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CREATING A QUALITY CULTURE
– A Need in the New Millennium

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Quality has become an important subject receiving increasing attention worldwide. The focus on quality is probably the main issue confronting the building industry today and has been in the forefront since the early 1980s. In a building project, quality is viewed by the users/client as the key determinate of the desirability and the success of the project assuming all other things are equal. This paper provides a response to this awareness and seek to eliminate out-of date or narrow views of quality, investigate the problems surrounding the achievement of quality and possible solutions, particularly highlighting the need for a new attitude towards achieving quality in the new millennium.

Projects have now become more complex and the building industry is undergoing rapid changes increasing competitive pressures. Unlike in the past, clients are more concerned about whether they get what they should get. The traditional way of looking at quality is only in relation to the finished product. But now this is changing. In the case of a building project, quality is not judged by looking at the finished product because it has been realized that quality encompasses the entire project rather than just a single element. The entire project in the case of a building comprises several phases, which include inter-alia Briefing, Design, Specifying, Tendering, Construction and Maintenance.

The term 'quality management' has now become popular, in every sphere of activity let alone in the building industry. The underlying principle of this investigation on quality, is that quality can be achieved only if it is managed by the systematic process of control throughout every stage of a building project. If principles of achieving quality are understood and applied by all participants in a project, the end result will be a raising of standards, because repair and rework will not occur. There will be a reduction in cost because wasted resources and time have been avoided. Every participant must play their part in applying the quality principles.

It is a known fact that since the turn of the 20th century, the building industry has experienced a number of shifts in focus in its development such as technological advances in construction materials viz: steel which has led to high-rise construction, and the shift in emphasis to quality. Out of the 20th century paradigm shifts, the issue of quality is probably the most difficult to grasp because it is the least amenable to quantitative methods. Quality weaves its way through the entire life-cycle of a building project from its inception to its demolition. Therefore achieving quality in a building project is a difficult task involving the collective effort all its participants such as the client, architect, contractor, manufacturer and user.

According to author's experience, usually quality is appropriated to the architect. It is not uncommon for the architect to be criticized for not achieving required quality of the building. But it is not just the architect who may be at fault. For example, client may be found lacking in specifying clearly their desires and requirements. Therefore, it is necessary for all the project participants to be aware of how quality can be achieved, what action should be taken and when.

ALTERNATIVE DEFINITIONS OF QUALITY

> *'Quality is like politics, or sex, or religion. It is something everyone understands, and is convinced that he does correctly. Few would like to explain it, and discussions on it are generally short and superficial, with one or other of the participants soon changing the subject through boredom or embarrassment. We all think we understand the subject, and are all convinced that our ways are right'*

The word 'quality' while receiving rather widespread usage, does not have a corresponding universal or widely accepted definition. The lack of an agreed upon definition points out that the nature of the term is largely subjective. Therefore, discussion of the definitional problem is nonetheless essential. Various points of views from which it has been defined are from aesthetic, functional and legal, which are briefly presented in the discussion to follow, to set the context for the analysis of quality.

Traditionally design professional believed that quality is measured by the aesthetic properties of the buildings they design. This traditional definition of quality based on such issues as:

- How well a building blends into its surroundings
- A building's psychological impacts on its inhabitants

- The ability of a landscaping design to match the theme of adjacent structures.
- The use of bold new design concepts that capture peoples' imaginations.

One can see that these aesthetic definitions are largely subjective and therefore, major disagreements arise as to whether quality has been achieved or not. According to Stasiowiski & Burstein (1994) design professionals generally take it upon themselves to define the aesthetic quality of their design. Since objective definitions of aesthetic quality do not exist, it is not considered as a suitable definition of quality and also it is difficult if not impossible to measure quantitatively.

The law defines quality in terms of professional liability, the legal concept that requires all professional such as architects, engineers, quantity surveyors any other professional are subject to professional liability laws. This definition cannot be considered as a suitable definition because not all participants of a project or manufactures of a product are professionals with legal liabilities.

