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Confirmatory Factor Analysis on the Propensity of Housing Adjustment Behavior in Low-Cost Housing in Kendari City, Southeast Sulawesi, Indonesia

M. Arzal Tahir[1], Samdin[2], Ishak Kadir[1], Endro Sukotjo[2]
[1]*Faculty of Engineering, Halu Oleo University-Kendari, Indonesia, e-mail: marzal.tahir_ft@uho.ac.id*
[2]*Faculty of Economics, Halu Oleo University-Kendari, Indonesia*

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ABSTRACT:Confirmatory factor analysis is carried out by determining the number and relationship between indicators and constructs built on theory. The purpose of this study was to determine the indicators that have the greatest contribution to each research variable. The variables in this study are the characteristics of the residential unit, residential environment, public facility services, satisfaction with living and the behavioral tendency of residence adjustment of residents who live in simple housing in Kendari City. Primary data was obtained through a survey using a questionnaire on 220 residents of simple housing spread over seven sub-districts in the city of Kendari. The data were analyzed using the Confirmatory Factor Analysis (CFA) method which was used to confirm the indicators on the latent variables using the AMOS version 24.0 program. The results showed that the characteristic construct of residential units with the largest contribution was the indicator X1.10 (quality of materials for ceilings) of 0.733. Then for the construction of residential environmental characteristics with the variable indicator X2.1 (road condition of the residential environment) provides the largest contribution of 0.672. The characteristic construct of public facility services provides the largest contribution with the X3.3 indicator (access to education/school facility services) of 0.766. The construct of residence satisfaction that gives the largest contribution is the Y1.2 indicator (satisfaction with the residential environment) of 0.901. As well as the behavioral trend of housing adjustment with the Y2.4 indicator (positive speaking) of 0.782. Further research can identify the relationship between the dependent and independent constructs of building satisfaction. The findings are useful for evaluating performance in subsidized simple housing studies, analyzing user satisfaction and formulating policies to achieve satisfaction in living in simple housing.

KEYWORDS:housing adjustment, confirmatory factor analysis, residential satisfaction, structural equation modeling.

I. INTRODUCTION

Home is a basic need for humans and is a right for everyone to occupy decent and affordable housing. In addition to being a place of refuge and rest, the house also functions as a place for education and regeneration of values and culture in a family as well as being an asset for its owner. The study of residence satisfaction to date has been used in various disciplines such as housing, consumer satisfaction, marketing, architecture, as well as the medical and health fields. Studies on residence satisfaction can basically be classified into two types, namely as a criterion for assessing housing quality and as a tool for predicting behavior to stay or move from existing housing (Amerigo, MA & Aragones, IJ, 1997).

Housing satisfaction is important because it will have an impact on a person's psychological condition and quality of life. Dissatisfaction with one's community can reduce a person's psychological well-being and quality of life (Morris, EW, Crull, S., R., & Winter, M., 1976) and influence the decision to move out of the community (Amole, 2009). Therefore, the housing demand characteristics must be thoroughly examined to meet the needs of the housing market, especially for lower-middle income residents. One of the indicators to determine the characteristics of housing demand is housing satisfaction (Aulia and Ismail, 2013).

Several studies that have been conducted regarding the satisfaction of living have produced varying results (Abdullah, MI, et al. 2020). A number of studies that have been conducted in various countries show that having a satisfactory place to live is often the main demand of human needs (Balestra and Sultan, 2013). A number of

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studies show that dissatisfaction with the characteristics of the residential environment affects the mobility behavior of the residence (Dempsey, et. al. 2012). On the other hand, Rabe and Taylor (2010) report that environmental characteristics explain a relatively small proportion of the causes of housing mobility behavior, although many expressed dissatisfaction with their living environment. Lack of access to public facilities such as shops, workplaces and recreation spaces encourages housing mobility behavior (Kim, et al, 2005). However, Fang (2005) reported his findings that low residence satisfaction often does not lead to moving behavior even though the intention to move is high. This condition is different from that in the western literature regarding low housing satisfaction related to the tendency to move.

