# A Systematic Literature Review on Risk Identification Towards a Public-Private Partnership Approach in Building Reuse Projects

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**Abstract**

This paper aims to systematically review a wide range of literature to provide insights on the risk of public-private partnership (PPP) projects. The authors have critically reviewed the risk elements from the entire spectrum of the construction industry. Thus, the systematic literature review (SLR) method was employed to synthesise research with precise attention to detail. To achieve research objectives and to retrieve articles related to PPP and risk identification building adaptive reuse, the following database was utilised: Scopus, Google Scholar, ScienceDirect, and Web of Science. Number of related themes were collected and analysed according to the coding structure. The results present that a total of twelve (12) risk categories have been identified from the existing literature, namely, political, economic, legal, natural, demand risk, financial, residual asset risk, design, construction, operation, partner selection, and contract risk, respectively. These categories were further divided into fifty-seven (57) different risk factors, whereby the classifications were perceived to be related to the PPP project. In addition, sixteen (16) risk factors were identified in the context of building adaptive reuse specifically, focusing on feasibility and procurement stages. Consequently, the present review recognised the knowledge gaps to offer a new perspective on risk identifications in the context of building adaptive reuse in Malaysia.

Keywords: Risk category, risk factor, public-private partnership and building adaptive reuse

## 1.0 INTRODUCTION

Risk is characterised as an unknown occurrence or situation that can positively or negatively impact one or more project objectives (Le et al., 2019). Traditionally, risk has been described as a possible event that exerts negative implications. However, there is an opposite opinion where researcher views risk as both an opportunity and a threat to projects (Lehtiranta, 2014). Risk is ubiquitous in any construction project as it cannot be eliminated but it can be controlled (Karim, 2011). In a project management context, the type of procurement method must be considered to facilitate effective risk identification and management (Osipova & Eriksson, 2011). Nowadays, one of the most popular procurement methods to deliver public sector projects is public-private partnership (PPP) (Osei-Kyei & Chan, 2015). In the lens of the building industry, Yap et al. (2019) define procurement as a process, procedure and organised method that is required to obtain a construction project. There are several types of procurement methods used in the construction industry such as traditional, design and build, management procurement, and public-private partnership (PPP) (El Sawalhi & El Agha, 2017; O'shea et al., 2019). PPP is defined as a collaboration between public and private sectors. Through this alliance, both sectors contribute complementary skills to a project with varying levels of involvement and responsibility, resulting in the best and most efficient public services. (Cheung & Chan, 2011). In Malaysia, the Public Private Partnership Unit of the Prime Minister's Department (UKAS) classifies PPP as: A form of cooperation between public and private sector pursuant to which a stand-alone business is formed, financed, and managed by the private sector as a package comprising several elements: construction management, maintenance, repaired works, and replacement of public facilities such as building and infrastructure.

Othman and Mahmoud (2020) advocate that the expertise, knowledge, and resources of both sectors, i.e., public, and private, are shared through the PPP agreement in order to deliver a service that will be used by the mass public. Apart from that, such an agreement not only focuses on resource sharing but also on risk and benefit distribution. It comprises contractual agreement that not only upholds equitable risk-sharing, but on-time, on-budget and improved service delivery (van den Hurk & Verhoest, 2016) which consequently manifests three core elements of resources, responsibilities, and risk.

Building reuse is not a new agenda in the built environment. The term is employed to look after new building usage or new function. Also known as adaptive reuse, it is an alternative for encouraging sustainability by giving an old structure a new life through the repurposing process (Conejos et al., 2012). This process refers to a technique that was applied to provide a new life to the abandoned building in numerous conditions (Elrod & Fortenberry, 2017). Furthermore, adaptive reuse will contribute to economic conservation and benefit the communities (Kincaid, 2000).

In the context of building adaptive reuse, PPP has been applied to heritage projects since the late 1960s (Othman & Mahmoud, 2020). The shift towards PPP implementation is because the public sector may have adequate financial resources to conserve and preserve a heritage building, but they presumably lack expertise in reconstruction and managing the heritage buildings (Cheung & Chan, 2012, 2014; Othman & Mahmoud, 2020). It is interesting to note that a few researchers have explored on the PPP and building adaptive reuse (see Cheung & Chan, 2014; Chung, 2012; Macdonald & Cheong, 2014; Othman & Mahmoud, 2020). Developed countries such as Sweden, Australia and Hong Kong have already applied PPP for their building reuse process. Therefore, it can be surmised that PPP offers a promising new approach for a win-win situation for both parties in the context of adaptive reuse of heritage buildings (Othman & Mahmoud, 2020).

## 2.0 RESEARCH METHODOLOGY

This section highlights the research materials and methods utilised to collect, synthesise, and analyse the literature. A comprehensive systematic review is employed to combine different research on PPP in accordance with the implementation of PPP in Malaysia. In addition, the risks of PPP from the entire industry spectrum are precisely reviewed. Therefore, at the end of this review, the risk of PPP pertaining to building adaptive reuse will be identified by focusing on Malaysian practices. The systematic article search utilised various electronic databases such as, Scopus, Google Scholar, ScienceDirect, and Web of Science. Referring to the research objective and evaluating the research gaps, the following review procedures were adopted: identify the keywords, screen, and select the best relevant articles based on the keywords, read the abstract thoughtfully, evaluate and eliminate irrelevant articles, and then organise the review results.

Firstly, this systematic review was carried out by defining the research criteria and searching the database using the keywords in this study. Based on the scope of the study, two (2) levels of literature search have been conducted, (1) General search and (2) specific search on PPP and adaptive building reuse. The first stage used the following keywords: “PPP”, “PPP in Malaysia”, “partnership”, “procurement”, “building adaptive reuse”, “PPP and adaptive reuse”, “risk of PPP”, “risk factor”, “risk identification”, “risk management”, “risk assessment”, “risk mitigation”, and “risk management”, Public-Private Partnership (PPP), PPP in Malaysia, Adaptive reuse, building. Moreover, various related subjects were also explored in order to understand the application of adaptive reuse via PPP and the risk associated with the adaptation of this concept including “construction risk”, “pre-construction”, and “post-construction”, “contract”, and “construction industry”. Based on the explored data, one hundred and thirty-two (132) number of articles have been found.

