

## Evaluation of Health and Safety performance in Brunei Construction Industry

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### Abstract

An evaluation of Health and Safety (H&S) performance in the Brunei Darussalam construction industry (BDCI) is not only important; but integrating the concept based on Total Quality Management (TQM) would greatly enhance and improve the industry practices. H&S of any workforce in any part of the world is an important issue deserving the attention of engineers and safety officers in the construction industry. The need for good quality management in any good construction site is crucial for the overall success of achieving H&S. The present trend where the rates and frequency of accidents arising from poor implementation or non-compliance on H&S code based on TQM principles in the industry is relatively higher. The research paper seeks to evaluate the significance and existence of H&S performance in the BDCI with regards to TQM. Questionnaires form an important method of data collection in this research paper. From the survey conducted, it can be seen that the implementation of H&S and TQM develop and reinforce a positive impact and environmental values in the organization. In the current performance of BDCI, there is still need for continuous development in terms of enhancing H&S based on TQM.

**Keywords:** Health and Safety, Total Quality Management, Accidents, Construction Industry

### Introduction

An evaluation of Health and Safety (H&S) performance in the Brunei Darussalam construction industry (BDCI) is not only important; but integrating the concept based on Total Quality Management (TQM) would greatly enhance and improve the industry practices. H&S of any workforce in any part of the world is an important issue deserving the attention of engineers and safety officers in the construction industry. H&S is an integral part of any good quality management in the construction industry. However, accident rate and frequency are not only rampant, but contribute largely to cost of construction as well as H&S of the worker involved. Considerable efforts were made by various experts to ascertain the causes of such accidents which arise as a result of poor H&S practice in Brunei Construction Industry which affects the TQM in Construction Industry in Brunei. Some construction companies do not comply with the safety measures as set by the national legislation and do not realize how important it is to comply and abide the H&S measures stated by the management and even the reputation of the company.

TQM is the integrated concept to continually improve the delivery of quality of goods and services through the participation of all levels and functions of the organization. Implementing H&S practices are one of the ways to improve the Quality Management. The success of H&S implementation with regards to Quality Management depends on the compliance of the lower level in an organization and the commitment of the top management to continuously motivate everybody in an organization. The need for good quality management in any good construction site is crucial for the overall success of achieving H&S. The present trend where the rates and frequency of accidents arising from poor implementation or non-compliance on H&S code based on TQM principles in the industry is relatively higher.

In Brunei Darussalam, there is still currently no proper statistical data being disclosed by the Ministry of Development of Brunei as the ministry is rapidly updating the backdated data on H&S in Construction Industry. Though Brunei still does not have its own independent H&S body to monitor industrial activities, specifically related to construction, there are H&S as well as quality assurance and quality control departments in most company to monitor their compliance to the H&S compliance based on Quality Management System. But in the

upcoming legislation, there will be an independent H&S body will be established and this will further improve the Quality Management status of Brunei Darussalam's construction industry. This is mainly because H&S management is vital to Quality Management success. Apart from other countries, H&S as well as Quality Management System have become increasingly popular in Brunei Darussalam's industry in general. This is due to Brunei Darussalam's industry nowadays are now focus on improving the quality, services, internal operation and also H&S especially in construction to increase competitiveness and value in construction industry, to have a better business opportunities in the near future.

### 1.1 Health and Safety

Hughes, P. and Ferrett, E. (2010, p.3) in defining H&S states that health is the protection of the bodies and minds of people from illness resulting from the materials, processes or procedures used in the workplace and Safety is the protection of people from physical injury. The borderline between H&S is ill-defined and the two words are normally used together to indicate concern for the physical and mental well-being of the individual at the place of work.

The need for good Quality Management in any good construction is crucial because without good quality management, it will contribute higher cost to the employer, labor and the larger society. The rate and frequency of accidents arising from poor implementation or the non compliance on H&S in Construction Industry is overwhelmingly high due to the large direct relation of H&S to accidents. With regards to this, regulating authorities need to double their efforts to curtail the effects of hazards.

H&S measures taken in every industry could prevent any accident that can cause moral or economic and legal losses that can be adverse for any industry or business opportunity. Poor H&S performance results in additional costs to both public and private sectors of the economy of a country. Accidents due to non compliance of occupational H&S will cause both direct and indirect costs and incur an insured and an uninsured cost and in the end this would end up with legal actions by the national civil or criminal court. This will create a bad image for the company and there will be a significant decrease of customer loyalty and also in its business opportunity.