Therefore, the purpose of this study is to determine the indicators that have the greatest contribution to each research variable. The variables in this study are the characteristics of the residential unit, residential environment, public facility services, satisfaction with living and the behavioral tendency of residence adjustment of residents who live in simple housing in Kendari City. This paper begins with an overview and literature on this topic. Then, the methodology used in this study follows the results of the questionnaire survey analysis and research findings. Finally, some conclusions and recommendations will be provided at the end of this article. This paper makes a significant contribution to better understand the environmental characteristics of the project in order to provide subsidized low-cost housing for low-income communities. This study also provides insight into how satisfied residents are with their homes and residential adjustment behavior of low-cost housing.

II. LITERATURE REVIEW

Individual adjustment behavior to the environment is an effort to reduce discrepancies in an environment to promote harmony.Altman (1980) states that the adjustment between individuals and their environment is known as adaptation. In this condition, the individual changes his behavior to suit his environmental conditions, while the adjustment to the individual's environmental conditions is known as adjustment. Characteristics of occupant behavior or housing adjustment and adaptation as conceptualized in the study is the family's effort to correct the mismatch between the housing they own and the housing they feel they should have (Morris, EW, Crull, SR, & Winter, M. 1976). The behavioral characteristics of residents reflect their feelings about occupancy satisfaction and dissatisfaction (Mohit, MA, & Mubarak, 2014). However, in Fang, Y. (2005)'s research, it was shown that although occupancy satisfaction was low, it did not lead to the behavior of moving to another more suitable residential place. Meanwhile, Lioa (2004) uses indicators of intention to move and planning to move to measure housing adjustment behavior. Jiang, W., et al. (2017) in his study using the parameter of intention to move to measure the behavioral tendency of residents to find that intention to move is significantly and negatively affected by satisfaction with living.

Confirmatory factor analysis is one of the multivariate analysis methods that can be used to confirm whether the measurement model built is in accordance with the hypothesis. In confirmatory factor analysis there are construct variables and indicator variables. Construct variables are variables that cannot be established and constructed directly, while indicator variables are variables that can be observed and measured directly (Ghozali, 2003). In SEM confirmatory factor analysis is used to evaluate the measurement model, namely to test the validity and reliability of the construct (Latan, 2013).

According to Brown (2006), confirmatory factor analysis is an extension of explanatory factor analysis. In confirmatory factor analysis, researchers must determine the number of indicators and the relationship between indicators and constructs based on theory. Meanwhile, in the analysis of explanatory factors, researchers look for a number of indicators that form common factors without any previous theoretical basis. In other words, explanatory factor analysis is a method to build a theory (theory building).

Assumptions of Confirmatory Factor Analysis. Generally, confirmatory factor analysis requires a large number of samples so that the results obtained have a sufficient level of confidence. The sample size provides the basis for estimating the error in sampling. By using the maximum likelihood estimation, at least 100 samples are needed, when the sample is increased the sensitivity increases to detect differences between data (Hair, J., F., et al, 2010). Maximum likelihood requires the assumption of a normal distribution of data. The value that is commonly used to see the normality of the data in this analysis is to look at the value of cr (critical ratio).

Convergent Validity and Construct Reliability. Indicators of a construct must be valid. To measure the validity of the indicator can be seen from the loading factor. The higher the value of the loading factor of a construct indicates that they converge at one point. Therefore, the instrument used to assess the perception of the occupants of a

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simple housing about a certain concept needs to be evaluated before being given. This is to ensure that the questionnaire used is valid and reliable, or in other words, measures what it is supposed to measure, and the extent to which the test scores are free from measurement errors (Muijs, 2011). When it comes to measurement, the validity and reliability of the questionnaire are the most important things to consider (Barroon and Abd Rahman, 2015). There are several types of reliability but in this study, three types of reliability were considered, namely internal reliability, construct reliability (CR) and average variance extract (AVE), while in the aspect of validity, there were convergent validity, construct validity, and discriminant validity. Internal reliability is a concept that refers to the extent to which all items measure the same basic construct (Pallant, 2007) while construct reliability is a concept to assess the extent to which measuring instruments accurately measure the theoretical constructs that have been designed (Jackson, 2003). Construct validity is the extent to which a set of items has reflected the theoretical latent construct the item is designed to measure whereas discriminant validity is a concept in which an individual measured item should represent only one latent construct (Hair et al., 2006).

