Cost of Poor Quality in Construction Projects in Swaziland

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Abstract

Errors on construction sites occur frequently and can be costly for the contractors and owners of constructed facilities. In fact, 6-15% of construction cost is found to be wasted due to rework of defective components detected late during construction. Cost of poor quality (COPQ) in the construction industry is a serious problem that the industry is facing. Hence, the study analyzed the causes of poor quality in construction projects in the Swaziland construction industry. This research adopted quantitative research and 50 useable questionnaires were used as an instrument tool for the study. Random sampling method was used to select the respondents in various construction companies. Cost of poor quality impact the construction industry of Swaziland's and construction companies have to reserve funds for such occurrences, since poor quality cannot be tolerated and contractor have to rectify at own cost. Findings revealed that Ineffective monitoring and feedback by Project Members was the cause of poor quality on most construction site; lack of planning and coordination; Reluctance in timely decision by top management; Ineffective monitoring and feedback by the project team members; Poor human resource management and labour strike; Failure to identify problems and institute necessary design and programming changes; Government's way of procuring-choosing the lowest bidder; Inadequate project formulation in the beginning; Another challenge was underpricing the construction project and rectifying construction mistake it becomes a big problem for the contractor. The results of this study have shown that it is difficult to define quality in the construction industry. The cost of poor quality (COPQ) has a negative impact on the project and construction companies as productivity, additional work and repair, loss of the clients' confidence in contractor which may eventually put the contractors out of business are some of the main ripple effects of cost of poor quality.

Keywords
Construction, Cost of Poor Quality

1. Introduction

According to Abdel-Razek, (1998), it is important to identify the cost of poor quality so that one can determine the expenses associated with producing quality products. Cost of Poor Quality (COPQ) in the construction industry is a serious problem that the industry is faced with; due to failure in preventing defects and wastages during construction work (Waje & Patil n.d). The cost of poor quality remains hidden and usually appears within the lantet and patent defect period, the contractor is obliged to fixed and eats up to 40% revenues of the enterprise including construction companies; which then can run a company which was once or trying to be successful to failure (Mashwama & Musonda, 2014). The cost of poor quality on construction projects impacts the economy of any nation with the reinvestment of funds to rework the poor quality projects (Love et al, 1997b). Also, in case of government sponsored projects, the government has to invest in the same project again, thus leading to a waste of tax payer's money (Mashwama & Musonda, 2014). Success or failure of construction work significantly affects the construction industry, which contributes significantly to socio-economic development and employment in any country (Jha, 2006).

There are many success factors such as providing effective leadership, team development and deploying skilled workforce, cash flow, defining quality objectives, just to name a few and if addressed effectively that can reduce the COPQ from the construction projects (Mashwama et al, 2017). Losses can be reduced by handling the Success Factors effectively. In the realm of project management, the schedule, cost and quality achievement is also referred to as the iron triangle (Hassan et al., 2000). Out of these three aspects, it is the achievement of schedule and cost compliances

that the project management is attending to most of the time. This normally causes the achievement of quality to slack down at construction sites, in order to achieve the schedule and cost objectives.
Jha, (2006), Stated that the project quality is sometimes overlooked at and this can be seen as one of the many causes of poor quality in construction projects. According to Rumane (2011), the Cost of poor quality (COPQ) is the cost faced due to the production of poor quality products and services. The lack of quality in construction projects is caused by poor or non-sustainable workmanship, unsafe structures, delays, cost overruns and disputes in construction. Value and quality of construction is of concern to both public and private sector clients (Rumane, 2011). This study is focused on identifying the critical success factors for the Cost of Poor Quality (COPQ) from construction projects. A survey was conducted on companies of various categories, both working on private and public sector projects.

2. Construction industry

The construction industry is an important key player in the economy of every country (Mashwama et al, 2017). Despite a number of challenges facing the interest-rate sensitive sectors within the building and construction environment. Although, it is deemed that the industry is improving, the construction industry still faces challenges such as rise of construction cost to 7% (Dale, 2003). Therefore, the construction industry needs to grow above 7% to show some improvement, due to constant cost increases, the industry faces an uphill battles for growth and the cost of poor quality amongst other factors (Dale 2000 and Dale 2003). Swaziland has not escaped the problem of lack of quality focus in the construction industry (Mashwama, et al., 2017). The Swaziland construction industry is under pressure due to a combination of factors such as skills shortage, delays in payment, increased fee completion and variable quality (Mashwama and Musonda 2014).

