

Influence of Human Factors on the Uncertainties of Refurbishment Projects: A Proposed Conceptual Approach

(Pengaruh Faktor Manusia keatas Ketidakpastian Projek-Projek Pembaikpulihan: Pendekatan Konseptual)

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ABSTRACT

The number of building refurbishment projects has increased significantly over the past few years in Malaysia. The key features of such projects are that these are unique, with high uncertainties especially when these involve structural modifications with sensitive, dangerous and difficult operations as well as the high number of building services involved. From many past studies, uncertainty has always been identified as one of the reasons for poor performance in such projects. This seems to be the case because few considerations were given to the human factor compared to the technical issues. This emphasis is however questionable in the real world. This conceptually based paper therefore aims to determine and understand the influence of human factor on the uncertainties of refurbishment projects. The method used for this study is based on a comprehensive review of related journal papers, book chapters and conference papers from 1997 to 2017. The exercise identified 146 articles initially. 57 papers were subsequently included for further analysis after screening and assessment for eligibility. This study concludes that the human impact element is indeed one of the most important factors that tends to influence the levels of uncertainties in building refurbishment projects. As a result, there is still room for improving the performance of building refurbishment projects. The findings of this study form the basis for an extended investigation to identify the effect of human factors on the uncertainties of building refurbishment projects in Malaysia.

Keywords: Refurbishment projects, Uncertainties, Human factors

ABSTRAK

Bilangan kerja-kerja pembaikpulihan bangunan telah meningkat secara drastik sejak kebelakangan ini di Malaysia. Ciri-ciri utama projek sedemikian adalah sangat unik, faktor ketidakpastian yang tinggi terutamanya apabila melibatkan kerja-kerja pengubahsuaian struktur yang sensitif, berbahaya, operasinya yang rumit serta melibatkan kerja-kerja pendawaian dan servis yang tinggi. Walaupun banyak penyelidikan telah dijalankan, namun faktor ketidakpastian masih dikaitkan sebagai salah satu punca terhadap prestasi projek yang lemah. Masalah ini disebabkan oleh kebanyakan dapatan daripada kajian-kajian yang lepas hanya tertumpu kepada isu-isu teknikal berbanding faktor impak manusia, sedangkan dalam keadaan sebenarnya sering dipersoalkan. Kajian berasaskan konseptual ini adalah bertujuan untuk menentukan dan memahami secara umum pengaruh faktor impak manusia terhadap ketidakpastian projek-projek pembaikpulihan. Kaedah yang digunakan adalah melalui tinjauan terhadap jurnal, buku dan kertas persidangan yang berkaitan melalui enjin carian, termasuk Scopus, ScienceDirect, Web of Science, EBSCOhost dan Google Scholar, dengan jarak tahun yang dipilih dari 1997 hingga 2017, sebanyak 146 artikel yang berpotensi telah dikenalpasti, dan 57 kekal selepas saringan dan dinilai untuk penyesuaian. Penemuan kajian ini telah membentuk satu asas penting untuk kajian-kajian yang seterusnya bagi mengenal pasti kesan faktor-faktor impak manusia terhadap ketidakpastian projek-projek pembaikpulihan bangunan di Malaysia.

Kata kunci: Projek pembaikpulihan, Ketidakpastian, Faktor impak manusia

INTRODUCTION

Building refurbishment work can be defined as work that makes use of what is usable from the existing stock of ageing buildings that are still valuable in their own right. Such work can be classified as repair, rehabilitation, renovation,

restoration, retrofit, extension and modernization (Ali & Zakaria 2012). Ryu (2014) defined refurbishment works as activities to extend the useful life of existing buildings through the adaptation of their basic forms to provide a new updated version of the original structure. According To Rahmat and Adnan (2012), refurbishment works are usually

initiated for many reasons. Some of these reasons are due to obsolete and physical deterioration, functional and changing dynamics of economic activities, innovation, technological changes, social, location, legal, and aesthetics, as well as the limited land available in urban areas.

Refurbishment works are fast becoming one of the most important sectors of the construction industry. Based on a research by Rahmat and Ali (2009), in many developed countries such as the United Kingdom and Germany, this sector contributes to about a half of the construction output. The trend has grown and expanded similarly to Malaysia. The Construction Industry Development Board of Malaysia (2014) reported that the refurbishment sector contributed to about 7.1 percent of total output in the construction industry and is steadily increasing annually. Ali, Kamaruzzaman, and Zulkiflee (2010) however observed that many of the refurbishment works carried out were unreported, especially those undertaken by individual homeowners who had carried out illegal renovation works. Hence, the actual value of refurbishment works could be higher.

