compliance or otherwise of the project with the ISO 9000:2000 standards.

### 4. Results and Discussions

#### 4.1. Socio – Economic Benefits of the Road Construction Project

The main socio - economic benefits of the Golo- Kwati – Wli Road Project are discussed below:

- i. The road provided a direct link between Wli and Golo – Kwati and forms part of the eastern corridor multimodal project.
- ii. Increase agricultural production, socio-economic advancement of the people and reduce poverty; and
- iii. Provide the shortest access to Wli waterfalls, which is the highest waterfalls in West Africa and serves as an important national landmark of great tourism importance.

##### 4.1.1. Situation Before

The low-lying nature of some sections of the road makes it flood-prone and not motorable after heavy rains. The gullies created by severe erosion at sections of the road have led to narrowing of the road, which has affected traffic flow, and hence slowing down the movement of goods and people. The rough nature of the road led to longer travel time, increased wear and tear of vehicular parts, and increased emissions, especially greenhouse gases, impacting climate change. This has also led to the loss of interest in visiting the Wli water falls which is the highest water falls in West Africa and one of the major tourism attractions in Ghana.

##### 4.2. The New Project

The completion of the project however opened up the area, by increasing the patronage of the Wli waterfalls as a major tourism site. It has helped to boost especially the rural agricultural section and provided a boost to socio-economic activities with its resultant benefits to the local communities and the nation as a whole. Other beneficial impacts of the road project include, reduction in travel time and cost, employment opportunities, enhanced economy and gender development. Thus since the road is now in a good condition, cars now use it and the local people sell their farm produce by the roadside to the numerous road users.

The project has also provided an improved road surface, which has resulted in savings on general fuel consumption and reduction in travel time and emission. It has also improved the transportation system along that stretch of the country and opened up communities for improved economic activities. For instance, farming communities are now easily accessed to evacuate farm produce. Access to educational, health, socio-cultural activities and administrative facilities has also been improved according the interview conducted with the indigenes. All the community members interviewed on the impact of the road on their livelihood spoke with joy and recounted some of their troubled moments when the road was in a bad shape. One of the members of the community recounted his experience and said ‘ I remember with much sorrow how my wife got a miscarriage when she was being transported to the hospital for a check up on a motorbike as a result of non availability of cars because of the poor nature of the roads. If the was road was this good at the time I would not have lost my baby through a miscarriage but thank God the situation has been remedied.’ He retorted with mixed feelings.

##### 4.3. Quality Assurance and Control on the Project

Due to the scale of the project, the Independent Certifiers were rational about the quality checks on site, this they did by prioritizing what will be checked because checking the quality at each stage will need the same resources that the execution team has, thereby making it more extensive checking and also makes it uneconomical for the client. The Independent Certifiers did not only monitor the quality they also monitored the cost of the project for the client. The Contractor had a quality assurance department that looked out for quality and certified their project internally. The internal quality assurance department of the contractor served as levels of certification up to the overall certifiers that certified payment when satisfied. The table 1 below is a summary of final field density sample test conducted on the road. The test results indicate clearly that all the measurements for relative compaction is above 92.0% which is an excellent relative compaction rate for a quality construction project.

Date of Test	Location or Chainage	Layer	Max. Dry Lab. Mg/M <sup>3</sup>	Optimum Moisture Content %	Field Density Mg/M <sup>3</sup>	Relative Compaction %	Thickness of Layer (Mm)
26/02/2013	2 + 500 C	Base Material	2.24	8.8	2.09	93.3	203
"	2 + 550 R	"	"	"	2.08	92.9	198
"	2 + 600 L	"	"	"	2.08	92.9	198
"	2 + 650 C	"	"	"	2.09	93.3	201
"	2 + 700 R	"	"	"	2.08	92.9	194
"	2 + 750 L	"	"	"	2.10	93.8	197
"	2 + 800 C	"	"	"	2.08	92.9	194
"	2 + 850 R	"	"	"	2.07	92.4	200
"	2 + 900 L	"	"	"	2.08	92.9	197
"	2 + 950 C	"	"	"	2.09	93.3	201
"	3 + 000 R	"	"	"	2.09	93.3	204

Table 1: Summary of Final Field Density Test Sample  
Source: Ghana Highways Authority, Ho (Reported on 15<sup>th</sup> April 2013)

The client in this case the Government of Ghana also had a representative on site similar in function to the resident engineer who monitored the quality of the work executed on site. The representative had the authority to stop work on site anytime the execution of the project was not according to the drawings or specifications. The structure of the quality management system in terms of quality personnel is explained below. There were project quality managers from Ghana Roads and Highways Authority responsible for quality control and quality assurance of the project. The quality management team was integrated with the execution team to implement the quality system. The quality manager ensured that the execution team gave the client a quality product, which was in conformance with the standards specified in the contract document. The quality manager carried out quality control and quality assurance in the project execution stage. The quality manager had inspectors that worked for him. The quality manager and inspectors did the inspections on site together with other members of the execution team, ensuring that the correct materials were used and the correct testing was done. This was achieved with the aid of planned documentation. Table 2 below contains the shape and strength test of samples and this revealed that the test samples have met the quality requirements of the project.

