Selection Internal Control over Financial Reporting Framework in the Republic of Indonesia using Analytic Hierarchy Process Approach

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ABSTRACT— *System of the internal control over financial reporting (ICOFR) on state finance management in the Republic of Indonesia had been designed using soft system methodology. ICOFR framework in the Republic of Indonesia was needed. Based on questionnaire, we found risk focus, applicability, harmony with PP No. 60/2018, can be applied in entity and transactional level, and can be applied IT environment as criteria. We found understandability, clarity of control components, and effectiveness assessment as sub criterion of criterion applicability and we found general control and application control as sub criterion of criterion 'can be applied in IT environment'. The Analytic Hierarchy Process (AHP) methodology are used to choose best alternative. Calculations of the results by Expert Choice software indicated COSO ranked 1st, COBIT ranked 2rd, and CoCo ranked 3th.*

Keywords— Internal Control over Financial Reporting; Analytic Hierarchy Process; Expert Choice
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1. INTRODUCTION

State financial management needed ICOFR as effective internal control that functioned to increase reliability of financial reporting [1]. This will strengthen the draft Law on Accountability for the Implementation of the State Budget (APBN) submitted by the President in the form of central government financial report (LKPP) which is a consolidation of the state general treasurer's financial report (LKBUN) and ministry/institution finance Report (LKK / L). Based on audit supreme's recommendation, the government needs to strengthen the internal control system by implementing control self assessment (CSA) within the framework of ICOFR.

James Hamilton required to base an internal control over financial reporting assessment with a framework of appropriate evaluation [2]. Berkowitz stated the need for the appropriate internal control integrated framework [3]. The more appropriate the framework will improve the accuracy of the assessment of its internal control.

There are many internal control frameworks. Some of the internal control frameworks known in best practices are COSO, COBIT, and CoCo. There are several internal control frameworks, including the COSO, COBIT, and CoCo. Treadway Commission's Committee of Sponsoring Organization developed COSO framework in 1992. COSO internal control divided their internal control components into five components. COBIT developed by ISACA in 1992. COBIT fis translated into the four domains, 34 control objectives, and 256 control indicator. The four domains are: planning and organizing, acquisition and implementation, services and support, as well as monitoring and evaluation. CoCo framework was published CoCo by CICA in 1995. CoCo defined internal control comprising resources, systems, processes, cultures, structures, and tasks and another organization elements that together support management in achieving organizational goals [4].

In its implementation in the United States, the SEC indicated COSO framework as an appropriate framework example (James Hamilton, 2007) although not mandatory. In contrast to Hamilton which revealed the SEC indicated the COSO internal control integrated framework as an example of a suitable framework for ICOFR, Rubino and Vitolla reveal something else. Rubino and Vitolla disclose the adoption of the COBIT framework to enable managers to implement ICOFR effectively and provide devices that comply with the Sarbanes-Oxley Act requirements [5]. .

The differences of opinion between Hamilton and Rubino and Vitolla further underscore that the appropriate control framework for ICOFR between an organization and other organizations may differ depending on the environment of each organization. In order to design the ICOFR system for the state finance management, it is necessary to select an

appropriate internal control framework of the system between COSO and COBIT or other internal control framework..

This study evaluate the three ICOFR frameworks to select one that is compatible with ICOFR for the management of state finance in Indonesia. Some criteria and sub-criteria founded based on questionnaire before were weighted using the Analytical Hierarchy Process methodology [6]. .

2. ANALYTIC HIERARCHY PROCESS (AHP)

AHP is a technique of Multiple Criteria Decision Making, a technique that allows someone to make decisions in the presence of multiple criteria [7] . Multiple Criteria Decision Making originates from operational research and supports an individual decision maker make an appropriate decision [8]. To provide ease in the process of making decisions wisely from a varied group of options available, MCDM methods are applied effectively.

Another MCDM technique is Analytical Network Process (ANP). The AHP was chosen than the ANP because there is hierarchical structure in this study. The hierarchical structure requires elements judgments does not depend on the elements on the lower level. Additionally, the usage of AHP may allow for excellent results if totally independent alternatives no more than nine [9] and in this study the totally independent alternatives are three.

