Research Paper **Open Access**

Adel Noori*

Assessment of interorganisational conflict in building refurbishment projects using EFA and PLS-SEM

DOI 10.2478/otmcj-2023-0013
Received: January 28, 2022; Accepted: July 16, 2023

Abstract: It is generally known that building refurbishment (BR) projects are more likely to face uncertainties than new building projects. Therefore, uncertainty is an element that may cause interorganisational conflict (IOC). This paper presents a study with three objectives: to evaluate the uncertainty levels, assess the IOC that may arise due to the uncertain nature of BR projects and examine the interrelated dependence relationship between uncertainty and IOC variables. A total of 188 refurbishment projects formed the database for this study. The study applied Exploratory Factor Analysis (EFA) and Structural Equation Modelling (SEM) based on Partial Least Squares (PLS) in the data analysis process. The findings show that uncertainty and IOC BR projects are moderate. Additionally, the uncertainty variable has a positive relationship with the IOC variable; in other words, the higher the uncertainty, the higher is the level of IOC. However, the three factors that emerged as being predictably more uncertain are inadequate space for storage of material and working, difficulty in access to the site and unclear scope of the work.

Keywords: interorganisational conflict, building refurbishment projects, uncertainty, structural equation modelling, partial least squares, exploratory factor analysis

1 Introduction

In recent years, the number of building refurbishment (BR) works has increased sharply due to the change in economic conditions and the emphasis on sustainable development (Kamari et al. 2019). Investment in new construction projects has recently declined, but the need for BR has increased due to the recession and deterioration of existing buildings. BR is defined as renovating, upgrading, retrofitting, improving and repairing existing buildings (Egbu 1994; Juan et al. 2009). BR projects are more uncertain than new building projects and need to be managed differently (Noori and Mokariantabari 2019b). Besides, due to budget and schedule overruns and unsatisfying project outcomes, interorganisational conflict (IOC) is a common problem in BR projects, typically associated with project uncertainties (Lumineau et al. 2015). IOC can be defined as a phenomenon between interdependent organisations in a project as they disagree over achieving their goals and responsibilities. In addition, BR projects have substantial socioeconomic effects (Korytárová et al. 2017), but these socioeconomic consequences will be negatively affected when IOCs are frequent (Lumineau et al. 2015). However, to what extent the uncertainty factors affect IOC in BR projects is unclear. Besides, although there are numerous research works on the uncertainty in construction projects, most of them are focused on new projects (Harvett 2013; Baudrit et al. 2019; Harter et al. 2020). Despite the growing importance of the refurbishment sector, research on BR works is still lacking. Therefore, this paper's first objective is to evaluate the level of uncertainty in BR projects; the second objective is to determine the level of IOC in the uncertain environment of BR projects; and the third objective is to examine the interrelated dependence relationship between uncertainty and IOCvariables.

2 Literature review

2.1 Uncertainty factors in BR projects

The organisations (e.g. client, architect and contractor) inappropriately manage BR projects due to the lack of

***Corresponding author: Adel Noori,** School of Architecture and Civil Engineering, Liming Vocational University, Quanzhou, 362046, Fujian, China.

knowledge, insufficient information and lack of proper understanding of the uncertain nature of BR projects. Thus, a high level of IOC is not surprising in BR works (Ali and Zakaria 2012; Noori et al. 2016; Noori and Mokariantabari 2019b). The literature review reveals that lack of information, such as archived documents, utility information and building inspection results, are some of the issues that contribute to the uncertainty in BR projects (Doran et al. 2009; Ali 2010, 2014; Bernstein et al. 2014; Volk et al. 2014; Noori and Mokariantabari 2019b). Additionally, physical constraints and human factors also contribute to the uncertainty in BR projects. Physical constraints include access to the site, inadequate space for working or storage of materials, unforeseen site conditions, the unclear scope of work, difficulty in matching new materials with existing materials and difficulty in obtaining construction materials (Rahmat 2008; Vaysburd et al. 2014; Aziz and Abdel-Hakam 2016; Noori and Mokariantabari 2019b; Diab and Mehany 2021; Ranasinghe et al. 2021). However, physical constraints can be increased further due to human factors when an organisation or the tenants need to remain in an existing building while BR work is undertaken (Nutt et al. 1998; Holm 2000). Human factors are the characteristics and behaviours of the participants involved in BR projects. Accordingly, human factors can be listed as design changes made by the client, lack of client skill and knowledge, uncertain client needs and unclear contractual obligations, which can pose a difficult task for BR managers and the construction organisations involved (Akintan and Morledge 2013; Vaux and Kirk 2014; Yap et al. 2017; Noori and Mokariantabari 2019b). Table 1 shows the critical uncertainty factors in BR projects.

2.2 IOC factors in BR projects

In addition, the organisations involved in BR projects require comprehensive information about the existing buildings, clear site conditions, clear contractual obligations and finalised design to virtually design, plan and control

Tab. 1: Uncertainty factors in building refurbishment projects.

Uncertainty factors	Reference
Lack of archived documents of the existing building	Bernstein et al. (2014), Ali (2010) and Noori and Mokariantabari (2019b)
Incomplete utility information of the existing building	Bernstein et al. (2014), Volk et al. (2014) and Noori and Mokariantabari (2019b)
Unavailability of non-destructive testing results	Ali (2010) and Noori and Mokariantabari (2019b)
Unavailability of building inspection results	Doran et al. (2009), Bulleit (2008) and Noori and Mokariantabari (2019b)
Unavailability of building site survey results	Bernstein et al. (2014) and Zolkafli et al. (2012)
Lack of design information during the design stage	Zolkafli et al. (2012) and Ali (2008)
Lack of design information during the construction stage	Ali (2014), Rahmat (2008) and Mokariantabari et al. (2019)
Difficulty in access to the construction site	Tzortzopoulos et al. (2020) and Mokariantabari et al. (2019)
Inadequate space available for working on the building refurbishment site	Mokariantabari et al. (2019), Noori and Mokariantabari (2019b) and Sezer (2017)
Inadequate space available for storage of material	Sheth et al. (2010) and Chong and Zin (2010)
Unforeseen site conditions	Kim et al. (2020) and Bernstein et al. (2014)
Unclear scope of work	Mokariantabari et al. (2019)
Unclear contractual obligations	Manuel et al. (2016), Rahmat (2008) and Noori and Mokariantabari (2019b)
Uncertain client needs	Akintan and Morledge (2013), Mustafa (2007) and Noori and Mokariantabari (2019a)
Design changes made by the client	Bernstein et al. (2014) and Ofori (2013)
Lack of client's skill and knowledge related to the building refurbishment project	Vaux and Kirk (2014) and Ali and Au-Yong (2021)
Difficulty in matching new materials with existing materials	Vaysburd et al. (2014) and Noori and Mokariantabari (2019b)
Difficulty in obtaining construction materials	Aziz and Abdel-Hakam (2016) and Diab and Mehany (2021)