III. METHODOLOGY

This research was conducted in type 36 simple housing in Kendari City, Southeast Sulawesi Province. The location selection was carried out in clusters in 7 (seven) sub-districts in the city of Kendari by considering the tendency of housing development provided by housing developers in that area and the occupancy process that has been running on existing housing. The total population is 11,195 households. Questionnaires were distributed directly to respondents who became the research sample. Homeowners were chosen as respondents because they are the ones who make decisions regarding the condition of their housing. A total of 220 questionnaires have been obtained for further analysis. This sample size meets the suggestion by Kline (2005) that a sample size of more than 200 is sufficient for SEM analysis. Unidimensionality, reliability and validity problems for all measurement models were determined.

In this study, AMOS version 24 and SPSS version 24 were used to facilitate the analysis of the results. AMOS software was used to assess the relationship between latent variables and observed variables from the measurement model. The technique used is called factor confirmation analysis. In this study, the maximum likelihood estimation method is used in generating parameter estimates from the measurement model. This estimation method is more practical because of its ability to handle complex models and also its resistance to abnormal data (Brown, 2006). There are several fit indices used in this study to see how well the specified model reproduces the covariance matrix among the indicator items (Hair et al., 2006). They are grouped into three main groups of actions; practical fit measure (chi-square statistic or cmin/df), absolute match index (GFI, AGFI or RMSEA) and incremental match index (TLI or CFI). According to Hair et al. (2010), a study must report at least three fit indices with at leastone of each category.

IV. RESULTS AND DISCUSSION

Multicollinearity Assumption Testing

Assumption of multicollinearity is not collinearity or perfect relationship between variables. A research model is said to be good if it has low multicollinearity. Multicollinearity testing can be based on the value of tolerance and VIF (Variance Inflation Factor). If the tolerance value is > 0.10 and VIF < 10, it means that there is no multicollinearity in the study. On the other hand, if tolerance is <0.10 and VIF>10, then there is an indication of interference. The results of the multicollinearity assumption test in this study can be seen in table 1.

Table 1. Multicollinearity Test Results

Structural Equations	Exogenous Variable	Collinearity Statistics	
		Tolerance	VIF
Substructure-1 Endogenous Variable Living Satisfaction	Characteristics of Residential Units	0.777	1.287
	Residential Environmental Characteristics	0.655	1.527
	Public Facilities Service Characteristics	0.693	1.443
Substructure -2 Endogenous Variables Behavioral Tendency to Adjustment of Residence	Characteristics of Residential Units	0.777	1.287
	Characteristics of Residential Environment	0.655	1.527
	Characteristics of Public Facilities Services	0.693	1.443

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Structural Equations	Exogenous Variable	Collinearity Statistics	
		Tolerance	VIF
Substructure-3 Endogenous Variables Behavioral Tendencies to Adjust Living	Residential Unit Characteristics	0.767	1.305
	Residential Environmental Characteristics	0.577	1.732
	Characteristics of Public Facilities Services	0.645	1.550
	Settlement Satisfaction	0.635	1.575

Based on Table 1. It can be seen that all exogenous variables are good for the substructure-1 equation, substructure-2 equation and substructure-3 equation. have a tolerance value > 0.10 and a VIF value < 10, so it can be said that there are no symptoms of multicollinearity. Thus, the assumption of multicollinearity in this study has been fulfilled.

Measurement model of validity and reliability
Test of Reliability

Basically, the reliability test (reliability) shows the extent to which a measuring instrument can provide relatively the same results when repeated measurements are made on the same subject. Reliability test in SEM can be obtained through the following formula:

The recommended level of reliability is 0.6. The value of construct reliability can be seen in the appendix and the results of the calculation of construct reliability can be seen in table 2 below.

