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A Conceptual Innovative Risk Management Model for Commercial Buildings Refurbishment Projects

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Abstract: In construction industry, refurbishment is an alternative way to upgrade the lifespan of the existing infrastructure. The refurbishment approach has been widely used even though it seems riskier, complex, and more difficult than constructing new projects. Despite several risk-management tools are available, a high level of uncertainties, risks and requirements of refurbishment for commercial projects have not been reduced and it becomes more challenging. There is a relatively low implementation of formal risk-management methods in practice and in fact, there have been limited studies focusing on this issue, particularly in Malaysia context. This study aims to promote a comprehensive tool to managing risks of refurbishment projects, particularly for commercial buildings in developing country including Malaysia. A critical review of the existing studies in regard to risks management from different perspectives was used to develop a conceptual framework. A qualitative method of face-to-face interviews was used in the study. Content analysis showed that the proposed tool would be beneficial and pave a way to developers as risk management can influence their decision-making process. This paper will be useful for developers in making decisions before undertaking refurbishment projects. In fact, the proposed risk-management model would be potentially providing a pave in motivating clients, consultants, and other participants to enhance their service and product quality in refurbishment project for commercial buildings.

Keywords: Building refurbishment, risk management, risk in refurbishment

1.0 Introduction

The construction industry is highly risk-prone, with complex and dynamic project environments creating an atmosphere of high uncertainty and risk (Ehsan et al., 2010). The construction workload is large, especially for refurbishment projects, because of the riskier, complex and less predictable tasks involved (Egbu, 1994; Rahmat, 1997; Rayers and Mansfield, 2001; Ali et al., 2009). Refurbishment work includes the upgrading, alteration, extension, and renovation of existing buildings in order to improve their facilities and lifespan but excludes maintenance and cleaning work (Quah, 1988; Ali and Rahmat, 2009; Ali and Zakaria, 2012). Data from the Malaysian Construction Industry

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Development Board (CIDB, 2014) show that refurbishment works, which are normally used by practitioners as a guide on the value of refurbishment work, accounted for 1,227 total projects with a total value of RM7,033.41 million in 2010. The numbers increased in 2013, with a total of 1,380 projects and a total value of RM8,515.32 million, illustrating demand for refurbishment projects in Malaysia is growing rapidly.

However, Ranasinghe et al. (2021) state that most refurbishment work involves a high level of risk, uncertainty, and coordination, which are likely to cause asymmetric information between contractors and stakeholders during the refurbishment process. Additionally, refurbishment projects are generally more uncertain than other construction projects (Rayers and Mansfield, 2001; Ali and Rahmat, 2009). Due to these uncertainties, refurbishment contractors often leave the primary objectives of cost, time, and performance as flexible, which means there are no targets. Ali (2010) addresses that the level of knowledge in implementing refurbishment works is still underperform and very limited. Because of that, the majority of refurbishment projects are completed with overestimated time frames and run over in costs (Ali et al., 2009). In addition, Ali et al. (2009) add that refurbishment works will cost more compared to newly built projects because of the uncertain needs of clients during the project.

Refurbishment is used as an alternative for a building that has reached the end of its service life or failed to perform as required (Ali et al., 2009). Ali et al. (2009) add that the refurbishments are initiated by several factors, such as deterioration, change in use, economic factors, the economy, and changes in condition. Additionally, refurbishment is not a new phenomenon; indeed, since the Renaissance period, classical monuments have been transformed for new uses (Plevoets and Van Cleempoel, 2011). Lyons and Skitmore (2004) state that many studies have shown that there is a relatively low implementation of formal risk-management methods in practice. However, a building's refurbishment evaluation is quite difficult to undertake because the building's systems and the environment are complex (Kaklauskas et al., 2005). As a result, there have been limited studies focusing on risk management for refurbishment projects in Malaysia. As such, this study focuses only on risk management in refurbishment projects, particularly for commercial buildings.

2.0 Risk Management

The Project Management Institute (2008) states that risk management is one of the nine knowledge areas in project management and is probably the most difficult aspect of project management. Risk management is a major feature of project managing construction projects to deal effectively with uncertainty and unexpected events to achieve project success (Banaitiene and Banaitis, 2012). Risk management can be defined as a comprehensive and systematic way to identify, analyze, and respond to risks to achieve project objectives (Banaitiene and Banaitis, 2012). In addition, risk management also can be described as the process through which an organization reaches decisions on the steps it needs to take to adequately control the risks it generates or to which it is exposed and is the process through which it ensures those steps are taken (Doran et al., 2009).