In construction industry, it is very important to monitor the level of H&S compliance of the industry. According to Agilarajan A/L Selvarajah in his thesis, Chi, C.F., Chang, T.C., & Ting, H.I. (2004) states that construction industry has been identified as one of the most hazardous industries in many part of the world. This is because construction industry is a wide industry and covers a wide area of work in many different approaches and also that most of the construction jobs are linked to very high risk and dangerous activities.

Good H&S practices can be maintained by using the 'plan, do, act review' principles. This system is widely used in environmental management and this system is a part of ISO 14001 Environmental Management System Standard and it is applicable to H&S Management Systems. These phases are intended to develop systematic management approach to the H&S concerns of the organization as shown in the figure 1. By implementing this system will lead to continual improvement in H&S management.



**Figure 1: Phases for Good Health and Safety Management Practice (Source : Martin, 1998)**

It is a requirement that requires top management of the company to clearly define a H&S policy that is appropriate to construction industry and provides a framework for setting and reviewing H&S objectives and targets.

It is a requirement that the company establishes and maintains procedures to identify H&S aspects and impacts that comply with legal and other requirements to meet the aims and objectives set. This planning and implementation shall be reviewed and audited periodically.

For a H&S Management System to be effective, individual roles and responsibilities must be clearly defined as they relate to the achievement of the H&S Objectives and Targets, and the overall operations of the Management System. Top management must supply necessary resources, both financial and staff to ensure that the H&S Management system is effectively implemented.

It is a requirement that the company identifies training needs and institutes a program to appropriately train employees on the H&S Policy, employee's individual roles and responsibilities and the potential consequences of departure from specified operating procedures. Personnel performing tasks that could cause significant H&S impacts must be competent on the basis of appropriate education, training and/or experience.

With regard to its H&S aspects and H&S Management System, the organization is required to establish and maintain procedures for internal communication between various levels and functions of the organization.

The organization is required to establish and maintain documentation of the core elements of its H&S management system and provides direction to related documentation. This is basically programs for achieving the organization's objectives and targets which includes:

- The designation of responsibilities at each relevant function / level of the organization's requirement, and
- The means and time frame by which they are to be achieved

The company is required to identify those operations and activities with significant H&S aspects in line with its policy, objectives and targets. Wherever relevant, operating procedures must be communicated to suppliers and contractors. It is required for the company to outline procedures to identify risks and respond to accident and emergency situations, and for preventing the H&S impacts that may be associated with them. These procedures are to be reviewed and revised periodically where practicable.

The company is required to establish documented procedures for monitoring and measuring key characteristics of its performance which impact the H&S practices. Records are to be kept to monitor its H&S objectives and targets. Any H&S monitoring methods must be reviewed periodically and maintained in accordance with the applicable procedures in compliance with H&S laws and regulations

