IMPORTANCE OF DESIGN PHASE STAKEHOLDER MANAGEMENT FOR SUCCESSFULLY ACHIEVING OBJECTIVES OF BUILDING PROJECTS: A SRI LANKAN PERSPECTIVE

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ABSTRACT

Contribution of the building design process for achieving the project objectives with a higher degree of success has been highlighted in several researches worldwide. Conventionally, success of a building project is judged in terms of, completion within the scheduled time, completion within the budget, and fully complying to the clients' satisfaction with minimum subsequent modifications and reworks. In achieving these, design phase of a building project alone offers the greatest scope. Irrespective of this awareness, instances are not rare to find, where clients are facing various difficulties in completing/ operating their buildings. Research and many case studies from the industry have provided evidence for cost overruns, delay in completion, mismatch between the delivered product and the clients' expectations, and high cost and time expenditure on variations and modifications in building projects. The aim of this paper is to present the outcomes of a research, which identified the importance of acquiring the timely contribution of design phase stakeholders and effective coordination amongst them, throughout the design phase for better achievement of the project objectives. The discussion is based on findings of a comprehensive questionnaire survey carried out in Sri Lanka on a sample of design phase stakeholders who holds hands-on-experience in building trade. Based on findings recommendations are made to encourage higher investment on stakeholder management during the design phase.

Keywords: *Design Phase, Design Stakeholders, Effective Coordination, Success of Building Project, Timely Participation.*

1. INTRODUCTION

Design process is intense in human involvement. It is performed by several design specialties (architecture, structures, building systems, etc.) that develop solutions with increasing levels of details (Fabricio *et al*., 1999). It also involves a large number of stakeholders whose voices must be heard and whose needs are often conflicting (Ballard and Koskela, 1998). However, their contribution is essential in the thousands of decisions to be made, with numerous interdependencies, within a short period of time relative to the total project duration, in a highly uncertain environment. Clients and developers/ investors are not only interested in value for money in relation to the investment in project development but also in costs associated with operation and maintenance over the period of lifecycle (Doloi, 2010). The design professionals are supposed to deliver the best alternative which would fulfil this requirement. Further, to be competitive, they need to adhere to the time constraints stipulated by the overall project duration which greatly depends on clients' business schedules. Hence, understanding at early stages, the complexity of design in both functional and operational context is important in defining the appropriate end facility (Kohler, 2008; Doloi, 2010).

In addition, increasing complexity of modern building also demands incorporating novel technologies, innovative applications and new concerns such as sustainability and green building concepts (Austin *et al.*,1994; Doloi, 2010). During the last three decades, the expectations of clients have changed

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considerably from the conventional frame, resulting in complex and fascinating building forms with various superior features. These have put more pressure on design teams to come up with better solutions. Consequent is an enhanced challenge exerted on the design professionals. They are supposed to be more conscious on the degree that their design meets the project objectives and clients expectations, completely and comprehensively. The project managers / lead consultants are supposed to form design team which include all important design stakeholders, ensure timely appointment and participation of each design professional and maintain proper coordination amongst them throughout the design phase of the project.

This paper focuses on the importance of design phase stakeholders involvement in achieving the project objectives, successfully. It argues that identifying all stakeholders who are important for the design process, planning their contribution in an effective manner and maintaining proper coordination among them have a significant impact on the success of a project.