Table 2. Calculation of Construct Reliability

No.	Variable	ConstructReliability
1	Characteristics of Residential Unit	0.774
2	Residential Environment Characteristics	0.666
3	Characteristics of the Public Facilities Service	0.771
4	Satisfaction Living	0.883
5	Adjustments Behavior TrendsShelter	0.773

Based on calculations construct reliability in Table 2 above, obtained the reliability value is between 0.666 to 0.883. The reliability values of the five variables are in accordance with the values construct reliability recommended. This shows that the reliability of the variable characteristics of the residential unit, the characteristics of the residential environment, the characteristics of public facilities services, satisfaction with living and the tendency of residential adjustment behavior is high.

Convergent Validity and Construct Reliability Test

To determine the construct validity of the questionnaire, CFA was used. This is done using a structural equation model (SEM). The eigenvalue is greater than 1 and the loading factor value is greater than 0.30 (Siembida, EJ, et all, 2018) as acceptable criteria for this study. SPSS statistical software in the latest version and Amos 24 were used to analyze the data.

can use Transistors/MOSFETs as switches.

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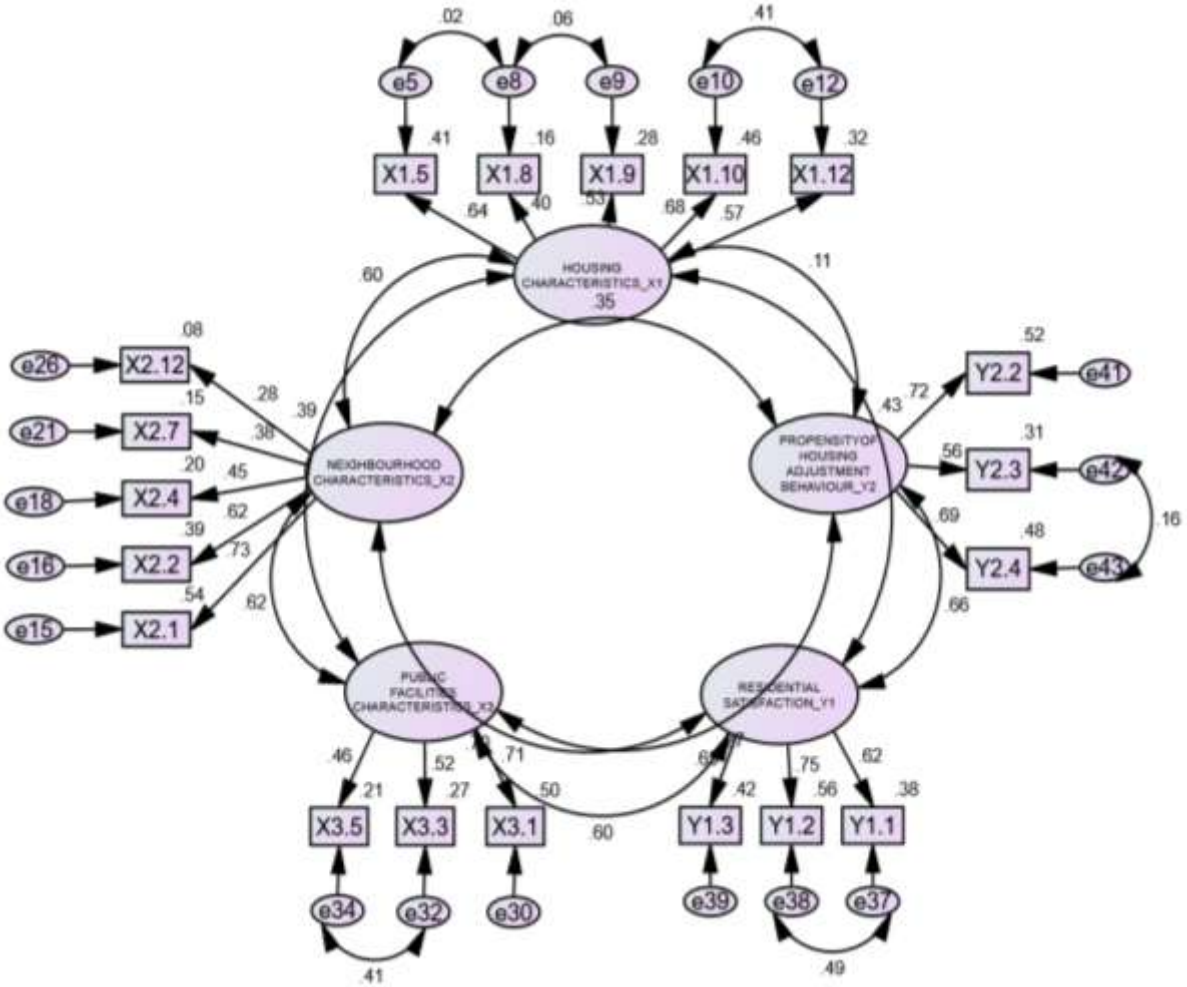