ELONGATION INDEX						
	B.S.SIEVE	TOTAL	RETAINED	PASSING	VALUE (%)	
1	14 <sub>mm</sub> - 10 <sub>mm</sub>	263.0	10.0	253.0	3.8	4.1%
2	14 <sub>mm</sub> - 10 <sub>mm</sub>	250.8	10.3	240.5	4.1	
3	14 <sub>mm</sub> - 10 <sub>mm</sub>	254.6	11.5	243.1	4.5	
FLAKINESS INDEX						
	B.S.SIEVE	TOTAL	RETAINED	PASSING	VALUE (%)	
1		263.0	220.5	42.5	16.2	16.1%
2		250.8	210.9	39.9	15.9	
3		254.6	213.6	41.0	16.1	
IMPACT (DRY)						
	B.S.SIEVE	TOTAL	RETAINED	PASSING	VALUE (%)	
1	14 <sub>mm</sub> - 10 <sub>mm</sub>	340.1	294.1	46.0	13.5	14.4%
2	14 <sub>mm</sub> - 10 <sub>mm</sub>	342.2		46.9	13.7	
3	14 <sub>mm</sub> - 10 <sub>mm</sub>	321.8	270.7	51.1	15.9	
ACV						
	B.S.SIEVE	TOTAL	RETAINED	PASSING	VALUE (%)	
1	14 <sub>mm</sub> - 10 <sub>mm</sub>	2850	2388.3	800.0	16.0	16.1%
2	14 <sub>mm</sub> - 10 <sub>mm</sub>	2795	2350.6	830.0	16.6	
3	14 <sub>mm</sub> - 10 <sub>mm</sub>	2908	2434.0	474.0	16.3	
LOS ANGLS ABRAISION						
	B.S.SIEVE	TOTAL	RETAINED	PASSING	VALUE (%)	
1	14 <sub>mm</sub> - 10 <sub>mm</sub>	5000	4200	800.0	16.0	16.0
2	14 <sub>mm</sub> - 10 <sub>mm</sub>	5000	4170	830.0	16.6	
3	14 <sub>mm</sub> - 10 <sub>mm</sub>	5000	4225	775	15.5	
10% FINES						
	B.S.SIEVE	TOTAL	RETAINED	PASSING	VALUE (%)	
1	10mm-8mm	2724	2430	294	10.8	11.4%
2	10mm-8mm	2750	2425	325	11.9	

Table 2: Summary of Shape and Strength Test Sample  
Source: Ghana Highways Authority Materials Division, Ho, V/R

The quality manager liaised directly with the client, Ghana Government, to make sure that they were satisfied with the work on site. In instances where there were queries on site, the quality manager discussed them with the client for the best thing to be done in the interest of the project. The quality manager also interacted with the designers to ensure that the design was ready on time and done properly. Any correspondence from the site to the design team went via the quality manager, using the system that was set up for this purpose. The coordination of testing on site is done by the quality manager to ensure that the structures meet the specifications and requirements from the client. Table 3 below shows concrete works test results, which revealed that the test samples met the quality requirements of the project.

Cube No	Date Manufd	Density gm/cm <sup>3</sup>	Cube weight (g)	Date Crushed	Age days	Load KN	Strength N/mm <sup>2</sup>	Av. Strength N/mm <sup>2</sup>	Coarse Agg. Size(mm)	Coarse Agg. Source	Location	
1	17/12/12	2.434	8215	24/12/12	7	370	16.5	16.7	20	Quarry	CH. 5 + 371 - 5 + 471 (RHS)	
2	"	2.413	8143	"	7	380	17.0		"	"	"	
3	"	2.431	8206	"	7	370	16.5		"	"	"	
4	"	2.462	8310	14/01/13	28	600	26.8		26.6	"	"	"
5	"	2.459	8300	"	28	585	26.2			"	"	"
6	"	2.467	8325	"	28	600	26.8			"	"	"
7	18/12/12	2.410	8134	25/12/12	7	385	17.2	16.5	20	Quarry	CH. 5 + 471 - 5 + 555 (RHS)	
8	"	2.418	8160	"	7	360	16.1		"	"	"	
9	"	2.433	8212	"	7	365	16.3		"	"	"	
10	"	2.455	8287	15/01/13	28	605	27.1	26.5	"	"	"	
11	"	2.473	8345	"	28	595	26.6		"	"	"	
12	"	2.447	8258	"	28	580	25.9		"	"	"	

Table 3: Quality Control of concrete works Test Sample  
Source: Ghana Highways Authority, Ho