The advantage of AHP is that the final ranking is obtained on the basis of pair-wise assessment between the criteria and the alternatives, both of which are selected as part of this study. Additional reason, the AHP approach is engaged because its algorithm is rational and easily comprehensible. AHP is a basic approach to decision making, designed rationally and intuitively to select the best of evaluated options taking into account several criteria [10]. AHP is a useful tool for analyzing decisions [11]. The decision analysis according to Keeney and Raiffa [12] is designed to help make a choice among some predetermined alternatives.

3. METHODOLOGY

To get the criteria and sub criteria that will be used in choosing the control framework, 56 respondents involved in the management of state finances was ask questions through questionnaires. Previously the questionnaires instrument has been tested the validity and reliability to 25 respondents with 5% significance for two-way test and r table is 0.3961. The result was stated valid because the correlation coefficient of each question in questionnaire > 0.3961 and reliable because cronbach alpha above 0.70 [13]. From the questionnaires, criteria, sub criteria, and sub sub-criteria was generated as Table 1

Table 1: Criteria, sub criteria, and sub sub-criteria

Criteria	Sub criteria	Sub sub-criteria
1 harmony with PP No. 60/2008	None	none
2 can be applied in IT environment	2a general control	none
	2b application control	none
3 can be applied in entity and transactional level	None	none
4 easy to apply	4a easy to understand	none
	4b can be assessed its effectiveness	4b.1 design
		4b.2 implementation
	4c clarity of control elements	none
5 pay attention to risk	None	none

The Analytical Hierarchy Process, a powerful and flexible MCDM technique, involves pair- wise comparisons between a set of alternatives for each criterion and can be modeled by dividing the problem at various levels so that it forms a hierarchy. A goal position in the highest hierarchy level. The middle levels are criteria that contribute to the goal. The criteria can be breakdown as sub criteria and sub sub-criteria. Some alternatives positions are in the bottom level to be evaluated. Pair-wise comparisons are made using a scale of absolute judgments (1, 3, 5, 7, 9), as well as intermediate values between the two judgments that represents the relative measure of one alternative over another with respect to the criteria [14]. The AHP reduces complex decisions to a series of simple comparisons and rankings and then synthesizes the results. The AHP main steps using Expert Choice Software include:
1. Statement of the goal, decision criteria, and alternatives.
2. Achieving decisions from several experts.
3. Computation of the consistency ratio which should be less than 0.1.

4. Comparing the relative importance with respect to goal
5. Ranking the priority of criteria
6. Ranking the priority of alternatives
7. Selecting alternatives with choosing the highest rank.

Based on the criteria, sub criteria, and sub sub-criteria that have been generated through the questionnaire and associated with the choice of control framework, can be arranged AHP hierarchy structure as Figure 1.
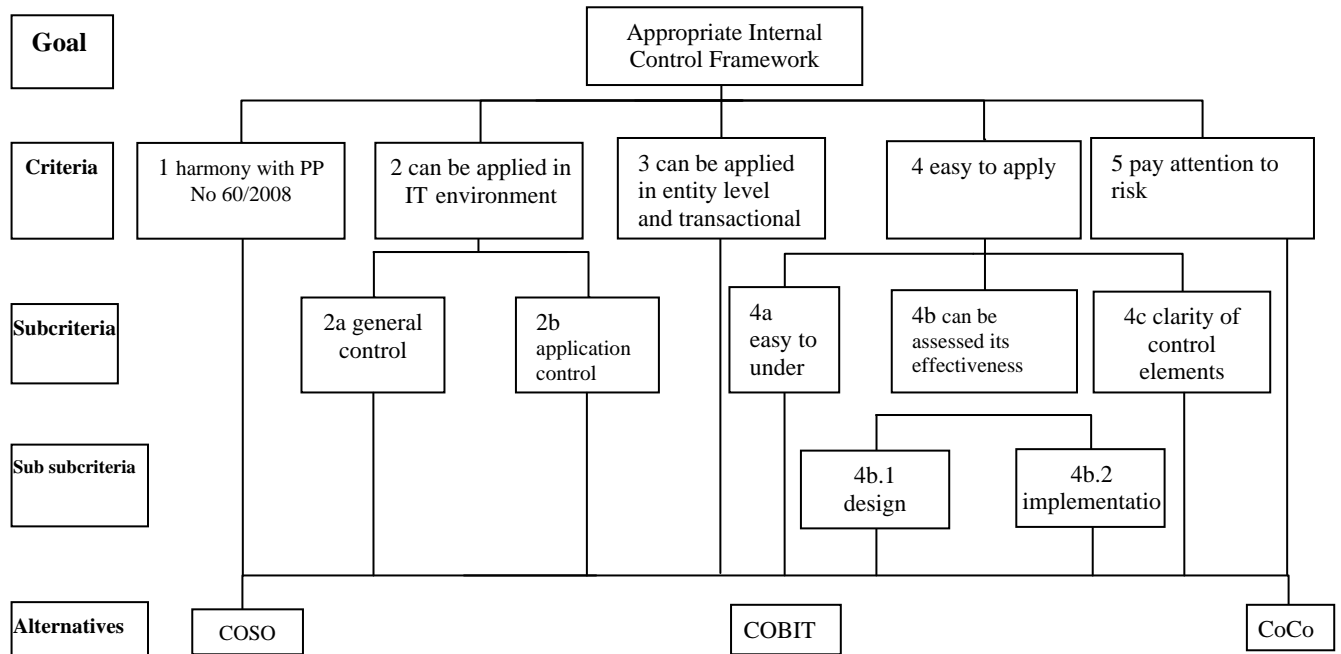