the projects. The IOC level in BR projects may increase if the organisation fails to provide other organisations with the requirements mentioned (Noori et al. 2021). This is because, in an uncertain environment such as BR projects, different organisations have different interpretations and perceptions of the problems. Thus, uncertainty can cause IOC in BR projects (Dada 2013; You et al. 2018). According to Kromidha et al. (2019) and Tonder et al. (2008), a high level of uncertainty provides fertile ground for conflict in construction projects. Construction projects, including BR projects, typically start well, but problems can lead to conflicts between the organisation (e.g. contractors, clients and consultants). Disagreement over basic responsibilities (Narh et al. 2015; Noori et al. 2021), how to achieve the project's goals (Harmon, 2003a, 2003b; Kerzner 2013) and task expectations (You et al. 2018) can provide fertile ground for IOC in construction projects. Moreover, disagreement over the interference by other project members in their works (Cao et al. 2020); the final cost, duration and quality (Noori et al. 2021; Ansari et al. 2022); and ethical standards of behaviour (Noori et al. 2021) are the roots causes of IOC in construction and BR projects. Table 2 shows the factors contributing to IOC in BR projects. Therefore, IOC can be defined as a situation between interrelated organisations in an uncertain project as they disagree on their responsibilities and achievement of goals.

However, reducing and controlling the level of uncertainty by BR managers and organisations involved can reduce the IOC level (Noori et al. 2021). Researchers have suggested different ways to control and reduce IOC in BR projects: e.g. effective communication (Wu et al. 2017) and trust between organisations (Noori and Mokariantabari 2019a; Cerić 2021), complete contract documents (Xu 2011) and meaningful interactions with tenants (Yee et al. 2013). Moreover, Charkhakan and Heravi (2022) observe that identifying the organisations' culture and elevating their decision-making patterns constitute the most effective way to control IOC in construction projects.

3 Research method and data collection

3.1 Research methodology

Depending on the research purpose, scientific studies could be categorised into three types: exploratory, descriptive and explanatory (Zainudin 2010; Bhattacherjee 2012; Sekaran 2019). Since this study has been conducted to determine the relationship between uncertainty as an independent variable and IOC as a dependent variable in BR projects, a combination of descriptive and explanatory (descripto-explanatory) research methods is considered appropriate. It must also be highlighted that this study uses partial least squares structural equation modelling (PLS-SEM) for analysis. Besides, a cross-sectional design is selected for this study because of the time constraint.

3.2 Data collection

This study used two stages of data collection (i.e. literature review and questionnaire survey) to achieve the research objectives. The first stage started with identifying secondary data collected through extensive literature reviews in the area of project management, general management and BR works published in refereed journals, conferences and textbooks.

The second stage of the study involved the questionnaire survey. The data was collected from boundary role persons in contraction and architectural firms with experience in BR projects. Thus, medium and large refurbishment projects, which must have been carried out within the past 5 years from the data collection date (to minimise the respondents' memory lapse), were targeted for this study. However, since this research focuses on the IOC in BR projects, construction and architectural firms

Tab. 2: Interorganisational conflict factors in building refurbishment projects.

Interorganisational conflict factors	References
Disagreement over basic responsibilities	Noori et al. (2021) and Narh et al. (2015)
Disagreement on how to achieve the project's goals	Ali et al. (2014), Kerzner (2013) and Harmon (2003a, 2003b)
Disagreement over task expectations	You et al. (2018) and Vaux and Kirk (2014)
Disagreement over the interference of other project members in their works	Cao et al. (2020), Bekele (2015) and Moura and Teixeira (2010)
Disagreement over ethical standards of behaviour	Noori et al. (2021), Lumineau et al. (2015) and Kang (2004)
Disagreement over the final cost, duration and quality	Ansari et al. (2022), Khahro and Ali (2014) and Noori et al. (2021)

were chosen because they are the organisations that are actively involved in the projects. After identifying and selecting the respondents, Web-based questionnaires were sent to 1,050 construction firms and 733 architectural firms, requesting them to identify and ask managers involved in refurbishment projects to complete the questionnaires. A Web-based survey with a five-point Likert scale was used in this study to collect the data (see Sections A and B and Tables A1 and B1 in the Appendix). The five-point Likert scale adopted to ensure the reliability of the study instruments was as follows: 1 = totally disagree; 2 = disagree; 3 = moderate (neither agree nor disagree); 4 = agree; and 5 = totally agree. Finally, the author received 232 responses from construction firms and 178 responses from architectural firms; of these, only 118 were valid responses. However, the overall response rate for both construction and architectural firms was 27%, and the valid response rate was 11%.

3.3 Uncertainty and classification of IOC factors

This study used exploratory factor analysis (EFA) to classify, reduce and condense uncertainty and the IOC factors. However, different measurement tests (e.g. the Kaiser–Meyer–Olkin [KMO] measure of sampling adequacy and Bartlett's test of sphericity [BTS]) were applied to verify that the data set was suitable for EFA. According to Pallant (2020), the significant value of KMO is >0.6, and the significant value of BTS is <0.05. Table 3 shows that the value of KMO is >0.6, and the significant value of BTS is <0.05. Therefore, the data meets this assumption, and the values are appropriate for EFA. Table 4 shows the summary of EFA analysis for uncertainty and IOC in BR works using the principal component extraction and varimax rotation methods. The KMO measure of sampling adequacy indicates that the strength of the relationships among uncertainty variables is high (KMO =0.899), and BTS is significant (X^2 (153) = 2,490.606, $P < 0.001$); thus, it can be concluded that the values are appropriate for EFA. Furthermore, three variables should be extracted from BR projects' uncertainties since three eigenvalues are exceeded (eigenvalue = 9.105, 1.160 and 1.207). These extracted variables are predicted to have 66.18% of the variance explained to explain the uncertainty variables of BR projects. The group items are called the documentation factor (Cronbach's alpha = 0.901), physical constraints factors (Cronbach's alpha = 0.858) and human factors (Cronbach's alpha = 0.881). It also shows that all grouped items have good reliability values since Cronbach's alpha values are >0.80, with an acceptable value of >0.70 (Pallant 2020).

Additionally, Table 4 shows that the result of the KMO test for IOC variables is high (KMO = 0.953), indicating strong relationships among the IOC variables. Further, the BTS result for the IOC items is significant, where the significance value of BTS is <0.05 (X2 (78) = 2,874.404, $P < 0.001$), which shows the appropriateness of the values for EFA. It can be seen that only one variable should be extracted from the IOC factors in BR projects since one eigenvalue is exceeded (eigenvalue = 9.69). This extracted variable is predicted to have 74.51% of the variance explained to explain the IOC variables. The group items

Tab. 3: Initial assumptions of EFA.

