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Evaluation of the PeGI Framework based on the Kappa Approach

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The purpose of this study is to conduct a validity and reliability assessment in order to evaluate the PeGI framework. The method used to collect data is survey, based on the Guttman scale instrument. The Kappa approach was conducted to analyse the inter-rater agreement between experts. The results showed that only 23 items were considered adequate in presenting the content domain of the PeGI framework. The Kappa coefficient obtained in this study was 0.6390, which possesses a good consistency. This study contributed to the current literature of empirical research on the PeGI framework evaluation, which was very limited. As a practical implication, this study provides an opportunity for IS/IT researchers to consider quantitative analysis for testing the validity and reliability of items.

Key words: *PeGI, Kappa, Framework, Evaluation, Validity.*

Introduction

The government must immediately realise the process of transformation towards an electronic-based government, known as e-Government, because of the increasingly high demands of society for quality public services. Through the use of Information and Communication Technology (ICT), it will improve public services more effectively, efficiently, transparently and make them more affordable to the public. To achieve this strategic goal, based on the Presidential Instruction No 3 in 2003, there are six strategies that must be carried out by the government. Namely, developing a reliable and trustworthy service system that is affordable to the wider community; organize the management system and work process of the government and autonomous regional government holistically; make optimal use of information technology; enhance the participation of the business world and develop the telecommunications and information technology industry; develop human

resource capacity, both in government and autonomous regional governments, accompanied by increased e-literacy of the community; and carry out development systematically through realistic and measurable stages (Instruksi Presiden Nomor 3, 2003).

Related to the last strategy — namely, the systematic development through realistic and measurable stages — the government, through the Directorate of e-Government, the Directorate General of Applications and Telematics, and the Ministry of Communication and Information Technology (Ministry of Communication and Information), has developed the PeGI (e-Government rating in Indonesia) framework to analyse the e-Government in government institutions, both at the central and regional levels (district/city). The framework, developed in 2007, has the objective of providing a reference for the development and use of ICT in government circles; providing impetus for increasing the use of ICTs in the government environment through a comprehensive, balanced and objective evaluation; and ascertaining a map of the conditions for the use of ICT in the national government environment (Napitupulu, 2017).

This means that the PeGI Framework is designed to be a guideline for ICT development in government agencies while increasing the motivation of all government agencies to increase the use of ICT in serving stakeholders. PeGI is also expected to be able to describe the condition of e-Government in terms of the strengths and weaknesses of government institutions, which will be very useful for the development of ICT in the future (Napitupulu, 2017; Irawan, 2017).

The PeGI Framework has five dimensions of appraisal. They are policy, institutional, infrastructure, application and planning, as presented in Figure 1. The five dimensions of the PeGI Framework have the same weight in assessment because all are important, interrelated, and mutually supportive of one another. PeGI has a total of 35 indicators or items that are classified into five dimensions. Namely, there are eight policy items; five institutional items; seven infrastructure items; ten application items; and the planning dimension has five items (Napitupulu, 2017).

However, the effectiveness of the PeGI framework on e-Government development has never been reported. Furthermore, empirical research involving primary data related to the evaluation of the PeGI framework is very limited in its literature. Some researchers have tested PeGI based on secondary data from the previous PeGI assessment (Napitupulu, 2017; Sensuse, 2016). Additionally, evaluation of the PeGI framework using expert judgment is still rare (Ariyani, 2013). Though expert opinion is very useful to provide insight into the appropriateness of items and their judgment, it is also important to validate the framework or items (Ali et al., 2014). This is improved in accordance with the development of the e-Government field (Masyhur, 2017).

This study aims to validate the overall items of the PeGI framework to prove whether the items can adequately measure the desired content domain. This research contributes to the lack of literature related to the evaluation of the PeGI framework, while providing opportunities and guidelines for IS/ IT researchers to consider quantitative analysis in order to conduct validity testing on the IS/IT field.

