

*Tracing client interests in the course of a project: why are some client interests incorporated whereas others are not?*

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# TRACING CLIENT INTERESTS IN THE COURSE OF THE PROJECT: WHY ARE SOME CLIENT INTERESTS INCORPORATED WHEREAS OTHERS ARE NOT?

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Many construction professionals and policy-makers would agree that client expectations should be accommodated during a building project. However, this aspiration is not easy to deal with as there may be conflicting interests within a client organization and these may change over time in the course of a project. This research asks why some client interests, and not others, are incorporated into the development of a building project. Actor-Network Theory (ANT) is used to study a single building project on a University campus. The building project is analysed as a number of discussions and negotiations, in which actors persuade each other to choose one solution over another. The analysis traces dynamic client engagement in decision-making processes as available options became increasingly constrained. However, this relative loss of control was countered by clients who continued the control over the timing of participants' involvement, and thus the way to impose their interests even at the later stage of the project.

Keywords: client organization, actor-network theory, decision-making process, stakeholders.

## INTRODUCTION

Policy-makers, practitioners and academics have often encouraged the construction sector to shift its attention away from simple product delivery towards satisfying more general client needs. In such a client-focused climate, the accommodation of client expectations throughout projects emerges as a significant topic of study. This paper explores the way different and changing client expectations are accommodated in the course of a project. A basic assumption of this paper is that a building develops through successive discussions and negotiations between a number of actors including clients, project team members and material objects. Thus, the paper explores client engagement among the range of actors without privileging clients and their expectations. The analysis provides insights into the way clients impose their expectations over others.

## LITERATURE REVIEW

Several construction management researchers have drawn attention to the complex nature of construction clients. For example, Cherns and Bryant (1984) note that there may be cooperation and conflict between individuals inside a client organization (i.e. clients) and that their project goals may change depending on project situations. A

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number of authors in the construction field acknowledge the diversity of client needs. For example, Chinyio *et al.*'s (1998) work, on how to best support clients in their choice of procurement strategy, highlights the diversity of client needs. Their focus on a single decision point leads them to treat these needs as fixed and stable. In contrast, Kamara *et al.*'s (2000) study of the briefing process traces the ongoing clarification and specification of client requirements over time. However, their analysis offers a linear model with little attention to unexpected changes in client requirements. Other authors have explored client-consultant interactions. For example, Green and Simister (1998) and Luck (2007) documented the ongoing emergence and change of client expectations. Clients are influenced by other clients or architects during interactions. Various clients' perspectives are clarified, and the relationships with consultants or their skills influence changes in client expectations. These studies highlight how client expectations emerge and change under the influence of specific people. However, their focus is limited to client-consultant interactions during briefing and design. This paper builds on these observations but expands on them by exploring the way that client interactions, with each other and with members of the project team and external stakeholders, may shape the impact of clients on a building project.

The focus on client engagement in the course of a project builds on a number of studies, each of which focuses on different types of processes. Connaughton (1993) explored how clients change their organizational goals mid-project to better reflect their business activities. He illustrated the impact of client engagement on changing project decisions. However, the author did not specifically account for the impact of project team members' perspectives which are different from those of clients. Winch, Usmani and Edkins (1998) studied the project process as an information process that takes into account the transformational influence of decision points on client goals and expectations as the process unfolds. However, both of the above studies focus on client organizations' rational procedures and did not involve observations of the individual behaviours of client personnel. In contrast, Hedgren and Stehn (2013) explored clients' dynamic engagement in successive sub-processes of decision-making, which includes an information process of the kind discussed by Winch, Usmani and Edkins. Hedgren and Stehn assessed the types of client engagement in each sub-process: rational, judgemental or managing multiple meanings. They took into account both organizational rational procedures and individual behaviours of clients, which were iteratively observed during a decision-making process. They aimed to trace dynamic client engagement. However, they did not study clients' specific goals and requirements. These studies highlight aspects of dynamic client engagement, but none traces specific client organizational and individual requirements being influenced by project team members during interactions, due to their exclusive focus on particular types of process.