Figure 1. Confirmatory Factor Analysis Model of Housing Adjustment Behavior In Low-Cost Housing Kendari City

Figure 1. shows the test results after removing invalid indicators. Viewed from the goodness of fit statistic, it shows that the measurement model shows a very good fit (as shown in Table 4).

Table 3. Variable Characteristics of Residential Units

Variable	Indicator	Loading Factor
Characteristics of Residential Units	X1.5	0.683
	X1.8	0.535
	X1.9	0.533
	X1.10	0.733
	X1.12	0.729
Residential Environmental Characteristics	X2 .1	0.672
	X2.2	0.555
	X2.4	0.445
	X2.7	0.446
	X2.12	0.377
Characteristics of Services Public Facility	X3.1	0.498
	X3.3	0.766
	X3.5	0.710
Residential Satisfaction	Y1.1	0.802
	Y1.2	0.901

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Variable	Indicator	Loading Factor
	Y1.3	0.529
Trend Behavior of Adjustment Residential	Y2.2	0.646
	Y2.3	0.619
	Y2.4	0.782

Table 3 shows the acquisition of all valid loading factor values because they are above 0.30 so that the measurement model for each construct is obtained as follows:

Characteristics of Residential Units

in the characteristic construct For residential units, there are five indicators, namely the kitchen area (X1.5) with a loading factor of 0.683, air circulation entering the house (X1.8) with a loading factor of 0.535, the number of electrical plugs (X1.9) with a loading factor seb esar 0.533, ceiling quality (X1.10) with a loading factor of 0.733 and wall quality (X1.12) with a loading factor of 0.729. This shows that the five indicators can explain the existence of the characteristic constructs of residential units. The X1.10 indicator is the indicator that gives the biggest contribution in explaining the characteristic construct of the residential unit because it has the largest loading factor value, which is 0.733.

Residential Environment Characteristics

In the residential environment characteristic construct, there are five indicators, namely the condition of the residential neighborhood road (X2.1) with a loading factor of 0.672, the condition of the clean water network (X2.2) with a loading factor of 0.555, the availability of vehicle parking spaces (X2 .4) with a loading factor of 0.445, the availability of telephone/internet networks (X2.7) with a loading factor of 0.446 and air quality (X2.12) with a loading factor of 0.377. This shows that the five indicators can explain the existence of the characteristic constructs of the residential environment. The X2.1 indicator is the indicator that gives the largest contribution in explaining the characteristic construction of the residential environment because it has the largest loading factor value, which is 0.672.

Characteristics of Public Facilities Services

In the characteristic construct of public facilities services, there are three indicators, namely the ease of access to public transportation services (X3.1) with a loading factor of 0.498, the availability of educational facilities (X3.3) with a loading factor of 0.766, and the availability of health facilities services. (X3.5) with a loading factor of 0.710. This shows that the three indicators can explain the existence of the characteristic construct of public facilities services. The X3.3 indicator is the indicator that gives the biggest contribution in explaining the characteristic construct of public facility services because it has the largest loading factor value, which is 0.766.

Residential Satisfaction

In the housing satisfaction construct, there are three indicators, namely satisfaction with the condition of the residential unit (Y1.1) with a loading factor of 0.802, satisfaction with the condition of the residential environment (Y1.2) with a loading factor of 0.901, and satisfaction with the condition of service facilities. public (Y1.3) with a loading factor of 0.529. This shows that the three indicators can explain the existence of the construct of settlement satisfaction. The Y1.2 indicator is the indicator that gives the largest contribution in explaining the construct of satisfaction with living because it has the largest loading factor value, which is 0.901.