Figure 1: AHP Hierarchy Structure

Numerical values was taken from fundamental scale of absolute numbers (1,2,3,4,5,6,7,8,9). Intensity of importance "1" means equal importance and "9" means extreme importance and between them there are 2 until 8. By judgments using them we make the pair wise comparisons. These comparisons lead to positive and reciprocal (a_{ij} = 1/ a_{ji}) matrices in which scales of ratio are derived in the main eigenvectors form. The method calculates the consistency ratio to confirm the consistency of the decisions, and the acceptability of these decisions should be about 0.10 or less [15].

4. DISCUSSION

Eight experts who have practical experiences and international certifications in the internal control / audit fields (eg. CCSA [Certified of Control Self Assesment], CIA in internal audit, CISA in IS audit, CA [Chartered Accountant], CPA [Certified Public Accountant]) are consulted from point of view of each criterion. The eights experts are: Bayu Triastoto, CIA, CRMA, CA, an auditor and trainer of internal control as 1st Expert, Widodo, CIA, CISA, CISM, an IT auditor and practitioner of internal control as 2nd Expert, Tri Achmadi, CA, CIA, CISA, CGEIT, an auditor and practitioner of internal control as 3rd Expert, Diaz, CFE, CIA, CA, CRMA, CPA, CFSA, CCSA, CICA, a trainer of practitioner of internal control as 4th Expert, Harso, CIA, CCSA, an auditor and trainer of internal control as 5th Expert, Gilang , CISA, CGEIT, COBIT5F. an IT auditor as 6th Expert, Robby, COBIT, CISA, an auditor as 7th Expert, and Febri, CIA, CISA, CFSA, an auditor as 8th Expert.

The personal decisions of them were combined to produce only one value for the priorities of the aims. Before using personal decisions of eight experts above, Expert Choice calculates the consistency ratio to confirm the consistency of the decisions and the acceptability of these decisions. The result was obtained as Figure 2.

PID	Name	Overall	Goal: Appropriate Internal Control Framework
		#Factors	5
1	Combined	,0021	,0022
2	Bayu	,0061	,0059
3	Diaz	,0646	,0717
4	Febri	,0851	,0957
5	Gilang	,0464	,0496
6	Harso	,0000	,0000
7	Robby	,0049	,0045
8	Tri Ahmadi	,0000	,0000
9	Widodo	,0057	,0059

Figure 2: Inconsistencies at goal

According to figure 2, combined consistency ratio 0.21% indicates the eight experts' decision is consistent and acceptable because consistency ratio <10%. There is no personal experts consistency ratio more than 10%. The highest inconsistencies is 9,57% but still no more than 10%. The conclusions are the eight experts' decision is consistent and acceptable thus their decisions can be used in selecting internal control framework in this study.

Based on decision of the eight experts, there is a table pair wise comparison.