Meanwhile, Smith et al. (2014) define risk management as a proactive approach to the 'what ifs' that can influence the project's outcome and achievement of its objectives. Furthermore, risk management includes the processes concerned with conducting risk-management planning, identification, analysis, responses, and monitoring and controlling during a project (Cretu et al., 2011). On the other hand, Loosemore et al. (2006) describe risk management as the process of proactively working with stakeholders to minimize the risks and maximize the opportunities associated with project decisions. Based on the definitions above, it can be concluded that they have similarities that every process in the management task needs to consider carefully to achieve company goals. As for this paper, risk management can be described as the attitude toward risk and the activities of an organization to fulfill its objectives effectively.

2.1 Process of Risk Management

The risk-management process consists of a series of steps that can continue to improve decision-making (Kululanga and Kuotcha, 2010). Ahmed et al. (2007) state that the literature shows a variety of tools that exist to measure risk-management processes based on both qualitative and quantitative approaches. Generally, over the years, many variables have been studied in risk-management processes (Ward and Chapman, 2003; Baloi and Price, 2003). Table 1 shows the variables that affect the risk-management process.

According to Table 1, the most important process of risk management is the identification of risk. This involves identifying the source and type of risk (Banaitiene and Banaitis 2012). It includes recognizing the potential risk-event conditions in the construction project and clarifying the risk responsibilities (Ehsan et al., 2010). The moderately important processes based on experts' views are analysis and action, as well as monitoring and controlling. Kululanga

and Kuotcha (2010) state that risk analysis involves assessing the impact of risks, identifying the range of forces that could produce an adverse effect, recognizing the assets that could be affected, identifying the features that increase the risk, and considering the extent to which the risk might manifest by itself.

Table 1 - Process of risk management

Variables	Tummala & Burchett (1999)	Ahmed et al. (2007)	Doran et al. (2009)	Ehsan et al. (2010)	Kululanga & Kuotcha (2010)	Clayton (2011)
Identification	√	√	√	√	√	√
Assessment		√	√			
Analysis	√		√	√	√	√
Planning				√		√
Exposure					√	
Action	√		√	√	√	√
Monitor & Control	√	√			√	√

The action step involves actively scanning the environment for triggering events or emerging issues (Clayton, 2011). Clayton (2011) adds that continuous risk management means not only analyzing the outcomes of the actions that have been taken but also undertaking regular reviews to identify new risks emerging from project changes, the organization, and the wider environment. Lastly is risk monitoring, which involves monitoring known risks, identifying new risks, reducing risks, and evaluating the effectiveness of risk reduction (Kululanga and Kuotcha, 2010). In addition, Ehsan et al. (2010) state that risk control is the response to changes implemented to remove risks.

The least-used processes in risk management are assessment, planning, and exposure. Based on Ehsan et al. (2010), assessment of risks and the possible interactions of risks with project activities aims to evaluate the possible outcomes of the project. Risk planning focuses on predefined actions that the project team should take if an identified risk event occurs; for example, contingency reserves are provisions held by the project sponsor that can be used to mitigate cost or schedule risks if changes in scope or quality occur (Clayton, 2011). Lastly, for risk exposure, Kululanga and Kuotcha (2010) explain that risk exposure is aimed at determining the extent of what a construction contractor will lose if the risk occurs. They add that it is important for an entire project team to fully understand the coverage and revelation associated with the various determinants of project success that are at stake.

Hence, for this paper, processes that involve risk management are *identification*, followed by *analysis*, *action* and also *monitor and control*, in this sequence. This is because, before starting a project, it is important to identify first the relevant threats and opportunities. Once the risks have been identified, it is time to understand the risks and assess them by using either a qualitative or quantitative approach. Following this, action must be taken – assessing risks well is useless unless the organization takes action to manage the risks. Last but not least, these steps need to be monitored and controlled constantly in order to review what is happening in the project. The example risk-management processes are shown in Figure 1.

