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Modeling the Design Team as a Temporary Management Structure: Reality versus Theory

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ABSTRACT

The focus of the cost management literature is almost exclusively on technical issues, with scant attention to its social, political and organisational dimensions. In this paper the authors document research examining the design team as a temporary management structure, with emphasis on the efficacy of the cost management system as a vehicle for attaining client objectives with respect to time, cost and quality. Soft systems methodology is used to explore the perceptions of stakeholders to the cost management system, thus developing conceptual models of the theory and practice of cost management. Significant differences were found to exist between the perceptions of individual stakeholders concerning design team participants, participants' roles, and the very purpose of the cost management system. Recommendations are made for structural, attitudinal and procedural changes to the cost management system in order to facilitate its effective functioning in the achievement of the client's needs and objectives.

Keywords: Cost planning, cost management, design team, temporary management structure, systems thinking, South Africa

INTRODUCTION

Participants to construction projects are faced with sets of interacting problems, ranging from the technical and organisational to the social and political (Flanagan and Tate, 1997). These problems all embrace concerns about the environment within which they function, the framework of society, the roles of the key players, and the motivation of the individuals involved (Flood and Jackson, 1991). It is in this environment that the quantity surveyor, as a professional consultant in the construction industry, is expected to fulfil a competent cost management role for the design team, and more specifically, for the client.

The procurement process associated with construction projects is difficult from a management point of view. The fragmented

nature of the contracting industry, particularly the traditional separation of design and construction, the uniqueness of construction projects and the temporary nature of project organisations places great dependence on the project team in setting up the building process and bringing the project to a successful completion. Once client objectives have been established, a fundamental aspect of the procurement process that requires early attention is the selection of the most appropriate organisational structure (procurement system) for the design and construction of the project (Masterman, 1992). Franks (1990) describes 'the amalgam of activities undertaken by a client to obtain a new building' as a building procurement system.

The various procurement systems may be grouped together into three generic forms, namely: conventional (conventional, 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). Bowen *et al.* (1999), in examining client briefing processes and procurement method selection in South Africa, reported that clients and their professional advisors overwhelmingly favour the traditional forms of procurement; most notably the conventional method. Their research also established that, whilst the majority of clients require assistance in procurement method selection, few design team members are *au fait* with the characteristics associated with different procurement systems and little attempt is made to match procurement system attributes to client needs. One of the most important functions of the design team within the context of its temporary management structure is the provision of effective cost management (Bowen and Edwards, 1998).

Hall (1998) argued that research undertaken in the field of cost planning and control has tended to focus on the technical aspects of the process of cost planning and control.

Furthermore, that there is little evidence in the published literature of a concern for the organisational, social and political problems inherent in the process of cost planning and control and their impact on the ability of the quantity surveyor and the design team to meet the client's needs and objectives. In this context the design team is seen as a temporary management structure in terms of which internal and external stakeholders interact in an effort to satisfy the needs of the client.

A failing inherent in the documented research aimed at describing or improving the cost management system is the failure on the part of researchers to acknowledge the human aspect in management, let alone the application of a qualitative research methodology to the process of cost planning and control. Loosemore (1994) argued that the human element in any management situation is particularly important in dealing with unexpected problems since it is the interaction between the participants to the situation which must ultimately resolve any problems that arise. It is argued by Seymour and Rooke (1995) that the traditional approaches to cost planning and control research have resulted in a disparity between the world that the design team functions in and the idealized version of it that has been provided by traditional scientific approaches to research. It is further contended by Seymour and Rooke (1995) that, in attempting to improve the design team's ability to achieve the client's needs and objectives, it is this informal knowledge of the human element inherent in the design team that should be the focus of future research. Within this context the management of the human element in delivering the clients' needs and objectives becomes vital and failure to take cognisance of this factor in the design team may result in the team's inability to achieve the client's objectives.

