

A REVIEW: PROBLEMS IN REFURBISHMENT PROJECTS

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Abstract - Globally, the existing buildings take a significant portion of total stock. Due to the cyclical nature, the performance of a building is getting retarded when it is exposed to usage. Thus, in order to prolong the life of a building, refurbishment has become a popular concept. New construction and refurbishment process has salient differences. Even though there are some problems common to both new construction and refurbishment, the impact is different in refurbishment projects such as; difficulty in achieving cost, time and quality targets. Suitable approaches should be adopted in managing refurbishment projects. Sometimes, the same approaches used in new construction may not be always suitable for managing refurbishment projects due to certain differences. Thus, prior to determining approaches, it is necessary to identify the problems associated with refurbishment projects. Therefore, this study aims to identify problems present in refurbishment projects considering the two main stages of procurement and construction.

To achieve the aim, a comprehensive literature review was conducted by accompanying books, journals, articles, conference proceedings and other reliable resources. The literature findings manifest that the most important problems associated with refurbishment projects are inaccurate and incomplete information during design stage, determining client needs, restricted access, and unavailability of space on project for storage of materials, potentially reduced security and increased risk to health and/or safety from construction.

Keywords: refurbishment projects, problems, procurement phase, construction phase

I. INTRODUCTION

According to Clough, G.Sears, and Sears (2000), the 'nature of the construction industry is complex and heterogeneous. Subsequently, Hillebrandt (2000) stated that the construction industry has become a key sector of the economy of all countries. The term 'construction' can be defined as all the activities which related to physical infrastructure, civil engineering work, building work, maintenance and repair of existing works (Wells, 1984). Lawrence and Werna (2009) stated that equal extreme attention should be paid not only on new constructions; but also on the renovation and maintenance of existing structures. In addition, the authors stated that almost 50% of the total construction output is accounted for renovation and maintenance works where greater share of employment is also engaged than in new constructions. Thus, it is important to consider this refurbishment sector to develop the aggregate construction industry.

According to Mansfield (2002), the life of a building is in a cyclical nature with a sequence of discrete work parcels like maintenance, repair, replacement, refurbishment and redevelopment. Further, the author explained that, if it is unable to do regular maintenance of a property, it accelerates the decline in investment returns until refurbishment or redevelopments are implemented.

Wang (as cited in Arain, 2005) defined refurbishment as "a generic term including rehabilitations, modernization, renovations, alterations, improvements, additions, repairs, renewals, retrofitting: the term does not include domestic

maintenance work such as cleaning and emergency maintenance” (p.31). Even if, there is a wide range of constituents under refurbishment, it is difficult to identify the absolute boundaries of this physical process (Mansfield, 2002). Thus, the research identified the refurbishment as building work consists of any reconstruction, renovation, upgrading, restoration, renewal, conservation, rearrangement, alteration and conversion, expansion excluding new building or regular repair and maintenance works.

According to Ali, Kamaruzzaman, and Salleh (2009), once the existing buildings are getting old, maintenance and refurbishment works are done in order to prolong the life of those buildings. Further, the authors indicated that those refurbishment works have become an alternative when either the building reaches to the end of the service life or fails to perform the required function expected. In addition to that, Construction Industry Research and Information Association (CIRIA, 1994) stated that even the buildings with good working conditions, also subjected to refurbishments due to the requirement of owners to accommodate new technologies or to change the role of business operation. Thus, it is apparent that there are various reasons attributable to the refurbishment decision.

Refurbishment projects are considered to be more uncertain than other construction projects (Boothroyd & Emmett, 1996; CIRIA, 1994; Flanagan & Norman, 1985). Moreover, they are complex and less predictable projects within the construction industry (Egbu, 1994; Rahmat, 1997; Rahmat & Ali, 2010). According to Arain (2005), there are some highly changing variables and unpredictable factors that affect the construction process of a project those are result form different sources such as performance of construction parties, environmental conditions, involvement of other parties, contractual relations and resource availability.