Table 2: Decision from the eights experts

Pair-wise comparison		1st Expert		2nd Expert		3rd Expert		4th Expert		5th Expert		6th Expert		7th Expert		8th Expert	
A	B	A/B	1-9	A/B	1-9	A/B	1-9	A/B	1-9	A/B	1-9	A/B	1-9	A/B	1-9	A/B	1-9
Criteria																	
1	2	B	3	A	1	A	2	A	1	A	2	B	3	A	3	A	3
2	3	B	2	B	3	A	1	B	4	A	1	A	2	B	3	B	2
3	4	A	2	A	4	A	1	A	1	B	2	A	1	A	4	A	1
1	3	B	4	B	3	A	2	B	4	A	2	B	2	A	1	B	4
3	5	A	1	A	1	B	2	A	1	A	1	A	1	A	1	A	1
1	4	B	3	A	2	A	2	A	1	A	1	A	2	A	4	B	4
1	5	B	4	B	3	A	1	A	1	A	2	B	2	A	1	B	4
2	5	B	2	B	3	B	2	B	4	A	1	A	2	B	3	B	2
2	4	A	1	A	2	A	1	B	4	B	2	A	2	A	2	B	2
5	4	A	2	A	4	A	2	A	1	B	2	A	1	A	4	A	1
Sub criteria 2																	
2a	2b	A	2	A	2	A	1	A	1	A	1	A	1	B	3	A	1
Sub criteria 4																	
4a	4c	A	2	A	1	A	1	A	1	A	1	B	2	B	3	A	2
4a	4b	B	2	A	4	A	1	A	1	B	2	B	2	B	4	A	2
4c	4b	B	3	A	4	A	1	A	1	B	2	A	1	B	2	A	1
Sub subcriteria 4b																	
4b.1	4b.2	A	2	B	2	A	1	A	1	B	2	A	1	B	2	A	1
Based on criterion 1																	
COSO	COBIT	A	3	A	2	A	2	A	4	A	4	A	2	A	3	A	1
COSO	CoCo	A	3	A	5	A	2	A	5	A	3	A	4	A	4	A	1
COBIT	CoCo	A	1	A	4	A	1	A	2	B	2	A	3	A	2	A	1
Based on sub criterion 2a																	
COSO	COBIT	B	2	B	2	A	2	A	2	A	1	A	2	A	3	A	1
COSO	CoCo	A	2	A	3	A	2	A	1	A	1	A	4	A	3	A	2
COBIT	CoCo	A	3	A	4	A	1	B	2	A	1	A	5	A	1	A	2

Pair-wise comparison		1st Expert		2'nd Expert		3rd Expert		4th Expert		5th Expert		6th Expert		7th Expert		8th Expert	
A	B	A/B	1-9	A/B	1-9	A/B	1-9	A/B	1-9	A/B	1-9	A/B	1-9	A/B	1-9	A/B	1-9
Based on sub criterion 2b																	
COSO	COBIT	B	2	B	2	A	1	B	3	A	1	A	1	B	3	B	2
COSO	CoCo	A	2	A	3	A	2	A	2	A	3	A	3	A	2	A	2
COBIT	CoCo	A	3	A	4	A	2	A	4	A	3	A	3	A	2	A	3
Based on criterion 3																	
COSO	COBIT	B	2	B	3	A	2	A	3	A	2	A	1	B	3	A	1
COSO	CoCo	A	2	B	2	A	2	A	4	A	3	A	2	B	2	A	1
COBIT	CoCo	A	3	A	2	A	1	A	2	A	2	A	2	A	2	A	1
Based on sub criterion 4a																	
COSO	COBIT	A	3	A	2	A	1	A	3	A	3	A	1	B	2	A	1
COSO	CoCo	A	2	A	2	B	2	A	2	A	2	A	3	A	3	A	1
COBIT	CoCo	B	2	A	1	B	2	B	2	B	2	A	3	A	4	A	1
Based on sub criterion 4b.1																	
COSO	COBIT	B	2	B	2	A	2	A	1	A	1	B	2	A	1	A	1
COSO	CoCo	A	2	A	2	A	2	A	1	A	1	A	3	A	4	A	2
COBIT	CoCo	A	3	A	3	A	1	A	1	A	1	A	4	A	4	A	2
Based on sub criterion 4b.2																	
COSO	COBIT	B	2	B	3	A	2	A	1	A	1	A	1	B	2	A	1
COSO	CoCo	A	2	A	2	A	2	A	1	A	2	A	2	A	3	A	2
COBIT	CoCo	A	3	A	4	A	1	A	1	A	2	A	2	A	4	A	2
Based on sub criterion 4c																	
COSO	COBIT	A	2	B	2	A	2	A	3	A	2	B	2	A	1	A	1
COSO	CoCo	A	2	A	2	A	2	A	3	A	3	A	3	A	4	A	2
COBIT	CoCo	A	1	A	3	A	1	A	1	A	2	A	4	A	4	A	2
Based on criterion 5																	
COSO	COBIT	A	3	B	3	A	2	A	1	A	3	A	2	A	3	A	1
COSO	CoCo	A	2	A	2	A	2	A	4	A	2	A	5	A	4	A	2
COBIT	CoCo	B	2	A	4	A	1	A	4	B	2	A	4	A	2	A	2

Based on the decision of the eight experts, the following results from Expert Choice Software (version 11) related comparing the relative importance to goal were obtained as Figure 3.