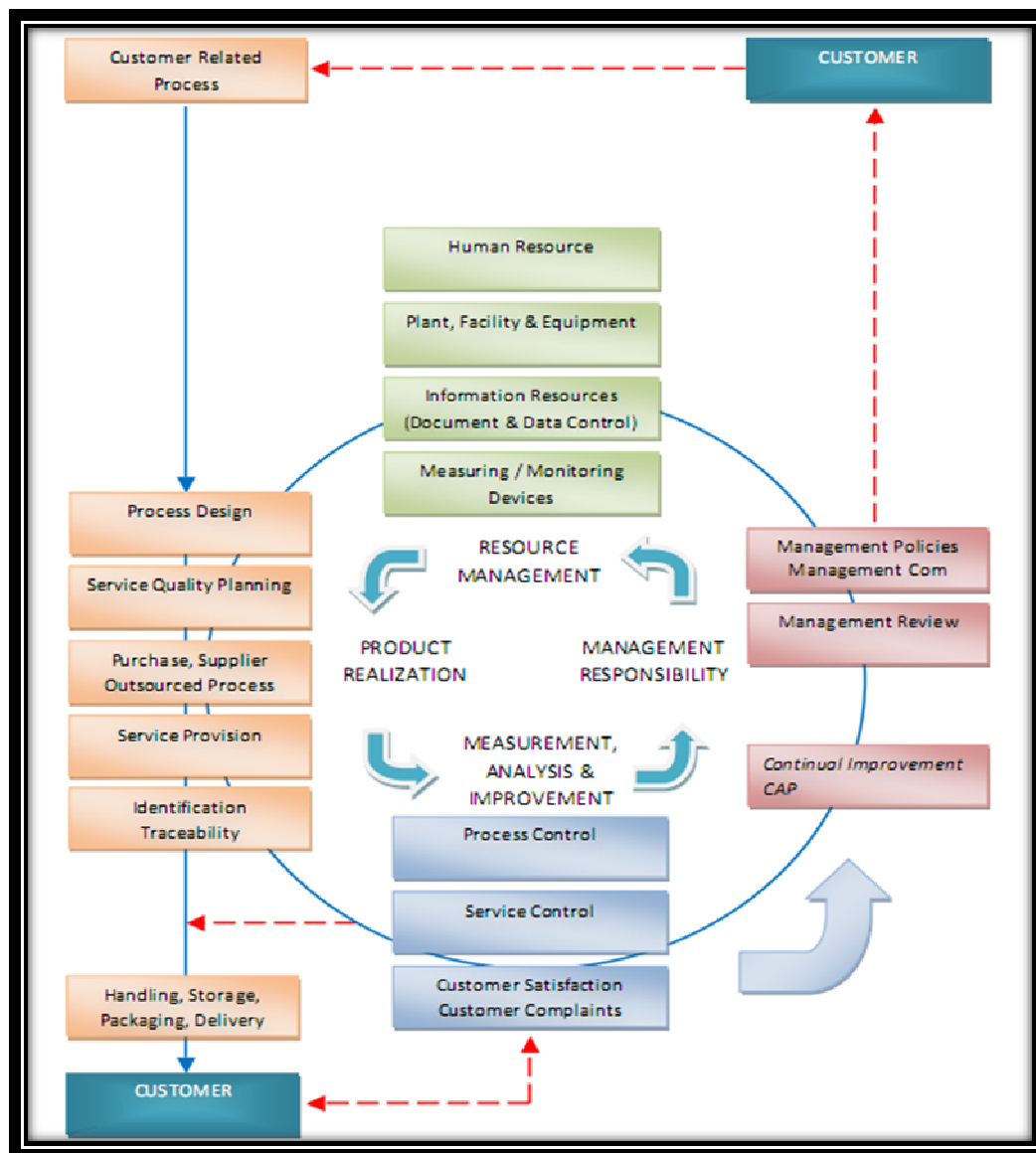
### **1.2 Total Quality Management**

According to Sahala Siallagan (2004), Besterfield (2001) states that TQM is an enhancement to the traditional way of doing any kind of business and is a proven technique to guarantee survival in world-class competition. TQM was first officially introduced in 1940's and has continued to change and improve through the years as stated by Salter, J.M. (1993) in his research. TQM is predominantly used in Japan and now is evolving and is almost a mandatory standard for most companies nowadays.

According to ISO 9000, Quality Management is a system of interrelated processes consisting of the following group of activities:

- Customer Related Processes
- Management Related Processes
- Resources Related Processes
- Service Provision Related Processes
- Outsources Processes
- Measurement, Analysis & Improvement Processes.

The sequences of their interaction are illustrated in the figure 2 below.



**Figure 2: Quality Management System Process Map (Source: RAY, 2012)**

The company needs to maintain documentation that is required by the International standards ISO 9001:2008 and those determined by others as necessary to ensure effective planning, operation and control of its processes. According to RAY (2012), to have a good documentation it shall be maintained in Four (4) levels. The document structure is illustrated in the figure 3 below.



**Figure 3: Documentation System (Source: RAY, 2012)**

The company shall provide a framework for establishing specific quality objectives, and reviewing the quality objectives for continual improvement. The company management must ensure that the Quality policy is known and understood by all of its employees, and is appropriately communicated throughout the company by prominently displaying the Quality Policy, through Quality Management System Indocination programs, Quality Management System Induction for incumbents and distribution to interested parties. The company management shall annually review the Quality Policy for continuing appropriateness and suitability to the purpose.

The company is responsible for and to ensure that Quality Objectives are consistent with the Quality Policy and are established at relevant functions and levels within the organization to meet the requirements for processes, services and improving the Quality Management System. Quality Objectives are must be specific to the function, measurable against a set target, achievable and realistic and monitored and measured.

The company management shall determine and manage work environment needed to achieve conformity to product requirements, which includes ensuring that the facility is maintained in a good state of repair, organization, and cleanliness consistent with the product and manufacturing requirements.

