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Communication Barriers in Indonesian Government Construction Projects

Barreras de comunicación en los proyectos de construcción del gobierno de Indonesia

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Abstract

Ineffective communication between the parties and elements in construction projects will harm the quality of work. This paper aims to identify the barriers to effective communication and to build a model for measuring the factors that hinder effective communication in construction projects. This study presents Exploratory Factor Analysis (EFA) and Structural Equation Modeling (SEM). The process begins with a determination of variables for communication barrier factors. Twenty-five (25) causes that hinder effective communication were identified. Questionnaires were distributed to stakeholders in construction projects. From the result obtained, 20 variables make up the three-factor constructs: technical language; project knowledge; and socio-cultural with the value of Comparative Fit Index (CFI) 0.812 and Tucker-Lewis Index (TLI) 0.78. Understanding and knowing the observed variable and effective communication factors helps the project management team to improve performance in government construction projects.

Keywords: Barriers; effective communication; measurement model; factor analysis; construction project.

Resumen

La comunicación ineficaz entre las partes y los elementos en el proyecto de construcción tendrá un impacto negativo en la calidad del trabajo. Este documento tiene como objetivo identificar las barreras para la comunicación efectiva y construir un modelo para medir los factores que obstaculizan la comunicación efectiva en proyectos de construcción. Este estudio presenta Análisis Factorial Exploratorio (EFA) y Modelado de Ecuaciones Estructurales (SEM). El proceso comienza con una determinación de variables para los factores de barrera de comunicación. Se identificaron veinticinco (25) causas que obstaculizan la comunicación efectiva. Se distribuyeron cuestionarios a las partes interesadas en los proyectos de construcción. A partir del resultado obtenido, 20 variables conforman los tres constructos factoriales: lenguaje técnico; conocimiento del proyecto; y sociocultural con el valor del Índice de Ajuste Comparativo (CFI) 0.812 y el Índice de Tucker-Lewis (TLI) 0.78. Comprender y conocer la variable observada y los factores de comunicación efectiva ayuda al equipo de gestión del proyecto a mejorar el desempeño en los proyectos de construcción del gobierno.

Keywords: Barreras; comunicación efectiva; modelo de medición; análisis factorial; proyecto de construccion.

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1. Introduction

Various studies have proven that communication aspects play an important role in the success of a construction project (Ceric, 2014); (Gamil Yaser and Ismael, 2017); (Ripkianto and Winanda, 2013); (Wu et al., 2017). Many professionals from different organizations must work together on construction projects (Adriaanse and Voordijk, 2005). Lack of communication between the parties and elements in a construction project also negatively impacts the quality of work, large project costs, and execution time delay (Ripkianto and Winanda, 2013). A study conducted by Kassa, (2020) on a railroad project in Ethiopia supports the findings of Chundawan and Alifen, (2018) that poor project management and coordination is one of the important factors of five aspects that result in extreme time and cost overruns.

Aspects of quality cost and time are often raised and studied from various perspectives in construction projects. Similar to the failure and success of construction projects, various studies try to find the factors that influence them. Communications can be widely accessible and complex as needed to accommodate all parties involved. However, not many have explored the communication aspect in construction projects, while this element is believed to be the main element in any activity involving various individuals with different interests. The existence of this research gap reflects that communication in construction projects needs to be studied.

The involvement of various stakeholders in a construction project increasingly indicates that effective and efficient coordination and communication between them is a crucial element that must exist. Construction projects in Indonesia, especially those owned by the government, are not free from this communication problem. For example, the ineffectiveness of communication between parties can be seen from the emergence of conflicts between implementers and supervisory consultants, lack of communication between implementers and project owners, slow decisions from project owners, negotiations and licensing in contracts are factors for failure and delays in building construction projects in Padang City (Natalia, 2018).

Therefore, this study aims to build a model for measuring factors that barrier effective communication in government projects in West Sumatra from the perspective of service providers.

In this regard, this article is organized as follows: the first section reviews the existing literature on communication barriers, emphasizing their critical role in the success of construction projects. The second section outlines the research methodology, detailing the instruments used and the data analysis procedures. The third section presents the results and discussion, elaborating on the measurement model and comparing the findings with those of previous studies.

