



**'FEEDBACK' REPORT ON A TOTAL QUALITY
MANAGEMENT (TQM) IN CONSTRUCTION STUDY
CONDUCTED AMONG GENERAL CONTRACTORS**

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DEDICATION

This report is dedicated to the improvement of construction health and safety (H&S) and performance in South African construction through a paradigm shift, resulting in the achievement of best practice.

ACKNOWLEDGEMENTS

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- those GCs that responded to the survey;
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ORIGIN AND NATURE OF THE REPORT

This report has been compiled to provide feedback to both respondents and non-respondents to the survey.

The report is essentially intended to provide feedback, and does not include a literature survey.

EXECUTIVE SUMMARY

The study investigated the extent to which various phenomena impact on the traditional and non-traditional project parameters. The phenomena include: inadequate H&S; accidents; poor productivity; rework, and poor project time performance. The project parameters include: cost; environment; H&S; productivity; quality; project time, and client and worker satisfaction.

Based upon an importance index (II) with a maximum value of 4, and a minimum value of 0, in terms of impact the phenomena had between a major and average impact on the project parameters in 33 out of 36 (91.7%) relationships ie. an II value ≥ 2 . In terms of overall impact by phenomena, rework and poor project time performance predominate.

The GCs agree that the parameters of cost (bid price) environment, H&S, quality and time should be used to prequalify contractors in terms of potential performance and to assess contractors in terms of actual performance.

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1. OBJECTIVES

The objectives of the study were to determine the:

- influence of various phenomena on the traditional and non-traditional project parameters, and
- extent of agreement / disagreement relative to the use of various traditional and non-traditional project parameters to prequalify and assess contractors in terms of potential and actual performance.

2. SAMPLE FRAME AND METHODOLOGY

The sample frame consisted of 26 GCs, who had achieved placings in the Building Industries Federation South Africa (BIFSA) national Health and Safety (H&S) competition and, or BIFSA 4 or 5-Star H&S gradings on one or more of their projects, for the years 1995 to 2000.

A 2-question questionnaire consisting of 46 sub-questions was mailed to the GCs. 11 GCs responded, which represents a response rate of 32.1%.

3. ANALYSIS

Given that respondents were required to respond in terms of impact on a scale of 1 to 5 and the extent to which they agree/disagree, it was necessary to compute an importance index (II) with a minimum value of 0, and a maximum value of 4, to enable a comparison of, and to rank various phenomena, parameters and interventions. The II is calculated using the formula:

$$\frac{4n_1 + 3n_2 + 2n_3 + 1n_4 + 0n_5}{(n_1 + n_2 + n_3 + n_4 + n_5)}$$

where n_1 = Major impact (1) / Strongly agree
 n_2 = Near major impact (2) / Agree
 n_3 = Impact (3) / Neutral
 n_4 = Some impact (4) / Disagree
 n_5 = Minor impact (5) / Strongly disagree and unsure

4. FINDINGS

Table 1 indicates the extent to which various phenomena impact on various project parameters in terms of impact on a scale of 1 (major) to 5 (no). The relationships have been ranked within the phenomena and overall.

It is significant that the II values of 33 of the 36 relationships are greater than the midpoint value of 2.0, which indicates that most of the phenomena have the equivalent of, or more than an impact on the various parameters. It is also significant that 16 of the 36 relationships have II values greater than 3.0, which indicates that the respective phenomena have a 'major' / 'substantial' impact on the respective parameters.

Based upon an average importance index for parameters relative to each phenomenon, rework and poor project time performance, predominated. In terms of the overall top five ranked relationships, it is significant that two are attributable to poor productivity, two to poor project time performance, and one to rework. In terms of the overall top twelve ranked relationships, it

is notable that four are attributable to rework, three to both accidents and poor project time performance, and two to poor productivity.

The top five II values recorded are: ‘poor productivity’ relative to ‘project time’ (3.90); ‘poor project time performance’ relative to ‘cost’ (3.82); ‘poor productivity’ relative to ‘cost’ (3.81); ‘rework’ relative to ‘productivity’ (3.73) ‘poor project time performance’ relative to ‘client satisfaction’ (3.73). These were followed by: ‘rework’ relative to ‘cost’ (3.63); ‘accidents’ relative to ‘cost’ (3.55); ‘accidents’ relative to ‘worker satisfaction’ (3.46); ‘rework’ relative to ‘project time’ (3.46); ‘accidents’ relative to ‘productivity’ (3.36), and ‘poor project time performance’ relative to ‘productivity’ (3.36).