Hancock *et al.* (1996) argue that the overall success of a construction project is to some extent determined by the degree to which the human element is managed. It is further argued by Marsden (1996) that the provision of value for money to the client can only be attained via trust, commitment, honest interaction and high quality communication between the client, the design team and all other parties involved on the project. Within this context the management of the human element is vital and failure to take cognisance of this factor in the design team may result in the team's inability to achieve the client's objectives. It is proposed that a reason for this

failure is that the research undertaken into the cost management system has failed to focus on the humanistic aspects inherent in the system. Little or no qualitative research has been undertaken into the inter-relationships between the members of the design team despite calls from a number of researchers for a 'change in thinking' and new perspectives on the cost management system. Hence, there is a need for qualitative research to be conducted into the humanistic aspects of the cost management system. This paper documents the results of a qualitative study that made use of soft systems methodology to investigate the inter-relationships between the members of the design team within a temporary management structure. In achieving this objective, a constructivist methodology is employed. 'Constructivism' is founded on the basic principle that reality is a socially-constructed phenomenon (Robson, 2002 *citing* Guba and Lincoln, 1994). Hence, in this study the researchers attempted to gain an understanding (from multiple perspectives) of the 'reality' of perceptions of the cost management system. This 'reality' was achieved *via* the use of interviews and the active participation of the research participants in constructing this 'reality' in the mind of the researchers.

SOFT SYSTEMS METHODOLOGY (SSM)

Soft Systems Methodology (SSM) was developed by Checkland (1981) for utilisation where problem situations are ill-structured and no clear view exists as to what action should be taken to overcome the difficulties being experienced. It evolved as a result of the criticisms levelled at the earlier 'hard systems' approaches and their inability to explain human behaviour within a system (Gharajedaghi, 1985). SSM may be seen as a problem-solving approach that was developed for the purposes of gaining understanding about systems that involve activities undertaken by humans. Checkland (1981:191) defines SSM as a '*strategic framework for guiding intervention in real world situations and as a general problem-solving approach appropriate to human activity systems*'. In essence, SSM is an organised way of exploring problem situations in that it provides an organised set of principles which guide action in trying to 'manage' real-world problem situations (Checkland and Scholes, 1990). SSM has four key features that need to be considered. The first is that it is a continuous learning system about the perceptions of the key stakeholders; secondly, cultural feasibility dominates the identification of organisational

and/or social constraints in the 'real world'; thirdly, it encourages the participation of those involved in order to draw on the widest variety of perceptions about the situation; and lastly, it distinguishes between 'real world' thinking and ideal systems thinking (Flood and Jackson, 1991).

There are seven stages that comprise SSM. Each of these stages will be discussed in terms of its application to the cost management system and, more specifically, the identification of the inter-relationships between members of the design team and the environment within which they function.

SSM AND COST MANAGEMENT SYSTEMS

The specific objective of the research was to establish and examine, from a humanistic perspective, the perceptions and inter-relationships between the key participants to the cost management system and their resultant impact on the ability of the design team, and more specifically the quantity surveyor, to achieve the client's needs and objectives.

Results

Stages 1 and 2

Stages 1 and 2 of the research were concerned with the development of a verbal 'rich picture' of the management of the design team. This rich picture is aimed at representing pictorially all the relevant information and relationships in the situation under investigation (Patching, 1990). Pilot interviews were undertaken with three architectural practices, three quantity surveying practices, three client organisations and three contracting organisations who are actively involved in the construction industry in South Africa. The interviewees were asked to comment on the role of the individual members of the design team and on their perceptions as to the factors affecting the team's ability to meet the client's needs. Interestingly, the quantity surveyors collectively as a group commented that the quantity surveyor, client, architect and engineer are all 'committed to delivering the project within budget'. In contrast, the architectural group argued that 'the engineer is not a part of the design team in terms of meeting the client's needs'. Interestingly, the client group indicated that one of the largest contributing factors for the design team's inability to meet their needs is the 'attitude of the quantity surveyor in terms of having no direct risks associated with the project'. It is also noteworthy that the

contractor group indicated that 'valuable cost related information can be provided by the contractor during the design stage' and that this is one of the major reasons for design team's inability to meet the client's needs.