1.1. DESIGN PHASE IN A BUILDING PROJECT

The increased emphasis for keeping the construction project on time and within the budget requires effective management of project scope and defining its limits clearly (Goldschmidt, 1992). It is an important fact that properly managed, systematic approach to the whole building design process is essential to ensure smooth and harmonious progress into construction (Austin, *et al.*, 1994). Design phase in a building project alone offers the greatest opportunity to add maximum value to the end-product and reduce overall project cost (Doloi, 2010). It is the phase during which the client's requirements are conceptualised and developed into various design drawings and engineering specifications, which ultimately would be used to build up the facility. It usually starts with a barely defined set of requirements, which usually does not describe client's needs explicitly. Right from this point, it is the design team's responsibility to develop a comprehensive design brief, develop alternatives, evaluate and detect the best option suited for client's requirements, develop it through integration of contributions from various disciplines, re-evaluate and improve through iterations, submit for various approvals from client and other corporate bodies and finally deliver a set of designs and specifications which explicitly comply with the client's need. This is essentially a team effort that needs effective and thorough planning and control within and among all disciplines. Hence successful design process of a large multidisciplinary project requires close coordination to ensure that all parties are constantly aware of every changing status of the project, if it is to eliminate design errors and limit design alterations. However, lack of design planning is often noticed in the architectural, engineering and construction (AEC) projects largely due to the fragmentation of the industry (Pekta and Pultar, 2006).

In the majority of projects the planning work that has to be carried out during the design phase is generally performed in a perfunctory fashion (Austin, *et al.*, 1994). It is not because that the designers are poor in planning but because that the 'design' being largely a creative process, it is difficult to plan at its early stages. Usually the planning is done on a disciplinary by disciplinary basis, with each discipline trying to accommodate the inputs from the others (Austin *et al.*, 1994). However, cross-discipline information flow is not continuous and results in conflicts at deep levels of details. Many intermediate decisions taken within these disciplines are reciprocally independent, which may or may not be communicated to or identified by other parties during the design phase. Any such unidentified decision could lead to variations and many other issues during subsequent phases of the project. Galvan and Tucker (1991) have shown how the minor design-related problems significantly affect the construction performance.

In addition, deficient planning of stakeholder involvement leads to lack of in-time response, lack of communication, poor understanding and cooperation between parties and poor understanding about the project objectives, in overall. This results in considerable reviews and rework. Reviews enhance quality and accuracy. However, rework absorbs considerable amount of useful time available for conceptualisation and design development. Most of the time, with poorly planned stakeholder involvement, overall effort does not ensure a satisfactory design.

1.2. STAKEHOLDER CONTRIBUTION ISSUES DURING DESIGN PHASE: WHAT LITERATURE REVEALS

Josephson and Hammarlund (1996) in a study carried out on seven building projects in Sweden, found that when measured by cost, design-caused defects were the biggest category among all defects of a building. Of the design caused defects, those originating from missing coordination between disciplines formed the largest category. In the study carried out in United States, on causes for quality deviations in design and construction, Burati, *et al.* (1992), found that the design deviations account for 78% of the total number of deviations, 79% of the total cost of deviations, and 9.5% of the total project cost. Poor communication, lack of adequate documentation, deficient or missing input information, unbalanced resources allocation, lack of co-ordination between disciplines and erratic decision making have been pointed out as the main problems in design management (Lyren and Sundgren, 1993; Sverlinger, 1996; Tzortzopoulos and Formoso,1999). In a study on management of design documentation, carried out in Australia, Gardiner (1994) says that he encounters many design consulting firms, who do not allocate a project manager or dedicated staff to the project and assign them roles that are clearly understood. Those observations are supported by Swedish studies on design management by Arnell, *et al.* (1996) and Koskela *et al.* (2002), where one central problem found was that the involved persons perceive uncertainty in what has to be done, who has to do it and when it has to be ready. Common consequences include slow approval from clients, late appointment of consultants, conflicts between details from different disciplines and inadequate time to complete design documentation carefully (Sverlinger, 2000).

2. TOWARDS BETTER MANAGEMENT OF DESIGN STAKEHOLDER INVOLVEMENT

As the methodology, this research utilised an experience survey conducted in Sri Lanka using a questionnaire as the tool on a carefully selected group consist of expert design professionals, building construction and maintenance professionals, quantity surveyors, clients and end-users who possess considerable experience in the building trade. The study was structured on a meaningful sub-division of the design phase.