2. Communication barriers

According to Dainty et al., (2007), there are several types of communication effectiveness in the construction project such as interpersonal communication, group and team communication, organizational communication, and corporate communication. The measurement of communication effectiveness is not the same at the organizational group and individual levels because the user's communication goals may be different from the context (Littlemore, 2003). Each project has its environment and conditions, and each industry has its particular conditions to be considered. Every day, lots of information should be exchanged in projects, but the basic approach to communication requirements is essentially the same.

Communication should be able to reduce the risk of project failure because from communication it is expected that people can achieve a common point of view to produce good cooperation (Chatra et al., 2019). Understanding barriers to effective communication is critical to improving the communication process during construction projects (Carlsson et al., 2001); (Ejohwomu et al., 2017). Therefore, an effective communication strategy allows us to structure the information flow in a better and more controlled manner and avoid the costs caused by a lack of effective and timely communication.

In the research conducted on the construction industry in Nigeria, Ejohwomu et al., (2017), found that the important factors that hinder effective communication are unclear project objectives, ineffective reporting systems, and poor leadership. In addition, the weak organizational structure of the construction team, lack of standardized construction information, and lack of support for advanced communication technologies are communication barriers (Tone et al., 2009). Inappropriate use of visualization media, inadequate resources (time and effort), information time,

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work experience, client attitudes, site constraints, and cultural and organizational barriers are factors that affect effective communication between clients and implementing contractors (Goh et al., 2005).

The very diverse culture and language in Indonesia can also be an inhibiting factor in communicating. Construction workers in Indonesia often come from various regions so they can become obstacles in communicating between colleagues and fellow members of the project, therefore knowledge or educational background, emotional, cultural background and nationality can be an obstacle in communication on construction projects (Fajar, 2009); (Gluch and Raisanen, 2009); (Hoezen et al., 2006). This is also expressed by Hapsari et al., (2018), that the diversity of origin, culture, and language of the workers is an obstacle to communication within the project team.

Communication is not only verbal but also written and in the implementation of a construction project a working drawing is also one way that communication is distributed. The factors of lack of expertise in writing, listening, and recording events, inexperience of personnel, incomplete drawings, lack of detail, complexity, and tension between parties are obstacles in communication on construction projects (Senaratne and Ruwanpura, 2016).

Listening and respecting the parties communicating with each other also influences effective communication. Research conducted on construction projects in the Netherlands found that one of the obstacles in communication on construction projects is the lack of ability of the stakeholders or owners to empathize with the parties. Others (contractors and consultants) are involved in the project (Harivarman, 2017); (Hoezen et al., 2006).

3. Methods

To build a model for measuring factors that hinder effective communication in construction projects, three steps were taken, namely, determination of variables of the communication barrier, Exploratory Factor Analysis (EFA), and Confirmatory Factor Analysis (CFA) using the Onyx program. The process begins with a determination of variables for communication barrier factors. The identification of factors inhibiting effective communication in construction projects was carried out by a previous literature study with the results obtained as shown in (Table 1) above. The purpose of factor analysis is to reduce or reduce existing factors into simpler factors and to determine the relationship between the constituent factors or dimensions with the formed factors (Supranto, 2004). The factor analysis used is EFA, which is a detailed form that shows the relationship between latent variables and observed variables that are not specified first, in carrying out EFA using the help of the IBM SPSS Statistics 25 program. EFA can also identify latent structures of the real/observed variables, and then create a new set of latent variables with factor loading (Hair et al., 2010).

The EFA results are then validated with CFA using the onyx program. This application provides an integrated solution by providing model specification options, summary estimates and visualizations in addition to having the ability to integrate with other SEM (von Oertzen et al., 2015). The model constructed through this application is then validated by taking into account the parameter values of construct reliability and goodness of fit. (Figure 1) illustrates the methodology adopted in this study.

3.1 Research Instrument

The study of literature review related to communication barriers in construction projects is used in the research as a question in the questionnaire. Thus, 25 variables affect the communication barrier. These obstacles can be summarized as shown in (Table 1) below.

The research questionnaire was grouped into two parts. Part A contains questions about the respondent's profile, and part B about the factors that cause communication barriers. A Likert scale of 1 -5 was used to measure communication barriers (very not influential - very influential). Furthermore, the questionnaire results were analyzed descriptively to see the demographic distribution of respondents. The Kaiser-Meyer-Olkin (KMO) and Bartlett test of sphericity were used to see the adequacy of the number of samples. After the sample adequacy requirements were met, factor extraction was done by looking at the Eigenvalues and scree plot graphs. The reliability and validity of the new factors formed were then measured for their reliability and validity.