Interactions are often studied with a particular focus on participants who have different perspectives, regardless of the types of process. For example, Newcombe (2003) proposed mapping out stakeholders who had different expectations and were likely to influence project decisions. The aim of his study was to enable project managers to predict and avoid potential conflicts. In contrast, Liu and Walker (1998) characterized project participants' interactions more positively, as a process by which they mutually understood each other's different perspectives. They argued that these participants continuously adapted project goals to reflect their respective expectations. Notably, studies by Ivory (2004) and Bresnen (1991) deal with the ways that

participants resolve conflicts and adapt their respective expectations. They studied participants' persuasion and negotiation processes at design and construction stages.

Such studies highlight how clients and project team members influence each other's expectations through interactions. Also, these interactions result in the accommodation of participants' expectations in project decisions. Building on these studies, this paper views a building project as a series of negotiations in which project participants with different expectations persuade with each other, as a result of which some of their expectations are accommodated. The incorporation of different and changing client expectations is analysed within this framework.

## **THEORETICAL FRAMEWORK**

This study adopts actor-network theory (ANT) to explore the incorporation of various and often shifting client expectations into the development of the building project process. The fundamental assumption of this approach is that a wide range of social, scientific and technological factors are involved in the development of scientific claims and technological artefacts (Law 2012: 107). Proponents of ANT often argue that it is not a theory; instead ANT offers a method to follow a number of actors who successively interact with each other during the development of an artefact or claim. A distinct feature of ANT is its treatment of material objects as actors in the same way as people.

A number of ANT researchers have studied the development of knowledge or technological artefacts in project contexts. They particularly analyse the way actors attempt to engage and persuade each other (Callon 1986; Law 2012). More specifically, actors who support one direction of the development of an artefact or a claim and those who resist that particular direction negotiate or persuade with each other. This paper applies ANT to explore how actors in a building project persuade each other to choose certain alternatives over others, and how differing and often shifting actor expectations were incorporated.

In particular, three analytic concepts 'problematization', 'translation' and 'interest' were used for this analysis. The first concept, problematization, refers to an actor's attempt to resolve a particular issue, and encompasses the network of relevant actors involved in that actor's proposal (independent of whether they agree to participate or not) as well as the interests and tasks that constitute this attempt. In response, the relevant actors may or may not accept the problematization. Any change of a network resulting from its problematization, or the relevant actor's response to it, is referred to as a translation of that network. Finally, the term interest refers to actor expectations, concerns, motivations and goals with respect to a particular issue. Interests are analysed in networks which are formed through problematization; the actors who are involved act, based on these interests ascribed in the problematization or advocate for certain positions on issues in response to the problematization.

Ivory's study (2004) of a social housing project is useful to illustrate the use of these concepts. In his case study, the architects proposed an acrylic wall rendering and a novel curved roof for a residential building project. They then attributed various actor interests in their proposal, or problematization, including their own interests in bolstering the firm's reputation for innovative design, the tenants' interests in the extra space afforded by the proposal, and the housing association's interest in funding the scheme. The architects then attempted to convince the tenants and housing association to adopt the proposal. In response, the tenants supported the architects' proposal by

accepting their assumption that they wanted extra space. In addition, new tenant interest in the aesthetics of the design emerged, which supported the proposed design. However, the housing association preferred a more conventional design based on their interests in ease of maintenance. In the end, based on tenant support, the housing association was compelled to accept the design scheme. This analysis reveals how relevant actor interest emerged and preferences changed in response to the architects' proposal (i.e. translation). In this way, the three ANT concepts allow for the analysis of different and changing interests in both actors' problematizations and other actors' response to them. ANT is applied with a particular focus on actors' interests in this research, which traces the configuration of actors, their proposals and their interests as a network that develops around a particular issue.

There are examples of ANT being applied in construction management research. Among other things, such work has shown how multiple actors, including clients, architects, engineers and contractors as well as architectural plans and engineering drawings are involved in various construction project discussions. For example, Tryggestad *et al.* (2010) studied the way that project decisions successively changed during a design process. While they particularly use ANT to study the roles of material objects as carrying information or translating project goals, they also highlighted the effect of particular decision-making processes on subsequent issues (i.e. knock-on effects). Building on that work, this paper investigates the incorporation of actor interests in decision-making processes about successive issues. The application of ANT provides a way to explore why some actor interests are incorporated whereas others are not, over the course of a project. Besides, the role of material objects is explored in terms of the way they influence the incorporation of client interests.