Several studies have noted that the management of building refurbishment works is demanding because of their inherent complexities; presence of many unforeseen elements; high factors of uncertainty; more risky operations especially when involving structural modifications; as well as the presence of obstructive building services (Ali et al. 2009; Ali & Zakaria 2012; Ali 2014; Yacob et al. 2017). In addition, Rahmat and Ali (2009) emphasized that the uncertainties of refurbishment works are constantly present throughout the project life cycle. When compared with a new build, refurbishment work is different and requires more flexible and integrated approach. As observed by Odimabo (2018), there is a difference between risk and uncertainty where, a risk is subjected to investigation and known probability, whereas uncertainty refers to events for which it is impracticable to specify numerical likelihood.

Hence, modifying the management process slightly to cater for successful refurbishment works is simply not sufficient. From a different perspective, this study suggests a new direction for future research where there is a need to determine how the element of human impact can potentially influence the uncertainties of refurbishment projects.

BACKGROUND TO THE STUDY

Uncertainty factors encountered in building refurbishment works are often referred to as the reason for poor performance. Based on a research completed by Ali (2014) more than half of the refurbishment projects studied exceeded the estimated original cost and time targets due to unpredictable design changes during construction. To circumvent this uncertainty consequently demands integrative mechanisms combined with coordination and involvement of all participants in the projects (Kim 2014; Oregi et al. 2017). In additions, the factors of uncertainty could be managed and minimized by forming good relationships between all the participants involved in the projects (Ali & Zakaria 2012).

Existing research in managing uncertainty factors to improve projects performance found that most of these projects have concentrated on the technical issues to the detriment of the human impact factors. The issues that exist in a real world situation suggest there are significant relationships between factors of uncertainty and leadership qualities of project managers to improve project performance (Jens 2013; Yacob et al. 2017). Despite the many research studies completed on building refurbishment projects in recent years, it takes time for these research findings to be adopted widely in practice where the non-technical and technical barriers exist and persist alongside one another (Sunikka et al. 2012). Hence, this study aims to identify, in general, the elements of human impact factors that can potentially contribute to the uncertainties in building refurbishment projects.

METHODOLOGY

The development of information science rendered the search for a variety of data from various sources easy. In this current study, a literature search for the relevant publications was carried out using Scopus, Science Direct, Web of Science, EBSCOhost, and Google Scholar using the reference management software Mendeley. To locate scholarly publications related to the study, a set of keyword searches were employed that covered a large range of databases and journals. The keywords included “refurbishment project”, “uncertainty” and “human impact”. The literature search served as a preliminary study to identify the human impact factors that influenced the uncertainties of refurbishment projects based on the previous research studies. Conducting research through literature review is described as “a form of research that reviews, critiques, and synthesizes the representative literature on the topic in an integrated way such that frameworks and perspectives on the topic are generated” (Torraco 2005).

The literature search identified 146 potentially relevant references from 1997 to 2017. The results were further screened and refined for appropriateness. Some references were therefore rejected because of duplication. From this screening and refinement exercise, 75 articles were retained. Each article was then reviewed and judged for its theoretical robustness and contribution to the current discussion. 57 articles were finally included and categorized for this current study (Figure 1). The articles from each category were then further analyzed to determine and understand the influence of human impact factors on uncertainties of refurbishment projects.

63% of the 57 articles were related to human impact factors and uncertainties of refurbishment projects. 14 articles were subsequently identified as the main references related to human impact factors (Table 1) and 22 articles as main references on uncertainties of refurbishment projects. The remaining articles provided supporting background information for the present study. Hence, the relationships identified allowed the research team to propose a conceptual

framework (Figure 2) to underpin this present study. The framework highlights the potential variables and background information for further research in the same area.