According to Rahmat and Ali (2010), most of the activities in the construction industry are more centered on new construction and many refurbishment managers tend to use same approaches used in new constructions for refurbishments. Further to them, those approaches may not always suitable for the management of refurbishment projects.

Then the author explained some of the common barriers in refurbishment projects in design stage. Ali (2010) highlighted that limited information as a major reason

to make difficulties for designers to complete the task successfully. Apart from that, Arain (2005) identified problems in construction stage. Further to the author, most of the problems may cause delay and extreme costs.

In order to minimize such adverse impacts to the cost, time and quality targets, suitable approaches should be adopted. Beforehand, it is required to identify the problems that are inherent which disturb the proper management. Thus, in this study it focuses the problems that are present in refurbishment projects due to the inherent characteristics of refurbishment concept.

II. RESEARCH METHODOLOGY

A comprehensive literature review was carried out to achieve the aim of this research study. Accordingly, data related on refurbishment projects were gathered referring books, journal articles, web sites, conference proceedings, and other related resources.

III. LITERATURE REVIEW

A. Nature of the refurbishment project

Refurbishments are one of the riskiest, complex, uncertain and less predictable projects in construction industry (Egbu, Barbara, & Victor, 1996; Rahmat, 1997; Rayers & Mansfield, 2001). Further, CIIRIA (1994) reinforced that refurbishment projects are more labour intensive than a new build.

When considering the refurbishment projects as a whole, Carbon Trust (2008) stated that one prominent difference that can be apparent between refurbishment and new build is the scale of the project. Further the same authors stated that new buildings tend to capture the imagination while existing are not. Moreover, the refurbishment projects are not focused on inspired or innovative solutions as new buildings which set ambitious targets. According to CIRIA (1994), one of the main characteristics that can be distinguished from a refurbishment project is the existing asset which is continuing throughout the duration of the project. Furthermore, in refurbishments the activities may involve completely refurbished, remodeled or redesigned to fulfill a new purpose which has a little relation to the previous function.

According to Babangida (2014) nature of the refurbishment demands a proper attention from managers and other

professionals on management more than usually paid on new build. Interestingly, Arain (2005) expounded that refurbishment projects demand more time and cost than initially estimated.

B. Reasons for refurbishment

It is important to identify the reasons for the decision to refurbish rather than selecting other alternative options. Arain (2005) stated that decision to refurbishing a particular building is taken relying on limited information available. Figure 1 shows the performance of a building throughout its life span.

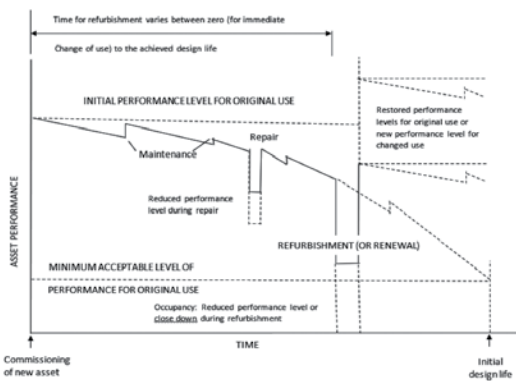


Figure 14: Performance of a building throughout the life time
 Source: (CIRIA, 1994)

According to the figure, it clearly illustrates the deterioration in the performance of a building when it is getting old. CIRIA (1994) stated that this deterioration can be reduced using routine maintenance and repairs. Also, author mentioned that major refurbishment will be needed when the performance is reducing further or to zero which leads to complete shut-down of the building.

Arain (2005) stated that decision to refurbish should impose once the building attained to its end of the service life. Author explained that end of the service life means building is no longer capable to be fit for the purpose. According to Babangida (2014) buildings are being physically deteriorated over time and while subjecting to different forms of obsolescence. Thomson, Van der Flier and Nieboer (2015) explained obsolescence as the process of declining the performance of buildings. The stage of obsolescence is important to get the decision whether to refurbish or completely redevelop (Kangwa&Olubodun, 2004).

