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PERCEPTIONS OF TIME, COST AND QUALITY MANAGEMENT ON BUILDING PROJECTS

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INTRODUCTION

The clients of the construction industry are primarily concerned with quality, time and cost and yet the majority of construction projects are procured on the basis of only two of these parameters, namely time and cost (Bennett and Grice, 1990). This is understandable since the majority of project management control systems highlight time and cost, and overlook the relative importance of quality (Hughes and Williams, 1991). It is argued by Herbsman and Ellis (1991) that the major failings in traditional approaches to project delivery have been in extensive delays in the planned schedules, cost overruns, serious problems in quality, and an increase in the number of claims and litigation associated with construction projects.

In order to plan and manage a successful project, the three parameters of time, cost and quality should be considered. Hughes and Williams (1991), in arguing for the consideration of these three factors in attaining the client's objectives, propose that these factors are the three points of a triangle and that neglecting one factor will have a corresponding detrimental effect upon the other two. In support of this, Lansley (1993) argued strongly for the importance of studying the behavioural aspects of management in attempting to address the problems facing the construction industry, i.e., that it is the issue of the 'human factor' involved in construction projects that needs to be addressed. Rwelamila and Hall (1995) further argue that little evidence exists of successful projects where these three factors have been balanced and there is a need to embrace time, cost and quality management as a human activity system.

The purpose of this paper is to explore how time, cost and quality management on

building projects is perceived by those involved in project teams. Conclusions are drawn and recommendations are made with respect to the perception of time, cost and quality management associated with building projects.

TIME, COST AND QUALITY (TCQ) MANAGEMENT IN THE ATTAINMENT OF CLIENT OBJECTIVES

The concept of managing construction projects is deeply embedded in the traditional building procurement system. Ireland (1983) argues that time, cost and quality are the principal feasible objectives of the client in any construction project. Although it is claimed that time, cost and quality are incorporated in the management of construction projects, research has shown that in fact a time-cost bias exists.

Time

Timely completion of a construction project is frequently seen as a major criterion of project success by clients, contractors and consultants alike. Newcombe et al. (1990) note that there has been universal criticism of the failure of the construction industry to deliver projects in a timely way. NEDO (1983) states that a disciplined management effort is needed to complete a construction project on time, and that this concerted management effort will help to control both costs and quality. This is tantamount to saying that the client's objectives can be achieved through a management effort that recognises the interdependence of time, cost and quality.

Cost

Clients have been increasingly concerned with the overall profitability of projects and the accountability of projects generally. Cost overruns, in association with project delays,

are frequently identified as one of the principal factors leading to the high cost of construction (Charles and Andrew, 1990). Research to date has tended to focus on the technical aspects of managing costs on construction projects in the attainment of client objectives. There is little evidence in the published literature of a concern for the organisational, social and political problems that are inherent in the management of construction costs and the ability of the project team to meet the client's needs in terms of cost.

Quality

To the client, quality may be defined as one of the components that contributes to "value for money" (Flanagan and Tate, 1997). Vincent and Joel (1995) define total quality management as:

"...the integration of all functions and processes within an organisation in order to achieve continuous improvement of the quality of goods and services. The goal is customer satisfaction."

Furthermore, in order to achieve successful project quality management three separate drivers to quality management must be managed, namely:

- **Integration** of the project team so as to have a single objective and a common culture
- A **customer focus** for the team thereby facilitating the provision of products and services that will meet the clients needs
- A process of continuous improvement in the management of the construction project.

When these three components are successfully integrated, the project will begin to realise significant, measurable and observable improvements in the attainment of the clients' objectives.

We argue that an efficient way to address these shortfalls is to recognise the 'human' factor within the management of time, cost and quality. An analysis of the perceptions held by clients, contractors and building professionals, concerning client objectives relating to time, cost and quality management will allow this proposition to be explored. This is done through an opinion survey.

THE SURVEY

The focus of the study

The effective management of project time, cost and quality (TCQ) is intrinsically important to the attainment of client objectives. In order to examine this causal link, the opinions of clients, architects, quantity surveyors, project managers, consulting engineers and general contractors in South Africa were obtained by means a national questionnaire survey. The questions sought to establish their perceptions concerning client objectives and the project time, cost and quality associated with building procurement systems in South Africa.