This research addresses the following questions;

- What are different and changing actor interests in solving a particular issue?
- How are actor interests incorporated into project decisions?
- What impact does client engagement have on the incorporation of client interests?

## **METHODS**

A university campus building project, in which the client organization members were actively engaged in decision-making processes, was selected for an empirical study. The medium scale of this project allowed for the study of various participants' interests in detail across the building process from the initiation to the completion. This building was designed to house facilities for the University's School of Film and Drama (SFD), and as such required the construction of special facilities, including theatre, film and TV production spaces. A project feasibility study was conducted in 2007 and construction was completed in 2011. To maintain confidentiality, the names of the University, the building project and all participants have been changed for this study. The selected building project is referred to as "*the SFD building*" on a fictitious Colmer University campus, set in the UK.

The background of the project helps to explain the clients' level of active engagement. At the time of this project's inception, the University's Estates Department had overseen the construction of several campus buildings, and thus had already developed guidelines for the involvement of University members and for procurement methods. The nature of the building's performance and specialized teaching spaces

called for the SFD's direct involvement on the project team to help shape these facilities to meet its expectations. Consequently, the project team members were motivated to meet the SFD's expectations in a collaborative team environment.

ANT was used to analyse the building project as a number of discussions in which relevant actors negotiated their proposals for different issues, which arose in the course of the project. The interview data was collected in 2013 both to identify issues that are subject to such discussions and the actors involved. To begin, client organization members (i.e. University members) were interviewed, and the names of additional interviewees were identified through these interviews. In addition, each interviewee provided applicable project documents useful to the study. In total, 13 interviews were conducted with project participants and a number of documents were collected from them. Other project participants, such as the BREEAM coordinators and external PM were not interviewed, as discussions or negotiations they were involved overlapped with other participants, or their participation in decision-making processes were limited in terms of their influence on project decisions. Interview data and project documents were analysed to further identify a number of key issues for closer analysis. Then, qualitative analysis software was used to record the coding of the data and to support the identification of the key issues that related to project participant negotiations.

Throughout the coding process, interdependencies between issues were analysed. For example, the SFD chose a ventilation system for the theatres, which influenced the services engineers' calculation of the size of mechanical size. These issues were grouped and coded as a single theme, i.e. "*mechanical space size*". In this way, most of the issues were grouped into four "*topics*", which involved complex processes of the incorporation of actor interests, and thus were suitable for this research analysis. As a result of the data analysis, three groups of issues – building location, space allocation and mechanical space size – were selected as main topics of decision-making processes, which were most frequently discussed by interviewees as well as those rich in project documentation. Also, different and changing actor interests – particularly client interests – were clearly analysed from the available data for these topics.

## **FINDINGS**

The analysis of three topics traced a range of actor interests involved over the course of the project, and explored why some interests were incorporated whereas others were not. The analysis highlighted dynamic decision-making and client engagement processes in the course of the project. It provided insights into how clients impose their interests among the range of actors.

A number of actors and their interests were involved in decision-making processes about three topics. The main clients (i.e. the University members) included: 1. the SFD members (user groups), 2. the Estates Department members, 3. University administrators and 4. the project managers. The project team members included: 1. architects, 2. services engineers, 3. structural engineers, 4. an acoustician, 5. a contractor and 6. a brick supplier. The material objects included: 1. floor plans, 2. an option table, 3. project budgets and 4. services ducts. The range of different and changing actor interests including both clients and project team members were traced. Multiple clients with different interests were involved at different times, and a single actor had different interests depending on particular issues at hand. Also, project team members had interests which often conflicted with client interests. In addition, the

“*interests*” of material objects were also analysed, as they influenced the incorporation of clients and project team members' interests. The analysis resulted in the documentation of the incorporation of selective actor interests into final project decisions.

### **Building location decision**

The first topic, building location, involved a number of different University members (i.e. clients) who successively changed their preferences with respect to the location. The analysis traced how different client interests were raised and impacted on their choice of the building locations.

