THE DESIGN PROCESS OF BUILDING REFURBISHMENT PROJECTS

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Abstract

Refurbishment work is one of the important sectors in the construction industry and has grown actively in this country. The popularity of refurbishment is well known and seen to be an option at the end of service life for a building. It also plays an important role as an alternative to the new development of building. Nevertheless, the complexity and uncertainty of refurbishment projects make it difficult to manage.

Design process is vital toward the successful of construction project. It is complex that consists a multiple interacting feedback processes from the project actors and non liner relationship within the process. Due to the nature, it is hard to plan and manage the process of design. The uncertainties and complexities of design process and refurbishment projects require different approach from the new build.

The research is to study the effect of uncertainty towards the performance of building refurbishment design process. The objectives are to identify the factors that course uncertainties in refurbishment design process and mechanisms to manage the uncertainties of the design process.

Key Words:
Uncertainty, Building Refurbishment, Design Process, Performance

1.0 Introduction

1.1 Research Background

In a highly competitive construction market, designers need to respond efficiently in order to meet client requirements. Efficient management in design process is paramount to provide quality design within budgeted cost and to ensure project running smoothly. The management of design process is an important and difficult task. The way it is manage can affect the performance of the refurbishment projects.

Building refurbishment refers to upgrade, major repairs work, renovations, alterations, conversions, extensions and modernization of building, but exclude routine maintenance and cleaning work (Quah, 1988). Refurbishment project is one of the most risky, complex and uncertain within the construction industry (Egbu, 1992, 1996; Rahmat, 1997; Brandon et al., 1999; McKim et. al., 2000; Rayers and Mansfield, 2001). Even though the difficulties characteristic in managing refurbishment projects, it’s had grown rapidly in UK for the last 30 years and the trend is now spreading over to this country.
Substantial growth in refurbishment project required deep understanding and knowledge in managing refurbishment project. According to Quah (1988) and Young and Egbu (1992) the study of refurbishment relatively ignored and more focus had been gave to research for new building.

This research will study on the effects of uncertainty and design’s team organizational structure on the performance of building refurbishment design process, with focus on role of the building refurbishment designers.

1.2 Problem Statement

Refurbishment project has grown rapidly in developed countries such as UK and US. The grown had spread over to Malaysia with high number of ageing building and change of usage.

Many researchers agreed that refurbishment projects are different in many situation compare with new project (Quah, 1992; Egbu, 1992, 1996, 1997; Rahmat, 1997). It had been identified that refurbishment work is the most difficult compared to new build project (Quah, 1988; Egbu, 1994), and the main characteristics of refurbishment work which are unique, high risk, full with uncertainty and complexity make it difficult to manage. (Hoffmann, 1978; Harrington, 1979; Koehen and Tower, 1978; Chapman, 1980; Hertz and Thomas, 1983; Teo, 1990; Fianagan and Norman, 1993; Boyd and Weaver, 1994; CIRIA, 1994; Boothroyd and Emmett, 1996; Rahmat et al, 1998; Brandon et al., 1999; McKim et. al., 2000; Rayers and Mansfield, 2001)

Efficient design process is critical for the project success (Chua et al., 2001; Manavazhi and Xunzhi, 2001; Baldwin et al., 1999). According to Atkin et al. (2003), design process is complex and has to handle a number of interdependencies. Atkin (2003) than added that design process is hard to plan and manage, but it still necessary, due to it roles in construction process. Other studies made by McGeroge, (1988) and Sterman, (1992) revealed the same problems in design process. Savido and Norton (1994) added that uncertainty or untimely information make the situation more complex. The variety of problems may crop up in the design phase due to inaccurate, in complete or untimely information. Study made by Koskela et al. (1997) revealed the same issue that is lack of information become an obstacle to complete the tasks successfully.

For design in refurbishment, Egbu et al. (1998) shown that less than 10% of design for construction refurbishment project were completed for more than 75% before project started compared to ship refurbishment, about 32%. Rahmat (1997) in his study found that about 20% of refurbishment project in UK commenced with more than 80% completeness of design. Rahmat than added that 50% of refurbishment projects commenced with 60% of design complete with majority of refurbishment project a high proportion of design information could only be obtain during the construction stage. These indicate that most of the refurbishment project commenced at site with high degree of uncertainty due to uncompleted documentations.
The existence of these characteristics in one situation demands different systematic approach to handle it successfully. The problem is design for refurbishment projects is not complete before tendering stage due to uncertainties. Question arises as can we get an accurate and complete design for building refurbishment project before tendering stage? Therefore, this research will study the impacts of uncertainties in design process and how to control it during building refurbishment design process.

