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A Model on the Significant Factors Contributing towards the Restoration of Abandoned Residential Projects in Malaysia using AMOS-SEM.

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ABSTRACT

Background: The issue of abandoned construction projects is something common that has been widely discussed globally, including Malaysia. This issue has brought a lot of loss to the construction industry and to the economy of the country as well. Identifying factors contributing towards the restoration of the abandoned projects are important to have a successful completed project. This paper is subjected to a study conducted in the purpose of identifying those factors and analyzing it further on to know the significance of it in abandoned project restoration. The study focuses on residential projects and a survey was conducted by distributing questionnaires to targeted groups, and 244 completed questionnaires were collected at the end of the survey. The collected questionnaires was tested on its' reliability and the factor analysis was also conducted using the SPSS software. The data from it was further on used to construct the latent and measured variables, and lastly a model with good fit index was established using the SEM-AMOS package. By using the stat tools analysis, the developed model is found to be valid, reliable and credible, and also generalizable. This model is hoped to be useful in contributing towards the restoration of the abandoned projects in Malaysia.

INTRODUCTION

The phenomenon of the issue of abandoned projects is something that is happening globally. This is issue has been talked about for quite some time, as it has been existing for the past 3 decades. This issue has been in many countries around the world, for instance it is noted to be happening in a large scale in third world countries and in developing countries as well. Developed countries such as US and UK has been also reported to have faced such issue. Therefore, the issue of abandoned projects should not be circulated as only happening in an underdeveloped country.

Before declaring a project as abandoned, the projects has to go through a couple of phases. The first is a project is considered to be a late project when the completion date of the project exceeds 10% and secondly is when the project is still being delayed beyond 10%-30% where at this point now it is known to be a sick project. The last phase in declaring a project as abandoned is when there is no activities or workers present at the site for over six months (Doraisamy and Akasah, 2015).

Malaysia is also very much facing the issue of abandoned projects at the moment. The highest number of abandonment that the country is facing is more to residential construction projects. Construction projects has been classified as several types, and they are 1) residential construction projects, 2) light

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commercial/commercial projects, 3) industrial projects, and 4) heavy civil projects. As for residential construction projects, the types of infrastructure or projects that are listed under this classification are 1) low-cost houses, 2) low-medium cost houses, 3) medium-cost houses and 4) high-cost houses, which these houses are also known as landed properties. Apart for that, under residential construction projects there are also multi-family projects such as 1) flats, 2) apartments, 3) condominiums, 4) quarters and townhomes. Overall, in Malaysia it is noted that residential construction projects varying from different types of residential categories has been abandoned.

Due to this issue, the end-users are the ones who are badly by this. They have invested a certain amount of money and also have taken bank loans in the purpose of owning a house. They have to start payment for their housing loans although they have yet to stay in their new house, and the payment has to be honoured and continued even though the housing project is long abandoned. If they default on payment, the unfortunate house-buyers would be fined or sued. From the reports given by the Ministry of Housing and Local Government (2015), since 1990 till to date, the problem of abandoned housing project is indeed serious. Whatever the root cause might be, the projects that has been abandoned has to be restored, especially in the best interest of all parties involved by contract.

There are projects that are currently reported to be under planning for restoration, being revived and has been successfully revived (MHLG, 2015). This is an effort that has been put forwarded by the government. The Ministry of Housing and Local Government (2014), has reported that from the year 2009 to 2014, a total of 216 projects were abandoned. As from the year 2009 to 2015, 30 projects are under planning for revival, 22 projects are currently being revived and 164 has been completed (MHLG, 2015).

Throughout the years, the causes or factors on abandoned projects has been widely studied and discussed by many parties, including researches from different countries as well. The significant factors that leads towards the restoration of abandoned residential projects is something very important and most relevant to be studied and looked into in the purpose of successfully reviving them. Establishing a study and illustrating the significant factors contributing towards the restoration of abandoned residential projects further on, could show a complete and full picture of the aspects and elements involved in a restoration process. Ultimately, this could also a guideline to educate and lead towards the restoration of an abandoned project successfully.