Williams (1986) described six forms of building obsolescence as follows.

- Physical Obsolescence which occurs relating to changes in building fabric
- Functional Obsolescence which occurs with the spatial arrangements and required performance of the buildings
- Statutory Obsolescence which occurs due to technical and financial difficulties to meet the statutory requirements
- Economic Obsolescence which occurs due to the demand for building attributes like type and demand for productions and services related to it
- Location Obsolescence which occurs due to losing location importance with changes in market interests
- Communication Obsolescence which occurs due to conflicts of interests arising with the usage of buildings

C. Project life cycle

Generally, all types of projects are gone through similar steps of work (Hughes, 2003). According to Holden (2015), there are eight main stages such as briefing, designing, constructing, operating and using building projects. Also, author has detailed the tasks and outputs which are intended to be changed or overlapped at each phase according to the project requirements. Kerzner (2009) presents five key stages as grouped in PMBOK guide; project initiation, planning, execution, monitoring and control and closure. According to Kulkarni, Bargstadt and Huckfeldt (as cited in Prabhakar, 2008) above stages can be grouped in to main three stages. Those are namely procurement phase, execution/construction phase and operation and handover phase. According to the author procurement phase includes from inception to beginning of work, execution includes the implementation and final stage includes significant completion and handover after the defect liability period. These stages can be used as a base to manage refurbishment projects while identifying problems encountered. Further, this facilitates identifying responsible party and thereby applying suitable approaches to minimize those problems in each stage. In this study mainly considered problems in first two stages which have higher impact on successful completion.

D. Problems in Procurement stage

- Lack of accurate and complete information during design stage

According to Ali (2010), lack of information and lack of quality in available information has become a major obstacle in completing tasks during initial stages. Further to him, uncertainty in refurbishment projects becomes the main reason for that obstacle. Ascertaining information regarding existing building condition is much more difficult task (Ali, 2009). Ali (2014) explained that lack of information such as operating facilities, space limitations and maintain existing design makes the design process more complex. When considering the services installation, most of the time (i.e. electrical wiring and piping) they have been embedded in ceilings and walls (Ali, 2009). Ali (2014) mentioned it is difficult to design an existing structure rather than a new build. Moreover, designers may be less interested and tend to limit their creativity on designing refurbishment projects.

- **Determining client's needs**

Barrett and Stantley (1999) mentioned that the design brief is prepared by gathering client's needs and this is updated throughout the construction project. This is much more important because inability of providing adequate brief always makes additional works, for example design variations (Shen, Li, Chung, & Hui, 2004). According to Mitropoulos and Howell (2002), this condition limits design options and later on it leads to iteration and rework in design process. Ultimately, as a result, cost and time would vary from the originally expected (Rahmat, 1997). Thus, it is clear that client's contribution is a key factor as if his preferences are uncertain in design process and it is likely to change those requirements later in the construction stage (Ali, 2009).

- **Determining the appropriate level of involvement of various parties at the different stages of the design process**

According to Ali, Rahmat, and Hassan (2008), determining appropriate level of involvement of each parties is a main problems presence in refurbishment projects. Further to authors, determining right involvement highly affects the performance of design which required to be within the estimated cost and time parameters. Traditionally, there are two main professionals involve namely; the architect and the contractor (Arain, 2005). Undoubtedly, gathering information on refurbishment projects is mostly depends on the competency and endeavor of designer's (CIRIA, 1994). Ali and Rahmat (2009) opined that the coordination in the design process helps to handle the uncertainty in efficient flow of information. Also stated

that, more the coordination is, speed and accuracy will be increased. Coordination methods could be used to improve project performance such as cost, safety and reduction in variations and claims (Mitropoulos & Tatum, 2000).