As a result of the pilot interviews, a provisional system boundary was drawn around the quantity surveyor, architect, client and engineer as within the traditional procurement system they comprise what is known as the 'design team'.

Stage 3

In this stage, 'root definitions' were constructed for the relevant human activity systems identified in Stages 1 and 2. The root definition is intended to encompass the main properties of the system under examination and is defined in terms of the CATWOE mnemonic, where: C = customer (people affected by the system); A = actor (people participating in the system); T = transformation (the transformation carried out by the system); W = Weltanschauung (worldview); O = owner (the person who could stop the activity of the system); E = environment (the wider system within which the system being reviewed falls).

During this stage a root definition (RD) for each stakeholder to the cost management system is formulated. Following the compilation of the RD's for each of the stakeholders the analyst draws all viewpoints together and formulates a RD for the overall system. Hence, the RD for the overall cost management system was identified as being: *"The cost management process is a client-owned system, staffed by professionals (architects, quantity surveyors, engineers and clients) which plans and organises the delivery of a building to the client"*.

In other words, the system manages the delivery of the client's needs and objectives i.e., time, cost and quality, in terms of facilitating design, maintaining the cost budget within the time constraints allowed, and operates according to the principles laid down by the professional institutions, the national building regulations and the local authority planning requirements.

Stage 4

Conceptual models for each of the stakeholders were developed on the basis of each RD during Stage 4. The purpose of the conceptual model is to clearly set out the task defined in the RD. Based on the conceptual model developed for each of the stakeholders, the analyst is able to develop an overall

conceptual model that encompasses all stakeholders 'worldviews' of the cost management system. For the sake of brevity, only the overall conceptual model is

documented in the paper. The overall conceptual model developed for the Root Definition stated above is provided in Fig. 1.

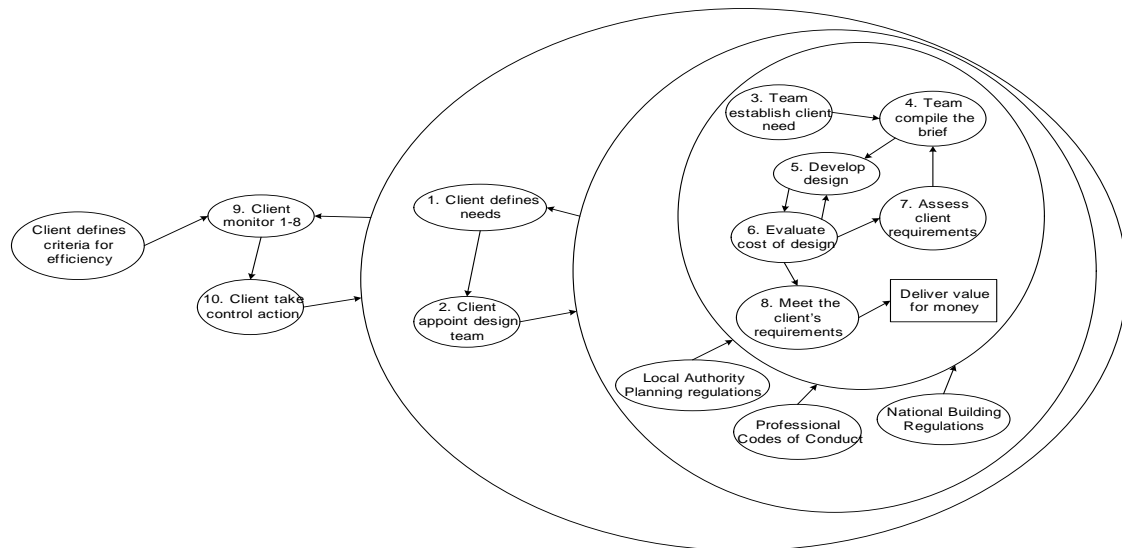


Figure1 Initial conceptual model for the cost management system

The activities needed to achieve the overall RD (the cost management process is a client-owned system, staffed by architects, quantity surveyors, engineers and clients, which plans and organises the delivery of a building to the client) as depicted in Fig.1 would be: client defines needs; client appoints the professional team; the professional team determines the client's needs; the team develops the brief; the team prepares the design and evaluates the cost, time and quality aspects of the design proposal; the team either complies with the client's requirements in terms of time, cost and quality, or the design team develop design further; the client monitors and controls the effectiveness of the system in achieving value for money in terms of balancing time, cost and quality.