Propensity of Housing Adjustment Behavior

In the propensity of housing adjustment behavioral construct, there are three indicators, namely the propensity to make adjustments to housing by making modifications (Y2.2) with a loading factor of 0.646, Tendency to stay because they feel at home (Y2.3).) with a loading factor of 0.619, and tend to speak positively by recommending family and friends to live in the housing estate (Y2.4) with a loading factor of 0.782. This shows that the three indicators can explain the existence of a behavioral trend of housing adjustment. Y2.4 indicator is the indicator that gives the largest contribution in explaining the behavioral trend of housing adjustment because it has the largest loading factor value, which is 0.782.

Model ofSuitability Test

Based on the test criteria, chi-square, cmin/df, rmsea, GFI, AGFI, TLI and CFI above and the goodness of fit value as a result of processing with AMOS version 24 program, as shown in Figure 5.9, the following table can be made.

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Table 4. Model of Suitability Test Result (Goodness-of-fit-Indices)

Goodness of fit index	Cut of value	Main Model	Value of Modification Results	Model Evaluation
Chi-Square	Expected small	1357,004	160.420	good
P-Value	0.05	0.000	0.075	good
CMIN/DF	2.00	2.192	1.180	good
RMSEA	≤0.08	0.078	0.030	good
GFI	0.90≥	0.731	0.924	good
AGFI	≥0.90	0.694	0.894	pretty good
TLI	≥0.95	0.697	0.966	good
CFI	0.95≥	0.718	0.973	good

Based on calculations, the chi-square obtained value of 160.420 is better. The probability value of 0.075 is good, which is above 0.05. The CMIN/DF value is 1.180 so it is better, which is below 2.00. The GFI value of 0.924 is better, which is more than 0.90 and the AGFI value of 0.894 which is still less than 0.90. The TLI value of 0.966 is good, which is already above 0.95. The CFI value of 0.973 is good, which is above 0.95 and the RMSEA value of 0.030 which is better, which is below 0.08.

V. CONCLUSION

Variable characteristics of residential units can be formed by indicators of kitchen space area (X1.5), smooth air circulation entering the house (X1.8), availability of electrical plugs (X1.9), ceiling quality (X1.10) and wall quality (X1.12). Then for the characteristics of the residential environment, it is formed by indicators of road conditions in the residential environment (X2.1), the condition of the clean water network (X2.2), the availability of vehicle parking spaces (X2.4), the availability of telephone/internet networks (X2.7) and air quality in a residential environment s(X2.12). In the variable characteristics of public facilities services, the forming indicators have three indicators, namely the ease of access to public transportation services (X3.1), the availability of educational facilities (X3.3), and the availability of health facility services (X3.5). In the variable of living satisfaction, there are three forming indicators, namely satisfaction with the condition of the residential unit (Y1.1), satisfaction with the condition of the residential environment (Y1.2) and satisfaction with the service conditions of public facilities (Y1.3). In the behavioral trend of residence adjustment variables, the indicators are the tendency to make adjustments to housing by making modifications (Y2.2), the tendency to stay because they feel at home (Y2.3), and tend to speak positively by recommending to family and friends. friends to live in the housing (Y2.4). In the occupancy unit characteristic variable, the indicator that gives the biggest contribution is. indicator X1.10 (ceiling quality) that is equal to 0.733. Then on the variable characteristics of the residential environment, the indicator X2.1 (road condition of the residential environment) is the indicator that gives the largest contribution, which is 0.672. Furthermore, on the variable characteristics of public facilities, the indicator that gives the largest contribution is the X3.3 indicator (availability of educational facilities) which is 0.766. In the variable of residence satisfaction, the indicator Y1.2 (satisfaction with the condition of the residential environment) is the indicator that gives the largest contribution, which is 0.901. Furthermore, for the variable of residence adjustment behavior, the Y2.4 indicator (tends to speak positively by recommending to family and friends to live in the housing) is the indicator that gives the largest contribution, which is 0.782.

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