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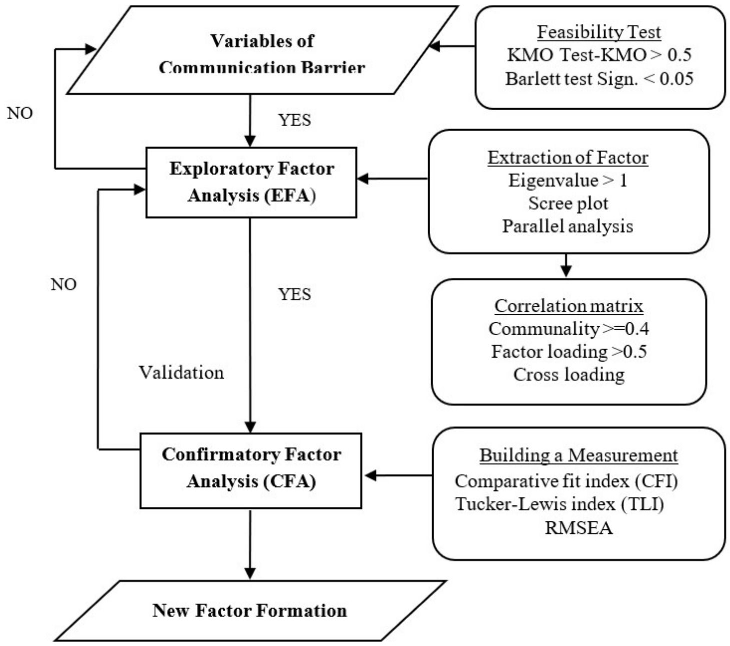

Figure 1. Research Methodology.

3.2 Data analysis

In conducting factor analysis, the number or size of the sample is still a matter of debate. (Zahoor et al., 2017) state that 100 samples are sufficient if the measuring variable is really clear and reliable which is obtained from a very strong theoretical basis. On the other hand, according to Hair et al., (2010) and Oke et al., (2012), the number of samples should be 5 to 10 times the number of measuring variables. The middle opinion states that 200 samples are sufficient for a fairly complex model (Bagozzi, 2010); (Molwus et al., 2013).

From the description above and with the ongoing COVID-19 pandemic situation, various efforts have been made to collect as much data as possible. A combination of online and offline methods is used to distribute the questionnaire. Until the specified time limit, the number of data collected is 125 questionnaires. Table 2 describes the information of the data respondent.

3.3 Feasibility Test

The initial stage of factor analysis is the Kaiser-Meyer-Olkin (KMO) test and the Bartlett test of sphericity against the existing data. The purpose of the KMO test is to see the feasibility of the existing data for factor analysis to be carried out. The resulting KMO value must be greater than 0.5 while if the results of the KMO test are less than 0.5 then factor analysis cannot be carried out (Widarjono, 2010). The Bartlett test of sphericity is a test carried out to see the correlation between factors and the significance value. The Barlett test must be smaller than 0.05 which indicates the correlation between factors is high so that the factor analysis process can proceed to the next stage (Field, 2009). From (Table 3) below, the KMO Measure of Sampling Adequacy value is 0.907 (above 0.5) which proves the adequacy of the sample, and the chi-square value of 2345,826 with the correlation between variables showing a significance value of 0.00 below 0.05.

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Table 1. Summary of Communication Barrier Variables.

CODE	FACTORS	1	2	3	4	5	6	7	8	9	10	11	12	13
V1	Emotional condition	v									x			x
V2	Speaking ability										x			
V3	Information needs										x			
V4	The importance of information										x			
V5	Noise disturbance in the project environment										x			
V6	Lack of facilities and infrastructure													x
V7	Mastery of communication techniques													x
V8	Inappropriate communication methods													x
V9	Educational background	x								x	x			
V10	Writing skills			x										
V11	Hearing ability					x								
V12	Recording capabilities					x								
V13	Differences in cultural background	x	x										x	
V14	Language differences		x	x							x	x		x
V15	Bad leadership				x									
V16	Incomplete drawing					x								
V17	Incomplete job details					x								
V18	Poor team relations							x						
V19	Slow distribution of information							x						
V20	Lack of understanding of the employment contract							x						
V21	Lack of technological support								x					
V22	Lack of empathy between parties									x	x	x		x
V23	Lack of experience					x							x	
V24	Lack of resources												x	
V25	Inappropriate use of media						x						x	