1.3 The Research Objectives

The characteristics of refurbishment work with high risk, complex, uncertain and less predictable Quah (1988), Egbu (1992) required improvements in their design process. According to Choo et al. (2004), nature of design process with information-intensive and its iterative make it hard to manage. These couple complexities and uncertainties lead to more difficult situation in managing refurbishment project successfully.

Thus, in order to solve the aforementioned scenario, the author has listed the research objectives as follows:

1. To identify variables that contributes to uncertainties of design process in refurbishment projects.
2. To examine the effect of uncertainties toward effective and efficient building refurbishment design process performance
3. To examine degree of involvement of key participants in design process of refurbishment projects.
4. To establish integrative control devices in managing design process for building refurbishment projects in Malaysia

1.4 The Research Hypotheses

Further to the research objectives, research hypotheses are as follows:

1 Uncertainty variables affects the performance of building refurbishment design process
2 The performance of design process depends on project organizational structure
3 Coordination devices used in refurbishment design process depend on project organizational structure.
4 Coordination devices used can improve the performance of building refurbishment design process

1.5 Scope and Limitations

This research will study on design process in building refurbishment projects. RIBA plan of work consist from stage A to M is used as the framework of design process. It focuses on the role of
designers i.e. architect in managing design process from inception (stage A) to detail design (stage E) and construction stage (stage H) for building refurbishment projects.

The scope of this study will derived from the about 2000 architect firms in the whole Malaysia, who are practicing and registered with Board and ‘Pertubuhan Architect Malaysia’ (PAM). From this number, author will sort out architect firms who had experience in designing and managing refurbishment projects as a sample for this study. This will makes the research results valid for whole regions in Malaysia.

The research study only related to the architects as a leader of design team for refurbishment projects. No data shall be collected form others design participants such as engineers and surveyors due to assumptions that the data from the design team leader’s are sufficient for this study.

1.6 Relative Significant of the Research

Outcome from this study is expected to benefit to the refurbishment project participants particularly for designers, educators and the clients. The significant of contribution are as follows:

1. The identification of ‘design process’ and uncertainty of refurbishment variables should be helping the clients and designers to formulate strategies in their design process.
2. The outcomes from the research would give guidelines for the best practices to the designers, contractors and clients in managing building refurbishment design process.
3. The outcomes from this research may improve designers’ understanding on the importance of their roles in delivering good design for building refurbishment projects.
4. Findings from this study could help the participants in design process to identify and understand their roles in producing good quality of design for building refurbishment projects.
5. The outcomes from this study could assist the designers and clients to implement the appropriate integration devices in their refurbishment projects

2.0 Literature Review

2.1 Introduction

Refurbishment works is one of the important sectors in construction industry. It became an alternative when the building has reach to the end of their service life, or fail to perform as required in its used (Aikivuori, 1996). Aikivuori then found the refurbishment were initiated by several factors such as deterioration, change in use, economic factor, economy and change on condition.
According to Egbul (1999), the demand of refurbishment work had increased significantly for the last twenty five years in UK. He observed from CCCIS (1996) and DOE (1981), stated that the refurbishment work had increased to 42.32% from 22.46% respectively of the total UK construction output from 1981 to 1996. However, this statistics did not include ‘do-it-yourself’ work which normally done by house owner. Therefore the actual numbers of refurbishment work most likely to be higher than the reported data. Clancy (1995) estimated that refurbishment contract UK in 1995 contribute to 25% of all construction order of the year and may increase for next decade due to use of existing assets more efficiently. This statement than supported by Rahmat et. al., (2003) where in 2002 refurbishment work was estimated around 40% of total output of construction in UK. According to Lee (1996), in the last decade, up to 50% of the construction budget in US has been spent on form of renovation, remodelling and reutilizing existing building. The US national average spending is 25% of new construction spending (US Census Bureau, 1998)

Further, through the observations, this scenario had then spread to Malaysia. The increase of ageing building and trend to change of space usage due to economic factor gives indictors that refurbishment sector has grow rapidly. In 2003, the Malaysian construction industry had contributed 1.9% to the total GDP growth and mostly contributed by residential construction activity. However, unfortunately, there is no official published data shown the percentage of refurbishment work carried out in this country. The unpublished data by CIDB shows that repair and maintenance work contributed about 2% of construction output in year 2001. This data also not including ‘do it yourself’ (DIY) work which normally do by the house owner themselves. Taking in to account DIY work, the output could be higher.