Conducting The Study:

A study was conducted to have and to establish a clearer picture on the significant factors contributing towards the restoration of abandoned residential projects in Malaysia. To achieve this, a modelling method was thought off where it allows the relationships among the main factors (latent variables) and also the contributing factors (measured variables) to be identified. A survey was conducted much earlier with using the quantitative approach, where the questionnaire that was designed was the measurement instrument that was used in this survey. In the process of developing the questionnaire with its' suitable items that complies with the purpose of this study, a thorough literature review was carries out. Apart from that, there were also interviews and discussions done with officials related to the issue as well.

The questionnaire that was designed based on the information and details collected, was referred to experts of the related field, and who are also aware and have experience, and knowledge on the issue. After going through the expert judgment, the final draft of the questionnaire was completed, and was distributed to the targeted populations of this study. There were a total of 244 completed questionnaires collected at the end of the survey. All of the 244 questionnaires underwent the reliability test and also the factor analysis using the SPSS software. The output of the test showed the items/variables in the questionnaires that was used in the survey were reliable enough to measure the intended issue or problem. The same test was already carried out in hence after conducting the pilot survey, and the output of the reliability test and the factor analysis had the same justification as with full survey. Table 1 is the items/variables in the questionnaire, arranged in accordance with the test that was conducted.

Referring to the variables in Table 1, Factors 1, 2, 3, 4 and 5 are the latent variables (unobserved), whereas the other items/variables within the factors in the table are the measured variables (observed).

As this part of the study was completed, the next part was determining the most significant factors contributing towards the restoration of abandoned residential projects, based on the responds given by the 244 people. To do so, as mentioned earlier a modelling method, which in this study the Structural Equation Modelling (SEM) was adapted. A structural model is a part of the entire structural equation model diagram that needs to be complete for every model proposed. It is used to relate all of the variables (both latent and manifest) that are accounted for in the model (Arbuckle, 2006).

Conducting Structural Equation Modelling Using Amos:

Structural equation modeling (SEM) is a series of statistical methods that allow complex relationships between one or more independent variables and one or more dependent variables. Though there are many ways to describe SEM, it is most commonly thought of as a hybrid between some form of analysis of

variance/regression and some form of factor analysis. In general, it can be remarked that SEM allows one to perform some type of multilevel regression on factors (Arbuckle, 2006). Structural equation modeling (SEM) conceptually used to answer any research question involving the indirect or direct observation of one or more independent variables or one or more dependent variables. However, the primary goal of SEM is to determine and validate a proposed causal process and/or model. Therefore, SEM is a confirmatory technique (Raykov, 2005). The two main goals of using SEM are 1) to understand the patterns of correlation/covariance among a set of variables, and 2) to explain as much of their variance as possible with the model specified (Kline, 2010).

Table 1: Factors/Variables in Accordance.