2.1. IMPORTANT DESIGN STAKEHOLDERS

The important stakeholders were identified based on authors' past and present experience in building projects and from the findings of previous researches by Fabricio *et al.* (1999), Tzortzopoulos and Formoso (1999) and Koskela *et al.* (2002). Accordingly, conventional stakeholders; Client, Project Manager, Architect, Structural Engineers, and Building Services Designers (Electrical Engineers, Mechanical Engineers, Water Services Engineers, IT and Telecom Engineers) and few nonconventional stakeholders; Developers/ Investors, Quantity Surveyors, Facilities Managers (FM) / Maintenance Engineers (ME), End Users/ Tenants of previous building projects, were identified as stakeholders important for the design phase.

2.2. STAGES OF DESIGN PHASE

The collaborative building design process is viewed as an iterative flow of interdependent decisions of different design professionals (Pekta and Pultar, 2006). It can be split into meaningful sub stages. It is argued in this research that understanding the depth of involvement of each stakeholder at each stage gives better grounds to understand the exact time to consult them. Selection of the best depth of division influences the ease and practicality of implementation of outcomes of this research. As such, the design phase was subdivided into five stages based on the specific, important deliverable that those produce.

Stage 1 - Functional Brief setting stage

Stage 2 - Conceptual design preparation stage.

Stage 3 - Council drawing preparation stage.

Stage 4 - Tender drawing preparation stage.

Stage 5 - Construction drawing preparation stage.

3. RELATIONSHIP OF DESIGN STAKEHOLDERS' PARTICIPATION AND COORDINATION WITH ACHIEVEMENTS OF PROJECT OBJECTIVES

The survey results revealed that over 87% of the participants agreed to the fact that the difficulties in completing the project within the contract duration and the budget, scope creep and problems associated with it, and many cost variations could have been avoided if all necessary stakeholders were consulted in the appropriate stages of the design process. Over 82% of them agree that such shortfalls could have been avoided if effective coordination among stakeholders is maintained throughout the design phase.

Further, 75% of the participants agreed that the scope creep is directly associated with incomplete designs delivered at the tender stage, which has a direct relationship to stakeholder participation and coordination amongst them. 55% agreed that the cost variations in building projects are generated mostly due to the inefficient contribution of design stakeholders during design phase. 45% and 37% voted respectively for and against on the fact that the reasons for time extensions were originated due to incomplete deigns and subsequent additions and amendments.

On the whole, the statistics revealed that obtaining the participation of all necessary design stakeholders during appropriate stages of the design phase and maintaining coordination amongst them would contribute highly in overcoming critical problems associated with achieving the core objectives of building projects. However, obtaining and maintaining the participation of all stakeholders, in all stages is practically impossible and costly. The degree of contribution in terms of inputs, comments and feedbacks from each stakeholder obviously vary throughout the design phase. In order to develop proposals for optimum arrangement, further investigations were carried out to query the importance of each stakeholder's participation in the identified phases of the design process.

3.1. TIMELY PARTICIPATION OF STAKEHOLDERS IN THE DESIGN PROCESS

Figure 1 illustrates the average of the responses received on a five point scale for the importance of participation of main design professionals, during the five stages for the successful achievement of overall project objectives.