3. Quality in construction industry

Errors in construction sites occur frequently and can be costly for the contractors and owners of constructed facilities. In fact, 6-15% of construction cost is found to be wastage due to rework of defective components detected during maintenance (Waje & Patil, nd). The nature of these errors is quit diverse 20-40% of all site defects have their roots in errors arising during the construction phase, 54% of the construction defects can be attributed to human factors like unskilled workers or insufficient supervision of construction works (Mashwama et al., 2016). Furthermore, 12% of the construction defects are based on material and system failures (Summer, 2004). These observations suggest that a thorough inspection of construction sites is needed and that current site inspection approaches need to be improved in identifying defects on construction sites effectively. Since the main causes of construction errors, e.g. human involvement in the construction process and changing environmental conditions resulting in discrepancies in material behavior are uncontrollable, it is critical to improve the inspection and assessment of the quality of construction projects (Mahmood et al., 2012).

4. Quality

Quality may mean different things to different people. To others it may represent customer satisfaction and others interpret it as compliance with contractual requirements. Quality in terms of construction is even more difficult to define (Jha, 2006). Therefore, quality is defined as “conformance with requirements”, construction project quality is the fulfilment of the owners needs per defined scope of works within a budget and specified schedule to satisfy the owners/user requirements per defined scope of works (Mashwama and Musonda, 2014; Mashwama, et al., 2017 & Rumane, 2011). In the case of the construction industry the requirements are the specifications and contract drawings [5]. These two documents are used by the contractor during the construction phase to assist with the achievement of quality on a project. Hence, it is important not to confuse quality with luxury (Hassan et el., 2000).

5. Causes of poor quality

The primary reasons for poor quality are mainly due to poor management. Report shows that the state of construction quality in South Africa is not satisfactory to the client, with the quality of construction on around 20% of all projects, and around 12% of the projects surveyed had levels of defects which are regarded as inappropriate. (Dai 2009) mentioned that ineptitude management is generally recognized as a major factor of poor construction. According to Dai *et al*. (2009) management factors are caused by insufficient of supervision on site. In fact, poor supervision on site contributes to the poor workmanship on construction site and it can be seen at many occasions on the jobsite

(Kasun & Janaka 2006). In addition, the ability of management on the construction site is the primary cause that affects labours' daily productivity. Therefore, poor project management is one of the factors contributing to poor workmanship. It is argued that clients should not be complacent with these levels of dissatisfaction, and that clients should strive to get better value for money(CIBD 2011) .A number of factors affect the cost of poor quality in a project, which ranges from poor work environment not only decreases productivity but it also affects the project quality. The government way of procuring, selecting the lowest bidder poses to also be a problem. In the case of emerging contractors, this underfunding resulted in a cutting into their profits, so they tend to cut corners instead. In the case of established contractors, this underfunding caused the established contractors to pull out of the low-cost housing sector, forcing government to continue using emerging contractors that were prepared to work under such cost pressures which poses to be a problem.

5.1 Labourers lack of experience and competency

Kasun & Janaka (2006) mentioned that productivity cannot be achieved by speed and harder work only without adopting better work practices. Industry stakeholders agreed that insufficient of skilled manpower is the most important matter that they concern about. Some construction companies in Turkey usually prefer to employ short-term unskilled labours and consequently cause the fault in the process of attaining the stability of quality associated issues (Abel-Razek, 1998). Hence, lack of experience and competency of labours must be taken into account as a factor contributing to poor workmanship.

5.2 Improper construction management

Ali & Wen (2011) argue that in most cases, construction managers do not know or recognise the factors that produce waste nor do they have measurements of their performance. It can be stated that most of the factors are not easily identifiable. Thus, the measurement of their importance would help management to act, in advance, to reduce their negative effects. Proper construction management would enhance the workmanship quality in construction projects. (Dai *et al*. 2009) stated that the capability of construction managers to manage, arrange and lead the work would affect the construction labour productivity. If a construction manager fails to lead and control the construction project, the quality problems may arise. Therefore, a proper construction management is very crucial for every construction project

5.3 Limited time in execution of projects

Insufficient time caused the construction projects executed to be rushed. According to Ali & Wen (2011), a number of "show houses" on the site were required for many construction projects. Many concurrent works were carried out and inadequate checking had been carried out by the senior managers sequentially caused by the speed of working. As a result, the deficiency of workmanship had been happened. In short, limited time causes low quality of workmanship in construction.

5.4 Limited cost in construction projects

The insufficient cost or budget would cause inadequate allocation of cost in construction project. Labour cost is included in construction cost. Ali & Wen (2011) stated that labour element is considered as the most difficult component to price within the reasonable level of accuracy. Obviously, labour costs estimation is considered as uncertainty. In addition, contractors who are not preparing sufficient budget for the project will cause the labour cost cut down correspondingly. As a result, the labours supplied are not sufficient to complete a project and construction defects may appear. Ali & Wen (2011) concluded that the causes of poor contractor performance, as perceived by clients, were a lack of concern for the environment, late information, poor management of the design activities, inadequate or poor planning, poor management and low skills level among the workers.