Factors contributing towards the restoration of abandoned housing projects	
FACTOR 1: Management Aspects	
B9	Determination & understanding the project goals
B10	Senior management involvement & support
B11	Better understanding on the works in terms of contract
B12	Identifying various problems & suitable decision-making in solving/tackling it
B13	Identifying effective & necessary changes
B14	Having early & complete planning & design
B15	Approval of Building Plan
B16	Availability & proper management of the needed resources including adequate funds, trained personnel & technology, based on the restoration plan
B17	Putting forward project updates & reviews conduction regularity(project controlling & monitoring)
B18	Putting forward project risk assessment & analysis
B19	Having an efficient restoration practice with logical sequence of various activities to be followed in the restoration process
FACTOR 2: Aspects based on inception point/stage	
B1	Accessing the basic information & details of the project
B2	Abandoned projects consisting of high number of units with maximum purchasers
B3	Surety on the ability of the project is able to advance & not a helpless project
B4	Negotiations conducted with the stakeholders
B5	Obtaining & achieving agreement with all the parties involved
B6	Complying with all the approval conditions & amendments that has been put forward by the technical agency
B7	Coordinating the revival efforts through the original developer & the savior developer.
B8	Obtaining professional & authorized developer for the project
FACTOR 3: Building/project Aspects	
B30	Looking into the behavior of material used & structural system in the projects.
B31	Identifying the possibility of deterioration, its' causes & mechanisms.
B32	Focus on the existing documents of the project.
B33	Evaluation on the remaining structure to expose its' actual physical condition.
B34	Making assessment & further gaining physical evidence on the condition of the existing structure by inspection, diagnosis & cause analysis.
B35	Knowing the environmental conditions of the building (building safety).
B36	Knowing the maintenance aspect & efficiency in hence, by having the knowledge of the whole-life of the building.
FACTOR 4: Client Aspects	
B20	Knowing the cultural significance & social values of the project towards the target group/clients
B21	Taking account the number of occupants intended in the project.
B22	Taking account the surrounding community & resolve any occurring issues.
B23	Resolving land issues/disputes (approval of land)
B24	Having the proper collaboration & giving the needed focus on the importance of the clients
FACTOR 5: Aspects based on Government Policies	
B25	Taking account the current political conditions.
B26	Taking account the current legislative mandates.
B27	Having & conducting proper steps in consideration of the economy condition or crisis.
B28	Political influences in bias contract rewarding
B29	Focus on new project developments by new political party, failing to focus & complete previous housing projects.

The suggested approach to SEM explained by (Schumacker & Lomax, 1996) are as follows:

- review the relevant theory and research literature to support model specification
- specify a model (e.g., diagram, equations)
- determine model identification (e.g., if unique values can be found for parameter estimation; number of degrees of freedom, df, for model testing is positive)
- select measures for the variables represented in the model
- collect data
- conduct preliminary descriptive statistical analysis (e.g., scaling, missing data, collinearity issues, outlier detection)
- estimate parameters in the model
- assess model fit
- specify again the model if meaningful
- interpret and present results.

Some of the suggested approaches above was already been carried out in conjunction with the next analysis using SEM. SEM is usually viewed as a confirmatory rather than exploratory procedure, and confirmatory factor analysis (CFA) was largely adapted in this study. Therefore the Analysis of Moment Structures or better known as AMOS, was the statistical package used in the model development of the factors, especially since the model is purely a confirmatory factor analysis (CFA) model.

Model Development Of The Factors:

The proposed model was originally designed incorporating the latent variables and the measured variables (Please refer Table 1), which are also known as the unobserved and observed variables respectively. The latent variables with its indicators and the paths were drawn by adding arrows using the AMOS Graphics in the package, in order to produce the intended model. Figure 1 is the original model designed with inserting the

variables from the SPSS data that was used in the full survey by using AMOS. Here, the intended measurable variables are inserted and the unobserved variables are named as well to complete the full figure of the model.

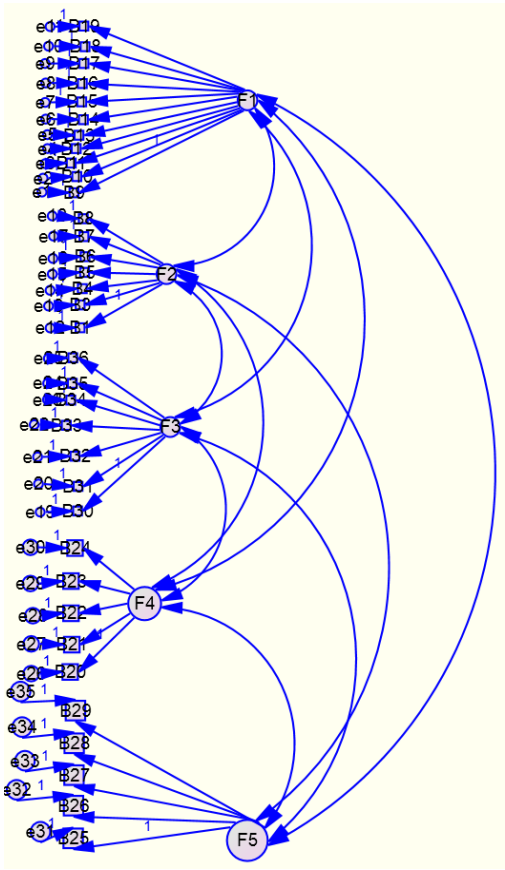

Fig. 1: Proposed Model of the Factors.