Secondly, following the discovery of relevant literature, an in-depth review of the research was done to develop and integrate the variables that could aid in explaining PPP in the context of adaptive reuse in Malaysia and the risk related to this concept. A specific literature search was done on keywords such as PPP for building projects, unused public buildings, adaptive reuse through PPP, adaptive reuse of public building and adaptive reuse in Malaysia. From this search, eighty-five (85) number of articles have been extracted. Lastly, in accordance with the examination of the published studies on the study scope, the irrelevant articles were excluded, and content analysis was conducted for the remaining (n = 37) articles. The below diagram (Figure 1) presents the flow of systematic review in detail.

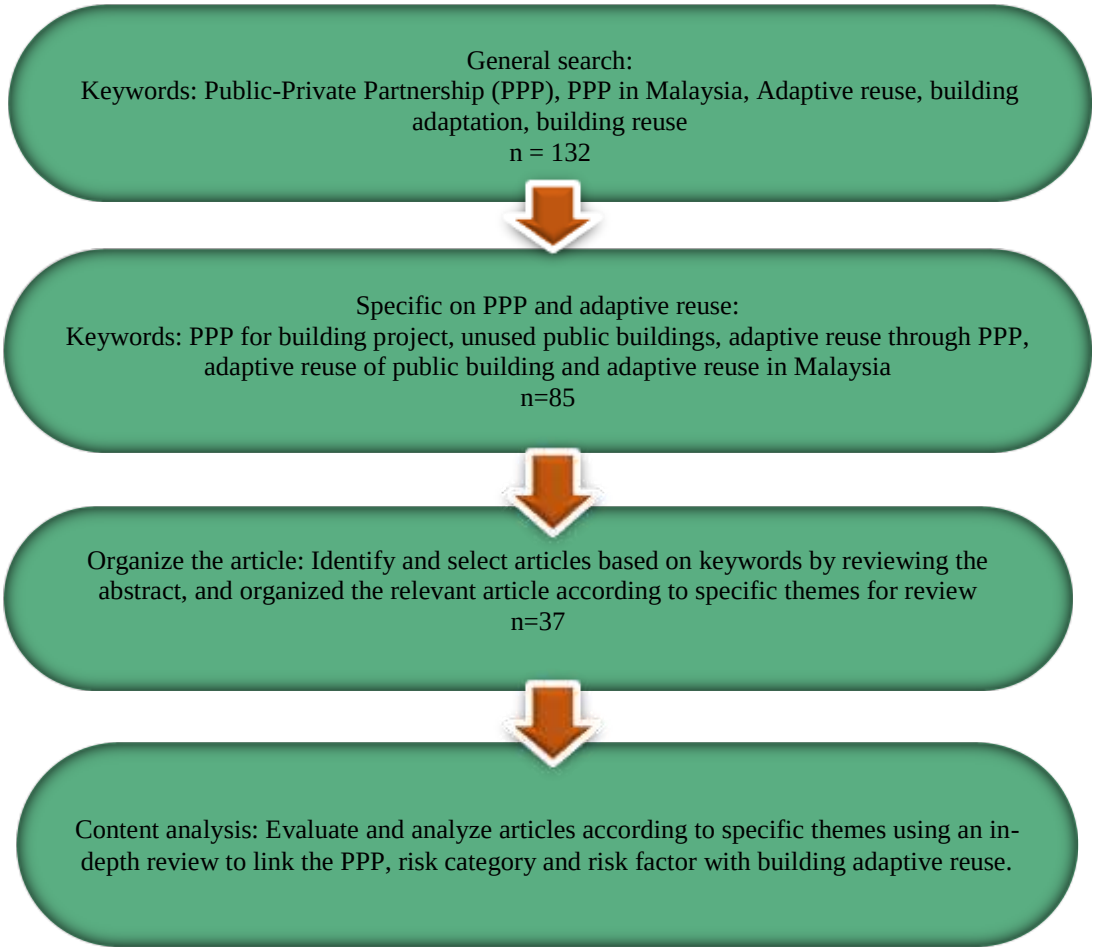


**Figure 1.** Flow of Systematic Review

## 3.0 PUBLIC-PRIVATE PARTNERSHIP (PPP) AND RISK

### 3.1. Definition of Public-Private Partnership (PPP)

Several studies on PPP point out that there is no generally accepted definition of PPP (Macdonald & Cheong, 2014; McQuaid, 2002; Pratap & Chakrabarti, 2017). However, there are a few keywords that have been used extensively to explain PPP. The keywords are long-term contractual agreement, delivery resources and responsibility of the private and public party. A contract or agreement refers to a long period agreement between two or more parties (Carbonara et al., 2014; Macdonald, 2011; Välilä, 2020). The delivery resources refer to a tool used to bring the potential parties involved in delivering a public project (Ullah & Thaheem, 2018) while responsibility refers to sharing risk, management duties (Almeida et al., 2020; Hadi & Erzaij, 2019; Song, 2020), skills, resources, and rewards (Macdonald & Cheong, 2014; OECD, 2008; Standard and Poor's, 2005). Prime Minister Department (UKAS) Malaysia and Ahmad et al. (2018) define PPP as a form of cooperation between the public and private sectors in which they form a stand-alone business, of which the private company will be responsible for the project's funding and management.