Many problems with quality are symptoms of managerial errors and /or omissions' which can be traced back to the earliest phases of a project (Pinto 2000). The positive/ negative influence of quality lasts long after cost success or schedule compliance have been discounted or even forgotten. According to (Pinto 2000) many managers make the mistake of not involving members of their project teams in early planning and conceptual meetings, perhaps under the assumption that the team members should only concern themselves with their specific jobs. In fact, it is very important at an early stage that both the project manager and the project team members "buy in" to the goals of the project and

the means to achieve those goals. The more project team members are aware of these goals, the greater the likelihood of their taking active part in the monitoring and troubleshooting of the project and, consequently, the higher the quality of those activities for the project implementation. If the project completion date has been frozen without arranging inputs and proper planning, this can lead to hasty and unsystematic work towards the end of the project resulting in the project's quality taking a back seat (Jha 2006). All this haste also leads to a relaxation in quality specification from the owners' side, as they tend to overlook the deviation by the contractor from the agreed technical specification. The contractor on his part tries to save time by adopting shortcuts and bad technical practices in order to make a quick buck for themselves.

5.5 High competition in bids

On the other hand, a project which starts off with a weak or poorly conceived strategy and receives strong subsequent tactical operationalization has the likelihood of being successfully implemented, but solves the wrong problem. Another stumbling stone faced could be the way government procures by choosing the lowest bidder which could also be one of the problems identified causing the cost of poor quality Aggressive competition sometimes forces the bidders to quote low for the project. Once awarded the project they are not motivated enough to do a quality job. To make some profit out of the project they sometime try to use inferior materials and bad technical practices, leading to poor quality (Jha 2006). The problem of a low bid is quiet common in cases of government-owned projects. While it is perfectly logical for the government, being the guardian of public funds, to accept low bids, selection of a low bidder more often than not causes problems to the project. In addition, the low bidder sometimes resorts to subcontracting the entire project to unqualified contractors, leading to poor quality.

6. Critical success factors

- Quality measurement criteria in construction
- Strategic planning as tool for quality improvement
- Management as a tool for quality improvement for success factor
- Adequate monitoring and feedback as success factor
- Owner involvement as success factor
- Team Organization
- The need for training as a success factor
- Continuous improvement on quality

7. Methodology

The study focused on the causes of poor quality in construction projects. The study also investigated possible techniques, measures and methods to improve the cost of poor quality in construction projects. The data was collected from secondary data which is (journal, articles, books & electronic databases) and primary data which is the questionnaire. This research adopted quantitative research and 50 useable questionnaires were used as an instrument tool for the study. Random sampling method was used to select the respondents in various construction companies. Questionnaires were used to collect data for the study and closed questions were asked in order to manage the data. The likert scale of 1 to 5, where 1 -"Strongly disagree", 2-"Disagree", 3-"neutral or unsure", 4-"Agree" and 5-"Strongly agree" was used. The likert scale is a popular format of questionnaire that is used in education research. [15] The likert scale is chosen in this study because it allows the respondents to express how much they are agree or disagree with certain statements. The Mean Item Score (MIS) is ranked in descending order (from the highest to the lowest).The statement with the highest ranking is the one that was considered to be dominant. The Mean Item Score (MIS) was derived from the following formula (Mashwama et al., 2017).

$$MIS = \frac{1n1 + 2n2 + 3n3 + 4n4 + 5n5}{\sum N}$$

Where;

n_1 = number of respondents for strongly disagree

n_2 = number of respondents for disagree

n_3 = number of respondents for neutral
n_4 = number of respondents for agree
n_5 = number of respondents for strongly agree
N = Total number of respondents