During the decision-making process, clients were presented with a range of options for building sites and chose from options based on their own preferences. For example, the master-plan architect suggested two possible locations and the University administrators chose one over another. After this initial choice of preferred location, in order to satisfy the local authority's requirement, a public consultation was held for the development of the campus master-plan, in which the preferred location for the SFD building was indicated. During the public consultation, there was opposition to the proposed SFD building site, which was presented as one of the planned future building projects in the campus master-plan. As a result, after the consultation, many of the University members changed their preference to a newly proposed site, which was supported by the Vice Chancellor. However, the Dean of the Faculty still preferred the previously proposed site. In the end, the newly proposed site was chosen. Stated differently, the Vice Chancellor's interest was incorporated, while the Dean of the Faculty's interest was overruled.

In this topic, a number of clients preferred different building sites at different times. They made alliances with each other with respect to their preferred options, resulting in the incorporation of some client interests over others. Apart from clients, other actors were also engaged in decision-making processes; the master-plan architects recommended a particular site as a preferable option. Also, the public consultation led to a change in some of the clients' preference. However, the clients were in charge of choosing from options and thus were able to impose their interests over others.

### **Space allocation**

The second topic, space allocation, involved discussions regarding the size and relative location of a number of spaces within the building footprint. The analysis shows the effect of interdependencies between design features on the incorporation of client interests. More specifically, it shows how decisions regarding the area, location and function of spaces were intertwined such that decisions on the one limited the options for decisions on the others.

During the discussions, actors mobilized different concerns to specify or modify their proposals for specific decisions. For example, the SFD required double-storey performance spaces (three theatres, TV studio and a screening space) on the ground floor of the building. This constrained the accommodation of other functional spaces due to the large size of the performance spaces, which was presented in the architectural floor plans. The architects proposed the single-storey height of Theatre 1 and its relocation to the first floor, based on their interest in making the ground floor more open. The SFD did not prefer this proposal as the School representative was concerned about heat from lights affecting performers in such a low-height theatre. However, this proposal was accepted when the architects proposed locating the

storage space between Theatre 2 and 3, where Theatre 1 used to be. The SFD supported this proposal as it made the storage space larger and the manoeuvre of seating and rostra to Theatre 2 and 3 easy, although this proposal in fact required the SFD's compromise on the height of Theatre 1. As a result, the architects successfully persuaded the SFD to accept their proposal about a single-storey Theatre 1, and thus, the architects' interest was incorporated into the decision.

In this topic, the architects dictated the design of the functional relationships between various spaces, which allowed them to impose their preferences. To persuade the SFD, the architects demonstrated that locating a shared storage space between Theatres 2 and 3, which was supported by the SFD, depended on the decision to reduce the height of Theatre 1, which was not favoured by the SFD. As this example illustrates, the architects' ability to impose their interests depended on arguments regarding the interdependence between their proposals. While the clients' ability to impose their interests through the choice of some proposals over others still remained, the project team members gradually gained more ability to impose their interests in their proposals as interdependencies between issues increased. By doing so, they prioritized client interests in some spaces over those in other spaces. Also, it is noteworthy that architectural floor plans facilitated the SFD's understanding of the interdependence between the sizes of spaces under the footprint restriction.

### **Mechanical space size**

The third topic, mechanical space size, involved successive interdependent issues. The analysis highlights how earlier fixed decisions shaped or limited the availability and appropriateness of subsequent design options.

During the decision-making process, actors sought to change fixed decisions or compromise on their proposals as earlier decisions circumscribed or conflicted with their preferred outcome yet to be determined. For example, the architectural floor plans fixed decisions with respect to locating the mechanical space. The mechanical space was located above the acoustically-sensitive performance spaces, which was not a favourable option according to the acoustician, as the mechanical equipment would potentially transmit noise to these spaces. However, despite the acoustician's proposal to change the location of the boiler room, its location could not be changed, as this decision was made in relation to the location decisions of a number of other spaces within the limited building footprint and size, which was presented by architectural floor plans. As a result, the acoustician compromised on his preference to change the site of the boiler room. In other words, the floor plans "*rejected*" the acoustician's proposal, and thus blocked the incorporation of the acoustician's interest.