Methodology

This study is quantitatively descriptive in order to conduct a validity and reliability assessment of items based on the PeGI framework. The evaluation of items is important to make sure the framework is still relevant to be adopted. The method of collecting data is using survey by convenient sampling utilising SMEs (Subject Matter Experts) to provide suggestions on the items that best represent the content domain of the research. Since this study employed the Kappa approach, there are two experts preoccupied in this survey to participate in conducting a validity and reliability assessment of the attributes or items.

The SMEs were asked to answer a closed questionnaire based on a set of items proposed by quantitatively means. The questionnaire was designed by adopting the Guttman scale and developed based on the PeGI framework, which consists of 35 attributes or items. The Guttman scale is a scale that has a firm answer, with answers such as true or false, yes or no, positive or negative, high or low, good or bad and so on. In this study, the scale used the responses of answers: "Important (Score 1)" and "Not Important (Score 0)" (Rothman, 2004). The Guttman scale was applied in the questionnaire because it fit with the Kappa approach as a statistical computation of the inter-rater agreement for nominal-scale items (Viera & Garrett, 2005).

Since Kappa uses the 2x2 pattern to compute the Kappa coefficient, in order to determine the relevant items, this study employed two SMEs that have more than ten years' experience in the IS/IT field, especially e-Government. Both experts also hold doctoral degrees and possess published articles in the context of e-Government. Thus, the experts were senior researchers in their institution. The Kappa coefficient is a measurement that states the consistency of measurements made by two observers (raters) or the consistency between two measurements or can also measure the consistency between two measurement tools. The Kappa coefficient is an index of agreement between the two observers (Viera & Garrett, 2005; Sim & Wright, 2005). Since its introduction, Kappa has been applied in thousands of research applications. Since Kappa has several useful interpretations, it is likely that it will continue to be a standard approach for summarising the inter-rater agreement on a nominal scale in the near future (Viera & Garrett, 2005; Sim & Wright, 2005; Fleiss, 1971; de Vet et al., 2018). In this context, the Kappa coefficient is often used to measure the agreement of two observers on the characteristics of the researcher's attention. The first step to calculate the Kappa coefficient

must compile the assertions of the two raters of the research subjects into the 2x2 table as follows (de Vet et al., 2018):

Table 1: Subject Distribution Based on Raters

		Rater 1		
		Yes	No	
Rater 2	Yes	A	B	A+B
	No	C	D	C+D
		A+C	B+D	A+B+C+D=N

Cohen (1960) defined a formula to compute the Kappa statistic as an evaluation of the agreement between the two raters, as outlined in the equation as follows (de Vet et al., 2018):

$$(k) = \frac{Po-Pe}{1-Pe} \qquad (1)$$

Where:
(k) = Kappa coefficient
Po = observed agreement
Pe = expected agreement

Further, Po and Pe formula is calculated through the formula below:

$$Pe = \frac{((A+B)(A+C)+(C+D)(B+D))}{N^2} \quad (2)$$

$$Po = \frac{A+D}{N} \qquad (3)$$

According to Table 1, the variable of A means both raters agree, B and C mean one of the raters does not agree, D means both raters do not agree about a criteria proposed and N (total subject) can be indicated as the total variable of A, B,C and D. Since the Kappa approach is on the expert opinion (expert judgment), the authors' subjectivity element related to the results of the research could be eliminated.

Table 2: Kappa Interpretation (Napitupulu, 2015)

Index Kappa	Agreement
< 0.40	Bad
0.40 – 0.60	Fair
0.60 – 0.75	Good
> 0.75	Excellent

The reliability test was also carried out to compare and determine the consistency between

the two experts (inter-rater agreement) in providing a rating to the criteria assessment by measuring the Kappa index interpretation of the Kappa value, as presented in Table 2 above (Napitupulu, 2015). In this study, we employed the minimum index Kappa of 0.60 to retain the best items which are believed to adequately measure a desired content domain (Grant & Davis, 1997).