Variables	KMO	BTS		
		Approx. chi-square	df	Significance
Uncertainty	0.899	2,490.606	153	0.000
IOC	0.953	2,874.404	78	0.000

BTS, Bartlett's test of sphericity; EFA, exploratory factor analysis; IOC, interorganisational conflict; KMO, Kaiser–Meyer–Olkin.

Tab. 4: Summary of EFA.

Variables	Extracted variables	Number of items	Eigenvalues	Variance explained	Factor loading[a]	Communalities[a]	CA	KMO
Uncertainty	Documentation factor	7	9.105	24.98%	0.574→0.789	0.563→0.776	0.901	0.899
	Physical constraints factors	4	1.160	22.24%	0.635→0.798	0.653→0.717	0.850	
	Human factors	7	1.207	18.95%	0.552→0.814	0.597→0.793	0.881	
IOC	Interorganisational conflict	13	9.687	74.51	0.784→0.912	0.746→0.828	0.971	0.953

[a]The reported values are the ranges of values from the minimum value to a maximum value.
CA, Cronbach's alpha; EFA, exploratory factor analysis; IOC, interorganisational conflict; KMO, Kaiser–Meyer–Olkin.

are called IOC (Cronbach's alpha = 0.971). Besides, the Cronbach's alpha value is >0.80, where the acceptable value is >0.70, verifying that the grouped item has a good reliability value. Moreover, it can be seen that the items to measure the targeted uncertainty and IOC variables are valid in terms of item validity from the EFA perspective (i.e. factor loading >0.55 and communalities >0.3) and have the right reliability level for each extracted variable (see Table 4).

4 Result and discussion

4.1 Uncertainty level in BR projects

In the current study, the respondents were asked to rate the level of uncertainty and IOC in BR projects in the context of achieving the objectives. The five-point Likert scale was applied: '1' indicates strongly disagree; '5' represents strongly agree. The higher the level of agreement, the lower is the level of uncertainty and IOC in BR. Further, the mean scores were classified into three categories:

1.0–2.33 – highly uncertain or high level of IOC;
2.34–3.66 – moderately uncertain or moderate level of IOC;
3.67–5.0 – Less uncertain or low level of IOC.

As shown in Table 5, the refurbishment projects are moderately uncertain, with an overall mean value of 2.48. The results show that the physical constraints factor is the topmost uncertain variable in BR works, with a mean score of 2.31, which falls under the highly uncertain category. Therefore, it could be concluded that the organisations involved in BR projects should pay more attention to the physical constraints factor, including access to the site, space for working, space for storage of materials and site conditions. However, access to the site is the most uncertain indicator, with a mean score of 2.20 (highly uncertain), which is not unexpected. Rahmat (1997) observed that access to a site is one of the most uncertain variables in refurbishment projects. It shows that access to the site has been an uncertainty factor in BR projects for at least the past 2 decades. Organisations involved in a refurbishment project must share the same space; they lose their independence and become interdependent, which

Tab. 5: Analysis of the level of uncertainty in refurbishment projects.

No.	Variable	Indicator	Mean (N=188)	Result	Overall mean	Rank	Overall result
A	Documentation factor	Archived document	2.62	Moderately uncertain	2.50	2	Moderately uncertain
		Utility information	2.56	Moderately uncertain			
		Non-destructive testing	1.73	Highly uncertain			
		Building inspection	2.64	Moderately uncertain			
		Building site survey	2.76	Moderately uncertain			
		Design information during the design stage	2.58	Moderately uncertain			
		Design information during the constructing stage	2.65	Moderately uncertain			
B	Physical constraints factor	Access to the site	2.20	Highly uncertain	2.31	1	Highly uncertain
		Space for working	2.48	Moderately uncertain			
		Space for storage of material	2.23	Highly uncertain			
		Unforeseen site conditions	2.34	Moderately uncertain			

(*Continued*)

Tab. 5: Continued

No.	Variable	Indicator	Mean (N=188)	Result	Overall mean	Rank	Overall result
C	Human factor	Scope of work	2.27	Highly uncertain	2.62	3	Moderately uncertain
		Contractual obligations	2.27	Highly uncertain			
		Matching of new materials	3.03	Moderately uncertain			
		Obtaining construction materials	2.53	Moderately uncertain			
		Client's skill and knowledge	2.84	Moderately uncertain			
		Client's needs	2.45	Moderately uncertain			
		Design changes made by client	2.97	Moderately uncertain			
Uncertainty in refurbishment projects					**2.48**		**Moderately uncertain**

is called interdependency. Waldron (2006) observed that interdependent organisations might be less willing to cooperate because it affects their work efficiency. For example, the occupants may not want to share the same access with the contractors since it disturbs their daily activities. Thus, Narh et al. (2015) mentioned that site access is one of the leading causes of IOC in construction projects. Therefore, organisations must create a collaborative culture to reduce IOC due to site access. Collaborative culture can be formed by sharing solutions and ideas, emphasising access and focusing on problems (Gref 2010; Yang et al. 2018). Further, 'inadequate space for storage of materials' is the second most uncertain indicator under the physical constraints factor, with a mean score of 2.23 (highly uncertain). It may disrupt the contractor's work, cause delay and increase the cost of BR works because the contractors have to order building materials in small packages. Therefore, the client and occupants need to cope with reduced space for working, which may cause discomfort for them. Additionally, IOC caused by inadequate space on the site can be reduced by frequent interactions between the client and the contractor.

Besides the physical constraints factor, the documentation factor is another uncertainty variable in BR projects, which is moderately uncertain, with an overall mean score of 2.5. The moderately uncertain level of documentation factor is somewhat surprising because previous researchers found that this is one of the main significant problems in refurbishment projects (Rahmat 2008; Mokariantabari et al. 2019). The non-destructive test (NDT) is highly uncertain in the current study, with a mean score of 1.73. Therefore, it can be noted that the test on structural stability and integrity are not regularly conducted, and NDT is the least crucial information-gathering method in Malaysia. Similarly, Ali (2010) found that NDT was the least essential means of information gathering for Malaysia's BR projects. Even though project documentation is not the most significant variable that causes IOC uncertainty, it could be significant.

Finally, the human factor is moderately uncertain, with an overall mean score of 2.62. Unclear scope of work and unclear contractual obligations are two indicators of the human factor that need to be emphasised. These two indicators are highly uncertain, which are related to the provisions in the contract. This finding is supported by Rahmat (2008), who found that unclear scope of work and unclear contractual obligations are the main uncertainty factors in BR projects. Besides, unclear scope of work and contractual obligations could cause IOC and reduce the quality of the project outcome because organisations may be unwilling to perform specific tasks if they assume that the tasks are not their responsibilities. This issue may also affect the performance of the other parties in the organisations in the project team. Therefore, a well-defined scope of the work, objectives and design basis with clear roles and responsibilities in a contract can be suggested to resolve uncertainties at an earlier stage of BR works. This may necessitate the use of a specific contract for BR

projects. Conflicts may also be controlled and reduced informally by having practical cooperation and communications among the organisations involved in BR projets.