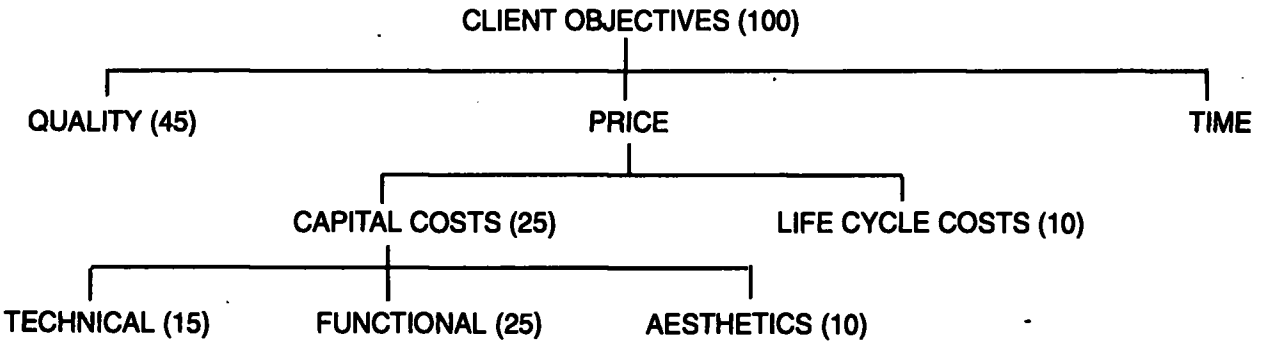
Furthermore, the law does not require professionals to do perfect work, nor does it require them to pay for all the mistakes they make. What the law requires is to provide services that confirm to the standards of the respective profession. So it does not require perfection. It only requires competence.

Quality can also be defined by how closely the building project confirms to its requirements. A high quality building may be described by such terms as:

- Spaces within the building are suitable for its function
- Services provided are adequate
- Easy to maintain
- Energy efficient
- Economical to construct
- Material used are suitable for purpose etc.

Although functional quality is also difficult to measure like the aesthetic and legal quality, it can be considered as a better definition. This is because, most of the attributes stated above such as energy efficiency, economy etc, are quantifiable. Therefore, the problem identified in the definition of quality is between the subjective and objective and the view of the actor being questioned.

Walker (1984) has a scenario in which he has subdivided quality into components namely, technical functional and aesthetic standards. Each component has its own weighting, functional standards being given the highest.



CLIENT OBJECTIVES – WEIGHTING OF FACTORS

Source : Walker, 1984.p69

Various international organizations which are concerned with quality have also based their definitions on functional aspects. For example, American the Society for Quality Control (ASQC) and the International Standards Organization (ISO) definition is :*The totality of factors and characteristics of a product or service that bears on its ability to satisfy given needs'*. American Society of Civil Engineers' (ASCE) definition is :*'Conformance to predetermined requirements'* and the Construction Industry Institute (CII) definition is : *'Conformance to established requirements'*. (ibid, p.37).

One can see that the ASQC/ISO definition is the broadest since the notion of need is a somewhat open ended concept. Thus this definition spans a relatively broad range of domain of acceptability that, depending on one's point of view, can lead to ambiguity in the measurement of quality. This may be suitable for the manufacturing industry.

The ASCE definition narrows the domain of accountability for quality conformance. In this definition, the issue of 'need' is eliminated by replacing it with the word 'requirement'. This cuts off

the potential debate over what constitutes needs and adds weight to the authority for the information specified. In addition, this definition includes the word 'predetermined' which eliminates the consideration of the past or its evaluation. According to this definition, any action to be taken in the design phase by the architect should be based on the information available before the design action. This places on the client the burden of having information relevant to the design to the design when it is needed.

The definition of the CII has the most restrictive terminology. The word 'predetermined' has been replace by information used to define the requirements.

The definition of the ASCE seems to be the middle ground of the three and is probably the most workable for a building project. Also it seems to provide somewhat more latitude to the provider of the service than the CII definition. Therefore, the author feels that the most appropriate definition of quality to be used in the building industry is the definition of the ASCE : 'Conformance to predetermined requirements'.

THE APPLICATION OF THE CONCEPT OF QUALITY TO BUILDING PROJECTS

As discussed earlier, the word quality can have different meanings to different people in particular situations, and is difficult to define. 'Quality' as applicable to building projects is even more difficult to define. Some of the reason for this can be stated as follows:

- Unlike in manufactured products, a building project is always a unique one.
- In a building project, the design and construction does not come under a single and continuous responsibility. In most situations, those who design the building are separate from those who produce it.
- The total responsibility for the creation of a building is divided between many different people and organizations.
- Participants of a building project usually work together only for period of time, and therefore sometimes the meaning of quality for a specific task or stage of the project can easily change over time.