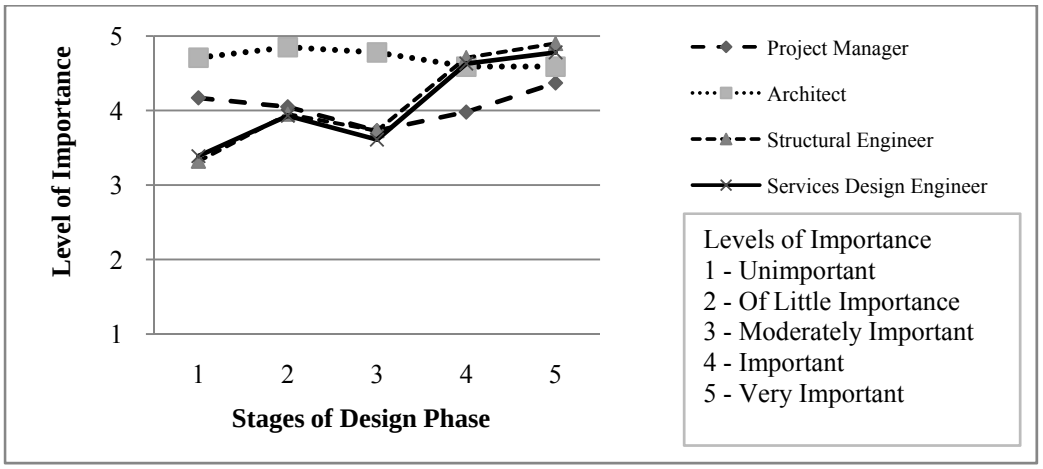

Figure 1: Importance of Participation of Main Design Professionals

The analyses show that the participation of all four categories of stakeholders is ranked above moderately importance. This follows the usual industrial trend, which shall be obviously visible in this kind of survey. However, beyond this, the analysis gives a better picture on the variation of the importance of participation of each professional category, during each stage of the design phase.

Figure 2 illustrates the averages of the responses received on the same scale, for participation of clients, developers and end users/tenants as stakeholders during the five stages, for the successful achievement of overall project objectives.

In Figure 2, clients' participation is ranked above moderate, in the three initial stages of the design phase. Developers' and end-users'/ tenants' participation is also placed above moderate, in the first two stages. Usually, the participation of these three stakeholders is more or less limited to the initial stages, as conceptual and layout design development is mostly completed during these stages. However, it does not give evidence to conclude that the availability of these three categories, during the rest of the design phase, is insignificant. Averages of the total responses made by all participants of the survey on the participation of these three categories are above scale point 2 for all design stages. This indicates that in the subsequent stages their presence is valued by the building experts against the convention, though with a lesser degree of importance.

In general, at the stage of council drawing preparation, the design development is mostly completed. However, between council drawings and tender drawings, there would be considerable refinements to reach the final design, which clients, developers and end-uses would like to be aware of. This is an iterative process, which ultimately produces the final design that would be handed over for construction. Furthermore, these designs would be used for procuring the builders and would be a part of the legal contract. Therefore, the participation of this stakeholder group would still be important, in the remaining stages where they can comment on subsequent essential modifications. Hence, the observation illustrated in Figure 2 has sound underline reasons. The surveyed sample has accepted the need of the participation of the three categories of stakeholders in all five stages for the successful achievement of overall project objectives.