After establishing the graphic part of the proposed model, performing the analysis by conducting the calculations for fitting the model was carried out also using the AMOS package, where here the path loadings were estimated and shown. The path loadings from the each latent variables to the measurable variables shows loading of 0.7-0.95, indicating that it is measuring what it is supposed to measure and the items are therefore good.

Anyhow, after running the calculate estimates and checking into the model fit, the original model had to be modified with deduction of one latent variable and several measurable variables. The latent variable that was omitted from the model is the GP factor also known as "Government Policies", and as for the measured variable that was omitted were B2- Abandoned projects consisting of high number of units with maximum purchasers, B3- Surety on the ability of the project is able to advance & not a helpless project, and lastly B4-Negotiations conducted with the stakeholders. The deduction of the variables was done by referring to the model fit indices, where the path loadings of these variables are below 0.65 and also quite low in regression weights, where it could be concluded here that these variables does not show much significance towards the developed model.

In structural equation modeling, the fit indices establish whether, overall, the model is acceptable. If the model is acceptable, researchers then establish whether specific paths are significant. Acceptable fit indices do not imply the relationships are strong. Indeed, high fit indices are often easier to obtain when the relationships between variables are low rather than high--because the power to detect discrepancies from predictions are amplified (Hipp and Bollen, 2003). Marsh *et al*., (1996) have elaborated that many of the fit indices are derived from the chi-square value. Conceptually, the chi-square value, in this context, represents the difference between the observed covariance matrix and the predicted or model covariance matrix. The fit indices can be classified into several classes. These classes include:

- Discrepancy functions, such as the chi square test, relative chi square, and RMS
- Tests that compare the target model with the null model, such as the CFI, NFI, TFI, and IFI
- Information theory goodness of fit measures, such as the AIC, BCC, BIC, and CAIC
- Non-centrality fit measures, such as the NCP.

They further recommended that individuals utilize a range of fit indices. As for Jaccard and Wan, (1995), both have also recommended using indices from different classes as well as this strategy overcomes the limitations of each index. As for summary of criteria that researches often use, a model is regarded as acceptable if:

- The Normed Fit Index (NFI) exceeds .90 (Byrne, 1994) or .95 (Schumacker & Lomax, 2004)
- The Goodness of Fit Index exceeds .90 (Byrne, 1994)
- The Comparative Fit Index exceeds .90 (Byrne, 1994)
- RMSEA is less than .08 (Browne & Cudeck, 1993) and ideally less than .05 (Stieger, 1990).
- Alternatively, the upper confidence interval of the RMS should not exceed .08 (Hu & Bentler, 1998)
- The relative chi-square should be less than 2 or 3 (Kline, 1999; Ullman, 2001).

These criteria are merely guidelines. To illustrate, in a field in which previous models generate CFI values of .70 only, a CFI value of .85 represents progress and thus should be acceptable (Bollen, 1989). However, for this study, in determining the model fit, Hair (2010) and Holmes-Smith (2006) were referred, where they have highly recommended the use of at least three fit indexes by including one index for each category as given in Table 2 for determining the model fit. The details of the fitness index category with the level of acceptance according to every specific index, and also the comments could be referred in Table 3.

Table 2: Fitness Index (Hair, 2010).