The company shall establish process to plan and implement monitoring, measurement, analysis and improvement processes in order to demonstrate conformity to product requirements, ensure conformity of the Quality Management System and continually improve the effectiveness of the Quality Management System

The company shall establish methods to obtain, monitor, and analyze information relating to customer perception as to whether the company has met customer requirement; sources of this information include customer satisfaction surveys, customer data on delivered service, lost business analysis, customer appreciation and awards and also customer complaints. The company shall handle customer complaints with highest priority and documents and investigates each customer complaint and records the process.

The company will determine, collect and analyze appropriate data to demonstrate suitability and effectiveness of Quality Management System, and to evaluate areas where continual improvement of the effectiveness of Quality Management System can be made. Data generated as a result of monitoring and measuring activities and from other relevant sources are taken for analysis.

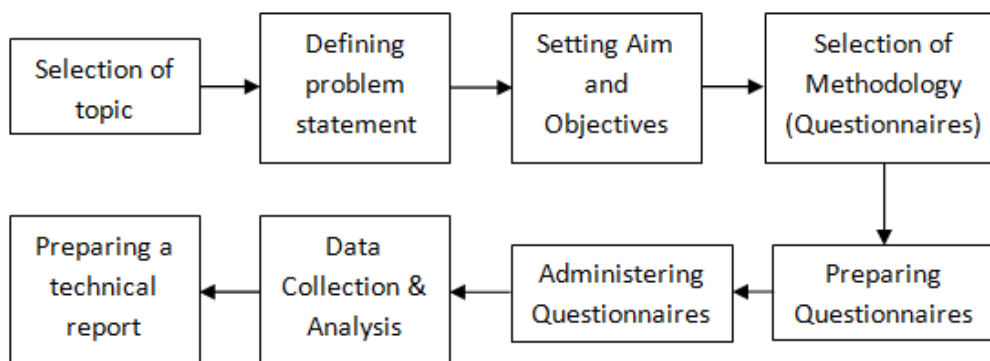
The company shall take conscious steps to continually improve the Quality Management System through the use of Quality Policy, Quality Objectives, Audit Results, analysis of data, corrective and prevention actions and management review of Quality management Systems.

### **Methodology**

In the BDCI, there has always been a growing need to be continuously improving its Quality Management performance and this will include the H&S performance. Since Brunei Darussalam has no external independent

H&S body, there is a need for the legislative council to accelerate the establishment of it. In terms of H&S implementation based on Quality Management System, there are two main issues that need to be addressed. The first one is the mechanical system improvement. The mechanical perspective focuses on observable, measurable elements that can be changed or improve, such as managerial strategy, processes, systems, organizational structures and job roles. The other dimension of the change is psychological that focuses on the reactions of humans to the changes in their working environment.

The research paper seeks to evaluate the significance and existence of H&S performance in the BDCI with regards to TQM. Questionnaires form an important method of data collection in this research paper. The H&S performance will be analyzed by gathering survey questionnaire. Figure 4 below is the flow chart representing the process involved in the making of the research.



**Figure 4: Flow chart representing the process involved in the making of research paper**

### 2.1 Method Chosen for the Study

In this study, 100 questionnaires distributed to the construction companies in every district of Brunei Darussalam. The survey is intended to cover the different levels in the construction company, from labors to managerial positions. Overall 55 questionnaires were responded by the respondents in this survey and is analysed using SPSS.

As a part of the study, the questionnaire was devised and distributed to the targeted levels in BDCI. The respondents were asked to indicate how strongly they agreed or disagreed with the statements or questions posed. Responses were based on a five-point Likert scale from 1 (disagree) to 5(agree). Demographic questions included age, gender, duration in current department (facilities), academic qualification, salary group and job.

The questionnaire is intended to assess the current H&S performance in related to TQM principles by all of the respondents. The measured variables are broadly categorized as shown in Table 1 below.

**Table 1 - Survey Variables and Respective Questions**

Category	Question Number
Communication	7, 8(e), 16(f), 17, 18
Social and Economic responsibilities	5(a), 5(b), 5(c), 16(e)
Organizational change and improvement	6(c), 6(d), 6(e), 10, 16(c), 16(d), 16(g)
Employee commitment and attitude	8(h), 11
Leadership	9(a), 9(b), 9(c), 9(d), 9(e)
Organizational responsiveness to Quality, Health and Safety	8(a), 8(b), 8(c), 8(d), 8(g), 8(k), 16(b)
Quality, Health and Safety Improvement related	6(a), 6(b), 8(f), 8(i), 8(j), 12, 13, 14, 15, 16(a)

## 2.2 Reliability of feedback

The reliability of the feedback was assessed by using statistical software called SPSS. When checked for internal consistency, the reliability of the Quality, Health and Safety survey Scale was high ( $\alpha = 0.89$ , see Table 2 below).