Relationship		Impact (%)					II	Rank (with in)	Rank (over all)	Ave II
		Major.....No								
Phenomenon	Parameter	1	2	3	4	5				
Inadequate health and safety (H&S)	Productivity	27.3	54.5	18.2	0.0	0.0	3.09	1=	14=	2.78
	Worker satisfaction	45.4	18.2	36.4	0.0	0.0	3.09	1=	14=	
	Quality	18.2	45.4	36.4	0.0	0.0	2.82	3	21=	
	Client satisfaction	27.3	27.3	18.2	27.3	0.0	2.73	4	23=	
	Cost	36.4	45.4	9.1	9.1	0.0	2.64	5	25=	
	Environment	27.3	9.1	54.5	9.1	0.0	2.55	6=	28=	
Accidents	Project time	18.2	45.4	9.1	27.3	0.0	2.55	6=	28=	2.91
	Cost	72.7	9.1	18.2	0.0	0.0	3.55	1	7	
	Worker satisfaction	63.6	27.3	0.0	9.1	0.0	3.46	2	8=	
	Productivity	45.4	45.4	9.2	0.0	0.0	3.36	3	10=	
	Project time	27.3	45.4	27.3	0.0	0.0	3.00	4	17=	
	Quality	9.1	45.4	27.3	18.2	0.0	2.46	5=	31=	
Poor productivity	Client satisfaction	36.3	27.3	9.1	27.3	0.0	2.46	5=	31=	2.93
	Environment	9.1	18.2	45.4	27.3	0.0	2.09	7	33	
	Project time	90.0	10.0	0.0	0.0	0.0	3.90	1	1	
	Cost	90.9	0.0	9.1	0.0	0.0	3.81	2	3	
	Client satisfaction	36.4	45.4	9.1	9.1	0.0	3.09	3	14=	
	Quality	27.2	36.4	36.4	0.0	0.0	2.91	4	20	
Rework	Worker satisfaction	45.4	9.1	18.2	27.3	0.0	2.73	5	23=	3.10
	H&S	27.3	27.3	18.1	27.3	0.0	2.55	6	28=	
	Environment	9.1	18.2	36.4	9.1	27.3	1.55	7	36	
	Productivity	72.7	27.3	0.0	0.0	0.0	3.73	1	4=	
	Cost	63.6	36.3	0.0	0.0	0.0	3.63	2	6	
	Project time	54.5	36.4	9.1	0.0	0.0	3.46	3	8=	
Poor project time performance	Worker satisfaction	45.4	36.4	18.2	0.0	0.0	3.27	4	12	3.04
	Client satisfaction	54.5	18.2	18.2	9.1	0.0	3.18	5	13	
	Quality	27.3	45.4	27.3	0.0	0.0	3.00	6	17=	
	H&S	36.4	27.2	9.1	18.2	9.1	2.64	7	25=	
	Environment	9.1	9.1	54.5	18.2	9.1	1.91	8	34=	
	Cost	81.8	18.2	0.0	0.0	0.0	3.82	1	2	
Poor project time performance	Client satisfaction	90.9	0.0	0.0	9.1	0.0	3.73	2	4=	3.04
	Productivity	45.4	45.4	9.2	0.0	0.0	3.36	3	10=	
	Quality	27.3	54.5	9.1	9.1	0.0	3.00	4	17=	
	Worker satisfaction	36.3	27.3	18.2	18.2	0.0	2.82	5	21=	
	H&S	27.3	27.3	27.3	18.1	0.0	2.63	6	27	
	Environment	9.1	18.2	45.4	9.1	18.2	1.91	7	34=	

Table 1: Impact of various phenomena on various project parameters.

Tables 2 and 3 present the extent to which GCs agree/disagree relative to the use of various parameters for the prequalification and assessment of contractors. Given that all the II values are above the midpoint value of 2.0, the GCs can be deemed to be in agreement therewith.

Parameter	Response (%)					II	Rank
	SA	A	N	D	SD		
Quality	60.0	30.0	10.0	0.0	0.0	3.50	1=
Time	60.0	30.0	10.0	0.0	0.0	3.50	1=
H&S	60.0	20.0	20.0	0.0	0.0	3.40	3
Environment	30.0	60.0	10.0	0.0	0.0	3.20	4
Cost (bid price)	40.0	40.0	10.0	10.0	0.0	3.10	5

Table 2: Extent of agreement / disagreement relative to the use of various parameters for the prequalification of contractors.

Parameter	Response (%)					II	Rank
	SA	A	N	D	SD		
Quality	77.8	22.2	0.0	0.0	0.0	3.78	1
H&S	55.6	44.4	0.0	0.0	0.0	3.56	2
Environment	44.4	55.6	0.0	0.0	0.0	3.44	3=
Time	55.6	33.3	11.1	0.0	0.0	3.44	3=
Cost (bid price)	33.3	55.6	0.0	11.1	0.0	3.11	5

Table 3: Extent of agreement / disagreement relative to the use of various parameters for the assessment of contractors.

Table 4 presents the mean IIs for prequalification and assessment. It is significant that quality achieved a ranking of first on all occasions and cost (bid price) fifth. It is notable that H&S achieved a ranking of second in terms of the mean, albeit marginally.

Parameter	Prequalification		Assessment		Mean	
	II	Rank	II	Rank	II	Rank
Quality	3.50	1=	3.78	1	3.64	1
H&S	3.40	3	3.56	2	3.48	2
Time	3.50	1=	3.44	3=	3.47	3
Environment	3.20	4	3.44	3=	3.32	4
Cost (bid price)	3.10	5	3.11	5	3.11	5

Table 4: Mean extent of agreement / disagreement relative to the use of various parameters for the prequalification and assessment of contractors.

5. CONCLUSIONS

The traditional and non-traditional project parameters affect project performance.

GCs, albeit 'H&S best practice' GCs, are in agreement with the use of traditional and non-traditional project parameters for the prequalification and assessment of contractors.

6. RECOMMENDATIONS

Given the impact of the traditional and non-traditional project parameters on project performance, the non-traditional project parameters, namely the environment and H&S, should be afforded status equal to that afforded cost, quality and project time.