Methodology

A stratified mail questionnaire opinion survey was conducted in South Africa. Survey participants comprised clients, architects, quantity surveyors, consulting structural engineers, project managers, and general contractors. Questionnaires were sent to practices and organisations rather than to individuals, using the membership directories of the South African Property Owners' Association, the South African Institute of Architects, the Association of South African Quantity Surveyors, the Institute of Consulting Engineers, the Institute of Project Managers, and the Master Builders' Associations. In total 180 questionnaires were distributed, comprising 30 from each sub-group. One hundred and forty-three replies were received (79.4%), comprising 10 clients (33%), 24 architects (80%), 30 quantity surveyors (100%), 30 engineers (100%), 25 project managers (83%) and 24 general contractors (80%). The questions for each of the six groups of participants were designed to facilitate an inter-group comparison. In the discussion of the results, percentages given in tables refer to the proportion of respondents offering that perception. The intention of the survey was to reveal areas of concern for the industry within the process of project time, cost and quality management rather than to provide hard evidence of inter-group differences between members of the design team.

Clients, as a group, are likely to be less homogeneous than the other groups of participants. The majority of client respondents to the survey described themselves as being experienced in property development, with 80% claiming to have continuous or frequent involvement in property development (50%

claimed a continuous involvement). Most clients (90%) reported being primarily involved in the commercial and industrial sectors of property development, with the majority (67%) being involved in the commercial sector. Average annual turnover varied considerably, but 89% of respondents claimed an annual turnover in excess of ZAR 10m (1 AU\$ = ZAR 5.50). The majority of client respondents thus constitute organisations wielding considerable financial influence in the property development market in South Africa, and have a frequent, if not continuous, involvement in property development. In this context, the client group exhibited reasonable homogeneity, but it should be noted that the views of small, one-off clients are almost certainly under-represented in this survey, as the data collection method would have limited their ability to participate.

Survey results

For the purposes of this study, various procurement systems have been grouped together into three generic types, namely: conventional (traditional, negotiated, cost-plus); design and build (design and build, package deal, turnkey, develop and construct); and management-orientated (management contracting, construction management, design and manage) (Masterman, 1992). The conventional method of building procurement is reported by nearly 70% of respondent clients in South Africa to be the most widely utilised procurement system. The management-orientated (21%) and design and build (9%) systems enjoy considerably less usage.

The results are discussed question by question and compare the participating groups' opinions about each issue.

Question 1: Please indicate whether clients are realistic with respect to expectations of time, cost and quality at the outset of the project. (Answer choice = all/most/some/none of the time)

The responses show that clients' and consultants' opinions are far from uniform. Clients are relatively sanguine about their TCQ expectations, with a large majority believing each of these to be realistic. The most pessimistic view of the reality of clients' TCQ expectations is held by architects, with only clients' quality expectations receiving a majority affirmative response. This is probably

attributable to the control over quality which architects perceive themselves to hold as principal agents for the client under conventional traditional procurement systems, as compared to the management of time and cost, for which they would assign responsibility to contractors and quantity surveyors, respectively. A similar response pattern is detectable with engineers and, given their principal role in engineering projects, a similar explanation may hold for their views.

Apart from the client group, quantity surveyors hold the next most optimistic view, a clear majority believing that clients have realistic expectations about time, cost and quality from the outset of a project. The quantity surveyors' views are closely matched by those of project managers.

The views of engineers are probably influenced by the nature of engineering projects, where quality is usually highly specified at the outset, but time and cost are far more uncertain (e.g., the use of schedule of rates and cost-plus forms of contract for engineering projects). Given that engineering projects often comprise far fewer components than building projects, and that many engineering projects are commissioned by public sector agencies with substantial experience, this may explain why engineers are more optimistic about realistic client expectations of quality.

Contractors are surprisingly optimistic about the reality of client expectations for project time and quality. An explanation for this view of project time is not readily forthcoming, given that, for most conventional procurement systems, the contract period is not part of the contractor's bid but is stipulated in advance by the client. Similarly, the defects liability period stipulated in most conventional procurement systems suggest that clients' expectations of quality are considerably less than realistic. Contractors' pessimistic view of the reality of client cost expectations is probably explained by their (the contractors) having to seek work in a highly competitive market.

Responses for the project time objective exhibit the greatest variability. Given clients' practical inability to model time performance reliability, their highly optimistic view of the reality of their own expectations for this factor, at the outset of a project, deserves more thorough research attention.