### 3.2. Risk Category and Risk Factor in Public-Private Partnership

PPP has been chosen as a primary method to procure infrastructure projects and public services in order to meet the demand in numerous countries due to national financial constraints (Osei-Kyei et al., 2019; Välilä, 2020). The public sector starts to adopt PPP concept in delivering public projects due to the benefits offered by this procurement

method (Kuru & Artan, 2020). Through PPP, skills, knowledge, asset, resources as well as risk are shared and allocated equally to both entities (Othman & Mahmoud, 2020). By adopting PPP, the public sector may reduce its burden in delivering public services and projects. At the same time, the national budget will be protected against project failure by transferring the risk to the private sector which has a better ability in risk management as well as securing political benefits (Almeida et al., 2020). However, there are a few PPP projects that have failed due to failure in risk identification and management (Kuru & Artan, 2020). The complexity of the PPP project with its long concession period, multiple stakeholder involvement, higher investment cost, and complex contractual relation between parties involved increases the uncertainties of the typical construction project risk (Kuru & Artan, 2020; Osei-Kyei et al., 2019; Osei-Kyei & Chan, 2017). Based on previous literature, the risks involved in PPP projects have been categorised into twelve (12) categories, namely political, economic, legal, natural, demand risk, financial, residual asset risk, design, construction, operation, partner selection, and contract risk that consist of 57 risk factors. The lists are presented in Table 1 as follows:

**Table 1.** Risk Categories and Risk Factors in Various PPP Projects

| No | Risk Factor | Sources* | | | | | | | | | | Frequency mentioned by authors |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| **Political Risk** | | | | | | | | | | | | |
| 1 | Unstable government | ✓ | | | | ✓ | ✓ | ✓ | | ✓ | | 5 |
| 2 | Expropriation or nationalization of assets | ✓ | ✓ | | | ✓ | | ✓ | | | | 4 |
| 3 | Poor public decision-making process | ✓ | ✓ | ✓ | | ✓ | | ✓ | | | ✓ | 6 |
| 4 | Strong political opposition/hostility | ✓ | ✓ | | | ✓ | ✓ | ✓ | | | | 5 |
| 5 | Corruption and bribery | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 9 |
| 6 | Government intervention | | | ✓ | ✓ | | | ✓ | | | | 3 |
| **Economic Risk** | | | | | | | | | | | | |
| 7 | Poor financial market | ✓ | ✓ | | | ✓ | | | | | | 3 |
| 8 | Inflation rate volatility | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | | 7 |
| 9 | Interest rate volatility | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 8 |
| 10 | Foreign exchange fluctuation | | | | ✓ | ✓ | ✓ | ✓ | | | | 4 |
| 11 | Credit risk | | | ✓ | ✓ | ✓ | | | | ✓ | | 4 |
| 12 | Financing risk | | | | | | | ✓ | ✓ | ✓ | ✓ | 4 |
| 13 | Concessionaire change | | | | ✓ | | ✓ | ✓ | | | | 3 |
| **Legal Risk** | | | | | | | | | | | | |
| 14 | Legislation changes | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| 15 | Change in tax laws | ✓ | ✓ | | ✓ | ✓ | | ✓ | | ✓ | | 6 |
| 16 | Policy risk | | | ✓ | | ✓ | | | | ✓ | | 3 |
| **Natural Risk** | | | | | | | | | | | | |
| 17 | Force majeure | ✓ | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 7 |
| 18 | Geotechnical conditions | ✓ | ✓ | | | ✓ | | ✓ | ✓ | ✓ | | 6 |
| 19 | Weather | ✓ | ✓ | | ✓ | | ✓ | ✓ | | ✓ | | 6 |
| 20 | Environment risk | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | ✓ | 7 |
| **Demand Risk** | | | | | | | | | | | | |
| 21 | Level of demand for project | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | | 5 |
| 22 | Level of public opposition to the project | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | 8 |
| 23 | Market demand | | | | ✓ | ✓ | | ✓ | | ✓ | ✓ | 5 |
| 24 | Market competition | | | | ✓ | | ✓ | | | ✓ | | 3 |
| **Financial Risk** | | | | | | | | | | | | |
| 25 | Availability of finance | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | | | 5 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | High finance costs | ✓ | ✓ | | | ✓ | ✓ | ✓ | | | 5 |
| 27 | Payment risk | | | ✓ | | | | ✓ | | ✓ | 3 |
| 28 | Revenue risk | | | ✓ | | | | ✓ | | | ✓ | 3 |
| **Residual Asset Risk** | | | | | | | | | | | |
| 29 | Residual assets risks | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | | 7 |
| **Design Risk** | | | | | | | | | | | |
| 30 | Delay in project approvals and permits | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 8 |
| 31 | Design deficiency | ✓ | ✓ | | ✓ | ✓ | | ✓ | | ✓ | | 6 |
| **Construction Risk** | | | | | | | | | | | |
| 32 | Construction deficiency | | | | ✓ | | | | | ✓ | | 2 |
| 33 | Construction cost overrun | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 9 |
| 34 | Construction time delay | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | | 7 |
| 35 | Material availability | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | 8 |
| 36 | Design changes | ✓ | ✓ | | | ✓ | | | | ✓ | | 4 |
| 37 | Poor quality of workmanship | ✓ | | | | | ✓ | ✓ | | ✓ | | 4 |
| 38 | Insolvency/default of sub-contractors/suppliers | ✓ | ✓ | | | ✓ | | ✓ | ✓ | | | 5 |
| 39 | Land acquisition risk | | ✓ | | ✓ | ✓ | ✓ | ✓ | | | | 5 |
| 40 | Completion risk | | | | ✓ | ✓ | | | | | ✓ | 3 |
| 41 | Labour availability | | ✓ | | | | | | | ✓ | | 2 |
| 42 | Site security and safety | | | | | | | ✓ | ✓ | ✓ | | 3 |
| **Operation Risk** | | | | | | | | | | | |
| 43 | Operation cost overrun | ✓ | ✓ | | | ✓ | | ✓ | ✓ | | | 5 |
| 44 | Maintenance costs higher than expected | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ | | 6 |
| 45 | Maintenance more frequent than expected | ✓ | ✓ | | | | | ✓ | | | | 3 |
| 46 | Organization and coordination risk | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | 6 |
| **Partner Selection Risk** | | | | | | | | | | | |
| 47 | Inadequate distribution of authority in the partnership | ✓ | ✓ | | | | | ✓ | | | | 3 |
| 48 | Differences in working method and know-how | ✓ | ✓ | | | ✓ | | ✓ | | | | 4 |
| 49 | Lack of PPP experience | | ✓ | ✓ | | ✓ | | ✓ | | ✓ | | 5 |
| 50 | Lack of commitment from private/public partner | | ✓ | | | | ✓ | ✓ | | ✓ | | 4 |
| 51 | No clear division of responsibilities and obligations | | ✓ | | | ✓ | | ✓ | | | | 3 |
| 52 | Imperfect supervision system | | | | ✓ | | | | | ✓ | | 2 |
| 53 | Inadequate supervision of project funds | | | | ✓ | | | | | ✓ | | 2 |
| 54 | Insufficient tender competition | | | | ✓ | ✓ | | ✓ | ✓ | | | 4 |
| 55 | Third party delay/default | | | | ✓ | | | | | ✓ | | 2 |
| **Contract Risk** | | | | | | | | | | | |
| 56 | Unreasonable contract design | | | | ✓ | | | ✓ | | | | 2 |
| 57 | Long term contract risk | ✓ | | | ✓ | | | | | | | 2 |