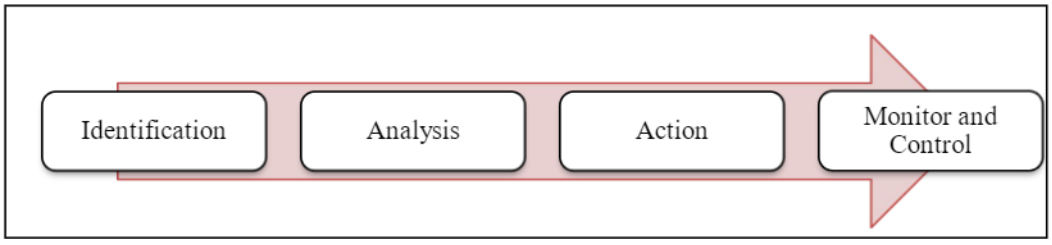

Fig. 1 – Process of risk management

2.2 Category of Risks in Refurbishment Projects

Everyone involved in a construction project will have a different specific attitude to risk (Doran et al., 2009). Doran et al. (2009) state that all the risks that occur can be minimized – if not avoided – with proper training. Table 2 shows the types of risks that might be faced by construction industry players while undertaking a refurbishment project.

Table 2 - Types of risks in refurbishment projects

Variables	Ahmed et al. (2007)	Doran et al. (2009)	Ali et al. (2009)	Clayton (2011)	Riley & Cotgrave (2011)
Cost and financial	√	√	√	√	√
Time	√		√	√	√
Quality	√		√	√	
Scope				√	
Technical		√			√
Emotional		√			
Health and Safety		√			
Management		√			√
Legal		√			√

The most influential risks in refurbishment projects are cost and financial risks. This is because the cost can affect the whole refurbishment process. For example, problems with the existing building will only become apparent during the construction work. In this case, problems that are not shown on the drawings will make the price of some items more expensive than the bill rates (Ali et al., 2009). The common risks that can affect the process of refurbishment projects and which are considered include time, quality, technical, management, and legal. Lastly, risks that can affect refurbishment projects the least are scope, emotional, and health and safety risks. In this paper, we outline all the types of risks that have been gathered from the literature.

3.0 Building Refurbishment

Building work can be classified as either a *new build* or *refurbishment* (Riley and Cotgrave, 2011). Riley and Cotgrave (2011) explain that a new build is an easy concept to grasp, while refurbishment is a more difficult concept to generalize. Ali and Zakaria (2012) state that refurbishment work can include upgrading, alteration, extension, and renovation. Riley and Cotgrave (2011) state that refurbishment can best be defined as extending the useful life of existing buildings through the adaptation of their basic forms to provide a new or updated version of the original structure. In addition, refurbishment is making use of usable buildings in the aging building stock and the skillful adaptation of a building which is valuable in its own right and not due to any historic, value, new, or updated version of its existing use (Marsh 1983). In addition, Quah (1988) states that refurbishment includes the upgrade, major repair works, renovation, alteration, conversion, and modernization of existing buildings but excludes routine maintenance and cleaning work.

Moreover, Mustafa (2007), describe refurbishment as the works of rehabilitation, extension, improvement, conversion, modernization, fitting out, and repair, which are undertaken on an existing building to permit its reuse for various specific purposes. In addition, refurbishment also can be defined as work carried out on an existing building with the intention to improve and update it to meet modern standards while retaining its current use (Marir and Watson, 1995). Van der Flier and Thomsen (2005) state that refurbishment is a transformation (process) of the physical, functional, financial, architectural, and ecological characteristics of a project to realize a comprehensive and useful extension of the building's life span. Over the years, the definition of refurbishment has not changed drastically from study to study. Considering the similarities between the definitions, this paper defines refurbishment as a process of improving the existing building from small- to large-scale works caused by the condition and needs of the building but excluding and not up to the level of demolition works.

3.1 Category of Refurbishment Works

Refurbishment covers project work ranging from simple redecoration to the complete remodeling of an existing building (CIDB, 2013). There are three common types of schemes of refurbishment work: simple refurbishment, medium refurbishment, and major refurbishment (APCC, 2010).