Table 1: Perceived extent to which clients are realistic, all or most of the time, with respect to their expectations of project time, cost and quality at the outset of the project

Project parameter	% of respondent groups						
	All	Clients	Architects	Quantity surveyors	Engineers	Project managers	Contractors
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Time	57	90	33	67	47	60	63
Cost	57	70	44	83	41	72	46
Quality	74	80	65	83	59	84	79

Question 2: Please rank the following factors in terms of their importance to building clients. (Answer choice: 1 = most important; 3 = least important)

All respondents to this question ranked project cost as the most important project parameter to building clients. The interesting finding from the responses to this question is that, contrary to the views of other project team participants, clients rate project quality as more important than project time performance. The converse was true for the other respondents. This suggests that clients may well be prepared to sacrifice construction time for improved quality.

Question 3: To what extent is an attempt made by the procurement team to match client needs with the characteristics of different procurement systems? (Answer choice:(always/sometimes/never)

Clearly, clients have a false illusion about the extent to which consultants and contractors will match procurement systems to clients' needs. Table 2 below indicates that while the majority of clients (67%) believe that the procurement team does match their needs to the appropriate procurement system, the perception is not supported by the procurement team themselves. The majority of the building professionals surveyed clearly believed that they did not usually attempt to match their clients' needs to an appropriate procurement system. It is possible that they did not see any need to do so, given the overwhelming prevalence of the traditional systems. The danger here is not only that consultants are not properly advising their clients in this regard (and thus clients may not be getting the procurement system which best matches their needs), but also (and more importantly) that clients are erroneously believing that they are actually receiving such advice from the procurement team.

Question 4: What proportion of building projects are completed within the client's agreed budget for the project? (Answer choice = all/most/some/none of the projects)

The response data is shown in Table 3. Clients clearly appreciate the greater cost certainty attributable to design and build procurement systems. Architects, however, see less potential in management-oriented systems or antipathy towards procurement systems which appear to diminish architects' traditional leadership roles in projects.

Quantity surveyors appear optimistic about the capacity of all three procurement systems to maintain project cost budgets. Engineers, on the other hand, are relatively pessimistic about this for design and build and management-oriented procurement systems.

Project managers show increasing confidence the capacity of alternative procurement systems to maintain project cost budgets, as their own level of involvement increases.

Contractors are highly confident of their own ability to meet client cost limits for projects under design and build and management-oriented procurement, but are less optimistic about these limits being maintained on conventional traditionally-procured projects.

Question 5: To what extent do clients make changes to the original brief (in respect to time, cost and quality) after the start of the project? (Answer choice = always/sometimes/never)

Eighty percent of client respondents believed that they never make changes to the original brief after the start of the project. This apparent high regard for their ability to stick to the original brief is clearly not shared by their consultants, who believe that changes do occur at least sometimes

Table 2: Perceptions of the extent to which the procurement team always and sometimes attempt to match client needs with the characteristics of different procurement systems during the election of a procurement system

	% of respondents groups						
	All	Clients	Architects	Quantity surveyors	Engineers	Project managers	Contractors
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Extent of the match	43	67	48	43	37	44	25

Table 3: Perceptions of whether all or most building projects are completed within the client's agreed budget (building cost) for the project

Procurement method	% of respondent groups						
	All	Clients	Architects	Quantity surveyors	Engineers	Project managers	Contractors
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Conventional	78	78	75	83	83	75	69
Design and build	77	83	71	76	58	89	94
Management-orientated	75	67	54	77	59	95	89

Table 4: Perceived extent to which inadequate briefing of the procurement team by the client is always responsible for client dissatisfaction with the resultant building in terms of time, cost and quality

Project parameter	% of respondent groups						
	All	Clients	Architects	Quantity surveyors	Engineers	Project managers	Contractors
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Time	24	30	22	23	13	20	42
Cost	29	56	35	23	30	21	29
Quality	26	33	22	30	35	12	25

Architects = 58%; Quantity Surveyors = 67%; Engineers = 70%; Project Managers = 60%. Nor are clients' views shared by contractors, with 71% believing that changes always or sometimes took place. This finding suggests that there is a serious gap between the perceptions of clients and the other members of the project procurement team about what constitutes a variation to the original brief, and that consultants in particular may not be successfully communicating the full implications of project variations to their clients.

Question 6: Does the procurement team utilise a formal brief-elicitation procedure for determining client requirements in respect of the project? (Answer choice = always/sometimes/never)

Surprisingly, the responses to this question were considerably worse than expected. Only 44% of clients believe that the procurement team utilises formal brief-

elicitation procedures. Similarly, 57% of architects and 37% of quantity surveyors believe that formal brief-elicitation procedures are utilised for conventionally procured projects. A lack of understanding on the part of the procurement team about what constitutes a formal brief-elicitation process may explain the responses to this question. Architects and quantity surveyors might have been expected to display far more confidence in formal brief-elicitation procedures for conventionally-procured projects.