*1. (Ahmad et al., 2018), 2. (Ahmad et al., 2017), 3. (Wu et al., 2018), 4. (Wu et al., 2017), 5. (Sarvari et al., 2014), 6. (Kavishe, 2018), 7. (Chou & Pramudawardhani, 2015), 8. (Sastoque et al., 2016), 9. (Sanda et al., 2020), 10. (Wang et al., 2020).

The below tables (Table 2 and Table 3) define risk categories and risk factors based on specific authors.

**Table 2.** Definition of Risk Categories

| No | Risk Category | Definition | References |
|---|---|---|---|
| **1** | Political Risk | Any risk resulting from the construction or performance handled by the political and governmental authorities. | Clark et al., (2019) |
| **2** | Economic Risk | These risks are related to variations in cash flows as a result of price volatility, changes in service demand, and economic changes. | Sastoque et al., (2016) |
| **3** | Legal Risk | These threats are related to regulatory and legal change that could have an impact on the project's progress. | Sastoque et al., (2016) |
| **4** | Natural Risk | These risks are related to events of force majeure, such as natural disasters, fires, floods, conflicts, or other types of disasters, as well as environmental concerns that may impair the project's long-term viability. | Sastoque et al., (2016) |
| **5** | Demand Risk | An exogenous risk, and it is not easy to predict the future demand by the public | Pagoni & Patroklos, (2019) |
| **6** | Financial Risk | Risk related to financial uncertainties happen during the concession period | Pagoni & Patroklos, (2019) |
| **7** | Residual Asset Risk | The PPP project's real residual value is lower than the residual value that should be allocated to the government under the contract agreement. | Wu et al., (2017) |
| **8** | Design Risk | A substantial risk occurs related to design in construction project | Clark et al., (2019) |
| **9** | Construction risk | These concerns are related to issues that arise during the construction phase, such as budget overruns or project delay. | Sastoque et al., (2016) |
| **10** | Operation Risk | These risks are related to issues that arise during the operation phase as a result of faulty design, construction failures, and changes in the expected operation characteristics. | Sastoque et al., (2016) |
| **11** | Partner Selection Risk | Risk arises due to the wrong selection of partner | Sanda et al., (2020) |
| **12** | Contract Risk | Risk related to a project agreement | Wang et al., (2020) and Wu et al., (2017) |

**Table 3.** Definition of Risk Factor

| No | Risk Factor | Definition | Reference/s |
|---|---|---|---|
| **Political Risk** | | | |
| **1** | Unstable government | Unanticipated change in government, as well as political instability triggered by the change of government. | Bracey & Moldovan (2006) and Little (2011) |
| **2** | Expropriation or nationalisation of assets | Government takeover of the project without (or with nominal) compensation. | Pratap & Chakrabarti (2017) |
| **3** | Poor public decision-making process | This risk arises when the government makes inefficient or erroneous decisions due to a lack of expertise or interest. | Cheung & Chan (2011) |
| **4** | Strong political opposition/hostility | Risk arises due to differences in local living standards, morals, culture, social system, and other factors, victims of prejudice from the general public. | Ke et al., (2011) |
| **5** | Corruption and bribery | Bribery of bureaucrats results in the private sector receiving unwarranted rights and rewards. | Cheung & Chan (2011) |
| **6** | Government intervention | The government meddles excessively in the facilities/services. | Cheung & Chan (2011) |
| **Economic Risk** | | | |
| **7** | Poor financial market | Immature local economic and banking system. | Sarvari et al., (2014) |
| **8** | Inflation rate volatility | Unexpected variations in the rate of inflation. | Cheung & Chan (2011) |
| **9** | Interest rate volatility | Unexpected interest rate variations. | Cheung & Chan (2011) |
| **10** | Foreign exchange fluctuation | Currency exchange rate fluctuations and/or conversion issues | Cheung & Chan (2011) |
| **11** | Credit Risk | The risk of default in repayments | Iyer & Purkayastha (2017) |
| **12** | Concessionaire change | The threat posed by concessionaire reorganization, concessionaire mode change, or concession period shortening | Wu et al., (2017) |
| **Legal risk** | | | |
| **13** | Legislation changes | Risk related to legal and regulatory changes that may have an impact on the project's progress. | Sastoque et al., (2016) |
| **14** | Change in tax | Variations in tax and tax rates will affect the costs and benefits of a project. | Wu et al., (2017) |
| **15** | Policy Risk | Inconsistency in government policy or due to the alterations in the laws and uncooperative policies of the government. | Sanda et al., (2020) and Sarvari et al., (2014) |
| **Natural Risk** | | | |
| **16** | Force majeure | Risk that arises from an objective condition that cannot be forecast, avoided and conquered, such as earthquakes, hurricanes and war. | Wu et al., (2017) |
| **17** | Geotechnical Conditions | Risk occurred due to actual ground and groundwater conditions or geological conditions. | Trenter (2003) and Wu et al., (2017) |
| **18** | Weather | Due to the uncertainty of weather, risks occur during the reconnaissance design phase. | Wu et al., (2017) |
| **19** | Environment Risk | Environmental pollution, including such dust and noise during the construction period, are concerns | Sastoque et al., (2016) and Zhang et al., (2019) |