The three main participant of a project namely the client, architect and the contractor may also attribute different meanings to quality. For example, architects and engineers may have their own professional view of quality depending on architectural and engineering tradition. Contractors and suppliers may judge quality based on price of products and components used in a building. So there may be conflicting views on quality among the various participants to a project which will create confusion. Therefore, the meaning of quality has to be agreed upon by all the participants who take part in a project especially:

- By the client who defines his requirements,
- By the architect who understands clients requirements and translates them into a physical reality and finally,
- By the contractor who produces the final output.

PRODUCT, PROJECT AND PROCESS

The simple definition of product, project and process have wide implications in the theoretical underpinnings of the concept of quality. A product is any and all output received by a client or a customer. A project can be defined as a group of tasks performed in a defined time frame in order to meet a specific set of objectives.

A building project has several distinct stages, the two main ones being the Pre construction and Construction stages.

A process can be defined as everything carried out to generate an output including controls such as procedures and resources such as people. In the case of a building project, the process includes all the operations and sequences of operations used to generate the product; the building, in the activities of Briefing, Designing, Specifying, Tendering, Construction etc. As the process is defined as the grouping in sequence of all the tasks directed at accomplishing one particular outcome, then every activity becomes part of a process. Therefore, a process can be considered as a series of related and interrelated tasks and the relationships between tasks become apparent. If these tasks are carried out in a systematic way, then quality can be achieved.

In order to achieve quality, each stage of the procurement process through which the building project evolves must be defined and their respective influences on quality determined. For example,

- Quality of the design process
- Quality of the construction process
- Quality of products
- Quality of maintenance

Quality of the design process includes reliability of the initial brief, reliability of the design solution, and the detail specifications, reliability of all the information that has been used as the basis for the design and product specification.

Quality of the construction process requires the reliability of the organization, procedures and skills of the builder to interpret the design and provide the end product on the site in accordance with the design/ specification.

Quality of the products needs reliability in all the materials/products/components incorporated in the building.

Quality of maintenance is the reliability of the upkeep, maintenance and repair programme and that the building's use is not modified in such away as to significantly affect its performance. All of these requirements place responsibility upon the five main parties namely client, architect, contractor, manufacturer and user.

MEANING OF QUALITY IN THE BUILDING PROCESS

Quality management is a systemic process control throughout every phase of the building project and quality means conformance to predetermined requirements. Then there must be some means of ensuring that an unbroken chain of conformance to requirements exists throughout the process of the project. For example, the quality of the outcome in the briefing stage of a project viz: obtaining clients requirements affects the quality in the design stage. The design depends on the brief. This means the quality of the outcome of a task based on how its requirements have been met within that task or stage is ultimately dependent on the quality of any other stage for the quality of the total building as a product.

In the life of a building project, several stages can be identified through which a chain of conformance to requirements must be carried out by all the parties involved in a project if quality is to be achieved. These stages comprise a particular set of tasks or functions which together will achieve a stated objective. These functions or tasks are carried out by one or more project participants. Each stage is distinct from the other. Pre construction stage mainly comprises the design activity. The design activity formally begins at the point where a legally binding agreement is made between the client and the consultant. The construction stage technically begins when an agreement is signed between the client and the contractor. The two most important stages of a building project namely, the pre construction stage and the construction stage have distinct objectives such as;

- Briefing
- Designing
- Specifying
- Tendering
- Construction

Some of the tasks or functions at the pre construction stage can be identified as follows;

Pre-construction stage – (main participants are the client and the architect)

BRIEFING AND DESIGNING	SPECIFYING
Obtaining client's requirements	Classification of works
Preparation of final brief	Information data base
Preparation of preliminary design	Contractual requirements
Alternative solutions	Technical specifications
Study of services	Bills of quantities
Study of costs	Drawing/specifications set
Study of materials and finishes	Preparation of final design
Coordination with other specialist consultants	Preparation of final design

Tendering – (main participant is the contractor)

BRIEFING, DESIGNING AND SPECIFYING

The need to manage quality in the pre construction stage, rather than trying to merely control quality in the construction stage stems from the proposition that prevention is better than cure. The latter approach will only solve the problems that come to light during construction and not those that remain latent appearing during the life of the building. Therefore, the processes namely, Briefing, Designing, specifying and Tendering are vital if the likely causes of quality problems are to be identified and prevented.