**Table 2 - Mean, standard deviation and Cronbach's alpha scores for Quality, Health and Safety questionnaires scale**

	M	SD	$\alpha$
<b>Quality, Health and Safety</b>	89.96	16.31	0.89

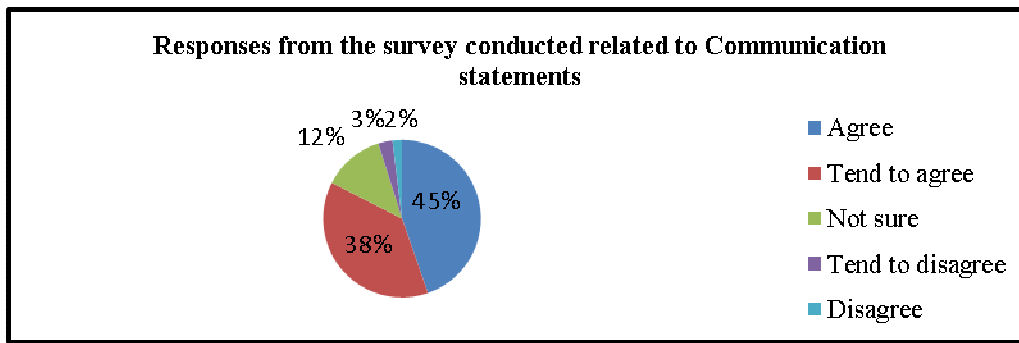
Cronbach's alpha reliability coefficient normally ranges between 0 and 1. However, there is actually no lower limit to the coefficient. The closer Cronbach's alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale. Based upon the formula  $\alpha = \frac{rk}{[1 + (k - 1)r]}$  where  $k$  is the number of items considered and  $r$  is the mean of the inter-item correlations the size of alpha is determined by both the number of items in the scale and the mean inter-item correlations. George and Mallery (2003) provide the following rules of thumb: " $\alpha > .9$  – Excellent,  $\alpha > .8$  – Good,  $\alpha > .7$  – Acceptable,  $\alpha > .6$  – Questionable,  $\alpha > .5$  – Poor, and  $\alpha < .5$  – Unacceptable" (p. 231). While increasing the value of alpha is partially dependent upon the number of items in the scale, it should be noted that this has diminishing returns. It should also be noted that an alpha of .8 is probably a reasonable goal. It should also be noted that while a high value for Cronbach's alpha indicates good internal consistency of the items in the scale, it does not mean that the scale is unidimensional.

## Findings and Discussion

### 3.1 Communication

**Table 3 - Responses from the survey conducted related to Communication statements**

	7	8(e)	16(f)	17	18
■ Agree	45%	47%	47%	38%	51%
■ Tend to agree	42%	45%	40%	36%	29%
■ Not sure	9%	4%	13%	20%	15%
■ Tend to disagree	4%	2%	0%	5%	2%
■ Disagree	0%	2%	0%	1%	3%



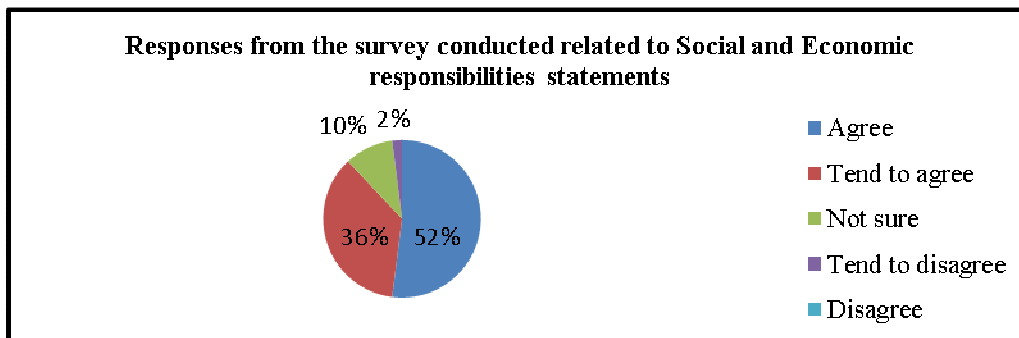
**Figure 5 - General responses from the survey conducted related to Communication**

Figure 5 above shows the responses on the statement above regarding communication. According to the analysed results, an average 45% of the total respondents agree, 38% tend to agree, 12% are not sure, 3% tend to disagree and 2% disagree to the communication statements.