| No | Risk Factor | Definition | Reference/s |
|---|---|---|---|
| | | related to environmental conditions that may have an impact on the project's sustainability. | |
| **Demand Risk** | | | |
| **20** | Level of demand for project | Changes in the service demand | Sastoque et al., (2016) |
| **21** | Level of public opposition to the project | This threat stems from public opposition due to poor site selection, environmental damage, and security issues. | Zhang et al., (2019) |
| **22** | Market demand | Demand has changed, and the demand for services and facilities is no longer as great as it once was. | Cheung & Chan (2011) |
| **23** | Market competition | It refers to the risks of competition posed by other similar government-approved projects. | Wu et al., (2017) |
| **Financial Risk** | | | |
| **24** | Financing risk | Risks associated with finance activities such as financing assurances, financing structure design, and finance organization selection. | Wu et al., (2017) |
| **25** | Availability of finance | The consortium encountered financial difficulties as a result of a bad financial market or a lack of financial income. | Cheung & Chan (2011) |
| **26** | High finance costs | Risk due to higher cost of finance of PPP, higher capital cost. | Eduardo & Ronald (2010) |
| **27** | Payment risk | This refers to the government's potential unwillingness to pay for private sectors on time. When payment is not guaranteed, the private firm has the option to withdraw. | Zhang et al., (2019) |
| **28** | Revenue risk | The profits are lower than the anticipated revenue. | Zhang et al., (2019) |
| **Residual assets Risk** | | | |
| **29** | Residual assets risks | The real residual value of the PPP project is less than the residual value that the contract agreement states should be given to the government. | Wu et al., (2017) |
| **Design Risk** | | | |
| **30** | Delay in project approvals and permits | Government delays or rejection of project permission or permit. | Cheung & Chan (2011) |
| **31** | Design deficiency | Defects in the design process that may prevent the project from fulfilling its intended role. | Wu et al., (2017) |
| **Construction Risk** | | | |
| **32** | Construction deficiency | Defects discovered during the construction period that may prevent the project from fulfilling its intended role. | Wu et al., (2017) |
| **33** | Construction cost overrun | Actual costs are higher than anticipated due to the economic, political, and technological factors, causing cash flow issues. | Wu et al., (2017) |
| **34** | Construction time delay | Risk arises as a result of the real duration of construction work exceeds the intended one, the project cannot be completed within the contract period. | Wu et al., (2017) |
| **35** | Material availability | Insufficient supply of raw materials the construction materials cause the increase in the price | Sarvari et al., (2014) and Wu et al., (2017) |
| **36** | Design changes | Variation in design | Sanda et al., (2020) |

| No | Risk Factor | Definition | Reference/s |
|---|---|---|---|
| **37** | Poor quality of workmanship | Poor quality of work | Ahmad et al., (2017) |
| **38** | Insolvency/default of subcontractors/suppliers | Failure did by supplier/subcontractor | Sastoque et al., (2016) |
| **39** | Land acquisition risk | The risk of land acquisition includes both the acquisition of new property and the demolition of existing structures. PPP projects may fail due to exorbitant acquisition costs or government duty dereliction. | Zhang et al., (2019) |
| **40** | Completion risk | The project will take longer to complete than expected. | Cheung & Chan (2011) |
| **41** | Labor availability | Insufficient supply labor | Ahmad et al., (2017) and Sarvari et al., (2014) |
| **42** | Site security and safety | Risks associated with a lack of safety management standards, the nature of the building sector, and worker habits, among other things. | Sanda et al., (2020) |
| **Operation Risk** | | | |
| **43** | Operation cost overrun | Overrun in operation costs as a result of overpriced and slow operation. | Cheung & Chan (2011) |
| **44** | Maintenance costs higher than expected | Risk arises due to incomplete information regarding implementation, operation, and maintenance costs are provided during the initial stage | Rahman et al., (2014) |
| **45** | Maintenance more frequent than expected | Risk arises due to incomplete information and knowledge regarding implementation, operation, and maintenance during the initial stage. | Rahman et al., (2014) |
| **46** | Organization and coordination risk | It refers to the risk that will have an impact on the normal functioning of the project as a result of poor coordination among the many participants, functional departments, and project members. | Wu et al., (2017) |
| **Partner selection risk** | | | |
| **47** | Inadequate distribution of authority in the partnership | Inadequate roles and authority distribution between the public and private sector | Ahmad et al., (2018) |
| **48** | Differences in working method and know-how | The difference in working method and different knowledge between public and private partner | Bing et al., (2005) |
| **49** | Lack of PPP experience | Both the public sector and the concessionaire have insufficient PPP project management and operating experience. | Zhang et al., (2019) |
| **50** | Lack of commitment from private/public partner | Risk from the inappropriate partner selection results in a breach of contract, which manifests as a lack of commitment from the contracting parties, affecting the satisfaction of the contract's parties. | Sanda et al., (2020) |
| **51** | No clear division of responsibilities and obligations | Inadequate distribution of roles and responsibility between the public and private partner | Sarvari et al., (2014) |
| **52** | Imperfect supervision system | Inadequate project supervision will come from information asymmetry, as will a lack of appropriate performance monitoring and evaluation. | Wu et al., (2017) |
| **53** | Inadequate supervision of project funds | The financial situation and expenditures are not being closely monitored and controlled. | Cheung & Chan (2011) |

| No | Risk Factor | Definition | Reference/s |
|---|---|---|---|
| **54** | Insufficient tender competition | There is a lack of openness and structure during the tender process, as well as a lack of chances for tenderers and a small number of tenderers. | Cheung & Chan (2011) |
| **55** | Third party delay/default | Third-party defaults or delays will jeopardize the project's success, including but not limited to the contractor, construction supervisor, equipment suppliers, and operations maintainers. | Wu et al., (2017) |
| **Contract Risk** | | | |
| **56** | Unreasonable contract design | Inadequate contract provisions, such as inadequate risk allocation among parties. | Cheung & Chan (2011) |
| **57** | Long term contract risk | During long contract durations, regulations and legislation may change, affecting the project. | Wu et al., (2017) |

Source: Author's compilation

### 3.3. Risk Management and PPP

Risk refers to the possibility of an occurrence that would cause actual project circumstances to differ from those predicted, when project benefits and expenses are forecasted (Straus, 2007). In PPP, risk is determined by all stakeholders' decision-making processes. Nevertheless, risk perception and impact vary from stakeholder to stakeholder and project to project (Ahmad et al., 2017). The complexity of a PPP in construction projects relates to the PPP concept, which involves a long-term concession period, high capital expenditure, and multiple parties; which could create unnecessary and unpredictable circumstances if it is not properly detected at the early stage. Failure to recognise risk has resulted in project termination or significant changes at the preliminary planning stage. Thus, earlier risk identification is necessary to mitigate the negative impact caused by unforeseen risk which leads to a better risk allocation and a proper risk planning and management (Sarvari et al., 2019). Previous studies have identified myriad risk factors. According to Zhao and Ying (2019), PPP risk varies depending on delivery types of PPP or PPP models. Therefore, implementation of PPP models are different in nature as they entail different risk management (Ahmad et al., 2017).