For example, in the briefing stage defining requirements is an important task. In the specifying activity, the main task is defining production requirements to achieve the design solution. Specifications are usually presented through structured written text related to detail design drawings. Therefore, a complete and accurate set of detail drawings: architectural, structural and all other specialized services is a prerequisite for the preparation of the specification. Unless these participants make a responsible contribution to these tasks, the inputs of skills and knowledge will be deficient. Even the client must be involved. Also, since several parties are involved, proper communication and coordinaton between these parties becomes a necessity to perform these tasks successfully.

From the author's experience, certain problems exists within this phase. In specifying the task, defining acceptance criteria for conforming to requirements will pose a problem because not all project participants get involved in this task. The architect is the main specifier. It is likely that whilst the building is in production, the original requirement will change, meaning that non conformance to requirements will occur. In practice, it is unlikely that

the actual produces of the building the contractor, is involved in the specifying task. Therefore, it is unlikely that a complete chain of conformance to requirements can be achieved throughout the building project. At this point, the responsibility and divided knowledge base between the designer and the contractor will result in several deficiencies. Therefore, unless this fragmentation is prevented, it will be difficult to achieve quality in practice.

TENDERING

Obtaining current cost data base Specialists sub contractors and suppliers Resource list (m e n , machinery and material) Financial standing (Bonds etc.) Pricing.

CONSTRUCTION

Construction stage is concerned with the physical realization of the outcome of all preceding stages namely brief, designing, specifying and tendering. In addition this stage should ensure that no more costs are incurred than has predicted as an outcome of tendering and the prescribed time targets are met. It is normally accepted that construction is the stage in which all the defects in the previous stages come to light. Therefore, the close involvement of the architects for how the contractor controls the constructing stage is essential, particularly with regard to:

- If changes occur to design, due to changes in clients requirements, new production requirements etc.
- If specialist contractors/suppliers are involved to incorporate their design into whole building design.

These few facts show that only by the close involvement of design with construction as processes can improve the final product; the building. It must also be mentioned here, that in a building project, it is in the architects best interest as well as part of his professional duty to be closely involved with the construction process. But in practice there is evidence to show that many quality related problems in the construction stage are a result of the actions in the pre construction stage. The main reason for this is unclear communication of requirements to the construction process for which mainly the architect should take the responsibility.

INTERFACE BETWEEN PARTIES

The previous discussions showed that there are certain problems in achieving quality of a building project. These are related to the parties involved and also affects the procurement system, fragmented responsibility and cultural attitude which needs further elaboration in fairness to the subject.

There are certain problems that are experienced in a traditional type of building contract which manifest primarily at two points in the total building process namely; at the interface between the client and the architect and, at the interface between the architect and the contractor.

The following can be identified as the principle reason for a project failing to meet the quality requirements.

- Client and the architect may misunderstand or not agree upon the details of the brief with regard to the building's purpose, performance or appearance. The brief must be precise and convey the client's genuine needs. Any discrepancies will adversely affect the level of quality achievable.
- The architect may perceive quality in a different way to the client.
- The architect may develop concepts that simply cannot be built without time and cost consuming modifications.
- Architect's failure to balance cost with quality at the initial briefing and design stages can lead to problems in achieving quality. This may result in re-specification of some items to an inferior standard and possibly to an eeonomic imbalance in design.
- There may be an insufficient time schedule to build to the desired quality levels. Time constraints must be carefully balanced with cost and quality at the briefing and designing stages to avoid any overruns.
- The contractor may fail to understand what the desired standards of quality are. If the design stage is completed before appointing the contractor as in the case of a traditional contract there is no opportunity for the architect to effectively communicate the required quality levels to the contractor first hand. The contractor does not always know the requirements before commencing the works.
- Design requirement may not always be communicated effectively to the contractor or to his workmen at site.