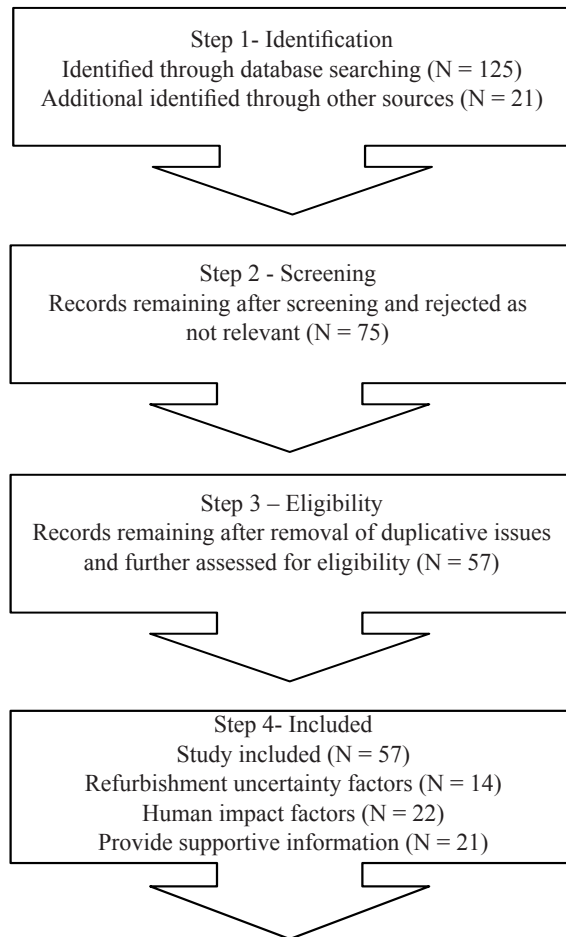


FIGURE 1. Literature search method (adapted from Papanti et al. 2013)

RESULTS AND DISCUSSION

The findings from the comprehensive literature review have revealed numerous pieces of evidence that showcased the potential variables of human impact factors associated with uncertainties of refurbishment projects (Table 1 and Table 2).

HUMAN FACTORS OF REFURBISHMENT PROJECTS

The human impact factor category examines the relationships between people and the systems within which they interact by improving efficiency, creativity, productivity and job satisfaction, with the goal of minimizing errors (Kohn, Corrigan & Donaldson 1999). The relationship between human impact factors and the success or failure of a construction project has already been researched extensively. According to Orlando (2013), consideration of the human impact factors is crucial for increasing efficiency and performance in the construction industry. This is especially so when projects

are complex, affecting the nature of the tasks involved. In addition, Wong (2007) commented that people are important in the building construction project environment, and that many projects have revealed frustrations caused not by deficiencies in the method or poorly constructed schedule of works, but rather by the people involved in the project. Thesis consistent with the observations made by Yacob et al. (2017). Based on the finding of the literature review, the factors that contributed to the impact of people on refurbishment projects are as follows:

PROJECT TEAM'S BEHAVIORS

The building refurbishment process is typically labor intensive. It needs skills, commitment and effective management of people (Rahmat 1997). As suggested by Egbu (1997) the challenges of organizing refurbishment works include knowledge and competencies of the employees, as well as innovative processes, product services, structured approach to education and training for management of refurbishment projects. According to Ciccotti (2014) and Gupta (2017) the major challenges to successful project implementation are the natural selection of the project team members, the growth of interpersonal skills, strategic thinking, conflicts management, organization culture, leadership skills, communication, and adaptability. These human factors are most often ignored despite the fact that it is crucial to have the ability to guide workers to achieve the project objectives and to balance the project constraints.

NEIGHBORHOOD COMPLAINTS

A study by Li (2014) on the intervention of the building owner in decision-making and the occupants' acceptance levels were also among the important issues relating to refurbishment works, especially in an occupied building. Equally challenging when pushing forward with the refurbishment works are the sentiments of the owners and occupants of the buildings (Miller & Buys 2008; Sodagar 2013). Hence, consideration of the issues of neighborhood complaints, behaviors and occupant's satisfaction is important. Human behavior cannot be ignored in favor of technical factors while managing refurbishment works during the construction stage in an occupied building. It is also vital to make sure that the refurbishment works can be completed within the scheduled timeframe (Yacob et al. 2017).