Stage 5

Stage 5 of the SSM process requires the comparison of the stakeholder conceptual models and the overall conceptual model developed in Stage 4 with what is exists in reality. The purpose of this comparison is to identify potential problem areas within the cost management system. This exploration involved further discussions and interviews with participants to the problem area and observations of the problem situation itself in order to establish if the activities represented in the models exist in reality. Participants were

leading practitioners in each respondent group identified by the initial root definition, namely: architects, clients, quantity surveyors and engineers. Each of these participants was asked to comment on any other potential stakeholders to the cost management system, where a stakeholder is defined as any person who 'has an affect on' or 'is affected by' the system under investigation (Patching, 1990). As a result further participants to the cost management system were identified, namely: contractors, town planners, land surveyors and project managers.

Client discussions - The discussions held with client organisations active within the construction industry revealed that they perceive the cost management system as a service provided by the design team, namely: the client, architect, quantity surveyor, engineer and interestingly the contractor, that entails a number of activities for example: cost control, cost budgeting and cost assessment of the project i.e., it is a cost management service that is provided by the design team. This is in contrast to what is suggested in the literature on the theory of cost planning and control which argues that the purpose of the cost management system is, firstly, to provide the client with value for money, secondly, to achieve a balance of expenditure between the various parts of the building and, lastly, to keep expenditure within the amount allowed

by the client (Flanagan and Tate, 1997). Moreover, in reality, clients perceive the contractor to be a part of the design team, whereas in theory they are excluded from this role in the design phase of traditional project procurement. Furthermore, the clients interviewed expressed dissatisfaction with the apparent inability of the design team to provide accurate estimates of the cost of building and their lack of appreciation for the risk and uncertainty involved in building work (see Pearl *et al.*, 2003 and Bowen, 1993).

Architect discussions - The discussions held with architects highlighted that they perceive cost management as a system that provides the client with a financially viable property investment. This is in contrast to what is documented in theory (Bowen, 1993). Viability studies were very low down on the list of priorities, which from the architect's perspective would view the cost management system as facilitating the design process and not ensuring the client of a financially viable property investment. Once again, as with the clients themselves, architects believe that the contractor is a part of the design team and has a valuable role to play in facilitating the design team's ability to meet the client's needs and objectives. The architects interviewed did, however, criticise the cost management system for 'stemming' enthusiastic design philosophy and believed that the main reason for this was primarily due to the quantity surveyor's failure to understand the purpose of the cost management system. Moreover, that the reason for this inability to service the needs of the architect was due to the quantity surveyor not understanding the client's needs and objectives, firstly, in terms of the information contained in the brief; secondly, in terms of balancing time, cost and quality; and thirdly, in terms of the architect's need meet the client's time, cost and quality requirements in their design solutions. Bowen *et al.* (1999) found evidence of design team members displaying little effort at embracing the building objectives of the client. Clearly, this perception held by the architect, of the quantity surveyor only managing to 'stem' enthusiastic design philosophy, can create inter-personal conflict within the design team as to the role and purpose of the quantity surveyor within the design team, and more specifically, the cost management system.