The above reasons show that throughout the entire building process it is essential that clear communication is encouraged, in particular at the interface of the client and the architect and also at the interface of the architect and the contractor.

THE ROLE OF THE CLIENT, ARCHITECT AND THE CONTRACTOR

Preceding discussions showed that the client plays his most important part in the achievement of quality before the project actually commences. The time and cost constraints specified by the client must be realistic and sufficient to give the client the standards of quality expected. Also, the client must be aware of the performance, cost and time consequences the decisions he takes. The client; ability to make decisions from the outset affects the quality of the building very much. Not all clients have sufficient skill and knowledge to maintain close interest in their projects. But quality is likely to be better if the client becomes actively involved in the total building process from the beginning to the end. In summary, following can be stated as the four major roles of the client in achieving quality.

- Be involved from the outset of the project
- Take an interest throughout the total building process
- Clearly specify his requirements
- Show commitment to the achievement of quality in all aspects of the building.

As stated before, architect can influence the quality of a building project at all stages particularly in a number of key areas during the pre construction stage such as:

- Brief preparation
- Conceptual design
- Final design
- Specifications
- Tender documents
- Appointment of the contractor
- Procurement of suppliers and sub-contractors

The architect should be able to understand effectively the requirements of the client, in order to arrive at an appropriate Brief. This shows that the architect plays a very important role in a building project as most of the client requirements are stated in the Brief. In this regard, the author feels in most projects architects and clients fail to devote enough time and effort to early definition of requirements. The more time and effort spent at the beginning in defining requirements, more smoothly the project will progress. Defining requirements on a design project must be viewed not as a task for the owner to do while preparing a request for proposal nor as an agenda item for a one hour kick-off meeting. The process requires a series of meetings during which the requirements become clearly defined and understood by both parties.

Preceding discussions showed that a successful design relies heavily on close integration and communication between the client, the design team and also between the various other consultants. At this stage, the required quality standards should be established within the context of other variables such as cost and time. A realistic balance between these should be established. The client must be made aware of expected quality levels arising from the suggested design and specification so that the clients understanding of value for money is realistically determined. Tender documents should contain all required quality standards such as specific requirements for suppliers and sub contractors with respect to the entire project. As many product or component suppliers are already subjected to third party quality assurance schemes such as BS 5750 / ISO 9000, consultants should make it a rule only to procure from such persons.

The architect should take into account the construction process too, by which a building is constructed in addition to how the building will look when completed. The architect must appreciate the complexities of this process and materials technology if quality is to be achieved. The architect has a duty not only to interpret the clients brief, but maintaining and controlling the design during its construction as site.

The contractor also can play a significant role in quality achievement. Essentially a contractor must demonstrate to the client that the service he is providing meets with the specified requirements.

Once the contract has been awarded, the immediate problem that the contractor faces is the limitation of time. There must be rapid organization of the project teams and consideration for quality achievement must form part of the strategies adopted within all aspects of the project. As Griffith (1990) has identified, consideration for quality achievement must form part of the strategies adopted within the following aspects of the project.

- Selection of the project teamincluding site staff.
- Meeting to discuss the contract with client and consultants.
- Assessment of the true implications of the contract.
- Study of drawings and specifications.
- Selection of sub contractors and suppliers and liaison with them.
- Arrangement of financial guarantees and insurances
- Selection of labour, plant and materials.
- Site organization. (ibid,p.84)

Undertaking these tasks is complex and far from easy to accomplish. The achievement of quality must be considered at each stage of the construction process and at all levels and it is not the responsibility of the

site staff only. Quality on site depends upon many factors such as communication of the design, quality of supervision, leadership and motivation at site etc.

Under the standard building contract as described in the ICTAD Standard Form, the contractor is responsible for execution of good quality work. But now as per BS 5750, contractors must have a structure for a quality system indicating the formal procedures under which the desired levels of quality specified in the contract can be achieved. The following can be identified as the main reasons for failure to achieve the required quality.

Not properly understanding;

- What the required quality levels are.
- What the duties of various levels of staff
- What the Standards prescribed are
- What quality control procedures are
- What the project priorities are with time and cost frequently outweighing the quality aspects.