SOURCE: 1.GLUCH& RAISANEN (2009); 2. HAPSARI ET AL (2018); 3. EJOHWAMU (2017); 4. HARIVAMAN(2017); 5.SENARATNE &RUMANPURA(2016) 6. ROBBINS(2013); 7. NOROUZI ET AL (2015); 8. TONE,ETC(2009); 9. HOEZEN, ET AL (2006); 10. FAJAR(2009); 11. RAMSING(2009); 12. GOH ET AL. (2005); 13. WU ET AL (2017)

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Table 2. Information of respondents.

Profile	Number	%	Profile	Number	%
Position			Organization		
a. Project manager	8	6.40	a. Contractor	50	40.00
b. Site operation manager	7	5.60	b. Supervising consultant	43	34.40
c. Supervisor	10	8.00	c. Planning Consultant	32	25.60
d. Director	28	22.40			
e. specialist	51	40.80			
f. Quantity Surveying	17	13.60			
g. Other	4	3.20			
Work experience			Type of project managed		
a. < 5 years	25	20.00	a. Building	101	80.80
b. 6 – 10 years	57	45.60	b. Road	17	13.60
c. 11 – 15 years	24	19.20	c. Bridge	3	2.40
d. > 15 years	19	15.20	d. Irrigation	4	3.20

Table 3. KMO and Bartlett Test Results.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.907
Bartlett's Test of Sphericity	2345.826	2345.826
	300	300
	.000	.000

3.4 Extraction of Factor

Not all factors will prevail in the analysis, a factor said to be worth keeping assessed from the results of eigenvalues associated with variations in the importance of substantive of these factors (Field, 2009). Eigenvalue used in determining the manner of a new factor in which the resulting value must be greater than or equal to one, the Kaiser Normalization criteria for the Eigenvalue of more than 1, where the factor with the result value > 1 will be maintained (Hair et al., 2010); (Seo et al., 2004). In addition, the scree test was also carried out in this study; an assessment of the results of the scree plot graph test is the point where the curve begins to slope.

The Total Variance Explained that there are 5 factors formed from the 25 variables tested (Table 4). Each factor eigenvalue > 1. Factor 1, an eigenvalue of 11,351 with variance (45,404%), Factor 2, an eigenvalue of 2,905 with variance (11,621%), Factor 3, an eigenvalue of 1,544 with variance (6.174%), Factor 4, an eigenvalue of 1,128 with variance (4.514%), and Factor 5, an eigenvalue of 1.020 with variance (4.079%).

The scree plot image shows the relationship between the factors formed from the eigenvalues depicted in the graph. In (Figure 2), the 4th factor of the graph starts to slope. From the analysis of the previous Total Variance Explained test, it was found that 5 factors had eigenvalues > 1 (Table 5). And to further ensure that new factors will be formed, the Horn Parallel Analysis method (HPA) is used, where this method is considered more reliable for factor extraction (Bahari and Clarke, 2013); (Hon et al., 2013); (Pallant, 2010); (Seo et al., 2004). In this stage, the results of the eigenvalues and the results of the scree plot graph test are juxtaposed with the test results from the Parallel Horn Analysis (HPA) for further decisions to be made in the formation of new factors. Only three factors are eligible to be accepted, namely those indicated by the HPA value which is smaller than the eigenvalue.