8. Findings and discussion

8.1 Factors causing poor quality

Ineffective monitoring and feedback by project team members and lack of planning and coordination ranked first (MIS=3.93; R=1); followed by Reluctance in timely decision by top management (MIS=3.88;R2); Ineffective monitoring and feedback by the project team members was ranked third (MIS=3.86:R=3); Poor human resource management and labour strike (MIS=3.93; R= 4); Failure to identify problems and institute necessary design and programming changes with (MIS=3.83; R=5.00); Government's way of procuring-choosing the lowest bidder with (MIS=3.76; R=6.00); Inadequate project formulation in the beginning with (MIS=3.73; R=7.00); Training the human resources in the skill demanded by the project with (MIS=3.73; R=7.00); Negative attitude of Project participants with (MIS=3.70; R=8.00); Ignorance of appropriate techniques by Project Manager with (MIS=3.65; R=9.00); A lack of quality audits with (MIS=3.63; R=10.00); Project manager's authority to take financial decision, selecting key team members with (MIS=3.61; R=11.00); Ignorance of appropriate planning tools with (MIS=3.61; R=11.00); Monitoring and feedback by top management with (MIS=3.61; R=11.00); Holding key decisions in suspension with (MIS=3.59;R=12.00); Reluctance in timely decision by Project Manager with (MIS=3.58;R=13.00); Training the human resources in the skill demanded by the project with (MIS= 3.53; R=14.00); Lack of concern for environment with (MIS=3.49; R=15.00); Conflicts among team members with (MIS=3.46; R=16.00); Monitoring and feedback by client with (MIS=3.46; R=16.00); Negative attitude of Project Manager with (MIS=3.37; R=17.00); Faulty project conceptualization with (MIS=3.45;R=17.00); Hostile social environment with (MIS=3.34;R=18.00); Aggressive competition during tendering with (MIS=3.37 and R=18.00); A lack of control over time and cost inputs with (MIS=3.34; R=19.00); Urgency emphasized by the owner while issuing tender Failure Factor with (MIS=3.32; R=20.00); Lack of understanding of operating procedure by the Project Manager with (MIS=3.29; R=21.00); Reluctance in timely decision by top management with (MIS=3.29; R=21.00); Size and value of the project being large with (MIS=3.28; R=22.00); Vested interest of client representative in not getting the project completed in time with (MIS=3.24; R=23.00).

Table 1: Factors causing poor quality

	Factors causing the cost of poor quality	MIS	RANK
1	Ineffective monitoring and feedback by Project Members	3.93	1.00
2	A lack of planning and coordination	3.93	1.00
3	Reluctance in timely decision by top management	3.88	2.00
4	Ineffective monitoring and feedback by the project team members	3.86	3.00
5	Poor human resource management and labour strike	3.85	4.00
6	Failure to identify problems and institute necessary design and programming changes	3.83	5.00
7	Government's way of procuring-choosing the lowest bidder	3.76	6.00
8	Inadequate project formulation in the beginning	3.73	7.00
9	Training the human resources in the skill demanded by the project	3.73	7.00
10	Negative attitude of Project participants	3.70	8.00
11	Ignorance of appropriate techniques by Project Manager	3.65	9.00
12	A lack of quality audits	3.63	10.00
13	Project manager's authority to take financial decision, selecting key team members	3.61	11.00
14	Ignorance of appropriate planning tools	3.61	11.00
15	Monitoring and feedback by top management	3.61	11.00
16	Holding key decisions in suspension	3.59	12.00

17	Reluctance in timely decision by Project Manager	3.58	13.00
18	Training the human resources in the skill demanded by the project	3.53	14.00
19	Lack of concern for environment	3.49	15.00
20	Conflicts among team members	3.46	16.00
21	Monitoring and feedback by client	3.46	16.00
22	Negative attitude of Project Manager	3.37	17.00
23	Faulty project conceptualization	3.45	17.00
24	Hostile social environment	3.34	18.00
25	Aggressive competition during tendering	3.37	18.00
26	A lack of control over time and cost inputs	3.34	19.00
27	Urgency emphasized by the owner while issuing tender Failure Factor	3.32	20.00
28	Lack of understanding of operating procedure by the Project Manager	3.29	21.00
29	Reluctance in timely decision by top management	3.29	21.00
30	Size and value of the project being large	3.28	22.00
31	Vested interest of client representative in not getting the project completed in time	3.24	23.00

8.2 Success factors for the reduction of cost of poor quality

Respondents under the planning stage they ranked Defining quality objectives (standards and specifications) highest with (MIS=4.39; R=1); Providing effective leadership was ranked second (MIS=4.20,R=2); respondents ranked team development third with (MIS=4.13,R=3); Clearly defining the project objectives was ranked fourth with (MIS=4.12, R=4) cash flow planning was ranked second last with(MIS=3.85, R=7) and Defining measurement and testing procedures was ranked last with (MIS=3.34; R= 8).