#### 4.4. Conformity of Project with ISO 9000:2008 standards

To establish the compliance of the project with the ISO 9000:2008 standards during the execution, there was the need for a benchmark. This benchmark was used in comparing the main output of the product to the expected output specified. For the specified standard to be acceptable, the standard must be globally recognized and accepted. The International Organization for Standardization (ISO) is a network of the national standards institutes of about 160 countries, with a central secretariat in Geneva, Switzerland, that coordinates the system. ISO 9000:2008 family is one of the ISO's best-known standards (International Organization of Standardization, 2009). It is an international reference for quality management requirements which also provides a manual for companies to fulfill the customer's quality requirements, meet applicable regulatory requirements, while aiming to enhance customer satisfaction, and achieve continual improvement of its performance in pursuit of these objectives. There are eight quality management principles on which the ISO 9000:2000 and ISO 9000:2008 series are based. These principles are summarized and discussed with the project standards below; The beneficial relationship enables the players involved to have reasonable concern for the project objectives and work hand-in-hand to realize them. These principles are reasonable in the actualization of project quality.

These principles are discussed below as;

##### 4.4.1. Customer Focus:

From the project it was revealed that the company that undertook the road construction project understood the current and future needs of the beneficiary communities and made all the necessary quality inputs in to the project in order to meet their satisfaction and expectations.

##### 4.4.2. Leadership:

The management and leadership that executed the project according to the employees of the company rallied behind all workers involved in the project and put in measures to establish a clear direction and unity of purpose for the company. This attribute led to the

creation of a congenial working environment, which in turn provided a strong cohesion amongst the various working teams and hence resulted in the delivery of a quality project to the satisfaction of the beneficiary communities.

#### 4.4.3. Involvement of People:

The project saw the involvement of all key players at all levels during the execution stage. This enabled the project to fully utilize the individual abilities of each participant on the project and introduced a lot of dynamism where every participant played their roles as assigned based on their expertise and competence. This resulted in quality execution of the project at each level or stage.

#### 4.4.4. Process Approach:

The project achieved the desired quality as a result of managing all activities and all related resources as a process. The company had a process approach to the execution of the project and this approach was well adhered to and audited at each stage of execution of the project. The company developed good relationships throughout the supply chain of the entire project. These relationships gave enough room for continual improvement in performance by adhering to advice from both internal and external quality assurance officers thereby making it easier to achieve the quality specifications of the project to the satisfaction of beneficiary communities.

#### 4.4.5. System Approach to Management:

The project execution team was able to identify, understand and manage all the interrelated processes involved in the execution of the project and this contributed greatly to the company's effectiveness and efficiency in achieving and meeting the quality targets of the project.

#### 4.4.6. Continual Improvement:

The company continually improved its performance on the project by paying critical attention to details in order to improve its overall performance to deliver a final product, which will meet the quality specifications and general acceptability of the beneficiary communities.

#### 4.4.7. Factual Approach to Decision Making:

During the execution of the project, the company made effective decisions that were based on the analysis of data and information gathered from the relevant aspects of the project. These decisions ensured that the right things were done at each time to ensure the quality of the final project.

#### 4.4.8. Mutually Beneficial Supplier Relationships:

The company and its suppliers were interdependent and had a mutually beneficial relationship which enhanced the ability of both parties to create value. The value created as a result of the cohesive interdependent relationship between the parties played a major role in delivering on the quality of the project to meet the specific needs of the project beneficiaries.

## **5. Conclusion and Recommendations**

### *5.1. Conclusion*

Quality control is the set of activities or techniques whose purpose is to ensure that all quality requirements are met. This study reveals that in order to ensure and achieve quality control of the various aspects that fall under the quality assessment of the project, performance was monitored and problems solved as and when the need arise. The quality control in this study was concerned with actual measurement and supervision of the final project by inspection of each unit or by sample testing. The entire test results as contained in the tables under the discussion section of this study revealed that each sample met the required quality standards. The study revealed that the project has been beneficial to the community and the country at large. The project opened up the various beneficiary communities and enhanced access to the Wli water falls, which is the highest water falls in West Africa hence increasing the potential for increment in Government revenue. The study finally revealed that the project was in conformity with the ISO 9000:2008 quality standards.

### *5.2. Recommendations*

The Ghanaian construction industry must ensure that all projects should be designed and built by the same contractor to prevent the conflict of non-conformity of design to site and its accompanying challenges, which impedes the smooth and successful execution of the project. Secondly, workers in the construction industry must be further educated on the need for quality delivery in the industry and their role as workers to aid in the successful implementation of quality standards in the industry.

Also, there must be extensive education on the need to ensure quality at all times and players in the construction industry should endeavor to abide by the ethical principles for the progress of the industry. Corrupt quality control officers must be given stringent punishment to deter them from such unprofessional behaviors. Finally, the award of contracts for construction must be done in full for all projects so that the project can be executed in time and within budget to meet the needs of the beneficiaries.

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