Three (3) major gaps have been identified in supporting the objective of this study. First, PPP risk factors have been explored and noted pertaining to new construction projects. For instance, Wu et al. (2017) discussed on a power generation project in China; Chan et al. (2015) on water infrastructure project in China; Sanda et al. (2020) on Nigerian housing project, and Kavishe (2018) on housing projects in Tanzania. However, the study on PPP risk is conspicuously scarce in the context of building reuse. Second, in Malaysia, some researchers explored the risk on PPP in the context of public infrastructure projects (Sarvari et al., 2014), on Built-Lease-Maintain-Transfer project (Ahmad et al., 2018), and on Building Information Modelling (BIM) projects by Habib et al. (2020). Third, according to Mohamad et al. (2018), some pieces of evidence demonstrate several local PPP projects struggled to meet their objectives. In this case, one of the most considerable reasons commonly cited for the failure of PPP projects in Malaysia is due to the lack of the appropriate risk management (Ahmad et al., 2018), and failure in risk factor identification which, resulted in project termination (Sarvari et al., 2019).

Risk identification is an essential aspect of any project and can contribute to minimising the adverse effects caused by unanticipated risks (Sarvari et al., 2019). Keers and van Fenema (2018) noted that the recent literature on risk management in PPPs has emphasised risk recognition and risk allocation as risk management strategies rather than just risk identification. Thus, the possible risk associated with implementation of the PPP model in adaptive reuse has been almost non-existent. This paper tends to explore the PPP risks by reviewing the PPP implementation in Malaysia before critically review the risk components of PPP from the whole industry spectrum.

This research contributes to the body of knowledge on the risk categorisation and risk factors of PPP implementation and suggests the potential risks for a building adaptive reuse.

### 3.4. PPP Risk in the Context of Building Adaptive Reuse

The possible risk factors and risk categorisation for the PPP in building adaptive reuse have been explored during this systematic literature review (Table 4). The discussion in this review was limited into risk identification at feasibility and preliminary stages due to the following reasons: (1) the selection of different types of PPP will be done at the preliminary stage of the adaptive reuse decision (European Union, 2017), and (2) the most significant risk occurs during feasibility and procurement stage (Shrestha et al., 2017). Therefore, based on types of PPP risk in building adaptive reuse and risk of PPP during feasibility study and procurement stage, this paper proposed seven (7) categories of risk to be explored that include financial, political, demand, environmental, tender risk, partner selection, and contract risk. Shrestha et al. (2017) findings demonstrated the importance of mentioned above risk factors. Table 3 presents some risk factors are excluded from categories, such as expropriation or nationalisation of assets, solid political opposition/hostility in political risk, as well as payment and revenue risk in financial risks. These factors are excluded due to the risks were probably happened during the construction and operational stage (Pratap & Chakrabarti, 2017; Soomro et al., 2020; Wibowo et al., 2012; Zhang et al., 2019). As a result, seventeen (17) risk factors have been identified under seven risks categories (see Figure 2). Table 4 details the risk category and risk factor.