4.2 IOC level in BR projects

As mentioned earlier, uncertainty variables cause IOC in BR projects, and as shown in Table 6, IOC is at a moderate level, with a mean value of 2.80. Under circumstances where BR projects are moderately uncertain, a moderate level of IOCarises as well, hence, indicating that there is an interrelation between these two variables. Thus, with proper uncertainty management, the IOC can be managed optimally.

Table 6 shows that disagreement over the final cost and duration are the top indicators of IOC, with a mean score of 2.02 and 2.13 (high level), respectively. Khahro and Ali (2014) also observed that disagreement over the final cost and duration between the organisations is the main reason for the high IOC in construction projects. Therefore, it should be noted that all organisations should be aware of the IOC level in order to complete the construction project within the budget. IOC over final cost frequently arises from errors in drawings and specifications, delays in payment progress, changes in orders and differing site conditions since these factors often cause cost overruns (Okeil et al. 2013). It can also happen when organisations face uncertainties during the construction stage, which the designers do not consider during the design stage (Lee and Polkinghorn 2008).

Moreover, a high level of conflict between the contractor and the client is the third critical factor that causes IOC, with a mean score of 2.28. This result is somewhat predictable due to the uncertain environment of BR works, design changes made by clients, lack of trust and communication between organisations, poor information sharing and unrealistic expectations over cost and time. This result supports the findings of Cheung and Pang (2013) that IOC between the contractor and client is inevitable in the construction industry due to the high difference in their interests. However, the construction stages show the highest

Tab. 6: Analysis of the level of IOC in building refurbishment projects.

No.	Variable	Indicator	Mean (N=188)	Result	Overall mean	Overall result
A	Conflict factors	Basic responsibilities	3.13	Moderately conflicting	2.80	Moderately conflicting
		Project's goals	3.04	Moderately conflicting		
		Task expectations	3.03	Moderately conflicting		
		Interference	2.96	Moderately conflicting		
		Standards of behaviours	3.14	Moderately conflicting		
		Final cost	2.02	Highly conflicting		
		Final duration	2.13	Highly conflicting		
		Final quality	3.37	Moderately conflicting		
		Conflict between the client and the contractor	2.28	Highly conflicting		
		Conflict between the client and the consultant	3.12	Moderately conflicting		
		Conflict between the contractor and the consultant	3.22	Moderately conflicting		
		Conflict during the design stage	3.51	Moderately conflicting		
		Conflict during the construction stage	2.28	Highly conflicting		
Interorganisational conflict (IOC)			**2.80**			**Moderately conflicting**

IOC among all refurbishment stages, with a mean score of 2.28 (high level). This result supports the findings of Al-Sedairy (1994) and Lee et al. (2017), who found that the most frequent and severe IOC occurred during the project's construction phase compared to the design phase. It can be explained by the fact that more organisations are involved during the construction phase, which drastically increases the difficulty and complexity of communication among the entities involved. At the construction stage, conflicts are caused by inaccurate information (Noori et al. 2016; Osei-Kyei et al. 2019), delayed or late issue of design information (Camelo-Ordaz et al. 2014), delay in bill payment (Mahamid 2016) and unclear contract documents (Liu 2014).

Surprisingly, disagreement over the final quality has the most negligible impact on the IOC level, with a mean score of 3.37. The results contradict the finding of Moura and Teixeira (2010), who found that disagreement between organisations, in particular between clients and contractors, over the final quality is one of the main IOC factors in construction projects.

This could be because all the issues that affect the quality have been carefully considered and evaluated during the design stage since the conflict between the client/contractors and consultants also has the most negligible impact on the IOC level. Quality can be defined as conformity with requirements; therefore, it is vital to pay more attention to the causes of the IOC to finish the project with the required quality. However, the low level of IOC between the client/contractors and consultants could be because of their high trust level. Consultants are professionals who act as mediators between the contractor and the client. Therefore, their decisions and actions do not directly affect the interests of the clients and contractors. The consultants are more likely to find solutions to reduce the conflicts between the clients and the contractors. This observation is supported by Ntiyakunze (2011), who found that the conflict level between the clients/contractors and consultants is low in building construction projects.

4.3 SEM-PLS approach

Moreover, this study applied SEM by using the PLS (PLS-SEM) approach to analyse the relationship between uncertainty and IOCin BR projects. SmartPLS software by GmbH Company (SmartPLS) software was applied to analyse variance. The result of the PLS Algorithm is shown in Figure 1. The coefficient of determination (R^2) is for the IOC (endogenous latent variable). The R^2 for IOC is more than the substantial values for the dependent variable (Table 7). It means that the variance forcefully explains the uncertainties in refurbishment projects at 28.1% at the IOC level.

The inner model shows that uncertainty in refurbishment projects has 0.436 effects on the level of IOC. Path coefficients have a standardised value at ±1, with an estimated path coefficient close to +1 representing the variables (Hair et al. 2014). The present study shows that the hypothesised path relationship between uncertainty and the IOC level in BR projects is 0.435, a relatively strong positive correlation and statistically significant relationship between uncertainty and the IOC variables, because the path coefficient is close to +1. Meanwhile, predictive relevance was explored for the inner model as another aspect. The blindfolding procedure yields the Stone–Geisser (Q^2) values (i.e. cross-validated redundancy measures) in SmartPLS. The assessment of Q^2 yields a value of 0.271.

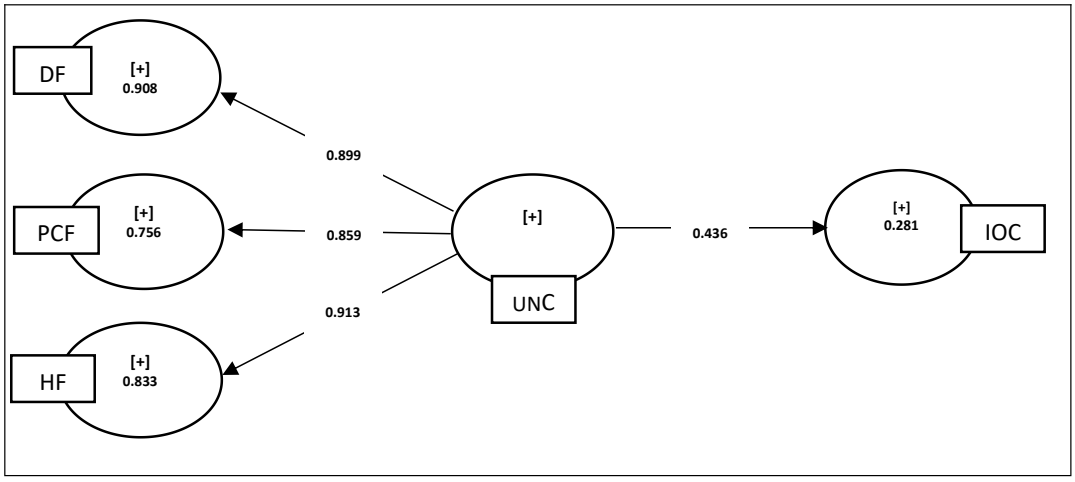

Fig. 1: SEM-PLS results for the theoretical framework describing the relation between UNC in refurbishment projects andIOC.
IOC, interorganisational conflict; PLS, partial least squares; SEM, structural equation modelling; UNC, uncertainty DF= Documentation Factor; PCF= Physical Constraints Factor; HF= Human Factor.

