Journal of Construction Engineering, Technology and Management
Volume 2, Issue 3, December 2012, Pages 13-21

The Development of the Quality Assurance Approach in the Building Construction Industry; the Malaysian Context

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ABSTRACT

This paper reviews the quality assurance approach which may have a huge potential impact in Malaysia's construction industry. Rather than the price of the product alone, it has been stated by many previous researchers that a better product quality will serve as an advantage in sustaining the competition that emerges in the construction market. Recently, quality has been identified as one of the basic requirements that the clients tend to look for. Buyers are becoming more educated and their expectation on high-quality products is increasing. The preference for product quality as one of the clients' aspect of concern in completed buildings can be classified as one of the biggest investments of assets in their entire lives, for most clients. This phenomenon results in the Malaysian government introducing a quality system model – the quality assessment system in construction (QLASSIC) to promote the approach towards better quality delivery in the construction industry.

Keywords: *Quality assurance approach, construction industry, workmanship, QLASSIC, objectives*

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1. INTRODUCTION

Quality has been given due attention by many parties since early 1970s. In 1979, the United Kingdom issued BS 5750 for the quality system and the concept of QA has been adopted by the construction industry since then. Meanwhile, the construction industry has been introduced with the ISO 9000 quality system standards. In 1987, the adoption of ISO 9000 standards started and since late 1980s, the ISO 9000 standard has been adopted by, and certified to, many construction companies in the United Kingdom and other European countries [1].

In recent years, there is an increase in the expectation towards the quality of construction work in the construction industry; this phenomenon also happens to be occurring in Malaysia. Rigorous demands towards more quality building voiced by the end users trigger the attention towards quality assurance in the construction work process.

Meanwhile, the construction is mainly a labor-intensive industry, where the lack of skilled workers can result in poor workmanship in many construction projects. It is important to sustain the construction industry in a healthy condition because the contribution towards the gross domestic product (GDP) is undeniably large.

To ascertain and measure the quality of construction and workmanship performance, the Construction Industry Development Board (CIDB) of Malaysia introduced quality improvement strategies – the quality assessment system in construction (QLASSIC) in 2001 to measure the quality of workmanship of a completed building project.

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2. WORKMANSHIP IN CONSTRUCTION INDUSTRY

Factors for the defects of buildings are seen in the designs of offices, poor workmanship and wrong choice of materials respectively, with 50%, 40% and 10% from research studies carried out by the Building Research Establishment [2]. This research study shows that poor workmanship is one of the major factors that contribute towards the defect of a building.

Human error is another common aspect that causes the poor quality and defect of building product according to construction literatures. However, technologies are not the predominant factor when it comes to any type of failure. Instead, the managerial factor is one of the most contributing factors to this issue [3–9].

Table I shows the model for error, which leads to poor workmanship in construction according to [10]. There are three models of error which include primary model, managerial model and global model, further giving us the idea that there are many factors which cause poor workmanship in the construction industry.

2.1. Customer Satisfaction

One of the most requisite elements for sustainability and customer satisfaction is "quality." Contractor's quality performance is considered as vital for clients' satisfaction in construction projects [11].

Table I: *Model of Errors which Lead to Poor Workmanship in Construction Projects.*

Level of the Model	Factor
Primary	Knowledge (education/training) Selection of knowledgeable personnel Self-inspection of tasks
Managerial	Checking work Dividing responsibilities Controlling change Controlling concurrent working Communications
Global	Organizational culture Economic pressure Time pressure Political pressure Societal pressure

Source: Ref. [10]

Clients' satisfaction is usually affected by the contractor's performance and it is considered as a significant contributor towards perceptions held by clients [12]. In the research study, researchers state that there are no comprehensive sets of comparable data on the performance contractors and previous project outcome, for the client to easily have an idea towards the contractor's performance. The industry has been driven by itself, the government and recently by greater consumer awareness and edification, for the interests on quality pursuance [13].

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Rather than viewing quality assurance internally on this industry, we need to look into customer's perspective, which requires an entirely new perspective which is regarded as viewing quality externally. Quality is whatever the customer says, whereby a product or service must meet a customer's expectation, no matter how the quality is extended [14].

This phenomenon urges the importance of executing quality assessment system in the construction industry, while the data related to contractor performance should not be treated as confidential and sensitive. In new housing projects, the contractor's performance score could be the guideline if the score is reviewed by the public [15]. At the same time, the key factor that determines the customers' perception of the products and services provided by the contractors is client satisfaction [16].

The quality assessment system is regarded the most significant quality assurance initiative, as they directly assess the quality of product delivered to ensure the quality achieved satisfies the customer. On doing so, the assessment would provide a fair manner of comparing the contractor's performance by measuring the performance output directly against the defined standards [1].

2.2. Quality Assessment System in Construction (QLASSIC); CIS 7:2006

The Malaysian Construction Industry Standard (CIS) – referred to as CIS 7:2006 QLASSIC – was developed by adopting several components with reference to the Construction Quality Assessment System 21 (CONQUAS), the BCA Construction Quality Assessment System (Sixth Edition 2005) from Singapore [17].