Result & Discussion

This study was conducted to test the validity and reliability of 35 items classified into five dimensions based on the PeGI framework. Empirical literature on the evaluation of the PeGI framework is still very limited (Napitupulu, 2017; Sensuse, 2016), even though PeGI, through a set of indicators, measures the growth of e-Government in Indonesia every year. Thus, the items should be reviewed as to whether they are still applicable to use. The Kappa approach is a robust tool and has been adopted in order to evaluate the 35 items proposed in this study. It will be divided into two stages: a validity test and a reliability test.

The validity test employed inclusive criteria in this study. The criteria defines that an item is valid in this research only when both experts (raters) have the same opinion, being they agree (Yes) about an item. Whereas, if one of the experts or both experts did not agree about an item, then the criteria is not valid and is eliminated from the criteria list. Each of the experts' opinions are presented in Table 3 as follows:

Table 3: Expert Opinion Analysis

Item	Expert (1)		Expert (2)	
	Yes	No	Yes	No
1.	1	0	1	0
2.	1	0	1	0
3.	1	0	1	0
4.	1	0	1	0
5.	1	0	1	0
6.	1	0	1	0
7.	1	0	1	0
8.	1	0	1	0
9.	0	1	0	1
10.	1	0	1	0
11.	1	0	1	0
12.	1	0	1	0
13.	0	1	1	0
14.	1	0	1	0
15.	0	1	0	1

16.	1	0	1	0
17.	0	1	1	0
18.	1	0	1	0
19.	0	1	0	1
20.	0	1	1	0
21.	1	0	1	0
22.	1	0	1	0
23.	1	0	1	0
24.	0	1	0	1
25.	1	0	0	1
26.	0	1	0	1
27.	1	0	0	1
28.	1	0	1	0
29.	0	1	0	1
30.	1	0	1	0
31.	1	0	1	0
32.	1	0	1	0
33.	1	0	1	0
34.	0	1	0	1
35.	1	0	1	0

Based on Table 3, it can be said that the first expert agreed that 25 items were considered important, whereas the second expert agreed that 26 items of the PeGI Framework were valid. Based on the validity test explained above and on the inclusive criteria, twenty-three of the same items were agreed upon by both experts, because both said yes. Thus, 12 items should be deleted from the list to retain the best items in the PeGI Framework.

The reliability test is conducted by the computing of the Kappa coefficient to measure the degree of consistency of the two observers (inter-rater agreement), and is illustrated by Table 4 as follows:

Table 4: Rater 1 and Rater 2 Cross Tabulation

		Rater 1		
		Yes	No	
Rater 2	Yes	23	3	26
	No	2	7	9
		25	10	35

Based on the Table 4 Cross Tabulation, the Kappa coefficient could be calculated using the formula described below:

$$Pe = \frac{(26 * 25) + (9 * 10)}{35^2} = 0.6041$$

$$Po = \frac{30}{35} = 0.8571$$

$$(k) = \frac{0.8571 - 0.6041}{1 - 0.6041} = \frac{0.2530}{0.3959} = \mathbf{0.6390}$$

Based on the calculation expressed above, the Kappa coefficient in this research was 0.6390. If we assign the Kappa interpretation and the Kappa index from Table 2, the result is determined as a good agreement because the Kappa coefficient is (k) > 0.60. Thus, the total items obtained were the remaining 23 valid and reliable items of the 35 initial items in the PeGI Framework. This study contributed theoretically to the current literature on the PeGI Framework evaluation by reporting a validity and reliability assessment of their items. This research also provides the opportunity for IS/IT researchers to consider using the quantitative approach in order to conduct validity and reliability assessments.

Conclusion

The PeGI Framework has been applied to measure the adoption of e-Government for the Government institution since 2007, but the study of evaluation of the PeGI Framework is very limited. This study contributed to the literature by conducting a validity and reliability assessment by computing the Kappa coefficient in order to evaluate items of the PeGI Framework. Both experts agreed that only 23 items were considered adequate to represent the content domain of the PeGI Framework. This study has also successfully demonstrated the Kappa approach and provided the results of the validity and reliability assessment in the IS/IT field. This could help IS/IT researchers to consider adopting the quantitative approach to conduct their validity and reliability assessments.

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