### 3.2 Social and Economic responsibilities

**Table 4 - Responses from the survey conducted related to Social and Economic Responsibilities statements**

	5(a)	5(b)	5(c)	16(e)
Agree	56%	53%	45%	51%
Tend to agree	36%	38%	36%	36%
Not sure	5%	9%	16%	11%
Tend to disagree	3%	0%	0%	2%
Disagree	0%	0%	3%	0%



**Figure 6 - General responses from the survey conducted related to Social and Economic Responsibilities statements**

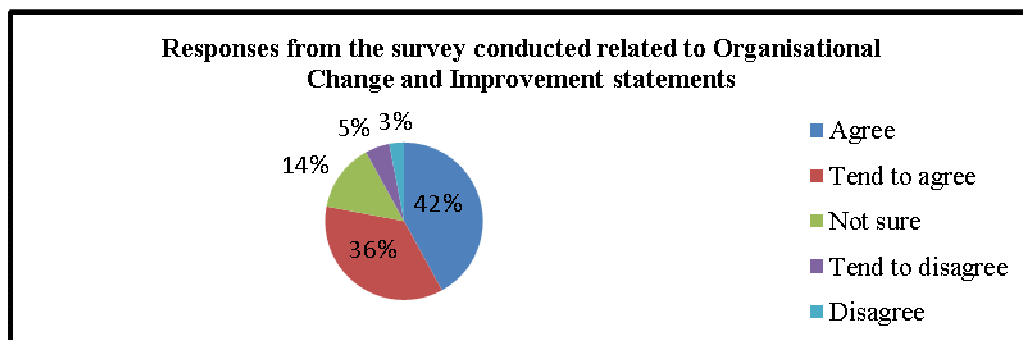
Figure 6 above shows the responses on the statement above regarding social and economic responsibilities. According to the analysed results, an average 52% of the total respondents agree, 36% tend to agree, 10% are not sure and 2% tend to disagree to the social and economic responsibilities statements.

### 3.3 Organisational Change and Improvement



**Table 5 - Responses from the survey conducted related to Organisational Change and Improvement statements**

	6(c)	6(d)	6(e)	10	16(c)	16(d)	16(g)
■ Agree	42%	47%	44%	36%	50%	42%	27%
■ Tend to agree	33%	36%	40%	45%	34%	40%	56%
■ Not sure	24%	15%	9%	13%	9%	15%	15%
■ Tend to disagree	1%	2%	2%	6%	2%	3%	0%
■ Disagree	0%	0%	5%	0%	5%	0%	2%



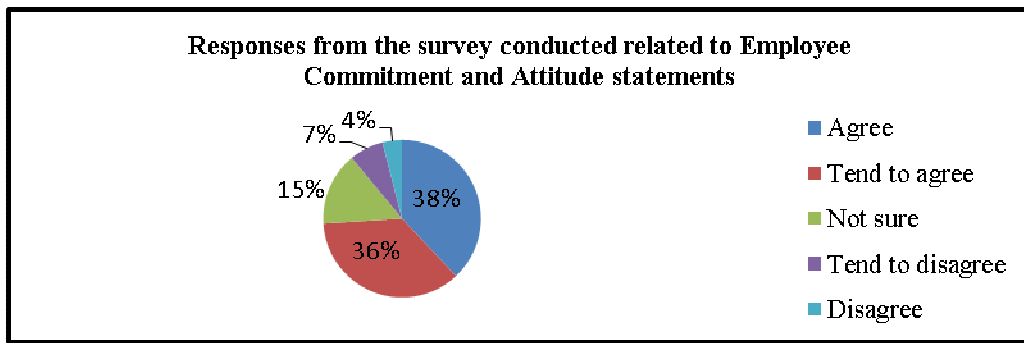
**Figure 7 - General responses from the survey conducted related to Organisational Change and Improvement statements**

Figure 7 above shows the responses on the statement above regarding organizational change and improvement. According to the analysed results, an average 42% of the total respondents agree, 36% tend to agree, 14% are not sure, 5% tend to disagree and 3% disagree to the organizational change and improvement statements.