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Table 4. Total Variance Explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loading			Rotation Sums of Squared Loading		
	Total	% of Variance	Commu-lative %	Total	% of Variance	Commu-lative %	Total	% of Variance	Commu-lative %
1	11.35	45.40	45.40	11.35	45.40	45.40	6.21	24.85	24.85
2	2.91	11.62	57.02	2.91	11.61	57.02	3.80	15.20	40.05
3	1.54	6.17	63.20	1.54	6.17	63.20	3.56	14.24	54.27
4	1.23	4.51	67.71	1.13	4.51	67.71	3.03	12.13	66.41
5	1.02	4.08	71.79	1.02	4.08	71.79	1.34	5.38	71.79
6	0.92	3.66	75.45						
7	0.67	2.70	78.15						
8	0.60	2.41	80.56						
9	0.53	2.12	82.68						
10	0.49	1.97	84.64						
11	0.46	1.86	86.50						
12	0.42	1.68	88.18						
13	0.40	1.59	89.77						
14	0.37	1.27	91.23						
15	0.32	1.12	92.49						
16	0.28	1.10	93.61						
17	0.28	0.92	94.71						
18	0.23	0.86	95.63						
19	0.22	0.86	96.49						
20	0.20	0.82	97.31						
21	0.19	0.74	98.05						
22	0.17	0.66	98.71						
23	0.14	0.58	99.29						
24	0.10	0.41	99.70						
25	0.08	0.30	100.0						

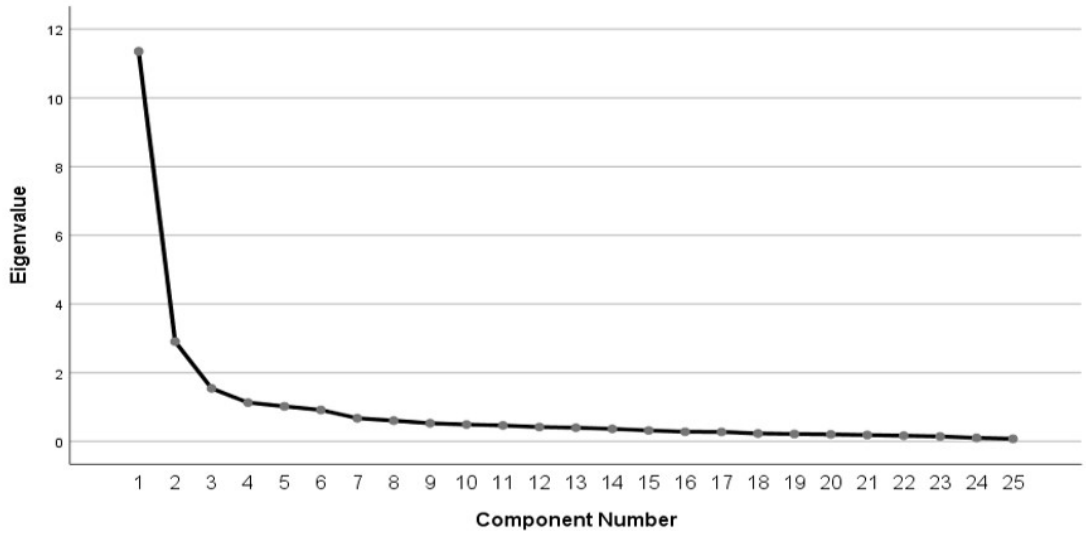

Figure 2. Scree Plot Graphic.

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3.5 Correlation Matrix

The varimax technique is used for the rotation process, to produce a large loading factor value or other factors as small as possible, and also to distinguish factors more clearly. According to Hair, (2010), the cross-loading value must be equal to or greater than 0.2. If the cross-loading value is found below 2 (< 2) then the factor will be removed and the process will be repeated. In (Table 5), the factor loading values of the 20 variables have been re-tested, where the results of the differences between the cross-loading variables yield values > 2. Existing variables already describe the magnitude of the correlation between factors that are formed according to the needs of the analysis.

Table 5. Variables and Communication Barrier Factors.

Variables	Component		
	1	2	3
Information needs	0.889		
The importance of information	0.864		
Lack of resources	0.788		
Poor team relations	0.774		
Hearing ability	0.771		
Speaking ability	0.745		
Inappropriate communication methods	0.732		
Recording capabilities	0.698		
Lack of empathy between parties	0.675		
Lack of facilities and infrastructure	0.657		
Emotional condition	0.645		
Mastery of communication techniques	0.620		
Incomplete drawing		0.763	
Lack of experience		0.716	
Incomplete job details		0.702	
Bad leadership		0.670	
Educational background		0.641	
Differences in cultural background			0.894
Writing skills			0.721
Language differences			0.692

The next step is to look at the Component Transformation Matrix table. In (Table 6), it can be seen that in Component 1 the correlation value is 0.859> 0.5, in Component 2 the correlation value is 0.903> 0.5, and in Component 3 the correlation value is 0.822> 0.5, this means that the three factors formed can correctly summarize the 20 existing factors.