Simple refurbishment or minor refurbishment involves repairs, redecorations, and updates to short-life items, such as furniture, fittings, and equipment (Riley and Cotgrave, 2011). Riley and Cotgrave (2011) add that refurbishments of this nature might be undertaken as part of a planned refresh cycle or might be a short-term tactical investment to extend the economic life of an asset. The timeframe of the investment is typically 5 to 7 years.

In addition, medium refurbishment generally involves upgrades to building services, with the frequency of investment being on a cycle of 15 to 25 years (CBRE, 2014). Increasingly, improvements to the building fabric are required as a consequence of building regulations. Refurbishments of this kind will involve a greater level of risk associated with the existing building fabric and systems.

Lastly, major refurbishment or complete refurbishment is aimed at the long-term repositioning of a building, which includes improving its performance and efficiency, addressing constraints (such as circulation), and maximizing the potential offered by the site and the building consent (APCC, 2010). The risk in these projects is much greater, but the opportunity for a contractor to manage its exposure is equally high; as such, the risk-management priority is to make sure the maximum amount of information on building conditions and other sources of risk is acquired and to make risk allocations.

3.2 Influential Factors of Successful Refurbishment Works

Refurbishment works become an alternative when a building has reached the end of its service life or fails to perform as required in its use (Ali et al., 2009). The refurbishment and reinvention of existing buildings offer a number of benefits when compared to complete redevelopment based on several factors (Davis Langdon, 2012). Table 3 shows the factors of refurbishment works and projects based on previous studies.

Table 3 - Influential factors of successful refurbishment works

Variables	Mickaityte et al. (2008)	Ali et al. (2009)	Sheth et al. (2010)	Ryu (2014)
Change in use	√	√	√	√
Economic change	√	√		√
Investment decisions		√	√	
Historic value		√	√	
Change in condition	√	√		√
Change in technology	√	√		√
Change in legislation		√	√	√
Lack of maintenance	√	√		√
Social problems	√	√		√
Financial crisis	√	√	√	√
Limited land for development	√	√	√	√
To meet modern standards			√	√
Maximization of space to let		√	√	

The greatest factors that can affect refurbishment works are a change in use and limited land for development. This is because the definition of refurbishment that has been adopted in this research is a process of improving the existing building from small- to large-scale works caused by the condition and needs of the building but excluding and not up to the level of demolition works. The definition shows that when there is a change in use for any building, it will need to be refurbished to extend the building's use (Ryu, 2014). On the other hand, some countries like Malaysia have limited land for new builds; as such, often the only solution that can be taken is to refurbish existing buildings (Ali et al., 2009).

Meanwhile, other factors like economic change, investment decisions, historic value, change in condition, change in technology, change in legislation, lack of maintenance, social problems, financial crisis, to meet modern standards, and maximization of space to let are the factors that are moderate and might be considered by industry players before carrying out refurbishment projects.

According to Ali et al. (2009), based on the data compiled by the Malaysian CIDB, refurbishment work accounted for 2% of total construction output in 2002 and increased to approximately 16% of total construction output in 2006. This shows that the demand for refurbishment works in Malaysia is high and is growing rapidly, which might be due to a change in use, financial crisis, or even limited land for development.

3.3 Existing Refurbishment Tools

Currently, while some well-established standards for tools or models for refurbishment exist, there is currently no matured foundation for specifying transformation between refurbishment and risk management. Table 4 shows the refurbishment tools that currently exist in the construction industry.

Table 4 - Refurbishment tools in the construction industry

Author(s) (Year)	Tools	Variables	Components of Model/Framework
Ali et al. (2005) Yacob et al. (2019)	Decision Process for Building Refurbishment Projects	• Refurbishment design uncertainty • Architects' characteristics • Integrative mechanism	• Design process performance
Mickaityte et al. (2008) Ranasinghe et al. (2021)	Concept Model of Sustainable Buildings Refurbishment	• Energy saving • Increase of comfort • Healthy working environment assurance • Extension of building life cycle • Economized exploitation • Environmental protection	• Sustainable refurbishment principles • Macro environment • Micro environment • Participating in the decision-making process
Zavadskas et al. (2008) Kamari et al. (2017)	Decision-making Model for Sustainable Building Refurbishment	• Environment indicators • Depreciation level • Energy-saving effects • Value of the building • Stakeholders' requirements • Type of refurbishment • Decision-making process	• Information collection and analysis • Refurbishment alternatives • Decision-making

The Decision Process for Building Refurbishment Projects tool by Ali et al. (2005) and Yacob et al (2019) reveal the relationship between the refurbishment uncertainty variables and architects' characteristics and the performance of the refurbishment design process. This model consists of several variables related to design in refurbishment works.