Question 7: In your experience, is inadequate briefing of the procurement team by the client responsible for client dissatisfaction with the building in terms of time, cost and quality? (Answer choice = always/sometimes/never)

The results to this question tend to contradict those obtained in Question 6. If the responses to Question 6 are reliable, then far higher percentages could have been ex-

pected for the ‘always’ response to this question. The logic for this is that, if formal brief-elicitation procedures are not always used, then inadequate briefing is likely to occur and hence there will be higher levels of client dissatisfaction with the finished building in terms of time, cost and quality. The mismatch of responses to Questions 6 and 7 could be explained by theorising that an adequate project brief may not always be attainable at the outset, and that it often “grows” with the project development.

Question 8: At the outset of the project, do clients know what their needs are with respect to the following factors? (Answer choice = always/sometimes/never)

Table 5 shows that all respondent groups (including clients) have little faith in clients’ ability to know exactly what they want at the outset of a project, particularly with respect to time schedules, quality requirements and methods of procuring the building. This lends support to the proposition theorised above. Only client respondents believe that they knew at the outset what level of functional performance they expect from the

completed building. Other respondents were far more pessimistic about clients knowing this. This points to the possibility of a communication failure occurring between clients and their professional advisors.

Question 9: What proportion of clients use their own resources to monitor and control construction time, cost and quality? (Answer choice =all/most/some/none)

For the purposes of this question, ‘control’ refers to the effective *management* of project time, cost and quality factors. From Table 6 it is clear that consultants and contractors hold a pessimistic view of clients’ capacity to monitor and control the TCQ performance of projects. The majority of clients (80%), however, believe that they have the resources available in order to adequately monitor and control project cost. It should be incumbent upon consultants to ensure that the accuracy and reliability of their clients’ cost monitoring and control resources at least matches their own.

Table 5: Perceived extent to which clients always know their requirements at the outset of the project

Client requirement	% of respondent groups						
	All	Clients	Architects	Quantity surveyors	Engineers	Project managers	Contractors
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Budget limit	58	80	35	70	67	60	44
Functionality of building	29	60	26	27	23	33	25
Time schedules	35	40	39	40	17	52	29
Quality requirements	23	50	18	20	17	28	21
Procurement method	10	30	0	13	10	4	13
Required return on investment	58	70	52	60	66	58	48

Table 6: Perceptions of whether all or most clients use their own resources to monitor and control construction time, cost and quality

Project parameter	% of respondents					
	Clients	Architects	Quantity Surveyors	Engineers	Project managers	Contractors
	(%)	(%)	(%)	(%)	(%)	(%)
Time	40	30	37	13	20	21
Cost	80	35	43	23	33	50
Quality	40	9	37	10	20	29

Table 7: Perceptions about whether client objectives with respect to time, cost and quality (as laid down in the brief) are always achieved on building projects (C = Conventional; D = Design and Build; M = Management oriented)

Project parameter	% of respondent groups																	
	Clients			Architects			Quantity surveyors			Engineers			Project Managers			Contractors		
	C	D	M	C	D	M	C	D	M	C	D	M	C	D	M	C	D	M
Time	22	40	0	21	13	31	24	50	35	7	17	4	46	52	73	18	41	47
Cost	33	40	20	22	27	27	25	32	8	4	29	4	46	52	59	10	59	41
Quality	11	20	0	32	14	27	50	5	8	25	13	13	64	38	62	43	35	35

Table 8: Perceptions about whether clients are satisfied with the time, cost and quality management of their building projects using the listed procurement systems (C = Conventional; D = Design and Build; M = Management oriented)

Project parameter	% of respondent groups																	
	Clients			Architects			Quantity surveyors			Engineers			Project Managers			Contractors		
	C	D	M	C	D	M	C	D	M	C	D	M	C	D	M	C	D	M
Time	100	100	100	91	73	80	41	95	91	97	81	92	81	90	86	75	93	94
Cost	78	60	60	96	80	80	62	74	74	93	69	88	81	84	91	75	80	94
Quality	67	40	40	96	47	87	77	42	91	93	50	70	96	79	91	80	67	81