Table 2: Success factor at planning stage

	Success factors that influence the reduction of COPQ	MIS	RANK
Planning stage	Defining quality objectives (standards and specifications)	4.39	1.00
	Providing effective leadership	4.20	2.00
	Team development and deploying skilled work force	4.13	3.00
	Clearly defining the project objectives (scope, time and cost)	4.12	4.00
	Identification of processes and skills for activities	4.08	5.00
	Identifying technology requirement for processes	4.03	6.00
	Cash flow planning	3.85	7.00
	Defining measurement and testing procedures	3.34	8.00

Under the organising stage the respondent ranked defining quality control mechanism the highest with (MIS=4.12,R=1); Team development second with (MIS=4.1,R=2); Providing effective project management process was ranked third with (MIS=4.02,R=3), Defining the decision making process and empowerment was rank fourth with (MIS=3.76, R=4); Use of integrated procurement systems was ranked second last with (MIS=3.71,R=6) and Training, development and quality awareness of HR with (MIS=3.68, R=7)

Table 3: Success factor at organizing stage

	Success factors that influence the reduction of COPQ	MIS	RANK
Organizing stage	Defining quality control mechanism	4.12	1.00
	Team development and deploying skilled work force	4.10	2.00
	Providing effective project management process	4.02	3.00
	Defining the decision making process and empowerment	3.76	4.00
	Induction of appropriate technology	3.88	4.00
	Defining organizational structure	3.78	5.00

	Use of intergrated procurement systems	3.71	6.00
	Training, development and quality awareness of HR	3.68	7.00

The respondent ranked team work the highest under the executing stage with (MIS=4.32,R=1); Providing effective leadership was rank second with (MIS=4.20,R=2), Optimum uses of resources was ranked third with (MIS=4.05, R=3); Fulfilling contractual obligations was ranked fourth with an (MIS=3.93, R=4); Exercising transparency in procurement process and transactions was ranked second last with (MIS=3.63, R=8); and protecting stakeholder rights with (MIS=3.51,R=9)

Table 4: Executing Stage

	Success factors that influence the reduction of COPQ	MIS	RANK
Executing stage	Team work	4.32	1.00
	Providing effective leadership	4.20	2.00
	Optimum use of resources	4.05	3.00
	Fulfilling contractual obligations	3.93	4.00
	Fulfilling health and safety requirements	3.87	5.00
	Employee involvement	3.71	6.00
	Fulfilling environmental protection requirements	3.66	7.00
	Exercising transparency in procurement process and transactions	3.63	8.00
	Protecting stakeholder rights	3.51	9.00

Under monitoring stage the respondent ranked fulfilling health and safety requirement the highest with (MIS=4.10, R=1); measuring performance of activities on critical path was ranked second with (MIS=3.93, R=2); Measurement of executed works was ranked third with (MIS=3.85, R=3); Measurement of productivity of resources was ranked second last with an (MIS=3.68, R=6); and Measure variation in planned and actual resource utilization was ranked last with (MIS=3.61,7).

Table 5: Monitoring stage

	Success factors that influence the reduction of COPQ	MIS	RANK
Monitoring stage	Fulfilling health and safety requirements	4.10	1.00
	Measuring performance of activities on critical path	3.93	2.00
	Measurement of executed works	3.85	3.00
	Measurement of wastage and reworks(COPQ)	3.80	4.00
	Audit of expenditure and procurement process	3.70	5.00
	Fulfilling environmental protection requirements	3.68	6.00
	Testing of executed works	3.68	6.00
	Measurement of productivity of resources	3.68	6.00
	Measure Variation in planned and actual resource utilization	3.61	7.00

9. Conclusion and Recommendations

9.1 Conclusion

The findings of this study revealed the causes of poor quality on construction site which were ineffective monitoring and feedback by project team members and lack of planning and coordination; followed by Reluctance in timely decision by top management; Ineffective monitoring and feedback by the project team members; Poor human resource management and labour strike; Failure to identify problems and institute necessary design and programming changes; Government's way of procuring-choosing the lowest bidder; Inadequate project formulation in the beginning with; Training the human resources in the skill demanded by the project; Negative attitude of Project participants; Ignorance of appropriate techniques by Project Manager. Furthermore, the study presented success factors that can be used to reduce COPQ only if addressed appropriately and effectively. The finding revealed that the construction professionals do not agree with that measurement s and testing procedure could reduce the COPQ, but rather defining the quality objectives during the planning stages is what is thought could help reduce the COPQ .Once the project participant

know what is expected of them from the beginning in order to achieve quality then COPQ will be reduced. The finding represents that it is more like knowing what to do, when to do it and at a certain cost is what could sum up to a meaningful successful running of a project, without poor quality having an impact on it.

9.2 Recommendation

The study has revealed research gap which might be fruitfully pursued, such quality to be taught in the higher learning instituted as a subject so that when the graduate access the industry they can simply apply and share the information with their colleagues in the industry.

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