Name of category	Name of index	Full name of index	Literature
Absolute fit	Chisq	Discrepancy Chi Square	Wheaton (1977)
	RMSEA	Root Mean Square of Error Approximation	Browne and Cudeck (1993)
	GFI	Goodness Fit Index	Joreskog and Sorbom (1984)
Incremental fit	AGFI	Adjusted Goodness Fit Index	Tanaka and Huba (1985)
	CFI	Comparative Fit Index	Bentler (1990)
	TLI	Tucker-lewis Index	Bentler and Bonett (1980)
	NFI	Normed Fit Index	Bollen (1989)
Parsimonious fit	Chisq/df	Chi Square/Degrees of Freedom	Marsh and Hocevar (1985)

Table 3: Index category and the level of acceptance (Hair, 2010).

Category name	Index name	Acceptance level	Comments
Absolute fit	Chisq	P > 0.05	Sensitive to sample size > 200
	RMSEA	RMSEA < 0.08	Range 0.05 to 0.10 acceptable
	GFI	GFI > 0.90	GFI = 0.95 is a good fit
Incremental fit	AGFI	AGFI > 0.90	AGFI = 0.95 is a good fit
	CFI	CFI > 0.90	CFI = 0.95 is a good fit
	TLI	TLI > 0.90	TLI = 0.95 is a good fit
	NFI	NFI > 0.90	NFI = 0.95 is a good fit
Parsimonious fit	Chi sq/df	Chi sq/df < 5.0	The value should be below 5.0

The root mean square error approximation or better known as RMSEA, and also the chi square/degree of freedom (chi sq/df), are indexes that are highly recommended as they are frequently reported in literatures for a model fit.

The final model that was developed with good and acceptable model fit is shown in Figure 2.

Keywords for the developed model in Figure 2 are as follows:

MA – Management Aspects
IP – Inception Point
BA – Building Aspects
CA – Client Aspects

Latent Variables

As for the other items in the model which shows B1, B2 and so on, are the measured variables as stated in Table 1 earlier.

The final fitness index that was obtained for the developed model in Figure 2 is shown in Table 4.

Table 4: Results of Developed Model Fit Index.

Category name	Index name	Index Obtained	Comments
Absolute fit	Chisq	P = 0.00	Sensitive to sample size > 200(N=244)
	RMSEA	0.058 < 0.08	Good and acceptable.
	GFI	GFI = 0.90	Acceptable.
Incremental fit	AGFI	AGFI =0.819	Acceptable.
	CFI	0.95 > 0.90	Good.
	TLI	0.941 > 0.90	Good.
	NFI	NFI = 0.90	Good.
Parsimonious fit	Chi sq/df	Chi sq/df = 1.799	Good fit.

From the output shown in Table 4 on the model fit, the developed model in Figure 2 is a good and acceptable model.

The next necessary step explained by Hair *et al*., (2010), is to establish the convergent and discriminant validity, as well as reliability, since the developed model adapted the confirmatory factor analysis (CFA). It is not efficient if the validity and reliability is not adequate enough for the factors in the model. In order to establish the validity and reliability, there are some measures are taken to do so and they are called the Composite Reliability (CR), Average Variance Extracted (AVE), Maximum Shared Variance (MSV) and Average Shared Variance (ASV). Table 4 shows the thresholds for the reliability, convergent and discriminant validity.

Table 4: Reliability, convergent and discriminant validity thresholds.

Reliability	CR	CR > 0.7
Convergent Validity	AVE	AVE > 0.5
Discriminant Validity	MSV	MSV < AVE
	ASV	ASV < AVE

If the convergent validity does not comply as given in Table 4, then it shows that the convergent validity has issues, meaning the variables in the model do not correlate well with each other within their parent factor, or also could be defined as the latent factor is not well explained by its observed variables (Hair *et al*., 2010). As for discriminant validity, if it does not comply with terms as same as in Table 4 as well, then it also identified as an issues, therefore the variables correlate more highly with variables outside their parent factor than with the variables within their parent factor, or could also be stated as the latent factor is better explained by some other variables from a different factor in the model, than by its own observed variables (Hair *et al*., 2010).

Now as for the reliability, convergent and discriminant validity for the model that was developed, is shown in Table 5.

Table 5: Reliability, Convergent and Discriminant Validity for Developed Model.