Tab. 7: Path coefficient of the relationship between uncertainty and IOC in refurbishment projects.

Path	B	*t*-value	R^2	Q^2	*P*-value
UNC → IOC	0.435	4.985**	0.281	0.271	$P < 0.01$

Note: *P*-value < 0.05* at *t*-value >1.96; *P*-value < 0.01** at *t*-value = 2.58 (two-tailed).
Q is the Stone_Geisser value.
IOC, interorganisational conflict; UNC, uncertainty.

Since a Q^2 value >0 has predictive relevance for endogenous variables under consideration (Hair et al. 2014), Q^2 with a value of 0.271 is considered an excellent predictive relevance (see Table 7). Based on the values of R^2 and Q^2, uncertainty has a positive relationship with IOC when β= 0.435, t= 4.985, $P < 0.01$; in other words, the higher uthe ncertainty, the higher is the level of IOC in BR projects.

5 Conclusions and contribution

5.1 Conclusions

In this study, the process of IOC occurrence was analysed while considering the uncertain nature of BR projects to provide an analytical benchmark to investigate the level of IOC and uncertainty in BR projects. The descriptive statistical analysis shows moderate uncertainty and IOC in BR projects. Under circumstances in which BR projects are moderately uncertain, a moderate level of IOCarises as well, indicating an interrelation between these two variables. Thus, with proper uncertainty management, the IOC can be managed optimally.

This paper defines IOC as a phenomenon between interdependent organisations in an uncertain and complex project as they disagree on achieving their goals, objectives and responsibilities.

The uncertainty factors are grouped into three variables or themes: documentation, physical constraints and human factors. The physical constraints factor is a highly uncertain variable because of difficult access to the site and availability of only a small space for storing materials and working. Therefore, the organisations involved in BR projects should manage the physical constraint factors to reduce the uncertainty in BR works. The site could be made more accessible by paying attention to site layout plans and changing working hours. The organisations involved should be integrated by having an effective communication channel, creating a collaborative culture and helping each other through space sharing.

The documentation factor is a moderately uncertain variable, mostly due to the lack of utility and design information during the design stage and the lack of NDT results for evaluating building structure and materials. The lack of information and documentation could be solved by sharing and providing clear and readable information through direct contact, regular meetings and exchanging information through social media.

The human factor is also a moderately uncertain variable but less problematic than the other two variables. The human factors include unclear scope of work and contractual obligations and the client's skill and knowledge.

However, disagreement over the final cost and duration are the top indicators of IOC. This is due to errors in drawings and specifications, delays in payments, changing orders, differing site conditions and uncertainties during construction. Conflict between the contractor and clients is another leading contributor to the IOC. This is due to the following: uncertain nature of BR works; design changes by client; lack of trust, communication and information sharing; and unrealistic expectations over cost and time. Therefore, proper contractual and documentation procedures, complete design information and clear site condition are necessary to manage the IOC arising in BR projects. Besides, building trust and effective communication may help manage and control the level of IOC effectively.

5.2 Contribution of knowledge

BR projects are more uncertain than new-build projects. Thus, it is important to identify and measure the uncertainties to provide a better basis for decision-making and effectively plan and control BR projects during both the design and construction stages. This could help to improve the image of the BR sector and motivate organisations to carry out refurbishment projects. Furthermore, there is a lack of literature on IOC in BR projects, and this study tries to fill the gap in identifying conflict indicators to help organisations establish rules and strategies to reduce the IOC level. However, identifying the uncertainty variables and managing IOC could help to increase the clients' satisfaction by improving BR project performance.

5.3 Limitations and future research

First, this study focuses only on the interrelated dependence relationship between uncertainty and IOCvariables. The model has not included moderator variables such as effective communication, trust between organisations and complete contract documents. Therefore, future

research opportunities exist to include mediator variables in determining their effects on controlling IOC and BR project success. Second, this research is limited to the construction industry, and it might not be the same when examining other industries due to the unique character of each industry. Research on each main factor contributing to uncertainty and conflict could be carried out in greater depth. Third, the non-existence of a directory of refurbishment contractors and architects and the types of refurbishment projects they undertook presented limitations to this study.

Acknowledgement

The authors acknowledge the Liming Vocational University for providing fund for this research project.

References

Akintan, O. A., & Morledge, R. (2013). Improving the collaboration between main contractors and subcontractors within traditional construction procurement. *Journal of Construction Engineering, 2013*, pp. 1-11. doi: 10.1155/2013/281236.

Ali, A. (2008). *Integrative Mechanisms in the Design Process of Building Refurbishment Projects*. Universiti Teknologi MARA, Shahalam, Selangor, Malaysia.

Ali, A. (2010). Design information in managing refurbishment projects in Malaysia. *The International Journal of Physical Sciences*, *5*, pp. 768-773.

Ali, A. S. (2014). Complexity in managing refurbishment design process : Malaysian experience. *Building Surveying, Facilities Management and Engineering, 15*, pp. 1-5. doi: 10.1051/matecconf/20141501030.

Ali, A. S., & Au-Yong C. P. (2021). Risk factors in the refurbishment design process: The case of Malaysia. *International Journal of Building Pathology and Adaptation*, *40*(4), pp. 622-635. doi: 10.1108/IJBPA-01-2021-0005.

Ali, A. S., Peng, A. Y. C., & Ling, S. C. (2014). Managing refurbishment projects through selection of procurement system: The case of Malaysia. *European Journal of Sustainable Development*, *3*(4), pp. 311-322. doi: 10.14207/ejsd.2014.v3n4p311.

Ali, A., & Zakaria, R. (2012). Complexity of statutory requirements: Case study of refurbishment projects in Malaysia. *Journal of Building Performance*, *3*(1), pp. 49-54.

Al-Sedairy, S. T. (1994). Management of conflict. *International Journal of Project Management, 12*(3), pp. 143-151. doi: 10.1016/0263-7863(94)90029-9.

Ansari, R., Khalilzadeh, M., Taherkhani, R., Antucheviciene, J., Migilinskas, D., & Moradi, S. (2022). Performance prediction of construction projects based on the causes of claims: A system dynamics approach. *Sustainability*, *14*(7), p. 4138. doi: 10.3390/su14074138.