Quantity surveyor discussions - The discussions held with the quantity surveyors highlighted that they perceive the cost management system to be a system that provides the professional support needed by

the client in order to provide the client with a financially viable property investment in terms of achieving a balance between time, cost and quality. Once again, as with the discussions held with the clients and the architects, the environment identified in which the cost management system operates was seen to be the same. Interestingly, the quantity surveyors interviewed perceive themselves as being the principal agent on the project and, in many ways, resent the traditional role played by the architect as principal agent. This perception of themselves has the potential to exacerbate inter-personal conflict between the architect and the quantity surveyor in that they both believe themselves to be managing the design team and the delivery of the client's needs and objectives in terms of time, cost and quality. The quantity surveyors interviewed also believed that the quantity surveyor is appointed too late in the project to provide an effective cost management service for the client and is therefore unable to ensure the financial viability of the property investment. This further inhibits their ability to meet the client's needs and objectives in terms of time, cost and quality. One comment that arose out of the discussions was the general perception among quantity surveyors that clients tend to set unrealistic budgets. Research has indicated that clients are not always knowledgeable with regard to desired goals in terms of budget limits, building functionality and desired rate of return (Bowen *et al.*, 1999).

Engineer discussions - The discussions held with the engineers revealed that they perceive the cost management system purely as a cost control system, exactly in line with what is documented in the literature. The engineers interviewed felt that quantity surveyors and, more specifically, the cost management system fails to take into account the engineering aspects of any construction project. Furthermore, they believe that there is a general lack of awareness on the part of quantity surveyors as to the importance of cost planning and control in the design team and in terms of achieving the client's needs and objectives in terms of time, cost and quality. Another interesting factor that arose out of the discussions with the engineers was that they perceive the land surveyor and the town planner to be a part of the design team. Moreover, that these professionals have an impact on the cost management system and therefore on the team's ability to achieve the client's needs and objectives and therefore achieve a balance between time, cost and quality. As a result of the engineers identifying

the land surveyor and the town planner as being a part of the team, discussions were held with these two groups to determine their perceptions of the cost management system..

Contractor discussions - The contractors interviewed identified a wish to move away from the traditional manner in which buildings are procured i.e., the traditional building procurement system. They believe that they should be involved in the design process as they have the potential to provide meaningful input to the client in terms of the priceability and buildability of the building. The contractors further criticised the inability of the architect to ensure the efficient running of the project and did not think that the architect should be appointed as the principal agent. They believed that the role of principal agent should be left to the project manager or quantity surveyor. As before, this different perception of the role of the quantity surveyor within the design team and the cost management system, has the potential to create inter-personal conflict between members of the design team in the attainment of the client's needs and objectives in terms of time, cost and quality. Due to the fact that the contractor had identified the project manager as having an impact on the cost management system, further discussions were held with project managers as to their perceptions of the management of the design team and cost management system. The contractors criticised the failure on the part of quantity surveyors to have sufficient understanding/knowledge of the physical construction process that occurs after the acceptance of the tender in the traditional building procurement process. As a result of this lack of understanding, contractors believe that the quantity surveyor is unable to provide an accurate cost estimate of the building for the client and therefore question their ability to accurately meet the client's cost requirement.

Town planner discussions - The town planners interviewed generally did not criticise the cost management system, but did, however, feel that the professional fee structures for services rendered should be altered to reflect the amount of work that is undertaken during the design stages of the project, usually 'on risk' by all the professionals involved in the design team.

Land surveyor discussions - The discussions held with the land surveyors identified that they perceive the cost management system as being a system that provides the client with a financially viable property investment. The land

surveyors criticised the cost management system for being unable to meet the client's requirements, in terms of time, cost and quality, primarily due to the lack of communication between the members of the design team involved on a project. Empirical research supports this contention (Bowen, 1993). Additional reasons cited for the failure of the cost management system to meet the client's needs and objectives were seen to be the existing professional fee structures and the fact that cognisance is not taken by the design team of the elements of risk and uncertainty that are inherent in property investment.

Project manager discussions - The project managers interviewed perceive the cost management system as a rigid process that has developed historically and one which does not allow for the complex nature of the design process and the interactions between members of the design team. In addition, the negative perceptions that exist between the members of the design team of each other's role in the design team and their respective roles in the delivery of the client's needs and objectives in terms of time, cost and quality (role ambiguity – see Bowen *et al.*, 1999), severely inhibits the team's ability to meet the client's needs and objectives. The cost management system is, however, seen as being an essential service that is provided by the design team to the client to ensure the financial viability of the project. Furthermore, the project managers argued for the early appointment of the quantity surveyor on the project, the removal of trade bills of quantities, and the removal of the use of the traditional building procurement system in the construction industry.