In contracts, the Concept Model of Sustainable Buildings Refurbishment (Mickaityte et al., 2008) and Ranasinghe et al. (2021) was created based on sustainable development principles and considers the decision-making process and model efficiency influencing factors. The extension in terms energy become a major concern in this model.

Zavadskas et al.'s (2008) and Kamari et al. (2017) Decision-making Model for Sustainable Building Refurbishment aims to select energy-efficient measures based on the sustainable refurbishment concept. The components of this model were included, first, to formulate the concept of energy-efficiency management in sustainable building refurbishment; second, to present the decision-making process, and third, to propose a decision-making model for sustainable building refurbishment from an energy-efficiency aspect. However, there is still lacking of concern on specific tool that integrates all the types of risk that can influence developers' decision-making before undertaking a refurbishment project. Therefore, the aim of this research is to develop an improved model that includes all the types of risk experienced in refurbishment projects, namely cost, time, quality, scope, technical, emotional, health and safety, management, and legal.

4.0 A Conceptual Innovative Model for Buildings Refurbishment

Currently, there are limited tools that can measure risks for refurbishment projects in Malaysia. Therefore, in the current situation, there should be a model that can take into consideration all the types of risks because it has been proven that risks can influence decision-making in construction projects, especially in refurbishment projects. In order to overcome the problems that occur and to cope with the gap that appears in the literature, the authors have proposed a conceptual model. The proposed conceptual model, titled the **Innovative Risks Management Model** (IRiMM), aims to identify the key risks in refurbishment works, particularly for commercial buildings.

This paper presents factors, such as personal profiles of the developers' firms, their professional backgrounds, and refurbishment project types. Opinions are reflected in the primary data through the expression of respondents' or interviewees' perceptions and personal beliefs. This paper gathered the preliminary information from a literature review and preliminary interviews. The information was then used to develop a conceptual model. The basis of the structural framework is to identify and explain the factors. Furthermore, a proposed risk-management model was developed based on a theory which is to identify the variables as well as their relationships. The proposed IRiMM for risk management is shown in Figure 2. This research focuses only on these two attributes because of the study's time limit. This research is useful for developers in making decisions before undertaking any refurbishment works. Additionally, a proposed risk-

management model will motivate clients, consultants, and other participants to enhance their service and product quality and also increase the levels of trust in developers.