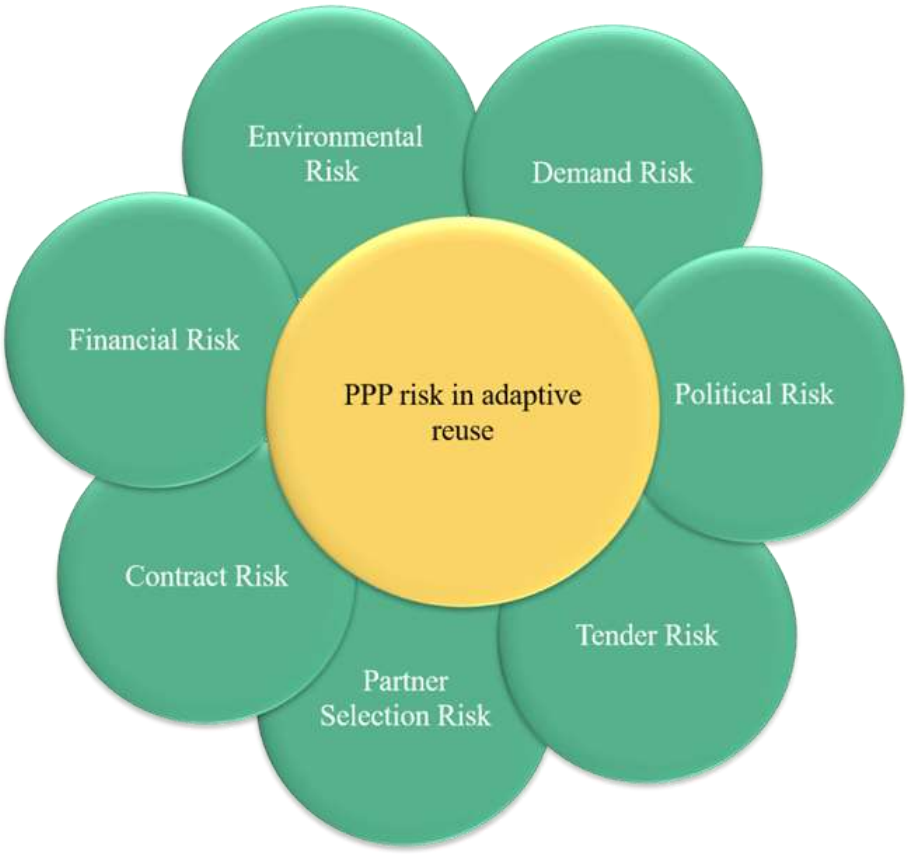


**Figure 2.** Risk Categorisation Involve at the Preliminary and Feasibility of PPP

**Table 4.** Explanation of Risk Factor during Feasibility and Procurement Stage

| No | Risk Factor | Explanation |
|---|---|---|
| **A. Financial Risk** | | |
| **1** | Availability of finance | In PPP projects, funding will be provided mainly by the private sector, though the public sector may contribute funding in a specific type of project (Almeida et al., 2020). Typically, the private sector is not compensated until the project begins operations (Alshawi, 2009). As a result, the private sector must fund the whole project, while the government will reimburse the private party during the concession period (Alshawi, 2009; Almeida et al., 2020). During the operating phase of some types of projects, the private sector can begin to gain from end-user fees (Almeida et al., 2020). As a result, the private sector should acquire adequate funding to construct or conserve the project, including maintenance and service, and the private sector should be more familiar with and experienced with commercial project financing strategies and financial markets than the public sector (Bing et al., 2005; Hwang, Zhao and Gay, 2013; Almeida et al., 2020). In the absence of a financial instrument, which results in funding difficulties, the project will be terminated, and the funds invested will be lost (Hwang, Zhao and Gay, 2013). This risk factor will be borne exclusively by the private sector (Hwang, Zhao and Gay, 2013). |
| **2** | High finance costs | In comparison to traditional procurement, PPP projects have a higher upfront cost (Leigland, 2018). Apart from that, PPP projects incur high transaction costs due to the project's complexity and limited flexibility, as changing project requirements after the contract has been signed can be extremely costly (Almeida et al., 2020). Additionally, the cost of private sector borrowing from financial institutions can be up to 2% to 3.75 % higher than the cost of government borrowing, increasing the project's cost (Toubasi, 2021). |
| **B. Political Risk** | | |
| **3** | Unstable government | Unexpected changes in politics and government instability may arise as a result of government change. The political risk posed by constant changes in government can result in misunderstanding, poor communication, and a lack of information flow (Bracey and Moldovan, 2006). An entering government's perception of the concessionaire may differ from that of the outgoing government, and so its perception or judgement of the project may alter (Bracey and Moldovan, 2006). Most of the time, the private sector must carry the risk associated with an unstable government (Little, 2011). |
| **4** | The flawed public decision-making process | Due to a major lack of expertise or interest, the government makes incorrect or unsatisfactory decisions (Cheung and Chan, 2011). This risk usually happened during the earlier stage of the project (Cheung and Chan, 2011). The decision-making process is much more complicated and would take a long time to adopt in the absence of detailed guidelines and scientific assessment mechanisms (Qi, Yi and Li, 2013). According to Qi et al. (2013), the imperfect decision-making process by the government could happen due to various reasons such as when there is no specific department in charge of the PPP project, lack of policy or detailed document to guide in PPP implementation, and lack of experience in PPP project. |
| **5** | Corruption and bribery | Corruption in PPP indicates improper influence in the contract of PPP projects. The corruption in the PPP project focuses not only on bribery but also on bid shopping, unequal bids, and extortion (Effah Ameyaw and Chan, 2013). The corruption act in PPP projects could increase the project cost, and the most severe effect is the contract repealed (Osei-Kyei and Chan, 2017). This issue related to corruption in public projects is due to a weak judicial system. The politician will take advantage to involved and gain some benefit from the project. This problem usually occurred in developing countries (Osei-Kyei and Chan, 2017). |

| | | |
|---|---|---|
| | | Additionally, the public project's corruption issue will also lessen the trust and confidence among the public toward the government. |
| **6** | Government intervention | Political interference could prolong construction duration and lead to project delays (Osei-Kyei and Chan, 2017). When the public sector starts to interfere in PPP, it will lead to a debate and lengthen construction. Most of the time, the government's interference is on the suitability of the PPP implementation in that project; they will start debating on the suitability and comparing PPP procurement with other types such as conventional procurement methods (Osei-Kyei and Chan, 2017). Apart from that, some government sectors will doubt transparency and accountability during the tendering process (Osei-Kyei and Chan, 2017). For example, case in Ghana, the political parties start to disagree with the PPP implementation on the Ghana National Housing project as there is a dearth of competition and equality while awarding the contract. Moreover, this issue will gain the public attention and trigger the public to doubt the government's transparency and accountability towards the project (Osei-Kyei and Chan, 2017). |
| **C. Demand Risk** | | |
| **7** | Level of demand for project | This type of risk depending on a few factors under public authority, such as economic growth, macroeconomic situation, and policies (Pagoni and Patroklos, 2019). The private sector will take a responsibility to predict the future demand in providing public service and facilities. This is not a straightforward task due to unpredictable social and economic factors. Therefore, it will increase the demand risk, and the services or project that has been delivered through PPP cannot achieve the general requirement. The government's involvement in predicting future demand could reduce the risk (OECD, 2008). The government has the ability to find out the total social demand by conducting a full-scale survey. According to the result of this survey, the government able to provide the best service to meet the demands. |
| **8** | Level of public opposition to the project | Public opposition can occur for various reasons, including opposition due to inappropriate site selection, environmental pollution, and security concerns (Zhang *et al.*, 2019). The public interest is affected as a result of a lack of environmental regulation and/or other factors, resulting in the possibility of public resistance to the project's continued construction (Wang *et al.*, 2020). As Wu et al., (2017) mentioned, public opposition to China's power generation projects is increasing as a result of landfill demolition, environmental pollution, straw acquisition, tariff subsidies, and other unresolved issues. |
| **9** | Market demand | This type of risk arises due to reduced demand for project services due to high user fees (Osei-Kyei and Chan, 2017). The fall in market demand could be a reason that affects the operational cost (Osei-Kyei and Chan, 2017). Therefore, in order to solve this issue, the public sector has been forced to come up with new ideas to meet market demand. |
| **10** | Market competition | Market competition might happen when the government sector approved a similar type of project (Wu *et al.*, 2017). For instance, difficulties may arise in a PPP when private companies/competitors become excessively strong, and the capital market becomes brittle (Rybnicek, Plakolm and Baumgartner, 2020). |
| **D. Environmental Risk** | | |
| **11** | Environment risk | Environmental risks refer to the impact of a project on the environment during its implementation. It is essential to determine if the project zone is subject to strict environmental liability. Appropriate preparation is needed to ensure that the project complies with current environmental legislation. The project that will result in pollution and a polluted atmosphere would exacerbate the risk to the environment. For instance, the China power plant project produces contaminants such as sulfur and nitrogen oxide that may have an adverse effect on the environment. Apart from that, environmental risks can arise as a result of construction machinery. Generally, this form of risk occurs in all types of |