Table 6. Component Transformation Matrix.

Component	1	2	3
1	.859	.319	.401
2	-.147	.903	-.404
3	-.491	.289	.822

4. Results and discussion

4.1 Building Measurement

The measurement model shows a relationship based on the observed variables and the first-order latent concept, while the structural model represents the relationship between three first-order latent concepts and one second-order latent concept (Zahoor et al., 2017). This research is focused on building a model for measuring the factors that hinder effective communication in construction projects. The measurement model

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adopts a maximum likelihood (ML) approach to measure structural lines and factor loading. The ML approach is often used because it provides a strong estimation method (Awang, 2015).

Evaluation of the measurement model can be done in two ways. The first way is with Convergent Validity, which is to evaluate the relationship/correlation of indicators with their constructs. The second way is through the Discriminant Validity test, which is to compare the correlation of indicators with their constructs and the correlation of indicators with other constructs. A good measurement model can be seen from the correlation of the indicator with its construct which is greater than the correlation of the indicator with other constructs. This shows that the indicator can explain the construct.

Data analysis at this stage will be processed using Structural Equation Modeling (SEM) through the Onyx program, which is free software for creating and estimating structural equation models, known as SEM. The program provides a graphical user interface that facilitates intuitive model creation and a powerful back-end for performing maximum parameter possible estimates. Onyx aims to provide a graphical modeling approach that offers an easy transition to understanding both state-of-definition matrix-based and scripted models (von Oertzen et al., 2015b). Onyx also allows the import of Open Mx models, which automatically turn scripts into graphic illustrations. An automated layout algorithm is used to arrange variables in the path diagram properly.

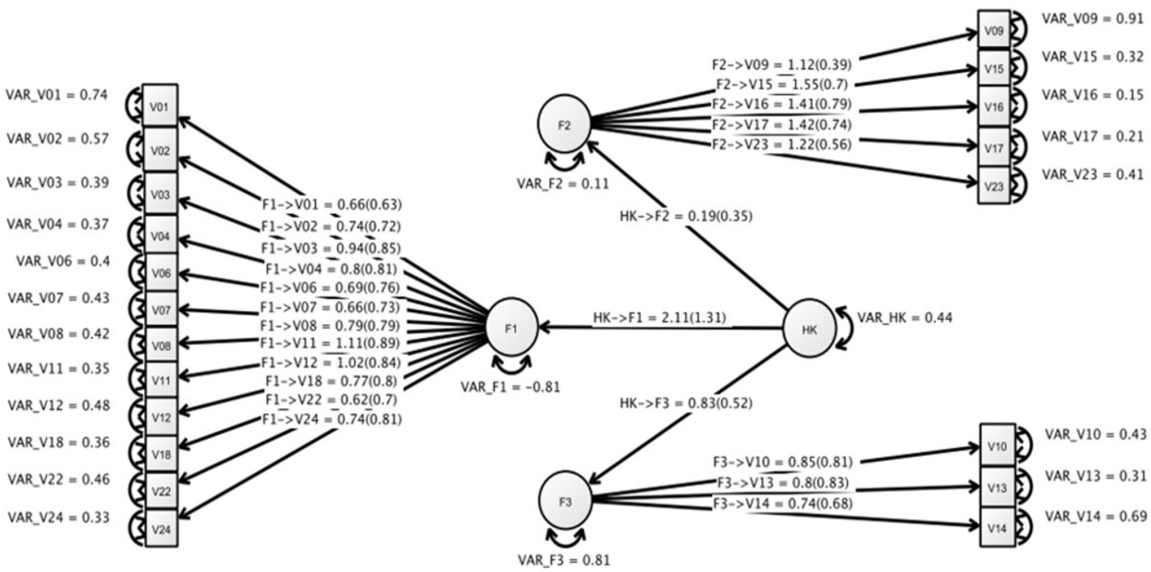

Figure 3. Validation of the Communication Barrier Measurement Model.

(Figure 3) shows the three new factors that were formed, and then validated with a measurement model through Structural Equation Modeling data processing using the Onyx program. The results of data processing with the Onyx application have shown a model fit, which is identified from the goodness of fit value, this value is determined by the comparative fit index (CFI) and the Tucker-Lewis Index (TLI). The value generated by the CFI 0.812 and TLI 0.78 assessments. The CFI and TLI values are in the range 0-1 where the closer to 1, indicating the highest level of fit, the recommended result is > 0.9 and the results obtained are quite close to the high level of fit.