Aziz, R. F., & Abdel-Hakam, A. A. (2016). Exploring delay causes of road construction projects in Egypt. *Alexandria Engineering Journal*, *55*(2), pp. 1515-1539. doi: 10.1016/j.aej.2016.03.006.

Baudrit, C., Taillandier, F., Tran, T. T. P., & Breysse, D. (2019). Uncertainty processing and risk monitoring in construction projects using hierarchical probabilistic relational models. *Computer-Aided Civil and Infrastructure Engineering*, *34*(2), pp. 97-115. doi: 10.1111/mice.12391.

Bekele, A. (2015). Alternative dispute resolution methods in construction industry : An assesment of ethiopian situation. PhD thesis*, School of Graduate Studies Addis Ababa University Faculity of Technology*, pp. 1-147.

Bernstein, H. M., Joneset, S. A., Russo, M. A., Laquidara, D., Taylor, W., Ramos, J., & Lorenz, A. (2014). Managing uncertainty and expectations in building design and construction. 1st edn. In: Bernstein, H. M., et al. (eds.), *SmartMarket Report*. Bedford, McGraw-Hill Construction.

Bhattacherjee, A. (2012). *Social Science Research: Principles, Methods, and Practices*. Textbooks Collection, University of South Florida,Tampa, USA.

Bulleit, W. M. (2008). Uncertainty in structural engineering. *Practice Periodical on Structural Design and Construction, 13*(1), pp. 24-30. doi: 10.1061/(ASCE)1084-0680(2008)13:1(24).

Camelo-Ordaz, C., García-Cruz, J., & Sousa-Ginel, E. (2014). Antecedents of relationship conflict in top management teams. *International Journal of Conflict Management, 25*(2), pp. 124–147. doi:10.1108/IJCMA-06-2012-0054.

Cao, J., Liu, C., Wu, G., Zhao, X., & Jiang, Z. (2020). Work–family conflict and job outcomes for construction professionals: The mediating role of affective organizational commitment. *International Journal of Environmental Research and Public Health*, *17*(4), p. 1443. doi: 10.3390/ijerph17041443.

Cerić, A. (2021). Reducing information asymmetry and building trust in projects using blockchain technology. *Gradjevinar*, *73*(10), pp. 967-978. doi: 10.14256/JCE.3310.2021.

Charkhakan, M. H., & Heravi, G. (2022). Quantifying the predictability and preventability of conflicts between construction project parties. *Engineering, Construction and Architectural Management*, *30*(19), pp. 1932-1950. doi: 10.1108/ECAM-11-2019-0651.

Cheung, S. O., & Pang, K. H. Y. (2013). Anatomy of construction disputes. *Construction Engineering and Management*, *139*, pp. 15-23. doi: 10.1061/(ASCE)CO.1943-7862.0000532.

Chong, H. Y., & Zin, R. M. (2010). A case study into the language structure of construction standard form in Malaysia. *International Journal of Project Management*, *28*(6), pp. 601-608. doi: 10.1016/j.ijproman.2009.09.008.

Dada, M. O. (2013). Conflicts in construction projects procured under traditional and integrated systems: A correlation analysis conflicts in construction projects procured under traditional and integrated methods: A correlation analysis. *International Journal of Construction Supply Chain Management*, *3*(1), pp. 1-15. doi: 10.14424/ijcscm301013-01-15.

Diab, M., Mehany, M. (2021). Contingency Use and Project Delivery Influence on Infrastructure Project Risk Assessment. In: Ahmed, S.M., Hampton, P., Azhar, S., D. Saul, A. (eds) Collaboration and Integration in Construction, Engineering, Management and Technology. *Advances in Science, Technology & Innovation*.

Springer, Cham. pp. 589-592,https://doi.org/10.1007/978-3-030-48465-1_97.

Doran, D., et al. (2009). *Refurbishment and Repair in Construction* Whittles Publishing, Dunbeath, Scotland, UK, pp. 11-314, IBSN 9781904445555.

Egbu, C. (1994). Management education and training for construction work within the construction industry. A Ph.D thesis submitted to the department of civil engineering and construction,university of Salford, Salford, UK.

Gref, L. G. (2010). *The Rise and Fall of American Technology*. Algora Pub, New York, USA.

Hair, Jr, J. F, Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). A primer on partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review*, *26*(2), pp. 106-121.doi: 10.1108/EBR-10-2013-0128.

Harmon, K. M. J. (2003a). Conflicts between owner and contractors: Proposed intervention process. *Journal of Management in Engineering*, *19*(3), pp. 121-125. doi: 10.1061/(ASCE)0742-597X(2003)19:3(121).

Harmon, K. M. J. (2003b). Resolution of construction disputes: A review of current methodologies. *Leadership & Management in Engineering*, *3*(4), pp. 187-201. doi: 10.1061/(ASCE)1532-6748(2003)3:4(187).

Harter, H., Singh, M. M., Schneider-Marin, P., Lang, W., & Geyer, P. (2020). Uncertainty analysis of life cycle energy assessment in early stages of design. *Energy and Buildings*, *208*, p. 109635. doi: 10.1016/j.enbuild.2019.109635.

Harvett, C. M. (2013). A study of uncertainty and risk management practice relative to perceived project complexity. *Doctoral Dissertations*, p. 265.

Holm, M. G. (2000). Service management in housing refurbishment: A theoretical approach. *Construction Management and Economics*, *18*(5), pp. 525-533. doi: 10.1080/014461900407338.

Juan, Y.-K., Perng, Y.-H., Castro-Lacouture, D., & Lu, K.-S. (2009). Housing refurbishment contractors selection based on a hybrid fuzzy-QFD approach. *Automation in Construction*, *18*(2), pp. 139-144. doi: 10.1016/j.autcon.2008.06.001.

Kamari, A., Jensen, S. R., Corrao, R., & Kirkegaard, P. H. (2019). A holistic multi-methodology for sustainable renovation. *International Journal of Strategic Property Management*, *23*(1), pp. 50-64. doi: 10.3846/ijspm.2019.6375.

Kang, B, Price, A D F, Thorpe, A., & Edum-Fotwe, F T (2004) Developing a systems approach for managing ethics in construction project environments. *ARCOM* Conference, Heriot Watt University. *Association of Researchers in Construction Management*, (2), 367-75.

Kerzner, H. H. R. (2013). *Project management: A systems approach to planning, scheduling, and controlling*. John Wiley & Sons, Inc.Hoboken, New Jersey Published simultaneously in Canada. doi: 10.1016/0377-2217(82)90164-3.

Khahro, S. H., & Ali, T. H. (2014). Causes leading to conflicts in construction projects : A viewpoint of Pakistani construction industry. International Conference on challenges in IT, Engineering and Technology (ICCIET'2014) July 17-18, 2014, Phuket (Thailand), pp. 116–121.