Question 10: To what extent are clients' objectives with respect to time, cost and quality (as laid down in the brief) achieved on building projects? (Answer choice: always/sometimes/never)

Project managers and contractors are the only respondent groups to exhibit at least one majority positive response in each of their procurement system/TCQ matrices. The majority of project managers believe that client time, cost and quality objectives are always achieved under management-oriented procurement systems. A smaller majority believe that time and cost objectives (but not quality) are always achieved under design-build systems, while a larger majority believe that only quality objectives are always achieved under conventional procurement systems. It seems likely that the project managers' responses are conditioned by the role they see themselves playing in achieving client TCQ objectives. Contractor respondents are most confident about their ability to always meet client cost objectives under design-build procurement systems; which might be expected, given the nature of these systems, but they are pessimistic in every other respect for all procurement systems.

Quantity surveyor respondents are evenly split about whether design-build systems can always deliver client time objectives;

and are similarly split about whether conventional systems can always achieve client quality objectives. All other respondent groups are generally pessimistic about the capacity of any procurement system to always achieve any of the client's TCQ objectives.

Question 11: In general, how satisfied are clients with the time, cost and quality management of their projects under the listed procurement systems? (Answer choice: satisfied/dissatisfied)

According to the client respondents, the conventional systems of building procurement yield the greatest level of client satisfaction with respect to time, cost and quality management on building projects. Clients appear to be indifferent between design and build and management-orientated systems. Within the client group responses relating to the conventional system, it is noteworthy that satisfaction with time management ranks the highest, followed by cost management. Indeed, clients appear dissatisfied with quality management under design and build and management-orientated systems.

Other respondent groups generally rate client satisfaction with time, cost and quality management on building projects as being higher (under all three procurement systems) than do the client respondents. Two points are noteworthy. The first point relates to quality management, where architects,

quantity surveyors and engineers point to disturbing levels of client satisfaction in this regard. Clearly room for improvement exists on the part of the procurement team. The second point refers to the response of quantity surveyors regarding cost management under conventional procurement systems. Only 62% of quantity surveyors claim that clients are always satisfied in this regard—*the very function this group of professional consultants is charged with managing.*

CONCLUSIONS

This paper has reported on the findings of a South African national questionnaire survey of the opinions project team participants hold about the relationship between time, cost and quality management and the attainment of client objectives.

Clients', contractors' and consultants' opinions with respect to client expectations of time, cost and quality at the outset of the project are not uniform. Clients believe their time, cost and quality expectations to be realistic, whereas contractors and consultants do not believe that this is generally so. Clients rate project quality as more important than project time performance, whereas contractors and consultants believe that clients actually hold a converse view.

Contractors and clients place great confidence in the time performance of design and build procurement systems but have slightly less confidence in the conventional and management-oriented procurement systems. Lower levels of confidence were evidenced with respect to the cost performance of projects under all the various procurement systems.

Clients believe that variations only sometimes occur after the start of the project. There is a large discrepancy between the perceptions of clients and other members of the project procurement team about what constitutes a variation to the original brief. All members of the project procurement team showed little faith in the clients' ability to know exactly what they wanted at the outset of the project.

Clients, contractors and building professionals believe that the choice of building procurement system has little influence on the level of subsequent cost variations to the contract. Clients believe that they have the resources to monitor and control project

cost. Contractors and building professionals did not believe that this is so.

Client induced changes are seen by contractors and building professionals to contribute the most to project time over-runs. Quantity surveyors see the potential for effective time management increasing in the construction phase of the project delivery process, whereas project managers believe that the briefing stage offers the highest potential for the effective management of time.

The conventional systems of building procurement yield the greatest level of client satisfaction with respect to time, cost and quality management on building projects. High levels of satisfaction were noted for time management. Clients are more likely to be dissatisfied with project quality management under design and build and management-orientated procurement systems.

The purpose of the research was to explore the proposition that a recognition of the 'human' factor, i.e., perceptions within the project team of the management of time, cost and quality, would assist attempts to address the perceived shortcomings of TCO management. The findings of this survey indicate that misperceptions do exist among project team members regarding the time, cost and quality management associated with building projects and potentially have an impact on the ability of the project team to achieve client objectives. While the findings of the research do not warrant any change in practice at this stage, the research itself has aided in gaining a richer understanding of the complexities of 'human' issues inherent in the management of time, cost and quality. More importantly, it points the way forward for further research into the 'human' aspect of how project teams can be more effectively managed in order to achieve client objectives, thereby providing a catalyst for change in practice.

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