This phase of the research project highlighted the increased number of participants to the cost management system and the complexity of the environment in which these participants are expected to achieve the client's needs and objectives. This facilitated the development of a revised stakeholder root definition's and subsequently the overall root definition for the cost management system. Hence, the RD for the cost management system in the 'real world' is:

A client-owned system, staffed by a team of professionals (client, architect, quantity surveyor, engineer, contractor, land surveyor, town planner and project manager) which plans, organises, manages and delivers a financially viable property investment to the client. The system manages the delivery of a cost

management service to the client, architect and engineer and operates within an environment governed by uncertainty and change.

Once again individual stakeholder conceptual models were constructed from the root definitions and an overall conceptual model for the cost management system was developed. The overall conceptual model for the cost management system is depicted in Figure 2.

The activities contained in this conceptual model of the 'real world' would be: clients define their needs in terms of this project; client appoints the design team who are to manage and deliver these needs; the design team must clearly identify and establish the client's needs; the architect and the engineer develop design alternatives; the quantity surveyor determines the cost of the design proposal; the quantity surveyor and the client determine the expected rate of return on the project; the architect and engineer further develop the detail design; the quantity surveyor manages the cost of the design; the design team organise and manage the project and, lastly, the design team deliver a cost management service and, ultimately, a financially viable property investment.

The development of the above conceptual model of the cost management system allows for the real world/systems world comparison and the identification of potential changes to the cost management system.

Stages 6 and 7

Stage 6 of the SSM process is aimed at identifying and deciding on those changes that may be made to the cost management system in order to facilitate its effective functioning in the achievement of the client's needs and objectives. In terms of the investigation of the cost management system, as depicted in Figs. 1 and 2, respectively, and an analysis of the conceptual models, the following implementable changes were identified.

Attitudinal changes - These changes pertain to peoples' perceptions of the cost management system and, therefore, facilitate the introduction of structural and procedural changes to that system. The attitudinal changes identified by the analyst via the application of SSM to the cost management system are