	CR	AVE	MSV	ASV	BA	MA	IP	CA
BA	0.884	0.517	0.645	0.569	0.719			
MA	0.932	0.559	0.707	0.632	0.803	0.748		
IP	0.850	0.509	0.707	0.578	0.749	0.841	0.713	
CA	0.834	0.501	0.545	0.504	0.709	0.738	0.682	0.700

From Table 5, what could be seen here is that the composite reliability (CR) for factors BA, MA, IP and CA exceeds more than 0.7, which means this part of the confirmatory factor analysis (CFA) of the model has cleared. This could be said the same for convergent validity (AVE), as the same factors shows AVE to exceed more than 0.5, indicating that variables correlate well with each other within their latent variables. As for the discriminant validity, it shows both MSV and ASV values for all the 4 factors are lesser than AVE, resulting it to be an issue. This means the variables in the model correlate more highly with variables outside their parent factor too than within their parent factor. So it could be stated here that the latent factor is better explained by some other variables (from a different factor), than by its' own observed variables. The output of the developed model on the whole could be said as generalizable for this study.

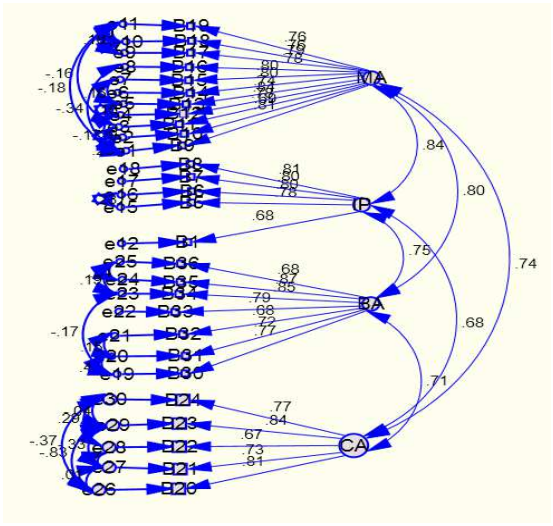

Fig. 2: Final Model of Factors Developed.

Conclusion:

Based on the analysis and the output data that was obtained, the factors in the model that was developed are statistically proven to be significant for the purpose of restoration. From the developed model it could also be seen that the factors which are the variables are reliable with showing consistent results. The variables that are highlighted in the developed model are valid enough as it measures what it is supposed to be measuring, if in case it was not so then a model with a good fit will not be able to be produced.

All the elements and aspects of the model fits well. When Maximum Shared Variance (MSV) and Average Shared Variance (ASV) shows values lesser than Average Variance Extracted (AVE), it indicates that the discriminant validity has issues. This means that the variables not only correlate well within their parent factor but correlate highly with variables outside their parent factors as well. This situation seems more relevant when looking at the observed variables in Factor 1 and 2, where it seems that the variables in Factor 1 have significant relationship among the other variables from Factor 2 as well. This also could be proved by looking at the correlation between Factor 1 (Management Aspects, MA) and Factor 2 (Inception Point, IP), with a strong and high correlation loadings of 0.84. So for this part, there are 2 alternatives that could be imposed here. One alternative that could be used here is to combine the variables in Factor 1 and Factor 2 under one parent factor/latent variable. The other alternative is to let the latent factor to be explained by variables from a different latent/factor as well.

Overall, it could be concluded that the model that has been developed meets to certain criteria. One is that it's reliable with consistent results. It does also shows a certain extend of validity where it is measuring what it is supposed to measure. Other than that, the model is generalizable making it to go further from the original group to be tested with a wider population. Lastly, when it comes to the matter of the model being credible, actually what is looked into here is that if the whole model makes sense, which in this case it does.

Lastly, the variables in the model which plays the part of factors could be looked into thoroughly in the purpose to achieve these factors. This could be a contribution towards abandoned project restoration. The model developed is hoped to be a guideline in the effort to revive abandoned projects, not only in Malaysia, but other countries as well which are facing the same issue.

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