### 3.4 Employee commitment and attitude

**Table 6 - Responses from the survey conducted related to Employee Commitment and Attitude statements**

	8(h)	11
■ Agree	62%	33%
■ Tend to agree	31%	42%
■ Not sure	5%	16%
■ Tend to disagree	2%	7%
■ Disagree	0%	2%



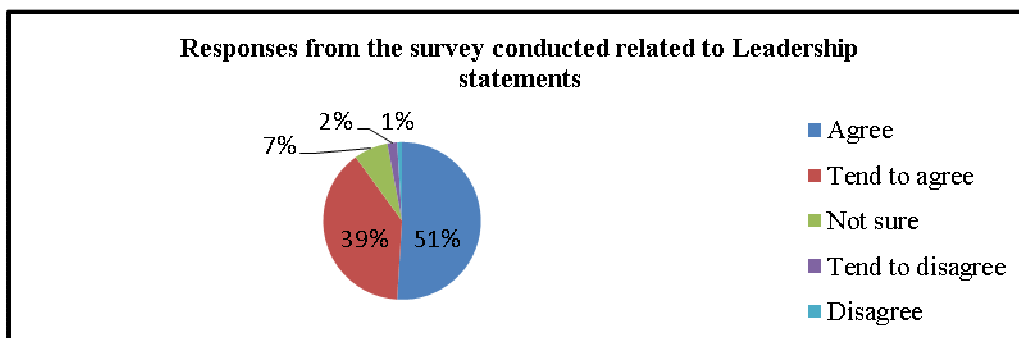
**Figure 8 - General responses from the survey conducted related to Employee Commitment and Attitude statements**

Figure 8 above shows the responses on the statement above regarding employee commitment and attitude. According to the analysed results, an average 38% of the total respondents agree, 36% tend to agree, 15% are not sure, 7% tend to disagree and 4% disagree to the employee commitment and attitude statements.

### 3.5 Leadership

**Table 7 - Responses from the survey conducted related to Leadership statements**

	9(a)	9(b)	9(c)	9(d)	9(e)
Agree	56%	49%	53%	44%	51%
Tend to agree	38%	44%	33%	42%	36%
Not sure	6%	4%	8%	10%	9%
Tend to disagree	0%	3%	4%	4%	4%
Disagree	0%	0%	2%	0%	0%



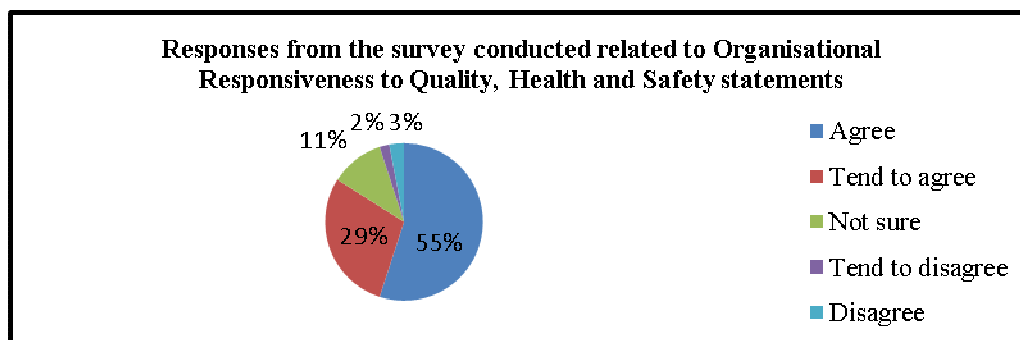
**Figure 9 - General responses from the survey conducted related to Leadership statements**

Figure 9 above shows the responses on the statement above regarding leadership. According to the analysed results, an average 51% of the total respondents agree, 39% tend to agree, 7% are not sure, 2% tend to disagree and 1% disagree to leadership statements.

### 3.6 Organizational responsiveness to Quality, Health and Safety

**Table 8 - Responses from the survey conducted related to Organisational responsiveness to Quality, Health and Safety statements**

	8(a)	8(b)	8(c)	8(d)	8(g)	8(k)	16(b)
■ Agree	60%	51%	45%	47%	64%	65%	58%
■ Tend to agree	22%	38%	38%	33%	24%	25%	29%
■ Not sure	15%	7%	15%	9%	11%	10%	11%
■ Tend to disagree	3%	2%	0%	6%	1%	0%	2%
■ Disagree	0%	2%	2%	5%	0%	0%	0%