Kim, J. J., Miller, J. A., & Kim, S. (2020). Cost impacts of change orders due to unforeseen existing conditions in building renovation projects. *Journal of Construction Engineering and Management*, *146*(8), p. 04020094. doi: 10.1061/(asce)co.1943-7862.0001888.

Korytárová, J., Hanák, T., & Lukele, P. E. (2017). Economic efficiency of brownfield regeneration: Study of South Moravian projects. *Scientific Review Engineering and Environmental Sciences*, *26*(2), pp. 151-158. doi: 10.22630/PNIKS.2017.26.2.13.

Kromidha, E., Spence, L. J., Anastasiadis, S., & Dore, D. (2019). A longitudinal perspective on sustainability and innovation governmentality: The case of the olympic games as a mega-event. *Journal of Management Inquiry*, *28*(1), pp. 77-93. doi: 10.1177/1056492617711585.

Lee, C. Won, J. W., Jang, W., Jung, W., Han, S. H., & Kwak, Y. H. (2017). Social conflict management framework for project viability: Case studies from Korean megaprojects. *International Journal of Project Management*, *35*(8), pp. 1683-1696. doi: 10.1016/j.ijproman.2017.07.011.

Lee, L. A., Jr., & Polkinghorn. B. (2008). Managing conflict in construction megaprojects: Leadership and third-party principles. *Conflict Resolution Quarterly*, *26*(2), pp. 167-198. doi: 10.1002/crq.229.

Liu, T. (2014). *Conflicting Objectives in Interfaces of Construction Project*. Norwegian University of Science and Technology, Trondheim, Norway.

Lumineau, F., Eckerd, V., & Handley, S. (2015) Inter-organizational conflicts. *Journal of Strategic Contracting and Negotiation*, *1*(1), pp. 42-64. doi: 10.1177/2055563614568493.

Mahamid, I. (2016). Micro and macro level of dispute causes in residential building projects: Studies of Saudi Arabia. *Journal of King Saud University - Engineering Sciences*, *28*(1), pp. 12-20. doi: 10.1016/J.JKSUES.2014.03.002.

Teixeira, J. M. C., Minasowicz, A., Zavadskas, E. K., Ustinovichius, L., Migilinskas, D., Armiñana, E. P., Nowak, P. O., & Grabiec, M. (2006). Training needs in construction project management: A survey of 4 countries of the EU. Journal of *Civil Engineering and Management*, 12(3), pp. 237-245. https://doi.org/10.3846/13923730.2006.9636398.

Manuel, J. et al. (2016). Training needs in construction project management : A survey of 4 countries of the EU. *Journal of Civil Engineering and Management*, 3730(May), pp. 237-245. doi:10.1080/13923730.2006.9636398.

Mokariantabari, M., Adnan, H., Hussin, M. A. J., Abidin, Z. Z., Baharuddin, H. E. A., & Ismail, W. N. W. (2019). Assessment of complexity factors in briefing stage of refurbishment projects in Malaysia. *IOP Conference Series: Earth and Environmental Science*, *385*(1), p. 012052. doi: 10.1088/1755-1315/385/1/012052.

Moura, H., & Teixeira, J. (2010). Managing stakeholders conflicts. *Construction Stakeholder Management*, pp. 286-316. https://api.semanticscholar.org/CorpusID:167140539

Mustafa, N. K. F. (2007). *Building Refurbishment Project in Malaysia*. Universiti Teknologi Malaysia,Skudai, Johor, Malaysia.

Narh, O. C., Owusu, E., Oduro-Apeatu, K., & Narh, J T.-W. (2015). An exploratory study of professional conflicts and disputes within the construction industry. *International Journal of Managerial Studies and Research, 3*(12), pp. 44-65.

Noori, A., & Mokariantabari, M. (2019a). Inter-organizational integration (IOI) in building refurbishment projects; An exploratory factor analysis (EFA) approach. *International Journal of Scientific & Engineering Research*, *10*(11), p. 1361.

Noori, A., & Mokariantabari, M. (2019b). Uncertainties in building refurbishment projects; an exploratory factor analysis (EFA) approach. *International Journal of Scientific & Engineering Research*, *10*(11), pp. 1065-1068.

Noori, A., Nafisi, N., & Mokariantabari, M. (2021). Inter-organizational conflict (IOC) in building refurbishment projects; an exploratory factor analysis (EFA) approach. *Journal of Construction Research*, *2*(1), pp. 29-36. doi: 10.30564/jcr.v2i1.2732.

Noori, A., Saruwono, M., Adnan, H., & Rahmat, I. (2016). Conflict, complexity, and uncertainty in building refurbishment projects. In: *InCIEC 2015*. Springer, Singapore, pp. 251-258. doi: 10.1007/978-981-10-0155-0_24.

Ntiyakunze, S. K. (2011). *Conflicts in Building Projects in Tanzania : Analysis of Causes and Management Approaches*. Royal Institute of Technology (KTH), Stockholm, Sweden.

Nutt, B., McLennan, P., & Walters, R. (1998). *Refurbishing Occupied Buildings: The Management of Risk Under the CDM Regulations.* Thomas Telford, Leeds, UK.

Ofori, G. (2013). Conflict in construction. *Construction Management and Economics, 31*(5), pp. 497-501. doi: 10.1080/01446193.2013.767465.

Okeil, A. M., et al. (2013). Enforce ability of limitation of liability clauses in engineering contracts. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, pp. 128-135. 5(3), https://doi.org/10.1061/(ASCE)LA.1943-4170.0000125.

Osei-Kyei, R., Chan, A. P. C., Yu, Y., Chen, C., & Dansoh, A. (2019). Root causes of conflict and conflict resolution mechanisms in public-private partnerships: Comparative study between Ghana and China. *Cities*, *87*, pp. 185-195. doi: 10.1016/j.cities.2018.10.001.

Pallant, J. (2020). *SPSS Survival Manual*: *A step by step guide to data analysis using IBM SPSS* (7th ed.). McGraw-Hill, Open University Press, London, UK. https://doi.org/10.4324/9781003117452

Rahmat, I. (1997). *The Planning and Control Process of Refurbishment Projects*. University College London, London, UK.

Rahmat, I. (2008). *Managing Refurbishment Projects*. Pusat Penerbitan Universiti, Universiti Teknologi MARA, Shah Alam, Malaysia.

Ranasinghe, U., Jefferies, M., Davis, P., & Pillay, M. (2021). Conceptualizing project uncertainty in the context of building refurbishment safety: A systematic review. *Buildings*, *11*(3), pp. 1-15. doi: 10.3390/buildings11030089.

Sekaran, U. (2019). Research methods for business: A skill building approach. In: McFadden, P. (ed.), John Wiley & Sons, Inc., New York.

