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MITIGATING CONSTRUCTION PROJECT SCHEDULE OVERRUNS

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There are many factors that contribute to the causes of schedule overruns in construction projects. This ranges from factors inherent in the technology and its management, to those resulting from the physical, social, and financial environment. Schedule overruns can give rise to disruption of work and loss of productivity, late completion of project, increased time related costs and third party claims and abandonment or termination of contract. Schedule overruns are costly and often result in disputes and claims. Hence, the need to identify mitigation measures of construction projects overruns that will bring about the timely delivery of construction projects. This paper assesses the measures to mitigate against construction projects schedule overruns in the Gauteng Province construction industry in South African. The data used in this paper were derived from both primary and secondary sources. The primary data were collected through a questionnaire distributed to construction professionals in the study area. Data received from the questionnaires were analyzed using descriptive statistics procedures. Findings revealed that proper project planning and scheduling, effective strategic planning, site management and supervision, amongst others, were the major mitigation measures of construction projects schedule overruns in the Gauteng Province of South Africa. This study contributes to the body of knowledge on the subject of the measures of mitigating against construction project schedule overruns in the Gauteng Province construction industry.

Keywords: Schedule overruns, Mitigation, Construction industry, Gauteng, South Africa

1 INTRODUCTION

Aiyetan, Smallwood and Shakantu (2011) show that the principle of Right-First-Time holds great value. Right-first-Time requires accuracy and precision. Accuracy means reflecting the realities (specifications), whereas precision implies meeting the specific dates. The processes of construction demand accuracy and very high precision. However, the problem of projects schedule overruns in the construction industry is a global phenomenon (Sambasivan and Soon 2007). Alkhathami (2004) defines schedule overruns as extra time required to finish a given construction project beyond its original planned duration, whether compensated for or not. Mohamad (2010) says schedule overruns are an act or event that extends the time to complete or perform an act under the contract. Also, Assaf and Al-Hejji (2006) defined schedule overrun as the time overrun either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project. It is basically a project slipping over its planned schedule and is considered as common problem in construction projects worldwide.

Abedi, Fathi, and Mohammad (2011) state that there are many factors that contributed to causes of schedule overruns in construction projects. These range from factors inherent in the technology and its management, to those resulting from the physical, social, and financial environment. Schedule overruns can give rise to disruption of work and loss of productivity, late completion of project, increased time related costs and third party claims and abandonment or termination of contract. Schedule overruns are costly and often result in disputes and claims. Hence, the need to identify mitigation measures of construction projects overruns that will help with timely delivery of construction projects.

2 CONSTRUCTION SCHEDULE OVERRUNS – MITIGATION MEASURES

Wei (2010) illustrates that when construction schedule overrun occurs, there is no question that the owner suffers financially. But the extent to which the owner can recover loss of income from the contractor, and more importantly minimize the risk that such overruns will occur, depends largely on how the construction contract is drawn up. Tabish and Jha (2011) identify five successful criterions that can be used to deliver construction projects within schedule. The study further revealed that there are independent measures that can be taken in each category to reduce schedule overruns. These criteria are as follows: schedule performance criterion, cost performance criterion, quality performance criterion, safety performance criterion and no-dispute performance criterion (Tabish and Jha 2011).

Aiyetan *et al*. (2011) identified twelve factors that would influence project delivery time, these includes: construction planning and control techniques, management style, economic policy, the quality of management during construction, site access conditions, site ground conditions, motivation of workers, constructability of designs, socio and political conditions, client understanding of the design, procurement and construction processes, the quality of management during design, and physical environmental conditions. Saleh, Abdelnaser, and Abdul (2009) reveal that construction schedule overruns can be mitigated by applying the flowing factors on construction projects: making risk management, proper planning, proper payment from client, prepare insurance claims, good scheduling program, client representative for project, selecting expert understand their assignment, clear contract and BOQ and compute the amount of financial damages. Wei (2010) identify fifteen ways of mitigating schedule overruns and ranks them as follows: site management and supervision, effective strategic planning, clear information and communication channels, collaborative working in construction, proper project planning and scheduling, frequent coordination between the parties involved, complete and proper design at the right time, use appropriate construction methods, accurate initial cost estimates, proper material procurement, proper emphasis on past experience, frequent progress meeting, compressing construction durations, use proper and modern construction equipment and use up-to-date technology utilization. These measures of mitigating construction schedule overruns were in agreement with the study by Majid (2006).