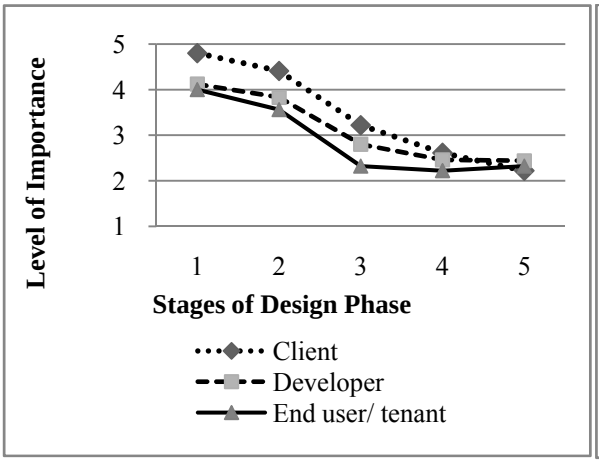

Figure 2: Importance of Participation of Clients, Developers, End Users/Tenants

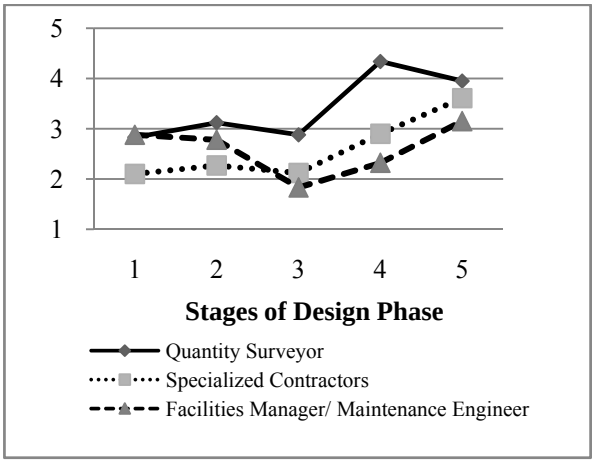

Figure 3: Importance of Participation of Quantity Surveyors, Specialized Contractors, and FM/MEs

The importance of participation of another three non-conventional stakeholders is illustrated in Figure 3. The results show that the importance of participation of quantity surveyors, in all the design stages is near or above moderate. At the stage of tender drawing preparation, this has received a significance level over 4 which is in the range of main design professionals. The survey brought the participants attention on their previous experience of cost variations and cost overruns. They confirmed with over 55% agreement that, 'subsequent cost variations of building projects have a relationship with the stakeholders' contribution during design phase'. Quantity surveyors play a major role in preparation of bills of quantities and specifications, parallel to the design development, which fix the price of the project. These two documents describe the work detailed in all designs completely and comprehensively. Any discrepancy between tender designs and these documents could lead to a dispute according to the contract document. Hence, continuous updating of these documents for all design alterations even at the last moment is of utmost importance from the point of the contract. On the other hand, quantity surveyors possess the capacity to provide advice and guidance in terms of cost implications of the various decisions taken while those are being made, which could be of great importance for clients and developers of the project. It is with this background the quantity surveyors were included in as a category of design stakeholders which had been accepted by the sample (Figure 3).

Participation of professionals who possess facilities management and/or building maintenance experiences were also proposed as design stakeholders in the study (Figure 3). These professionals possess experience in post occupancy issues of buildings, who in turn could provide valuable inputs during design phase of future works. The great advantage is that the issues related to operational and maintenance costs could be addressed in advance by effectively incorporating the lessons learned. Participation of these professionals has reached a level near or above moderate, in design brief setting stage, conceptual design preparation stage and construction design preparation stage.

Figure 3 also shows the importance of participation of the specialised contractors, who form another non-conventional stakeholder proposed in this research. Usually, specialised contractors in different trades are procured to the project team during the construction phase. Analysis of responses shows that, they also would be a category who could contribute in the design process for the successful achievement of overall project objectives. They possess considerable experience in issues arising during the construction phase, defect rectification period and during the post-occupancy stage of previous building projects. They also have a better idea of how those problems would originate and what is the best time to take precautions to reduce the chance of repeating the same problem in future projects. Hence the acceptance of their participation as design stakeholders by the survey participants has strong underlying reasons.

The above analyses show that it is needed to rethink on the organisation of design team stakeholders based on the new demands of the design process. It also illustrates that various design stakeholders hold different levels of importance of participation during different stages of the design phase. These findings could be used as a guideline in planning design teams for consultancy bids, scheduling design stakeholder participation during the design development process and optimising the stakeholders' involvement for profitable design projects.

3.2. EFFECTIVE COORDINATION AMONG DESIGN STAKEHOLDERS

Importance of maintaining the coordination among design stakeholders for better achieving project objectives was accepted with over 82% agreement by the respondents, as earlier. However, *the degree of importance* of coordination among each stakeholder category for all combinations remains a question to be answered. Maintaining the same level of coordination among all stakeholders, at all time is impractical and would not be the requirement for a successful design development. The coordination is required to minimise reworks in all disciplines during design development and minimise conflicts between different disciplines in the final designs. In this process, obviously, the main design professionals may need a higher level of coordination amongst them, but it would not be the same among all stakeholders. Usually the coordination among different disciplines takes place through periodical meetings and/or when queries are made upon issues aroused. However, depending on these and voluntary requests for coordination alone, has not been trustworthy enough for a large investment like a building project. Hence, coordination among design stakeholders cannot be left to occur in the way it comes, or in an arbitrary way. Instead, it needs to be planned and managed throughout the design phase.