Sezer, A. A. (2017). Factors influencing building refurbishment site managers' waste management efforts. *Journal of Facilities Management*, *15*(4), pp. 318-334. doi: 10.1108/JFM-10-2016-0041.

Sheth, A. Z., et al. (2010). A framework for refurbishment of health facilities. HaCIRIC International Conference 2010, Edinburgh, UK.https://api.semanticscholar.org/CorpusID:55463651.

Tonder, C. V., Havenga, W., & Visagie, J. (2008). The causes of conflict in public and private Sector', *Managing Global Transitions*, *6*(4), pp. 373-401.

Tzortzopoulos, P., Kagioglou, M., & Koskela, L. (2020). *Lean Construction: Core Concepts and New Frontiers*. CRC Press, New York. Available at: https://books.google.com.au/books?id=eTj3DwAAQBAJ.

Vaux, J. S., & Kirk, W. M. (2014). Relationship conflict in construction management and how it affects performance and profit. *Journal of Construction Engineering and Management, 144*(6) pp.6. https://doi.org/10.1002/crq.21286

Vaysburd, A. M., Bissonnette, B., & von Fay. K. F. (2014). *Compatibility Issues in Design and Implementation of Concrete Repairs and Overlays*. Denver, Colorado.

Volk, R., Stengel, J., & Schultmann, F. (2014). Building information modeling (BIM) for existing buildings – Literature review and future needs. *Automation in Construction, 38*, pp. 109-127. doi: 10.1016/j.autcon.2013.10.023.

Waldron, D. B. (2006) *A Survey of Pressure Points in Australian Construction and Infrastructure Projects*. Blake Dawson Waldron. North Sydney, Australia.

Wu, G., Liu, C., Zhao, X., & Zuo, J. (2017). Investigating the relationship between communication-conflict interaction and project success among construction project teams. *International Journal of Project Management*, *35*(8), pp. 1466-1482. doi: 10.1016/j.ijproman.2017.08.006.

Xu, C. (2011). Uncertainty and construction projects: A new institutional economics perspective. *2011 IEEE 18th International Conference on Industrial Engineering and Engineering Management*, pp. 286-290. doi:10.1109/ICIEEM.2011.6035159.

Yang, Z. Nguyen, V. T., & Le, P. B. (2018). Knowledge sharing serves as a mediator between collaborative culture and innovation capability: An empirical research. *Journal of Business and Industrial Marketing*, *33*(7), pp. 958-969. doi: 10.1108/JBIM-10-2017-0245.

Yap, J. B. H., Abdul-Rahman, H., & Chen, W. (2017). Collaborative model: Managing design changes with reusable project experiences through project learning and effective communication. *International Journal of Project Management*, *35*(7), pp. 1253-1271. doi: 10.1016/J.IJPROMAN.2017.04.010.

Yee, P., Fischer, M., & Haymaker, J. (2013) Automated identification of occupant interactions in renovations of occupied buildings. *Journal of Information Technology in Construction*, *18*, pp. 182–213.

You, J. Chen, Y., Wang, W., & Shi, C. (2018). Uncertainty, opportunistic behavior, and governance in construction projects: The efficacy of contracts. *International Journal of Project Management*, *36*(5), pp. 795-807. doi: 10.1016/j.ijproman.2018.03.002.

Zainudin, H. A. (2010). *Research Methodology for Business & Social Scince*. 1st edn. UiTM Publication Centre (UPENA), Shah Alam, Malaysia.

Zolkafli, U., Zakaria, N., Yahya, Z., Ali, A. S., Akashah, F. W., & Othman, M. (2012). Risks in conservation projects. *Journal of Design + Built, 5*, pp. 1-11.

Appendix

A Uncertainty-and-IOC part of questionnaire

A1 Project uncertainty

A1.1 Was the building occupied throughout the design stage of the refurbishment project?

[ ] Not occupied [ ] Partly occupied [ ] Fully occupied

A1.2 Was the building occupied throughout the construction stage of the refurbishment project?

[ ] Not occupied [ ] Partly occupied [ ] Fully occupied

Tab. A1: To what extent do you agree/disagree with the following statements relating to the refurbishment project that you have selected?

Item	Statement	Totally Disagree				Totally Agree
1	Archived document of the existing building (as-built drawings & reports) was available.	1	2	3	4	5
2	Utility information of the existing building was complete.	1	2	3	4	5
3	Non-destructive testing (e.g. ultrasonic testing) results were available	1	2	3	4	5
4	Building inspection results were available.	1	2	3	4	5
5	Building site survey results were available.	1	2	3	4	5
6	The design information during the design stage was fully available.	1	2	3	4	5
7	The design information during the constructing stage was fully available.	1	2	3	4	5
8	Access to the site was easy.	1	2	3	4	5
9	The space available for working on the refurbishment site was adequate.	1	2	3	4	5
10	The space available for storing material was adequate.	1	2	3	4	5
11	The site conditions (e.g. piping, electrical and structural) were foreseen	1	2	3	4	5
12	The scope of work was clear.	1	2	3	4	5
13	The contractual obligations were clear.	1	2	3	4	5
14	Matching new materials with the existing materials was easy.	1	2	3	4	5
15	The construction materials were easy to be obtained.	1	2	3	4	5
16	The client's skills and knowledge related to the refurbishment project were high.	1	2	3	4	5
17	The client's needs were certain.	1	2	3	4	5
18	The changes to the design made by the client were few.	1	2	3	4	5

B Interorganisational conflict

Tab. B1: To what extent did the following interorganisational conflicts occur in the refurbishment project?

Item	Interorganisational conflicts	Totally Disagree				Totally ree
1	The organisations involved in the refurbishment project agreed on their basic responsibilities.	1	2	3	4	5
2	The organisations involved in the refurbishment project agreed on achieving the project's goals.	1	2	3	4	5
3	The organisations involved in the refurbishment project agreed on task expectations.	1	2	3	4	5
4	The organisations involved in the refurbishment project agreed on the interference of other project members in their works.	1	2	3	4	5
5	The organisations involved in the refurbishment project agreed on standards of behaviour.	1	2	3	4	5
6	The client and the contractor agreed on the final cost of the refurbishment project.	1	2	3	4	5
7	The client and the contractor agreed on the final duration of the refurbishment project.	1	2	3	4	5
8	The client and the contractor agreed on the final quality of the refurbishment project.	1	2	3	4	5
9	The level of organisational conflict between the client and the contractor in the refurbishment project was low.	1	2	3	4	5
10	The level of organisational conflict between the client and the consultants in the refurbishment project was low.	1	2	3	4	5
11	The level of organisational conflict between the contractor and the consultants in the refurbishment project was low.	1	2	3	4	5
12	The level of interorganisational conflict during the design stage of the refurbishment project was low.	1	2	3	4	5
13	The level of interorganisational conflict during the construction stage of the refurbishment project was low.	1	2	3	4	5