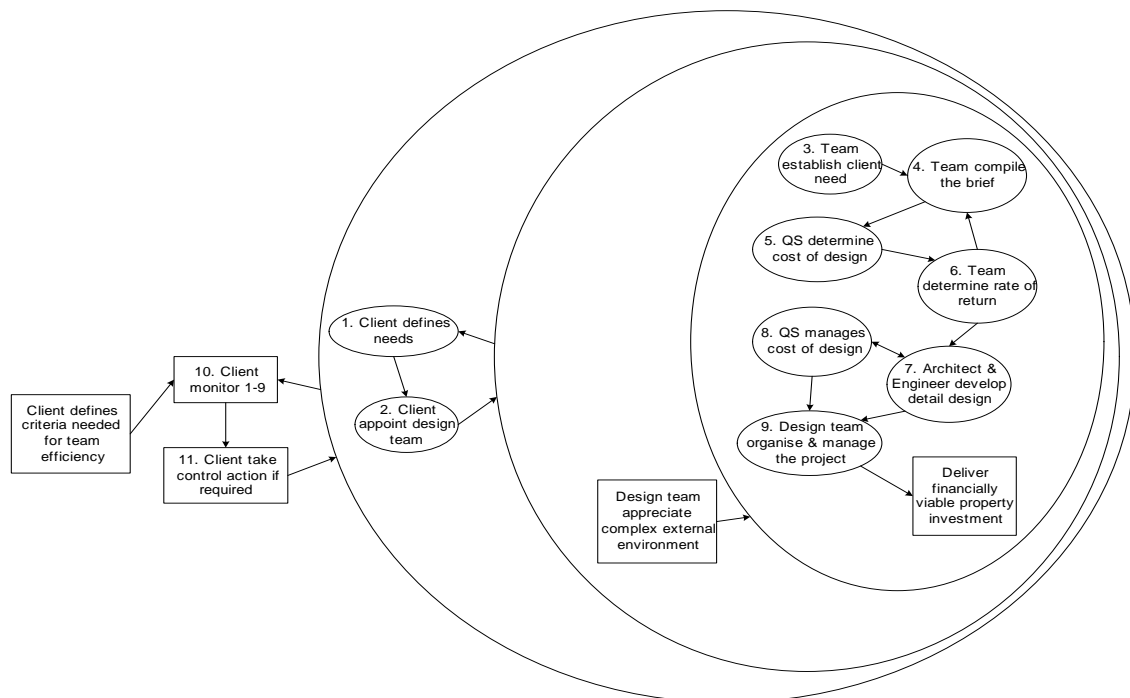


Figure 2 Conceptual model for the cost management system in the 'real world'

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Attitudinal changes - These changes pertain to peoples' perceptions of the cost management system and, therefore, facilitate the introduction of structural and procedural changes to that system. The attitudinal changes identified by the analyst via the application of SSM to the cost management system are

- greater clarity is required among members of the design team with respect to the fundamental purpose of the cost management system.
- there is a need for increased understanding between members of the design team with respect to what services the cost management system can provide to the client and the design team in meeting the client's needs and objectives in terms of time, cost and quality.

- recognition is needed in the industry at large as to who is involved i.e., has a 'stake' in the delivery of the cost management system. Those identified by the interview process were: architects, clients, contractors, engineers, land surveyors, project managers, quantity surveyors and town planners.
- greater understanding is required as to the role and purpose of the participants in the cost management system and their perceptions of the process itself. Moreover, clarity with respect to the role of the cost management system in the construction industry is required.
- there is a need for greater understanding with respect to the needs and objectives of the clients of the construction industry and a realisation that meeting those needs and objectives is the *raison d'être* of the design team.
- there is a need for increased understanding of the role of the engineering aspects in the design and the impact that they have on meeting the client's needs and objectives in terms of time, quality and cost.

Structural changes - Structural changes relate to the tasks involved in, and the role responsibilities of, the participants to the cost management system. Those structural changes identified are

- identification of all participants to the design team is required at the outset of the project. Those identified are the: client, architect, quantity surveyor, project manager, engineer, contractor, land surveyor and town planner.
- all participants to the design team must be appointed at the outset of the project i.e., inception.
- the roles and responsibilities of all participants to the cost management system need to be identified and stated at the outset of the project.
- management structures indicating lines of communication, roles and responsibilities need to be defined.

Procedural changes - These changes relate to the process and work activities involved in the cost management system. The procedural changes identified are

- all the participants to the design team must be appointed and actively

- involved in the project from the inception stage.
- the client must appoint one clearly defined 'team leader', who is then responsible for the management of the design team.
 - the professional fee scales must be changed to reflect the amount of work that is being undertaken by the design team prior to the physical construction process.

CONCLUSIONS

At this point the research has yielded a list of culturally feasible and systemically viable changes. These changes are related to the intrinsic sociological, behavioural and attitudinal aspects of the cost management system i.e., they are 'soft' issues. Soft systems methodology has served to provide insight into those issues inherent in the construction industry as a whole in South Africa, and more specifically, the process of cost planning and control. The research documented in this paper has served to emphasise the importance of an understanding of the socio-cultural and socio-political factors inherent in the design team as a temporary management structure. Moreover, it has forced a recognition of the conflict that may arise within the design team as a result of differing perceptions between participants to the process of cost planning and control.

Having established that in practice these 'human' issues do have an impact on the overall cost management system, it was unclear as to how these desired changes would be implemented in practice. More specifically, it was unclear as to what influence these changes would have on the cost management system, the role of the quantity surveyor, and the ability of the design team to meet the client's needs and objectives in terms of time, cost and quality. Consequently, future research would need to test the potential impact the introduction of these 'changes' would have on the cost management system.

It can be concluded that the systemic approach, although not the panacea for all the industry's problems, does provide meaningful insight into the sociological complexities inherent in the design team as a temporary management structure.

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