Abedi, Fathi, and Mohammad (2011) identified thirty measures that can be taken to minimize construction schedule overruns in Malaysia: accurate initial cost estimates, adopting a new approach to contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractors, perform a preconstruction planning of project tasks and resource needs, selection of a competent consultants and reliable contractors to carry out the work, allocation of sufficient time and money at the design phase, availability of adequate resources, commitment to projects, competent project managers, comprehensive contract documentation, ensure adequate and available source of finance until project completion, frequent progress meetings and enforcing liquidated damage clauses. Furthermore, Ade-ojo and Babalola (2013) identify six measures that can reduce schedule overruns on construction projects, these include: accurate design, prompt payment, financial capability of client, financial capability of contractor, favorable site condition, favorable weather and availability of subcontractor and supplier. Jonathan (2013) states that effective project planning, adequate funding to finance project to completion and ensuring that project parties play their role on project execution are the most effective ways of reducing schedule overruns on construction projects in Nigeria. However, Aibinu and Jagboro (2002) state that acceleration of site activities and contingency allowance would reduce schedule overruns on construction projects in Nigeria.

3 RESEARCH METHODOLOGY

The data used in this paper were derived from both primary and secondary sources. The primary data was obtained through the survey method, while the secondary data was derived from the review of literature and archival records. The primary data was obtained through the use of a structured questionnaire survey. This was distributed to a total of 200 construction professionals that included; Architects, quantity surveyors, civil engineers, construction mangers and project managers who are currently involved in construction works in Gauteng, South Africa. This yardstick was considered vital for the survey in order to have a true reflection of the effects of construction project schedule overruns. All professionals in Gauteng province had an equal chance to be drawn and participate in the survey. Out of the 200 questionnaires sent out, 146 were received back representing a 73% response rate. This was considered adequate for the analysis based on the assertion by Moser and Kalton (1971) that the result of a survey could be considered as biased and of little value if the return rate was lower than 30–40%. The data presentation and analysis made use of frequency distributions and percentages of all the respondents.

3.1 Mean Item Score (MIS)

A five point Likert scale was used to determine the causes of construction project cost overruns in Gauteng province with regards to the identified factors from the reviewed literature. The adopted scale was as follows: 1 = Extremely unlikely; 2 = Unlikely; 3 = Neutral; 4 = likely; 5 = Extremely likely.

The five-point scale was transformed to mean item score (MIS) for each of the factors of causes of cost overruns as assessed by the respondents. The indices were then used to determine the rank of each item. The ranking made it possible to cross compare the relative importance of the items as perceived by the respondents. This method was used to analyze the data collected from the questionnaires survey. The mean item score (MIS) was calculated for each item as follows:

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

Where: n1 = Number of respondents for extremely unlikely; n2 = Number of respondents for unlikely; n3 = Number of respondents for neutral; n4 = Number of respondents for likely; n5 = Number of respondents for extremely likely; N = Total number of respondents.

After mathematical computations, the factors were then ranked in descending order of their mean item score (from the highest to the lowest).

An internal consistence check was conducted using the consistence and reliability statistic measure of the Cronbach's Alpha. According to Tavakol and Dennick (2011) the Cronbach's alpha measures the internal consistency of a test or scale, it describes the extent to which all the items in a test measure the same concept or construct and hence it is connected to the inter-relatedness of the items within the test. The current study adopted the Cronbach's Alpha to check internal consistence, the results of the internal consistence for measure of mitigating construction projects schedule overruns was found to be 0.929. Gliem and Gliem (2003) state that an alpha of

0.8 is probably a reasonable goal. George and Mallery (2003) further note that the value of the Cronbach's Alpha above 0.7 is acceptable. Hence the current study proceeded with analysis as the internal consistence tests revealed that the Cronbach's Alpha was within the acceptable values, hence all items in the study were measuring the same concept and all the items were inter-related.