2.2 Uncertainty in Building Design Process and Refurbishment Work

Building design process defined by Hassan, (1996) as a process which maps an explicit set of client and end-user requirements to produce based on knowledge and experience, a set of document that describe and justify a project which would satisfy these requirements and other statuary and implicit requirements imposed by the domain or the environment. According to Baldwin at el., (1999) building design process is a multi-disciplinary process, performed in a series of iterative steps to conceive, describe and justify increasingly detailed solutions to meet the needs of the client. Based on the definitions it indicates that the design process involves with an inter-discipline and non-liner activities which is complex and full with uncertainty.

The important of study in building design process has been proved by the previous researchers. Some of the studies made in this area i.e. (Chua et al., 2001; Manavazhi and Xunzhi, 2001; Baldwin et al., 1999) revealed the important of design process towards the success of construction projects. The design process in a construction environment is extremely dynamic and complex which is consist a multiple interacting feedback processes and non liner relationship (Sterman, 1992; Ogunlana et. al., 1998). Study by Bibby et al., (2003) showed that construction performances in UK being are hindered
by difficulty managing construction design process. The complexity of design process is driven by lack of information, due to poor feedback received by the participants in the design team. Feedback in design process is a paramount in order to ensure the communication among the design team flow smoothly. According to Baldwin et al. (1999), the management of information exchange in design process is critical. Austin et al, (2001) found the same result and added that information needs to be understood and ultimately managed.

The design process would be more difficult to manage if the construction projects are complex and uncertain. Quah (1988) pointed out that refurbishment is one of the most uncertain in construction projects. The majority of refurbishment projects were found to be completed over budget and over estimate time.

Refurbishment is a generic term including rehabilitation, modernization, renovations, alterations, improvements, additions, repairs, renewal, retrofitting; the term does not include domestic maintenance work such as cleaning and emergency maintenance (Quah, 1988). The definition strengthens by Egbu et. al. (1998) by saying that refurbishment refer to such works as improvement, adaptation, upgrading, rehabilitation, restoration, modernization, conversion, retrofit and repair which are carried out on existing building for variety of reasons and excluding works such as cleaning, decorating and emergency maintenance work.

Refurbishment work generally accepted to be more difficult to manage than new build (Koehn and Tower, 1982; Quah, 1988; Egbu, 1994, 1995) and unique in many ways and should be approached cautiously by designers (Daoud, 1997). Some of the researchers added that refurbishment is more complex (Egbu, 1994; Boyd and Weaver, 1994), and need greater coordination than new build (CIRIA, 1994; Egbu, 1994). Refurbishment work often suffers form delays and escalating cost due to high degree of uncertainty in defining scope of work during design stage. It become more complex an uncertain when refurbishment works involve with structure modification which is more sensitive, dangerous and difficult operations and need to be executed carefully (Daoud, 1997). Research by McKim et. al.(2000), reported problems of reconstruction (refurbishment) projects included lack of information about the operating facilities, space limitation for reconstruction project, maintaining of safety and health and involving many players such as building users.

In early stage of refurbishment projects, the designers need to gather information from existing building as much as they can before starting their design work. Design in refurbishment is different from new built where designer has to suit their design with existing condition of the building. This scenario make the designer had less interested involved in rehabilitation work due to limitation put on their creativity and limited modification can be done, (Daoud, 1997). Daoud added that the designers have to realize not much of their talent and creativity is used in creating new design for refurbishment projects.
Galbraith, (1977) said that uncertainty defined as a difference between the amounts of information available to perform a task. According to Driskill and Goldstein, (1986) uncertainty in organizational communication means as a lack of information, knowledge, beliefs and feelings necessary for accomplishing organizational tasks. Ward and Chapman, (2002) supported the definition by saying that uncertainty is ‘lack of certainty’ and also about ‘ambiguity’ associated with lack of data, detail, structure to consider issue, working and framing assumptions and sources of bias. Based on the definition above, a lot of uncertainties characteristic occurred in the design process for refurbishment projects. The amounts of information always lacking during design stage which force the designers to use “gut feeling” in solving design problems.