In this topic, project documents shaped and limited the incorporation of the SFD's interest in the better sound proof level. Although the SFD was the client, it was not directly involved in the decision-making processes. Instead, the acoustician proposed a solution of changing the location of the boiler room based on assumptions about the SFD's interests in better sound proof levels in the performance spaces. However, this was rejected by the architectural floor plan which fixed the location of the mechanical space and other spaces. Significantly, as the project developed, project documents limited available options or rejected proposals outright by fixing several decisions. This led to compromise with respect to the incorporation of the SFD's interests. The analysis underscores the project team members' agency to propose or modify plans within project constraints. Also, material objects contributed to shaping or limiting project team members' proposals by fixing decisions. Over time, as more project

decisions were made, the relative ability of the clients to influence decisions was constrained, and the ability of the project team members and documents increased.

The analysis of the three topics illustrates how actors imposed their interests over others throughout the design and construction process as the range of options shifted over time. A key development concerned changes in who had the authority to specify the range of available options. Initially, clients shaped the range of options and selected among them. However, later on, project team members specified or modified clients' preferences as options were constrained by the interdependence between issues. As more decisions became fixed and the power of project documents increased, clients and project team members persuaded clients to compromise their interests and to alter existing decisions.

## DISCUSSION AND CONCLUSION

We have explored client engagement within the dynamic networks of a range of actors involved in a building project. We have traced client interests among a range of actor interests without privileging client perspectives. Methodologically, we traced client expectations without pre-determining participants from a client organization. In this regard, the approach is similar to that of Hedgren and Stehn (2013) who attempt to study clients' decision-making processes both as organizational procedure and individual behaviours. We have further analysed specific client expectations around successive issues in the course of the project. Theoretically, the analysis of actor interactions using “*interest*” allowed us to view a building project as the product of a range of actor negotiation and persuasion processes between actors with different interests. As a result, the analysis documented the incorporation of some actor interests over others. We highlighted the shifting ability of clients, project team members and even material objects in imposing their own interests over others. Such dynamic power relations are analysed as a result of actors' negotiation and persuasion processes in terms of whether they successfully imposed their interests over others. This is in contrast to Newcombe (2003), who analysed stakeholders' power relation to predict likely conflicts.

A main finding of this research relates to dynamic client engagement in decision-making processes as available options shifted over time. At the beginning of the project, clients chose their preferred design options based on their interests. However, clients' ability to impose their interests through the choice from options decreased as the project developed; client interests were often ascribed by project team members who became more empowered to impose their interests by specifying proposals. In this way, client interests were analysed even in the absence of clients. This is in contrast to the typical approach of studies of client engagement which mainly focus on clients (Connaughton 1999). Another finding is the role of material objects in relation to the incorporation of actor interests. Documents played a role of facilitating actors' understanding of interdependence between issues, or shaping and rejecting the incorporation of actor interests. This analysis adds to Tryggstad *et al.* (2010) who analysed material objects as carrying information or translating the meaning or goals.

The findings provide a basis to reflect upon clients' relative ability to directly impose their interests by shaping and choosing from options in the project decreased over time. This effect can be related to increasing interdependence between design features and decisions, to the role of material objects in fixing decisions and to the physical absence of clients from decision-making processes. Once interdependencies between issues were established, the project team members gained more ability to persuade the

clients to compromise on some of their preferred solutions. However, it is noteworthy that the interdependence between issues often stemmed from earlier client decisions. For example, the interdependence between the height and location of three theatres was due to building size restrictions. In this case, the size of the building was influenced by the clients' earlier decision regarding building location as the site condition restricted the building footprint. Similarly, some client preferences were constrained by fixed decisions, which led to compromise in the incorporation of client interests. However, it is worth noting that some decisions fixed by project documents, again, often reflected earlier client interests. Client interests were incorporated into the decisions about the locations of a number of required functional spaces, which led to the limited options for the plant space location. As a result, this led to the SFD's compromise on the sound proof level of the performance spaces. Clients' power to impose their interests through the choice from options decreased as the emerging client interests often conflicted with earlier client decisions, which became stabilized as the project developed.

Another factor affecting the observed decline in client engagement is their physical presence during decision making. At the later stage of the project, project team members often advocated for client interests when clients were only indirectly involved. Technical issues involve tables and figures, which represented "*client requirements*". The project team members regarded them as client requirements even though they were often beyond the SFD's understanding. For example, the acoustician set the noise rating level of each performance area to represent the SFD's requirement. However, the SFD did not understand what these figures meant in the reality, and could not clarify their positions during discussions. As the project developed, clients' ability to select options became more constrained, and project team members became more empowered to speak in the name of clients in their proposals.