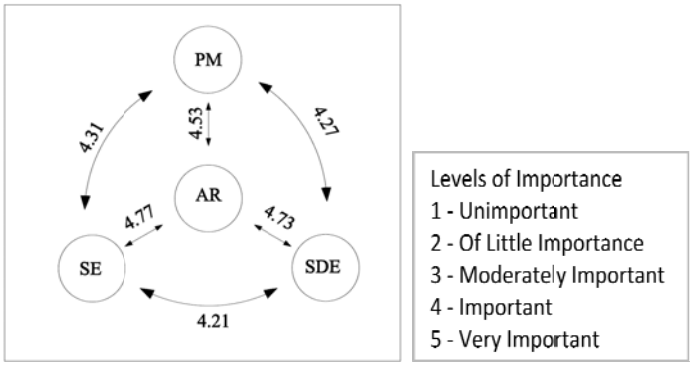

Figure 4: Importance of Coordination among Main Design Professional.
(PM – Project Manager, AR – Architect, SE – Structure Engineer, SDE – Services Design Engineer)

The study examined the variation of the degree of coordination among different stakeholders depending on the role they play in the team. In order to develop proposals for optimum arrangement, further investigations were carried out to query the importance of coordination among each stakeholder pair considering the entire design process.

Figure 4 illustrates the averages of the responses received on a five point scale for the importance of coordination among main design professionals during the design phase for the successful achievement of overall project objectives. It clearly indicates the high importance of coordination that needs to be maintained between them throughout the design phase. Usually, one could say that this is already secured in practice to a considerable extent. However, as highlighted in the literature, the cost and time variations resulting from the conflicts between design details of different disciplines cannot be taken casually. The scale values indicated in the figure stress the attention that needs to be paid on each relationship when it comes to integrating the contributions from different disciplines. The study proposes that these results trigger a necessity of higher and closer attention even on the conventional coordination relationships, in the effort exerted to develop the design that best fit to the project objectives.

Table 1: Importance of Coordination among Client/ Developer/ End User and Other Important Design Stakeholders.

	Client	Developer	Project Manager	Architect	Structural Engineer	Services Design Engineer	Quantity Surveyor	Specialised Contractor	Facilities Manager/ Maintenance Engineer
Client	-	4.27	4.19	4.82	3.55	3.85	3.24	2.77	3.19
Developer	4.27	-	4.55	4.44	3.55	3.40	3.29	3.15	2.89
End user/ tenant	4.15	3.06	2.89	3.94	2.29	2.63	1.90	2.48	3.76

Table 1 illustrates the averages of the responses received on the same scale, for the coordination of clients, developers and end users/tenants with all important stakeholders identified in the study, for the successful achievement of overall project objectives.

The zone highlighted shows the averages of the responses received on the five point scale for the expected coordination between main design stakeholders and the group under discussion. It shows that the importance of coordination of main design stakeholders with client and developer is above moderate importance (value of 3.0) for all combinations. This is as high as 4.82 between the client and the architect for the obvious reason of coordination required for the development of the project brief and the conceptual architectural design. However, the results reveal that clients direct coordination with services design engineers and structural engineers cannot be regarded of lesser importance. In the current context, clients and developers are concerned about the nature of building services that could be made available in their new facility, structural aspects such as performance of the building in natural disasters, economy of services and structural solutions adopted, possibilities of adopting the latest technologies available in the industry, and many such engineering aspects, in addition to the layouts of spaces and aesthetics. In addition clients are also interested on trade-offs made between different disciplines during design development and optimisations. Almost all of these are dealt during the design phase itself and successful achievement of them could be ensured if coordination among the clients/ developers and design engineers are maintained at a strong level. This is justified by the survey results.