According to Winch, (1989) there is strong relationship between complexity and uncertainty in construction project. No matter what condition of the project, both the uncertainty and complexity normally exist at the same time. This view is than supported by other researchers such as Thomson and Perry, (1992), Smith, (1989) and Rahmat, (1997). Therefore the author will use term complexity and uncertainty interchangeably with referring to the same meaning.

Gary’s study, (1983) defined the complexity is technically a difficult task. Malzio et al., (1988) suggested that a complex process is that which comprises of operations that are innovative and conducted in an uncertain situation or that which involves operations that are not clearly defined or lack a complete specification. Other research, such as Hill (1991) says that complexity associated with the size and diversity of tasks involved in a production process and the implications of decisions in terms of investment, cost, time and people. Complexity also defined by Bennett, (1992) as a different actions need to produce the end product.

The above reviewed literature seems to suggest that management of uncertainty is important especially for project which dealing with uncertainty and complexity conditions. Ward and Chapman (2002) suggested that a broader perspective concerned with managing uncertainty is needed for successful of construction projects. Therefore, key participants of refurbishment project needs a systematic management and deep understanding about the concept of refurbishment from inception stage to completion for refurbishment projects. It was identified that refurbishment is one of the least understood and most under-researched sectors, especially in the management of such works (Quah, 1988; Egbu, 1994). Due to high demand of refurbishment projects in this country, the further research in this area is urgently required.

3.0 RESEARCH METHODOLOGY

3.1 Theoretical Framework

From the literature reviews revealed the relation ship between the refurbishment uncertainties variables and organizational variables with performance of refurbishment design process as shown in.
The intervening variables as a control mechanism to minimized negative effect from independent variable to dependent variables which need further testing.

3.2 Data Analysis

The first stage of the research start with identifies preliminary data collected through extensive literature review. The research problem and the variable are then be identified. From the relationship of variables the theoretical framework being build up and will further be tested during exploratory survey.

In second stage the author would carry out exploratory research with the objective to identify the sample size in the market, size of refurbishment project, location, type of building and problems related to design for refurbishment projects in Malaysia. It will follow by semi-structured interview to clarify variables and the theoretical concept is generally accepted.

Final stage of the research consists of structured interview with selected respondents. All the collected data will be analysed using quantitative statistical analysis. The correlation test between the dependent, intervening and independent variables will determine the relationship between performances of refurbishment design with uncertainties and control mechanisms. Conclusion of the study will derive based on the result achieved from the data analysis.

4.0 CONCLUSION

The literature review revealed that building refurbishment is one of the most uncertain construction projects. The performance of refurbishment projects tend to be poor. Majority of them completed with over budget and over estimated time. One of the factors that contributed to poor performance is degree of accuracy and completeness of the design.

Literature review also revealed that the degree of integration during the design process affected design performance. The higher the degree of integration during design process, the more accurate and complete is the design.

References

5. Austin Simon, Andrew Baldwin, Baizhan Li and Paul Waskett (2000), Analytical design planning technique (ADePT): a dependency structure matrix tool to schedule the building design process, Journal of Construction Management and Economics 18, 173-182


18. Garner Steve and Phebe Mann, (2003), Perceptions of the value of computer-supported collaborative work in design for built environment, Journal of Automation in Construction 12, 495-499


23. Kam Calvin and Martin Fischer, (2004), Capitalizing on early project decision making opportunities to improve facility design, construction and life cycle performance- POP, PM4D and decision dashboard approaches, Journal of Automation in Construction 13, 53-65


26. Love Peter E.D, Purnendu Mandal, Jim Smith and Heng Li, (2000), Modelling the dynamics of design error induced rework in construction, Journal of Construction Management and Economics 18, 567-574


35. Professional in collaboration designing buildings, Her majesty's stationery Office, London 1967


40. Rahmat I., Torrance V.B. and Ezanee A. H., (2003), Refurbishment cycles and the management of refurbishment projects, UiTM Research Centre, Shah Alam, Selangor, Malaysia