- **Selecting suitable contract type**

Contract documents are much more critical as a source of information (Arain, 2005). Misinterpretation of actual requirement of project may happens due to poor contract documentation (Arain, Assaf, & Low, 2004). According to Arain (2005), it is preferred to use re-measurement contracts in refurbishment projects mostly where contractor quotes unit rates based on approximate quantities included in the tender document by the architect due to the inherent uncertainty. Moreover, author suggested not to use lump sum contracts when the projects have high risk factor.

- **The percentage of services work to contract value**

The services make greater problems in the accuracy of the designs and obviously affect the smooth running in construction process. According to Ali (2009), once the proportion of services work is increased, more problems likely to be encountered in services designs. Also, author explained, the difficulty in obtaining design information when the services were concealed either in wall or ceiling. According to author, in such circumstances, it is necessary to get the help of other designers such as structural engineers, architects to confirm the accuracy. As per McKim, Tarek, and Attalla (2000), inaccurate services drawings make the site condition unforeseen and unpredictable. If more information on services discovered in construction stage, it would make problems which lead to change the design which is initially accepted (Ali, 2009).

- **The percentage of provisional sum to project contract value**

According to Rahmat (1997), the provisional sum is an amount allocated for works that are unable to find sufficient information and value correctly only at the construction stage. According to Ali (2010), gathering most of the information of the existing building is difficult. As a result, greater proportion of provisional sums and contingency will require to be allowed in tender documents. This will lead to higher number of variations orders and exceed the target cost of the project (Rahmat, 1997). Barnes (as cited in Quah, 1998) stated that even though it is allocated

provision of the contract to provide such provisional sum, the determination of the amount to be included is difficult due to uncertain characteristics present in refurbishment project. According to the study of Rahmat (1997), it has founded the percentage of provisional sum also seems to be depend on the procurement system. Consequently, the author reported that it is lower in design and build projects than in traditional procurement system. Further to him, the involvement of estimators also in the construction phase is useful as the cost tend to vary frequently.

- **The percentage of structural work to project contract value**

According to Rahmat (1997) it necessary to do structural survey prior to design the refurbishment projects specially in historical buildings. Also stated that this increases the project cost and it would be difficult task with occupancy of the building. Moreover, if the project involves high proportion of structural work, it would be needed to use heavy plants which in turn reduce the space for material storage and make difficulties in access of sites.

- **Statutory requirements**

Ali (2009) stated that it is required to obtain necessary approvals prior to commence the designing phase of a construction project. According to Holm (2000), legislation requirements in construction industry is complex in nature. CIRIA(1994) reported that out of refurbishment types, certain projects such as change in use, alteration facades, historical buildings are vital to subject statutory requirements. When obtaining approvals from authroities, massive amount of time is wasting while making a adverse delay in refurbishment projects (Mitropoulos & Howell, 2002).

- **Degradation of undamaged materials over time**

According to Fisk (as cited in Arain, 2005), scope of the refurbishment project is determined at the inception stage. Consequently, Arain (2005) stated that there is a possibility of further deterioration occur between the period of initial survey and the start of construction. This extension may due to financial problems or delays in designs (Daoud, 1997). According to Mansfield (2002) there is no fixed period of time to start the refurbishment due to various factors. Babangida (2014) noted that in some incidents, the extent of refurbishment works to be undertaken is determined by the extent of deterioration of the building. Later replacement of degradations and

discovery leads to variations which need extra time and cost (Babangida, 2014).