Further, coordination between clients/developers and quantity surveyor has received an importance above moderate. This further strengthens the argument developed on quantity surveyor's involvement as a design stakeholder, discussed in the previous section. Coordination with quantity surveyor, who could advice the client/developer, in terms of cost implications of the various decisions taken while those are being made, is valued by the survey participants with a higher level of importance. In addition, clients/ end-

users/developers coordination with building maintenance experts has also received reasonable level of importance. Also, the coordination of developers/clients with specialised contractors, and architect with end-users also have been accepted with moderate values by the survey participants.

The importance of coordination between quantity surveyors, facilities management/ building maintenance experts and specialised contractors with the remaining design stakeholders are illustrated in Table 2. The results show that the importance of coordination of quantity surveyors with main design professionals, specialised contractors and facilities mangers/maintenance engineers is near or above moderate.

Table 2: Importance of Coordination among Quantity Surveyors, Specialised Contractors, and Facilities Mangers / Maintenance (FM/ME) Engineers and Other Important Design Stakeholders.

	Project Manager	Architect	Structural Engineer	Services Design Engineer	Specialized Contractor	Facilities Manager/ Maintenance Engineer	End user/ tenant
Quantity Surveyor	4.21	4.15	3.81	3.71	3.60	2.47	1.90
Specialised Contractors	4.00	3.76	3.65	3.94	-	3.39	2.48
Facilities Manager/ Maintenance Engineer	3.53	3.29	2.87	3.82	3.39	-	3.76

Coordination between the main design professionals and the group under consideration in Table 2, have received near or above moderate importance for every combination. In section 3.1 above their participation as design stakeholders in various design stages was discussed. Coordination between specialised contactors, and structural and services design engineers during design phase could improve constructability aspects of the building which would enhance the chance of completing the construction work within the planned duration. In addition, this would facilitate the use of proprietary systems (e.g. form-work systems) and ready-made products, which would reduce construction and operational wastage, which in turn would be beneficial for the project. This has been accepted according to the research findings. Importance of coordination between project manager/ architect with facilities managers/ maintenance engineers, during design phase also had received higher regard. Close coordination among these parties would be essential to improve the current designs using the lessons learnt in previous projects.

In summary, the research results shown in Table 2 reveal that obtaining the coordination of these non-conventional stakeholders, during the design phase, could considerably contribute to better achieving project objectives.

4. CONCLUSIONS

Building projects are capital investments of which the degree of success has serious implications on the investors' life. Design phase of a building project, not only finalises the building design, but also defines and fixes majority of the project parameters, boundaries and constraints in terms of scope, cost, time and quality. It requires intense involvement of various stakeholders. The aim of the study was to find out the importance of timely participation and effective coordination of the design phase stakeholders for successfully achieving the project objectives. The research findings show the varied importance of timely participation of different design stakeholders during various stages of the design phase. Those confirm the involvements of main design professionals and highlight the importance of involvements of the other non-conventional groups as design stakeholders, which were proposed by this study. The participation of, and

coordination among the Developers/ Investors, Quantity Surveyors and Facilities Managers (FM) / Maintenance Engineers (ME), in design phase has been accepted with high importance. The research methodology also facilitated the numerical expressions of the variations of the importance of participation and coordination of each stakeholder. These could be used as a guideline in planning design teams for consultancy bids, scheduling design stakeholder participation during the design development process and optimising the stakeholders' involvement for profitable design projects.

In addition, the research highlights the importance of higher coordination between client – design engineers, client – quantity surveyor, architect – quantity surveyor, design engineer – quantity surveyor and architect – building maintenance expert, for successful design process, which throws a light on project managers/ design managers who plan and monitor the coordination between various design disciplines.

The findings reveal that success of a project has a strong relationship with the design stakeholders' involvements during the design phase. The research also highlights the need to rethink on the conventional design stakeholder lists and managing their involvement throughout the design phase for greater success of building projects. Overall it concludes that the decision on higher investment on stakeholder participation and management during design phase would considerably increase the degree of success of building projects.

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