Reasons for these above stated problems are very complex because they are concerned not only with technical aspect but influenced by human factors as well. Therefore, rather than traditional quality control, quality management embracing all aspects including the human aspects can be the answer to quality problems in a building project.

PROCUREMENT SYSTEM AND THE FRAGMENTED RESPONSIBILITY

The achievement of quality can be affected by many issues surrounding the traditional form of building procurement: design and then build. Non traditional forms such as Design and Build aim to integrate and co-ordinate more effectively the design process with the construction process. Management contracting establishes the management of the project as a separate role to both the design and construction functions. Both these types of non traditional procurement systems has potential to improve standards of quality achieved during the total building process because their characteristics promotes following.

- Integration of architects with the construction process. This is identified as an important factor in the achievement of quality
- Improved communication between project participants allowing quality standards to be transmitted more efficiently and effectively.
- Closer co-ordination of various parties.
- One party takes the responsibility for all aspects of quality.
- Involvement of the contractor at the design stage.

The present situation in the process of a building project is not conductive to obtaining continuous feedback to the pre construction process, particularly the design process from the construction process. The main reason for this is the adversarial legal position that exists between the participants responsible for each stage. (client, architect and the contractor). The point here is that ways must be found of setting continuous feedback between the processes of the pre construction and construction stages within ones own organization and also between the three main participants' organization namely, ; the client organization, consultants organization and contractors organization.

MAINTAINING QUALITY THROUGHOUT THE BUILDING PROCESS

The preceding discussion revealed that the division of responsibility for the two main processes of design and construction pose real problems for the participants responsible for each of these aspects. This is because the ultimate quality of the architects work during the pre construction stage will be affected by the quality of the work of those responsible for the construction of the building. Equally, the quality of the work of the contractor will be affected by the quality of the requirements set by those responsible for briefing, design and specifying. Although the participants in the pre construction stage have a supervision role in the construction stage it is not one of total responsibility. Therefore, it could be stated that the architects and contractors are interdependent in their efforts to achieve quality in the building project as a whole.

The ultimate 'post construction' stage of the building project is the maintenance phase. During this phase, the responsibility of maintaining quality principles falls on the client/user. When the project reaches the maintenance level, all conformance to requirements have been satisfied by previous participants. This stage will generate requirements for maintaining of the building which must be conformed to if the original quality expected by all project participants is to be maintained throughout the life of the building. The present system practiced is for the client to obtain guarantees from the consultants or contractors which does not help in achieving quality. Since the client is also involved in the building process from the beginning, maintaining quality can be considered as his concern. Since present day buildings have sophisticated systems for services such as heating, lighting, ventilation etc. the requirements for maintenance management is recognized. This is another area which requires detailed investigation.

The review carried out so far established the fact that quality is concerned with the entire process of a building project. Also, it is required that the project

participants have the will, skills and knowledge, and also continuous communication.

CONCLUSION – A CHANGE IN THE CULTURAL ATTITUDE

This paper revealed that quality can be achieved if the principles of quality are properly understood and applied by the people involved in the building project. It is necessary for everyone including the client, architect and the contractor to perform their tasks conforming to requirements. Client must accept that they are part of the building production process and clearly define their requirements. Architects must ensure that they have interpreted those requirements and specified them correctly, and contractors must fully accept that the requirements are achievable. All participants should be committed to achieve quality which shows that a cultural shift is essential if quality is t be achieved. Education and training is also an integral part of the creating a 'quality culture' and it is an ongoing activity. Quality culture requires everyone to focus on the client who is the ultimate user and individuals need to understand who the client is and the work process performed to create the building. However, the discussion in the paper revealed that due to the divided responsibility that exists between project participants, difficulties arise in achieving quality because to achieve quality it is necessary to maintain quality principles throughout the entire process of the building project covering all the stages.

The two main requisites of quality highlighted in this paper are :

- The necessity of continuous feedback between the three major participants namely the client, consultant and the contractor - COMMUNICATION
- The parties involved in a project should process required skills and knowledge to perform their tasks – SKILLS & KNOWLEDGE

  And all above
- The parties should have a will to achieve quality – QUALITY CULTURE

The question that can be thrown out at this juncture is, **"Is achievement of quality a social problem requiring a change in cultural attitude and not anything else?"**

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