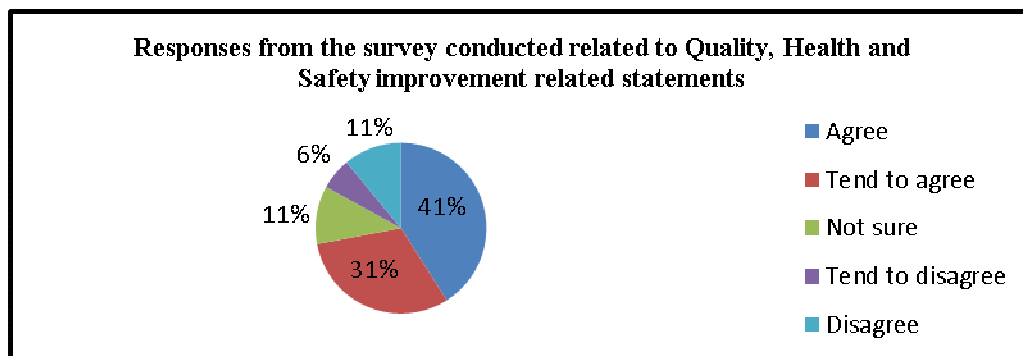
**Figure 10 - General responses from the survey conducted related to Organisational responsiveness to Quality, Health and Safety statements**

Figure 10 above shows the responses on the statement above regarding organizational responsiveness to quality, health and safety. According to the analysed results, an average 55% of the total respondents agree, 29% tend to agree, 11% are not sure, 2% tend to disagree and 3% disagree to organizational responsiveness to quality, H&S statements.

### 3.7 Quality, Health and Safety Improvement related

**Table 9 - Responses from the survey conducted related to Quality, Health and Safety Improvement related statements**

	6(a)	6(b)	8(f)	8(i)	8(j)	12	13	14	15	16(a)
■ Agree	45%	49%	69%	22%	29%	9%	5%	65%	49%	65%
■ Tend to agree	42%	44%	24%	24%	22%	45%	20%	27%	38%	29%
■ Not sure	7%	4%	7%	9%	18%	20%	33%	8%	9%	4%
■ Tend to disagree	4%	3%	0%	12%	13%	18%	16%	0%	2%	2%
■ Disagree	2%	0%	0%	33%	18%	8%	26%	0%	2%	0%



**Figure 11 - General responses from the survey conducted related to Quality, Health and Safety Improvement related statements**

Figure 11 above shows the responses on the statement above regarding quality, health and safety improvement related. According to the analysed results, an average 41% of the total respondents agree, 31% tend to agree, 11% are not sure, 6% tend to disagree and 11% disagree to quality, health and safety improvement related statements.

### Conclusion

From the survey conducted, it can be seen that the implementation of H&S and TQM develop and reinforce a positive impact and environmental values in the organization. In the current performance of BDCI, there is still need for continuous development in terms of enhancing H&S based on TQM. Implementation of TQM and H&S management is an important ingredient for effective and efficient flow of construction activities. Based on the research conducted, it was found that the prevailing performance in BDCI as regards to communication between all level of staff is positive though there is still minor outstanding issues with regards to communication need to be address. Effective communication is not only important for overall success in BDCI; but an essential ingredient for its survival. Significant percentage of respondents indicates that they have a better idea of what to expect from them with the implementation of TQM principles. Another important element detected in BDCI is the lack of adequate motivation packages which may not necessarily be monetary; but despite this shortcoming, there is improvement in motivation which indicates that most respondents are having a sense of belonging in the industry. This is evident from the survey conducted which shows that many respondents view their company as a part of them and understood the implication of adhering to TQM and H&S condition.

Consequently, based on the research; there is need for continuous improvement in the industry if only companies would provide enabling opportunities for staff to grow which is important element of motivation. Another evidence found from the research is that some respondents have opportunities for self-development which serves as a catalyst for commitment from employee. Another important element deduced from the research conducted is the issue of good leadership. Majority of the respondents agreed that their team leaders are considerate and accommodating while some are uncomfortable with the behavior of their team leaders; their bone of contention is the lack of acknowledgment of their contribution to the overall sectors of the company in terms of quality and H&S. They needed to be trained from time to time to improve their skills and sometimes when they needed the attention of their supervisor, they were unavailable to attend to them. Organization need to control their documents in terms of creation, modification, storage, availability and destruction. All appropriate documents such as procedure, work instructions and forms must be eligible, dated, readily identifiable and maintained in an orderly manner.

Based on the research conducted, the following were identified as an essential element for the success of H&S performance in BDCI based on TQM.

- 1) Improved employee commitment
- 2) Need for more structured approach to staff development
- 3) Increased job satisfaction

Author's opinion based on the research conducted is that there is need for continuous development of staff skills, improved communication between all levels in the industry and as well as need to realize the importance of TQM in terms of H&S in BDCI.

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