CLIENT AND DESIGNER ATTRIBUTES

Previous research studies have found that client and designer attributes are also essential elements that are prone to be influenced by the uncertainties of refurbishment works. In order to ensure, for instance, accuracy in decision-making by designers and experience in the selection of materials, good communication skills is imperative to successfully manage the refurbishment project (Ghose et al. 2017; Murphy 2013). In addition, the skills and experience in managing project planning and scheduling, ability to provide accurate work

breakdown structures and activities, would affect the overall project performance of the refurbishment works (Rahmat 2008). Therefore, the design process requires formal and informal communications, integration and differentiation of tasks, as well as flexible and rigid procedures as the case may be. All these require the involvement of every key participants in the production of the project plans (Rahmat & Ali 2010).

AUTHORITY MATTERS

Refurbishment projects can become even more uncertain when these involve complicated local authority matters arising from policy requirements of the respective offices. Ling (2002) and Yeong et al. (2015) argued that designers who are knowledgeable and enthusiastic about their work often obtained statutory approval speedily. In addition, designers should apply their knowledge about legislation to ensure that acceptable practices are adhered to. A case study conducted by Mitropoulos and Howell (2002) found that the main reason for the delay in a refurbishment project is usually caused by the process of getting approval from the local authority. A design that needed to be submitted more than once because of amendments and the need to rework the design because of changes in statutory regulations by the respective authorities often caused delays. Therefore, the skills in communication

and adequate allocation of time for the approval process are important, especially for the issuance of design approvals that can be uncertain and difficult to predict. This arose because this could involve multidisciplinary parties in decision-making to meet the prevailing building regulations (Stawarz 2014; Ballarini et al. 2017; Ali 2014).

CONFLICTS

Noori, Saruwono, and Adnan (2016) noted that building refurbishment projects are more uncertain than new build projects. Consequently, the former tended to increase conflicts. Building refurbishment projects therefore need to be systematically managed to achieve successful project implementation. Furthermore, conflicts in refurbishment works could include unforeseen actual site conditions that are challenging, restricted site access, lack of space during construction, the availability of materials, design changes, client's requirements and ineffective communications between the client and the contractor could eventually affect the overall project performance relating to time, cost, quality and the variations of work. Hence, identifying and managing the human impact factors that contribute to uncertainties of refurbishment projects are crucial to enhancing project performances (Yacob et al. 2017). A summary of the human impact factors are shown in Table 1.

TABLE 1. Human Factors

Items and Dimensions	Authors
1. Authority matters Policy changes affect approval, inconsistency of special requirements by different authorities need to be fulfilled due to poor decision-making, lack of experience and unclear attributes	Ali & Zakaria (2012); Ali (2014)
2. Team and working group behaviors Organization culture, and leadership quality and skills among project managers	Yacob et al. (2017); Ciccotti (2014); Ain, Nasaruddin & Rahman (2016); Egbu (1999); Udhayakumar & Karthikeyan (2014)
3. Client and consultant attributes Design changes due to lack of experience, skills, abilities and poor decision making	Ali (2014); Rahmat (2008); Rahmat & Ali (2010); Ali, Rahmat & Noordin (2007); Ali (2010)
4. Neighborhood complaints Refurbishment of occupied buildings, comfortable, managing materials and safety, ease of access, security, behavior and communications skills	Ali (2014); Rahmat (2008); Li (2014)
5. Managing conflicts Uncertainties tend to increase conflicts and these need to be managed systematically	Noori, Saruwono & Adnan (2016)

UNCERTAINTIES OF REFURBISHMENT PROJECTS

Uncertainty means there is a lack of information available to perform a task (Galbraith 1977). According to Ward and Chapman (2002), the definition of uncertainty is associated with the lack of certainty, ambiguity related to the lack of data and lack of details required to consider issues. Refurbishment work is one of the uncertain scenarios

experienced in construction projects (Quah 1988; Rahmat & Adnan 2012; Ali 2014; Yacob et al. 2017). A majority of refurbishment projects were completed with overestimated time and bloated costs (Yacob et al. 2017; Daoud 1997). As shown by previous research studies (Table 1), most of the factors that contributed to uncertainties in refurbishment projects are as follows:-

DESIGN PROCESS

According to Ali, Rahmat and Noordin (2007) and Baldwin et al. (1999), a design process is “a process that maps an explicit set of client and end-user requirements to produce based on knowledge and experience, a set of documents that describe and justify a project that would satisfy these requirements and other statutory and implicit requirements imposed by the domain or the environment”. It is also “a multi-disciplinary process, performed in a series of iterative steps to conceive, describe and justify increasingly complex solutions to meet the needs of the client”. These definitions showed that a design process involves inter-disciplinary and non-linear activities. The involvement of many participants in various disciplines creates difficulties in managing complex designs usually found in refurbishment projects. These definitions aligned well with Harris (2006) who noted that the difficulty level in refurbishment works depends largely on the interrelatedness of the building systems. According to Stone (1976) and Baha et al. (2017) increasing complication in the accuracy of design is expected in refurbishment projects that require an increased amount of services and this contributes to further uncertainties.