| | | |
|---|---|---|
| | | construction projects, not just PPP projects. In response to this risk factor, the public sector should strengthen environmental protection policies by institutionalizing hidden dangers associated with this risk (Wu et al., 2017). Apart from that, private sectors are expected to use environmentally friendly materials and new technology to mitigate environmental emissions (Zhang et al., 2019). |
| **E. Tender Risk** | | |
| **12** | Insufficient tender competition | Competitive tender bidding may benefit the public sector, as Verma (2011) points out, because any appealing offer made by other bidders during the competitive tender exercise may be the best offer, resulting in the lowest price received and accepted. However, a lack of transparency and structure during the tender process, a lack of opportunities for tenderers, and inadequate tender competition with a small number of tenderers could pose a risk to the PPP project. To mitigate this risk, it is critical for public entities to strategically approach the market with well-defined, well-structured PPP projects prior to initiating the procurement process; failure to do so would result in bidders making bids that are either incomparable to one another or purposefully low in order to resolve uncertainties through post-award negotiations (Wu *et al.*, 2017). |
| **F. Contract Risk** | | |
| **13** | Unreasonable contract design | Unreasonable contract design may occur due to improper contract arrangements, such as risk allocation between stakeholders (Cheung and Chan, 2011). Risk misallocation often results in significant contract renegotiations or expensive contract cancellations (Ameyaw and Chan, 2015). This type of risk will be shared by both parties (Mohd-Rahim *et al.*, 2018). |
| **14** | Long term contract risk | PPP projects are referred to as long-term contracts because they typically last between 25 and 30 years (Almeida *et al.*, 2020; Välilä, 2020). Over lengthy contract periods, policies and laws can change, having an effect on the project (Wu *et al.*, 2017). |
| **G. Partner Selection Risk** | | |
| **15** | Lack of PPP experience | While PPP projects are not new in the Malaysian construction industry, adaptive reuse projects via PPP has not yet been a practice in Malaysia (Ismail, 2013). Thus, both the public and private sectors may lack sufficient knowledge and experience regarding PPP in adaptive reuse. As Zhang et al. (2019) mentioned, PPP projects in China are still in their infancy, and the PPP model has a brief history in charging facilities. Both the government and the concessionaire lack operational and management experience with PPP projects. As a result of this factor, the risk is increased due to a lack of experience with specific PPP projects (Zhang *et al.*, 2019). Hence, while selecting a private sector partner, government agencies should consider their experience with other PPP ventures (Wu *et al.*, 2017). |
| **16** | Lack of commitment from private/public partner | Although long-term contracts may foster loyalty and stability in PPPs, they may also introduce issues of excessive reliance on the partner (Roehrich, Lewis and George, 2014). A poor partner selection results in contract violation, which manifests as a lack of commitment on the part of the contracting parties, thus affecting the contracting parties' satisfaction (Sanda *et al.*, 2020). Both sectors should bear this risk (Bing *et al.*, 2005). |

## 4.0 CONCLUSION

This paper systematically reviewed the possible risks of PPP projects and discussed the application for adaptive reuse projects in Malaysia. The PPP risk has been classified into twelve (12) categories and represented by fifty-seven (57) risk factors. However, these are general risks compiled from different types of PPP projects. This research bridged the lacunae on the lack of literature on the PPP risk in adaptive reuse. The review on PPP in the Malaysian context concludes that PPP has been applied in delivering projects since 1980s following the endorsement of privatisation policies.

PPP typically applies to projects that involve extensive new roads, highways, housing, and hospital developments. Due to the specific nature of PPP, which is associated with a long-term concession period, high capital expenditure, and multiple stakeholders, any decision on PPP will involve different types of risk. Previous scholars reveal on PPP risk for different project type which majority of them focus on new construction project from beginning until the agreement completed.

The collected literature on the built environment helped authors to identify the risk categories and risk factors as follows: political, economic, legal, natural, demand risk, financial, residual asset risk, design, construction, operation, partner selection, and contract risk (as explained in Table 1, 2 and 3 respectively). The scope of the present review on PPP risk for adaptive reuse projects was mainly focused on heritage buildings. As shown in Figure 2 and Table 4, this study limited its discussion on risk to specific stages (feasibility and procurement stage).

Nevertheless, the built environment deals with the high number of unused buildings that have the potential for reuse. In this context, especially after independence, Malaysia has focused on constructing many buildings, which are related to new urbanisation.as such, adaptive reuse received significant research attention in Malaysia after Melaka and Georgetown were acknowledged as world heritage sites. The recognition has seen many existing buildings change their ownership and function to cater to the demand for tourism development purposes. On the other hand, it is perceived that many commercial and public buildings were left unattended due to gradual new urbanisations in large cities. Although there are some cases that public buildings have been converted to new building functions, such as, building quarters to hostels or hotels using specific PPP models, there have been no cases which documented on the use of PPP for specific building reuse in Malaysia, specifically in terms of risk identification.

This systematic review paves the way for a new research agenda as the findings will contribute to the practical and theoretical implications in the context of managing a sustainable built environment. Further research can be improved based on the limitations discussed in this paper on risk identification, which is based on general PPP projects and does not focus on specific PPP models. It is henceforth recommended that future studies should select specific PPP model and the identification of risk, as both dimensions will be more relevant and useful to explore.

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