QLASSIC was introduced for implementation in the construction industry by CIDB Malaysia in the year 2001 to the construction players, to provide a standardized, quantifiable and systematical assessment system for grading the construction quality of a building [18].

Various aspects of the construction elements for general building works are established in a standard on the quality of workmanship. This quality assessment covers four main components which consist of structural works, architectural works, mechanical and electrical (M&E) works and finally external works. If the workmanship complies with the quality standards required in the assessment, marks will be awarded to the industry players.

The assessment not only includes site inspection, it also includes field tests which determine the functional performance of selected services and installations and also the quality of materials used.

Building occupant's safety, comfort and aesthetic values are the elements which would be given a guarantee in this assessment of quality; although defects may occur only after a while, in terms of deterioration [17].

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2.3. Objectives of QLASSIC; CIS 7:2006

The objectives of this assessment are as below:

- to benchmark the level of quality of the construction industry in Malaysia
- to have a standard quality assessment system for the quality workmanship of building projects
- to assess the quality of workmanship of a building project based on the approved standards
- to evaluate the performance of contractors based on the quality of workmanship
- to compile data for statistical analysis

2.4. QLASSIC; CIS 7:2006 Components

2.4.1. Structural Works

The entire structural system of the building is prevailingly of utmost importance, as the repair cost for the failing structure is usually significantly high. Meanwhile, the assessment of structural works comprises:

- Site inspection of formwork, steel reinforcement, prefabricated or pre-cast elements, etc. during construction
- Laboratory testing of compressive strength of concrete and tensile strength of steel reinforcement
- Non-destructive testing of the uniformity and the cover of hardened concrete

Table II shows the elements included for structural work assessment. Table III shows the weightage for the structural steelwork and pre-stressed concrete work:

***Table II**: Weightage for Reinforced Concrete Structure Element* [17].

Reinforced Concrete Structure Elements	Weightage Cast In -Situ (%)	Weightage Pre - Cast (%)
Formwork	20	0
Rebar	15	5
Finished Concrete	25	35
Concrete Quality	5	0
Steel Reinforcement Quality	5	0
Precast Specific Requirement	0	20
NDT-UPV Test for Concrete Uniformity	15	20
NDT- Electro-covermeter test for concrete cover	15	20
TOTAL	100	100
Note: If total pre-cast concrete volume exceed 20% of total structural concrete volume, assessment will be carried out for pre-cast concrete construction. The marks will be distributed proportionately between formwork/rebar assessment and pre-cast concrete assessment based on the respective concrete volume percentage.		

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Table III (A): *Weightage for Structural Steel Element* [17].

Structural steel work	Weightage (%)
Main member/Partially assemble components	40
Metal decking	20
Erection tolerance	10
Corrosion and Fire proteaction	10
Welding test report	20
Total	100
NOTE: Assessment for structural steel roof truss is compulsory irregardless of the 20% costing criteria.	

Table III (B): *Weightage for Pre-Stressed Concrete Element* [17].

Pre-stressed concrete work	Weightage (%)
Tendon and anchorage	25
Sheathing	25
Stressing and grouting	25
Debonding	25
Total	100

2.4.2. Architectural Works

Finishes are mainly dealt with in architectural works. Quality and standards of workmanship are most visible in architectural works component. This component consists of elements such as floors, internal walls, ceilings, doors and windows, fixtures and fittings, external walls, roofs, driveways, porches and aprons Table IV shows the weightage for architectural elements:

Table IV: *Weightage for Architectural Element* [17].

Architectural elements		Weightage (%)	
		Total	Breakdown
Internal Finishes		**56**	
	Floor		16
	Internal wall		16
	Ceiling		6
	Door		6
	Window		6
	Fixtures (Internal)		6
Roof		**10**	
External wall		**10**	
Apron and perimeter drain		**4**	
Material and Functional tests		**20**	
	Skim coat or pre-packed plaster		3
	Field window water tighness test (WTT)		6
	Wet area water-tighness test		6
	Pull-off-test for internal wall tiles		5
Total		**100**	
Note: A weightage of 3% is automatically awarded to projects where skim coat or pre-packed plaster is uesd. This is to encourge the use of these products in the industry.			

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2.4.3. Mechanical and Electrical (M & E) Works

The quality of M & E works is vital and it could impact the performance of a building if any breakdown occurs. The assessment covers electrical works, air-conditioning and mechanical ventilation works (ACMV), fire protection works, sanitary and plumbing works, lifts, escalator and other basic M & E fittings.

Table V shows the weightage for M & E element according to the building category:

Table V: *Weightage for M & E Element according to Building Category* [17].