4 FINDINGS AND DISCUSSION

Findings from the 146 usable questionnaires revealed that 59.6% of the respondents were male and 40. 4% were female. Findings relating to the respondents' age group revealed that 29.5% of the respondents were in the age group of 20-25 years old, 26.7% of the respondents were in the age group 26-30 years old, 17.1% were in the age group 31-35 years old, 11. 6% were in the age group 36-40 years old, 6.2% of the respondents were in the age group 41-45 years old, 4.1% were in the age group 46-50 years old, 3.4% of the respondents were above 50 years old and 1. 4% of the respondents were between 51-55 years old. Further, results showed that 76.7% of the respondents were Black, 14.4% were White, 4.8% were either Indian or Asian and 4.1% of the respondents were Colored. Findings relating to respondent's work professional qualification, results showed that 38.4% were quantity surveyors, 20.5% were civil engineers, 11% were project managers, 10.3% were construction managers, 8.9% were construction project managers, 5.5% were architects and 5.5% selected others, which included an artisan, a building inspector, electrical contractors, a safety consultant and a site agent.

Furthermore, results revealed that 56.8% of the respondents had experience that ranged from 1-5 years, 20.5% had experience in the range of 6-10 years, 11.6% had experience that ranged between 11-15 years, 6.2% had more than 20 years' experience and 4.8% had experience that ranged from 16-20 years in the construction industry. Further, 46.6% of the respondents had bachelor's degrees, 32.2% had diplomas, 12.3% of the respondents had masters degrees, 4.1% of the respondents had doctorate degrees and 4.8% of the respondents only had metric (grade 12) certificates. Furthermore, it was revealed that 35.6% of the respondents were employees of contractors, 34.9% of the respondents were employees of consultants and 20.5% were government employee, 8.2% were employed by clients and 0.7% of the respondents were self-employed.

4.1 Measures of mitigating construction projects schedule overruns

The respondents were asked to ranks the measures that can be undertaken to mitigate construction projects schedule overruns. The survey revealed the following factors as the top ten measure of mitigating construction projects schedule overruns in Gauteng: proper project planning and scheduling (SD=0.686, $\bar{x}$=4.57, R=1), effective strategic planning (SD=0.678, $\bar{x}$=4.53, R=2), site management and supervision (SD=0.738, $\bar{x}$=4.48, R=3), frequent coordination between the construction team (SD=0.677, $\bar{x}$=4.44, R=4), availability of clear information and communication channels (SD=0.734, $\bar{x}$=4.42, R=5), complete and proper design at the right time (SD=0.732, $\bar{x}$=4.39, R=6), frequent progress meeting (SD=0.794, $\bar{x}$=4.39, R=7), adherence to construction specifications (SD=0.727, $\bar{x}$=4.37, R=8), building according to the construction drawings (SD=0.800, 4.37, R=9) and collaboration working by the entire construction team (SD=0.799, $\bar{x}$=4.36, R=10). These findings were similar to the findings of Jonathan (20013) where effective project planning was identified as the most effective way of minimizing construction projects schedule overruns. However, the study by Wei (2010) identified site management and supervision as the most effective measure of minimizing construction projects schedule overruns.

Table 1. Mitigating measures for construction projects schedule overruns.

Mitigating measures	σX	$\bar{x}$	R
Proper project planning and scheduling	0.686	4.57	1
Effective strategic planning	0.678	4.53	2
Site management and supervision	0.738	4.48	3
Frequent coordination between the construction team	0.677	4.44	4
Availability of clear information and communication channels	0.734	4.42	5
Complete and proper design at the right time	0.732	4.39	6
Frequent progress meeting	0.794	4.39	6
Adherence to construction specifications	0.727	4.37	7
Building according to the construction drawings	0.800	4.37	7
Collaboration working by the entire construction team	0.799	4.36	8
Proper material procurement	0.720	4.29	9
Appropriate construction methods	0.847	4.24	10
Accurate initial cost estimates	0.847	4.19	11
Use proper and modern construction equipment	0.980	3.94	12
Use up-to-date technology utilization	0.951	3.90	13
Fast-tracking construction	1.028	3.83	14

5 CONCLUSION AND RECOMMENDATION

Literature revealed that there are various measures of mitigating construction projects schedule overruns. These include: site management and supervision, effective strategic planning, clear information and communication channels, collaborative working in construction, proper project planning and scheduling were identified as the major measures of mitigating construction projects schedule overruns from literature. From the questionnaire survey obtained from the respondents, it was revealed that proper project planning and scheduling, effective strategic planning, site management and supervision, frequent coordination between the construction team, availability of clear information and communication channels, complete and proper design at the right time, frequent progress meeting, adherence to construction specifications, building according to the construction drawings and collaboration working by the entire construction team were the top ten identified measures of mitigating construction projects cost overruns in Gauteng, South Africa. It is therefore recommended that all members of construction teams should practice the identified measure of mitigating construction schedule overruns.

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