The suitability of the next model is seen from the root mean square error of approximation or RMSEA score, the acceptable value is in the range of 0.05 to 1. In this study, the result of the RMSEA value is 0.129 which can be interpreted as still following the standard.

4.2 Discussion

From the factor analysis conducted, it has been found that there is a relationship between the existing factors with the inhibiting factors for effective communication in the government construction project environment. Three factors are namely Factor 1: technical language and collaboration factors, Factor 2: project knowledge and leadership factors, and Factor F3: socio-cultural factors.

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Technical language and collaboration factors consist of 12 factors. Variable 3, the information needed gives a very high contribution with a loading factor value of 0.889. Variable 4, the importance of information produces a loading factor value of 0.864. The above variables are an obstacle to the continuity of effective communication considering that the communication process is carried out by individuals who are directly involved in the construction project. Wulandari, (2012) in his research stated that obstacles in sharing information between project team members resulted in poor internal project relationships. In this study, the respondents consisted of contractors, planning consultants, and supervisors who had different interests. If each respondent responds to information in a limited communication according to his needs only to one party, then the information will be completed and will not continue to other parties.

The knowledge and project leadership factors consist of 5 variables with the highest loading factor value of 0.763 for the bad leadership variable (V15). Other variables are lack of experience (V23) with a loading factor of 0.716, incomplete job details (V17) with a loading factor of 0.702, lack of resources (V25) with a loading factor of 0.670, and educational background (V9) with the lowest loading factor 0.641. Bad leadership is one of the special skills that a project leader must possess according to the Project Management Body of Knowledge Guide in communication skills. Ejohwomu et al., (2017) also mentions that with good communication, a leader will be able to assign any existing work and be able to convey information clearly in construction projects.

Socio-cultural factor consists of 3 variables, namely cultural background (V13), writing ability (V10), and language differences (V14). Language differences in each region will affect good communication(Ejohwomu et al., 2017); (Hapsari et al., 2018). Although construction projects in West Sumatra Province rarely involve foreign companies, the diversity of languages in Indonesia can be a big influence. If an open tender process is carried out, all construction companies from all provinces can enter projects in West Sumatra. As a result, many workers who come from outside the island of Sumatra do not understand the local language or regional language which will be a serious communication barrier when the workers cannot speak Indonesian fluently. Another variable that affects the way a person communicates is V10 (writing ability). V10 is one of the dimensions of communication besides listening and speaking (Edum-Fotwe and Mccafler, 2000). When someone conveys information through report writing or technical writing, it must be understood by the recipient. In construction projects sometimes this is often overlooked. The writing ability will become a communication barrier if it is not effective (Ejohwomu et al., 2017).

After testing in this study, the factors that hinder effective communication on government projects in the province of West Sumatra with the highest ranking are incomplete images, lack of experience in construction projects, poor leadership factors, and incomplete work details. This, of course, can be a record for the government to be more mature in preparing construction procurement in its environment so that the construction procurement process in the province of West Sumatra can run well and follow the objectives.

5. Conclusion

The research aims to establish and validate factors that barrier effective communication in government projects in West Sumatra. A total of 125 respondents from various parties involved in the construction project have been successfully collected and tested for suitability and adequacy through the KMO test and the Bartlett test of sphericity. From the results of factor analysis using EFA, 3 factors of communication barriers can explain 63.18% of the total variance. These three factors are named technical language and collaboration; project knowledge and leadership; and socio-cultural.

This study provides an overview of the condition of communication barriers in government projects in West Sumatra. The results can be used as a reference for stakeholders involved in other government or private projects to identify aspects of communication barriers that need to be considered more seriously. This study suggests that communication techniques such as listening skills, speaking skills and others need to be improved. This is related to the involvement of various diverse project teams. Poor relationships and the emotional conditions of the parties involved also need to be considered.

Furthermore, project knowledge and leadership factors as well as socio-cultural factors also need to be considered so that communication as a dynamic process to convey opinions, ideas, goals and instructions between two or more people can occur. Considering previous research related to the failure of a project due to lack of good communication between parties can be avoided.

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