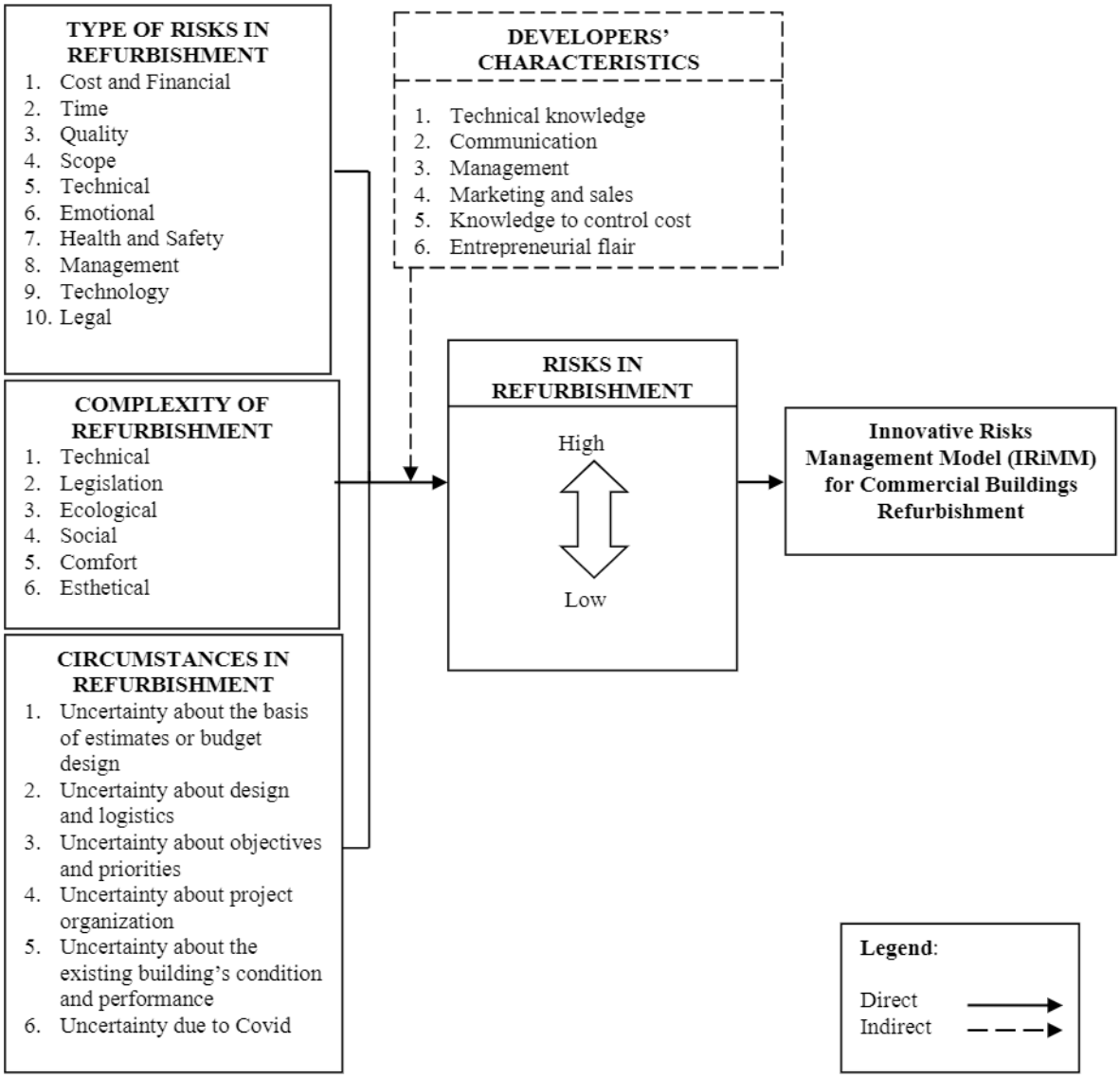

Fig. 2 - Proposed Conceptual Model of Innovative Risks Management Model (IRiMM) for commercial buildings refurbishment (Adapted from Ali et al., 2005)

Most of the previous researchers agreed that the main problems in refurbishment projects include risks. As shown in Figure 2, the review of the literature revealed nine variables for types of risks in refurbishment projects, with one variable identified through the preliminary interview session.

The complexity of refurbishment projects is reflected in all of the difficulties, whether before, during, or even after the project is completed. One of the factors contributing to the complexity of refurbishment projects is building legislation. Changes and updates to building regulations by the government also affect the approval process in refurbishment projects, especially projects related to conservation. Statutory requirements could cause project delays and cost overruns due to adjustments that need to be made to the design in order to comply with the regulations.

Extraneous circumstances in any type of construction project can happen – especially in refurbishment projects. Considering the circumstances surrounding refurbishment projects such as public pressure to refurbish public buildings can produce a better result of the level of risks.

Developers' characteristics were identified as an important factor in refurbishment project decision-making. Failure to make good decisions at the right place and at the right time can affect the whole refurbishment project. The literature review identified six developer characteristics that can affect decision-making for refurbishment projects, as shown in Figure 2.

The proposed model aims to emphasize to construction players, especially developers. The risk management requirements should be determined before undertaking refurbishment works and projects. This model targets non-residential projects, especially commercial buildings as the number of commercial buildings is significantly increasing in Malaysia.

5.0 Conclusion

In summary, a model of risk management that identifies the key risks in refurbishment projects is proposed. The components of IRiMM namely type of risk, complexity, and circumstances in refurbishment, and characteristics of developers. There are relationships between components directly and indirectly. This paper will be useful for developers in making decisions before commence and undertaking refurbishment projects. Additionally, the proposed risk-management model will provide a pave and motivate clients, consultants, and other participants to enhance their service and product quality and also increase the levels of trust in developers.

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