While direct client engagement declined in the course of the project, clients did not lose all influence; clients' control over the timing of participants' involvement could potentially be used to limit other actors' influence even at the later stage of the project. For some issues, clients made decisions or set policies to support their preferences before other project participants became involved. For example, the SFD drafted a project brief that became the basis for the concept design before the architects were hired. Also, the University established its space management policy before the project began, which limited the SFD and the architects' decisions about the size of spaces. In other cases, clients were able to decide on the timing of additional project participants' involvement. For example, the PM consulted the acoustician at certain moments during the detailed design stage. As a result, the acoustician's proposal to change the location of the boiler room was rejected when he was consulted, as the boiler room location had already been decided and could not be changed when he was involved. Thus, the PM was able to determine the timing of the acoustician's involvement based on whether the clients wanted to reflect acoustic concerns at a particular point in the project. However, the PM's intentional exercise of this strategy was not clearly examined in this project. Clients' control over the timings of participants' involvement is potentially useful in imposing their interests over others even at the later stage of the project.

As a final note, ANT application to a building project process also posed some challenges. While this perspective allowed for the analysis of a range of actor interests in the project, it also tended to blur the analytical distinction between client interests and other actors' interests, and between project team members' own interests and their

projection of those of the clients in their proposals. Also, the post-project study presented disadvantages, particularly in collecting data regarding complex and highly technical issues. Often, project team members did not recall why they chose one design option over another regarding these issues, a factor that was fundamental in analysing their interests. An additional real-time study focused on complex and technical design decision-making processes would provide insight into the dynamic power relations of a number of project team members.

## REFERENCES

- Bresnen, M J (1991) Construction contracting in theory and practice: A case study. *Construction Management and Economics*, **9**, 247-62.
- Callon, M (1986) Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St Brieuc bay. In: Law, J (ed) *Power, action and belief: A new sociology of knowledge*, London: Routledge and Kegan Paul.
- Cherns, A B and Bryant, D T (1984) Studying the client's role in construction management. *Construction Management and Economics*, **2**, 177-84.
- Chinyio, E, Olomolaiye, P, Kometa, S and Harris, F (1998) A needs-based methodology for classifying construction clients and selecting contractors. *Construction Management and Economics*, **16**, 91-8.
- Connaughton, J N (1993) Making and implementing industrial building investment decisions. *Unpublished PhD Thesis*, University of Greenwich.
- Bresnen, M J (1991) Construction contracting in theory and practice: A case study. *Construction Management and Economics*, **9**, 247-62.
- Green, S and Simister, S (1999) Modelling client business processes as an aid to strategic briefing. *Construction Management and Economics*, **17**, 63-76.
- Hedgren, E and Stehn, L (2014) The impact of clients' decision-making on their adoption of industrialized building. *Construction Management and Economics*, **32**, 126-145.
- Ivory, C (2004) Client, user and architect interactions in construction: Implications for analysing innovative outcomes from user-producer interactions in projects. *Technology Analysis and Strategic Management*, **16**, 495-508.
- Kamara, J M, Anumba, C J and Evbuomwan, N F O (2000) Establishing and processing client requirements-a key aspect of concurrent engineering in construction. *Engineering Construction and Architectural Management*, **7**, 15-28.
- Law, J (2012) Technology and heterogeneous engineering: The case of Portuguese expansion. In: Wiebe E, Bijker, T P H, Trevor Pinch (Ed.) *The social construction of technological systems: New directions in the sociology and history of technology, anniversary edition*. Cambridge, MA: MIT Press.
- Liu, A and Walker, A (1998) Evaluation of project outcomes. *Construction Management and Economics*, **16**, 209-19.
- Luck, R (2007) Learning to talk to users in participatory design situations. *Design Studies*, **28**(3), 217-42.
- Newcombe, R (2003) From client to project stakeholders: A stakeholder mapping approach. *Construction Management and Economics*, **21**, 841-8.
- Tryggestad, K, Georg, S and Hernes, T (2010) Constructing buildings and design ambitions. *Construction Management and Economics*, **28**, 695-705.
- Winch, G, Usmani, A and Edkins, A (1998) Towards total project quality: A gap analysis approach. *Construction Management and Economics*, **16**, 193-207.