PLANNING AND CONTROL

The planning and control processes in refurbishment projects are also fundamental to ensure that the activities of the key participants are closely integrated. This would inevitably narrow down the information and communication gaps (Rahmat 1997; Yacob et al. 2017). According to Laufer, Denker, and Shenhar (1996) a majority of the refurbishment projects employed a large number of subcontractors specializing in different technologies that purportedly serve to promote the integrative mechanisms to reduce fragmentation. Hence, it can be a major problem to plan and control the refurbishment projects.

REFURBISHMENT WORK IN OCCUPIED BUILDINGS

The uncertainties of refurbishment works are also normally contributed by the occupants of the building, for example in an existing office building, condominium, school and hospital (Rahmat 1997; Yacob et al. 2017). According to Quah (1988) refurbishment works in an occupied building should not interfere with the normal usage of the building. Therefore, productive activities for the refurbishment works would be less and thus affect the level of refurbishment performance. Daoud (1997) opined that the simultaneous operations by the user of the building would interrupt the flow of the overall refurbishment project. The sequence of work is difficult to determine if the building needs to be shared between the residents/occupiers and the refurbishment project team. Mitropoulos and Howell (2002) argued that a level of uncertainty is associated with the access to the occupied

building because more time is needed for coordination where the situation is often unpredictable.

PROCUREMENT METHOD

The type of procurement method used also influenced the level of uncertainty in a refurbishment project. This is potentially caused by the uncertainty in the way the projects are awarded and how the projects are managed in the contract (Ali 2014; Yacob et al. 2017). Procurement methods also affect the future performance of construction projects. A wide range of procurement methods also controlled the completion time of projects (Rahmat 2008). According to Abdul Rashid et al. (2006) numerous project procurement systems are used in the refurbishment sector. These ranged from the traditional system to the many variations of “fast-tracking” systems such as turnkey, design and build, build-operate-transfer and management contracting. In addition Ali, Kamaruzzaman & Zulkiflee (2010) as well as Okoroh (1992) pointed out that inadequate specifications from the architects made it difficult for contractors to define the exact scope of the work in advance. Consequently, this further increased the uncertainty of the project.

STATUTORY REQUIREMENTS

According to Ali and Zakaria (2012) in building regulations, the design of the refurbishment project is one of the factors affected by the complexity of the law. Changing and updating of prevailing regulations have also affected the government’s processing of building approvals in refurbishment projects, especially projects related to conservation.

Holm (2000) noted that the approval from the appropriate authorities relating to the design of the construction projects need to be complied with before the project could be executed. Manavazhi and Xunzhi (2001) found that additional requirements from different local authorities influenced the number of changes in the refurbishment design. Hence, these caused inconsistencies in the design requirements that necessitate an experienced person for liaison and communication purposes. A summary of the uncertainties of refurbishment projects is shown in Table 2.

PROPOSED CONCEPTUAL FRAMEWORK

A conceptual framework is an analytical tool with several variations and contexts, which is used to make conceptual distinctions and organize ideas. Hence, based on the findings of the comprehensive literature review, the dataset can be grouped into two main variables as follows; the human factors as the independent variable and the uncertainty of refurbishment project as the dependent variable. These two factors are incorporated in the conceptual framework (Refer to the Figure 2).

TABLE 2. The Uncertainties of Refurbishment Projects

Items and Dimensions	Authors
1. Design process Multi-discipline, involves testing and many participants	Ali, Rahmat & Noordin (2007); Baldwin et al. (1999); Harris (2006); Stone (1976)
2. Planning and control process Fragmentation issues, integration of all parties, sequences of works and coordination, a large number of sub-contractors	Yacob et al. (2017); Rahmat (1997); Rahmat & Ali (2010); Laufer et al. (1996); Christiansen (2012); Shah (2012); Strachan (2013)
3. Refurbishment works in occupied buildings Interfere with the normal usage by occupiers; interrupt the flow of work	Yacob et al. (2017); Rahmat (1997); Mitropoulos & Howell (2002); Quah (1988); Daoud (1997)
4. Procurement methods Types of procurement influence the level of uncertainty, managing the contracts of specialist contractors, and the inadequacy of specifications.	Ali et al. (2010); Ali (2014); Yacob et al. (2017); Rahmat (2008); Abdul Rashid et al. (2006); Okoroh (1992)
5. Statutory requirements Affected by the complexity of the law, changing and updating affects approval, inconsistency in design requirement and required experiences	Ali & Zakaria (2012); Holm (2000); Manavazhi & Xunzhi (2001)