E. Problems in Construction phase

- **Restricted access, circulation routes and site boundary**

The uncertainty, restriction on space and access to the work site are major problems in refurbishment projects than new build (Ali,2009; CIRIA,1994). CIRIA (1994) stated that delivery of material, disposal of waste has to be done in small batches and this is uneconomical. According to Ali (2009) designers have to pay special attention on access during the design development and also the way of transferring tools, equipment, materials and the like. Also, the author mentioned that this is difficult to be handled in case of high rise building as the options are likely to be limited to lifts and stairs. Sometimes, advices from structural engineer is necessary in handling, lifting heavy equipments and and demolition of parts of the buildings (Ali,2009). Apart from that, occupants may add restrictions to access for some parts of the building and then space would be reduced for the labour movements (Rahmat, 1997).Additionally,if the refurbishment projects are in a high traffic area, it may be required to deliver the required materials and other tools in the early hours of the morning (CIRIA,1994).

- **Availability of space for storage of materials**

Along with the restricted access, limited space for storage of materials also can be considered as a problem in refurbishment projects. Hardy (as cited in Rahmat, 1997) highlighted lack of space become a reason for uncertainty and complexity. Rahmat (1997) explained that due to limited space available, small hand tools should be used and requires more supervision when using heavy plant and equipment. Besides, author identified that it is essential prerequisite to maintain a proper site layout and employing an experienced contractor to handle such difficulties appear in refurbishment projects.

- **Potentially reduced security**

According to CIRIA (1994), maintaining security is crucial mostly in occupied refurbishment projects as strangers have the easy access to the premises while executing the refurbishment. Thus, extra precautions have to be taken to ensure securitybecause most of the important documents, equipment and machineriare kept at the site. Also, it

is required to provide warnings, security measures to decrease crimes, theft, and anti-social behaviour CIRIA (1994).

- **Noise, vibration, fumes and dirt**

According to CIRIA (1994), noise, vibration, fumes and dirt are four characteristics that should be carefully handle in refurbishment projects than new build. Thus, there is an extreme necessity to do proper planning and good communication on selecting equipment and relevant techniques to be followed in construction. Furthermore, if it is more harmful to continue occupying in building, building works should be stopped acquiring a huge loss.

- **Increased risk to health and/or safety from construction**

According to Hughes and Ferrett (2007) safety is the most important investment of construction projects. Authors identified health and safety as the health, physical and metal well-being of people around the workplace including economic motives. According to CIRIA (1994), the responsibility regarding safety in refurbishment projects is higher than in new build. Also, author explained that the professional and client involved in project have legal responsibility on their duties and their personnel. Further stated that, the presence of client's personnel makes complicate safety problems, enquiries in the progress. According to Ikpe, Potts, Proverbs, and Oloke (2006), accidents in construction sites may become a reason for death, dissability or illness of workers. Also author mentioned that fatal accidents and major injuries increase the cost of the construction.

CIRIA (1994) identified special risks in refurbishment projects namely;

- Many serious accidents occur during demolition work
- Dangerous in partly demolished buildings
- Hazardous roof working within the premises when occupiers present
- Difficulty in disposing material waste and keeping the site clear and secure
- Use of scaffolding and hoisting equipment

Additionally, according to Barnard (1998) some of the major dangers noticed in sites are falling workers or falling an object over a worker from height, falling into excavations, collapsing, and movement of vehicles in the same routes which pedestrians use.

IV. CONCLUSION

Refurbishment projects are unique in nature. Comparing to new construction the most critical aspect is the existing asset. It should be more careful when dealing with those as the necessity of acquiring right, existing data first. This becomes the first and foremost question that arises which contributes to more other problems. Also, it is important to identify other problems that interfere the management as the ultimate intention of refurbishment project is the successful completion within the targeted cost, time and quality. Thus, this study presents the most significant problems that is frequently present in refurbishment projects.

Generally, every project in construction industry go through similar kind of phases in their life cycle. Among various classifications, this study identifies the project life cycle in terms of three stages: Procurement, execution, operation and hand over. Consequently, problems in refurbishment projects were identified in first two phases as most of the problems occur in these phases which influence the successful management.

Some of the important problems identified are inaccurate and incomplete information during design stage, determining client needs, restricted access, unavailability of space on project for storage of materials, potentially reduced security and increased risk to health and/or safety from construction.

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