M & E elements	Category A (Landed Housing)	Category B (Stratified Housing)	Category C (Public Building)	Category D (Special Public Building)
M & E Works Assessment (%)				
Electrical Works	10	15	20	20
ACMV Works	10	10	25	20
Fire Proteaction Works	-	10	10	10
Plumbing & Sasnitary Works	20	20	20	25
Basic M & E Fitting	60	45	25	25
Sub - total	100	100	100	100
Wightage	50	50	30	30
M & E Works Performance Test Assessment (%)				
Performance Testing	100	100	100	100
Weightage	50	50	70	70
Total	**100**	**100**	**100**	**100**
Note:				
"-" Means that no assessment on that M&E element is required				
Performance testing will be done for electric power supply, water supply and sanitary flushing system				

2.4.4. External Works

External works consist of general external work elements in building construction such as the link ways/shelters, drains, road works, car parks, footpaths, turfs, playgrounds, gates and fences, swimming pools, hardscapes and electrical substations.

The facilities of external works vary with types of building according to the design. The assessment will be carried out after the building work is complete.

2.5. Total QLASSIC Score for a Building

The total quality score of a building project is the sum of marks awarded to the four components in each category of a building. Table VI shows the allocation of weightage for components of building construction work according to the building category.

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Table VI: *Allocation of Weightage for Components of Building Construction Work according to Building Category*. [17]

Components	Category A (Landed housing)	Category B (Stratified housing)	Category C (Public building)	Category D (Special public building)
Structural works	25%	30%	30%	30%
Architectural works	60%	50%	45%	35%
M & E works	5%	10%	15%	25%
External works	10%	10%	10%	10%
Total score	**100%**	**100%**	**100%**	**100%**

Each category of a building comprises as follows:

i. Category A (Landed Housing) – Detached, semi-detached, terrace and cluster house
ii. Category B (Stratified Housing) – Flats, apartments, condominiums, service apartments and town houses
iii. Category C (Public Building) – Office buildings, schools and other related facilities/buildings intended for public use
iv. Category D (Special Public Building) – Hospitals and airports only

The total QLASSIC score calculations are done, according to three formulas below. Firstly, the elements' score of each component should be determined according to formula (i). Then, each of the component score is determined by summing all the elements' scores of the component times the weightage of the component, according to formula (ii). Finally, the total QLASSIC score is determined by totaling all the four components' scores according to formula (iii), with the condition whereby if a component is not covered in the assessment, the weightage of that component will be pro-rated.

i. Element score (%) = (Number of compliance ÷ Number of checks) × weightage of element
ii. Component score (%) = Total score of elements × weightage of the component
iii. Total QLASSIC score (%) = Total score for all components

3. MALAYSIA'S WAY TO QUALITY

The strength of Malaysia's economy is majorly contributed by the construction sector, with the growth of this industry in 2010 at 9.8%; with the value of RM 74.13 billion in 2009 to RM 81.47 billion in 2010. In June 2011, the value of projects awarded was RM 24.26 billion and it was expected to exceed the total value of the year 2010 [19]. This is due to the fact that there will be several mega development projects which will be introduced and announced by the Malaysian government that will surely give a big impact to the growth of Malaysia's construction industry. One of these mega projects is namely the Mass Rapid Transit (MRT) project, incurring cost over RM 40 billion [20].

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For the means of surviving in this industry, the contractors should constantly upgrade themselves by providing good quality of work which is value for money. Contractors who have high QLASSIC score and ISO 9000 certificates will have more advantage in gaining tenders for upcoming projects if the government enforces the law on tendering opportunities for contractors who have achieved or fulfilled certain criteria. This will further result in creating trust among the clients, especially in the light of assuring quality building products.

The Malaysian CIDB has already developed a few quality concerning initiatives in the construction industry through its quality and productivity programs to raise Malaysia's construction quality standards to compete with those of the developed countries. In 2008, an average score of 60 on building construction projects had been assessed by the QLASSIC system [21]. At the end of phase 2 in year 2008, it was proposed that the median QLASSIC score was to be improved to 70 and eventually to 80 in 2015.

4. CONCLUSIONS AND RECOMMENDATIONS

The Malaysian CIDB has taken many initiatives to introduce and implement the quality culture in the Malaysian construction industry. There are seminars, events, courses and programs carried out by this local body to cultivate the quality culture towards the construction industry players. The simple assessment system of QLASSIC CIS 7:2006 can well measure the level of quality achieved by the contractors.

The QLASSIC assessment system contributes the much-needed motivation towards the key players in the industry especially contractors to provide a good-quality building in terms of the reduction of building defects due to poor workmanship; to ensure less rework and more sustainable industry. With proper training and introduction given by the players at the management level in the industry, the quality awareness and quality culture can also be adopted and applied by every other key player in our local construction industry.

Towards further improvement of the implementation of the QLASSIC system in Malaysia's construction industry, CIDB can learn from, and adopt the incentive schemes, premium scheme and preferential tendering eligibility system from Singapore's CIDB and the Hong Kong Housing Authority (HKHA). It should be seen as a wise move, since these initiatives introduced by CIDB in Singapore and HKHA have proved to be effective towards ensuring quality in their respective construction industries [1].

ACKNOWLEDGEMENTS

The researchers are thankful to Malaysia's Construction Industry Development Board,

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SHEQ Division, and Universiti Sains Malaysia, who made it possible to carry out this study.

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