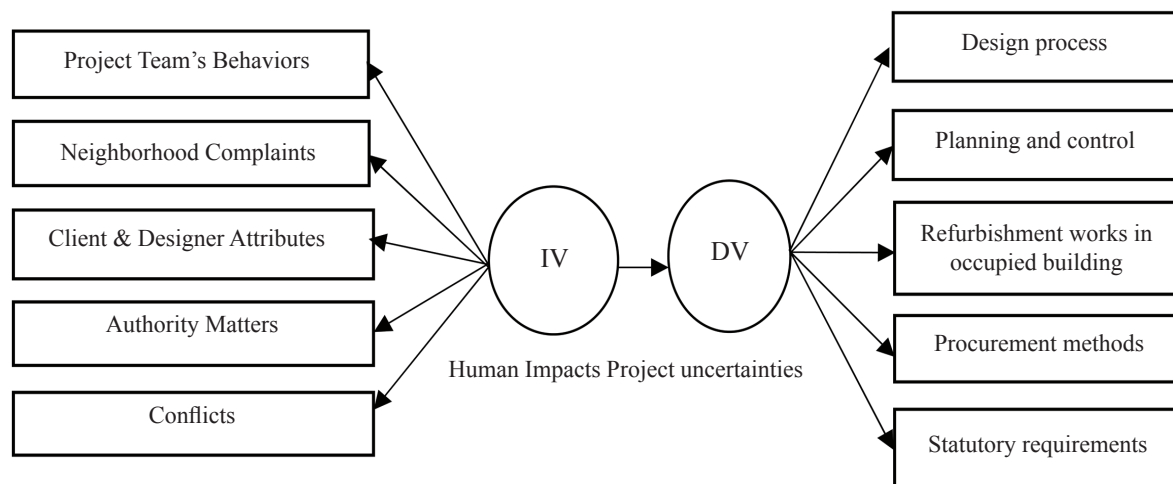


FIGURE 2. Proposed Conceptual Framework

The proposed conceptual framework has been constructed based on variables and items that have been determined according to previous studies and findings of the literature review. Although many recent studies have been conducted specifically on the technical issues in the context of effective management of uncertainties to improve the performance of refurbishment projects, the human impact factors also need to be considered. There is no consensus yet on how best these constructs can be incorporated to better manage the uncertainties of refurbishment projects. The focus of this current research study is to address the limitations of previous research studies conducted by Rahmat and Ali (2010); Sunikka, Chen & Britnell (2012); and Yacob et al. (2017). This current research aims to provide the basis for further research into managing the uncertainties of refurbishment projects with an emphasis on the potential impact human

factors can influence project performance and to identify the dependency relationship from different points of view.

CONCLUSION AND RECOMMENDATION

This study provides an overview of the influence of human factors on the uncertainties of refurbishment projects. The literature search method was employed (Papanti et al. 2013), with 146 related articles identified initially. 75 of these articles were subsequently screened for appropriateness. 57 articles were finally included in this review to form the basis for the analysis. This research aims to identify and understand the influence of human factors on the uncertainties of refurbishment projects. The research team establishes and concludes that the human impact element is one of the most

important factors that influence the levels of uncertainties in refurbishment projects. Consequently, there remains room for improvement. In this context, there are also potential impacts on time, cost and quality of the refurbishment projects. However, empirical research is further recommended to verify the findings and establish the current trends.

This research, in conceptual terms, is limited to the comprehensive literature review and published empirical research findings that have provided valuable insights for scholars and practitioners. Future studies can implement the proposed conceptual framework to develop a structural model for statistical analyses, and to understand better the relationships between the human impact factors and the uncertainties of refurbishment projects. This concept is relatively new and holds the potential to provide new knowledge to manage better building refurbishment projects.

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