	Harmony with PP No. 60/2008	Can be applied in IT environment	Can be applied in entity & transactional level	Easy to apply	Pay attention to risk
Harmony with PP No. 60/2008		1,18921	1,76923	1,13044	1,62239
Can be applied in IT environment			1,70674	1,09051	1,86121
Can be applied in entity & transactional level				1,41421	1,09051
Easy to apply					1,54221
Pay attention to					

Figure 3: Comparing The Relative Importance with Respect to Goal

Based on the decision of eight experts, the following results from Expert Choice Software (version 11) related the priority of criteria were: criterion "pay attention to risk" (26,8%/the highest priority), criterion "can be applied in entity & transactional level" (25,5%), criterion "harmony with PP No. 60/2008" (16,7%), criterion "easy to apply" (16,5%) and criterion "can be applied in IT environment" (14,6%/the lowest priority.

Based on the decision of eight experts, the following results from Expert Choice Software (version 11) related the priority of alternatives were: COSO (43,8%), (35,6%), and CoCo (20,6%). Totally, from viewpoint of overall criteria, COSO was chosen as the highest priority alternative. In detail, COSO was chosen as the highest priority alternative from viewpoint of criterion "harmony with PP No. 60/2008", "easy to apply", and "pay attention to risk". From viewpoint of criterion "can be applied in IT environment" and "can be applied in entity and transactional level", COBIT was chosen the highest priority alternative. Thus in the case of ICOFR in Indonesia the results show more likely to be equal to the SEC's recomendation cited by James Hamilton (2017) as compared to Rubino and Vitolla's opinion (2014).

Based on the decision of eight experts, the following results from Expert Choice Software (version 11) related the Tree view as Figure 4.
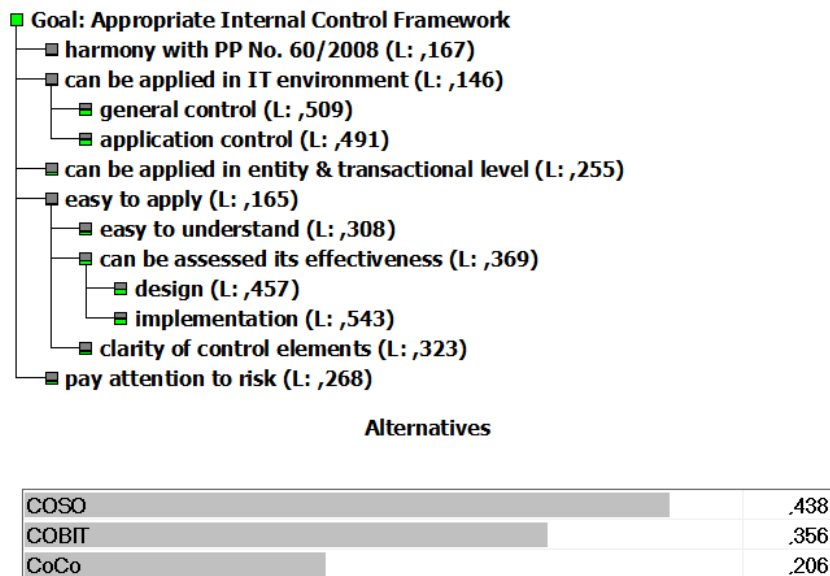

Figure 4: Tree View

According to the Figure 4, in the context of criterion "can be applied in IT environment", the highest priority is sub criterion "general control" (50,9% of 14,6%) and the lowest priority is sub criterion "application control" (49,1% of 14,6%). In the context of criterion "easy to apply", the highest priority is sub criterion "can be assessed its effectiveness" (36,9% of 16,5%) and the lowest priority is sub criterion "easy to understand" (30,8% of 16,5%). In the context of sub criterion "can be assessed its effectiveness", the highest priority is sub sub-criterion "implementation" (54,3% of 6,1%) and the lowest priority is sub sub criterion "design" (45,7% of 6,1%).

Table 3: Relationship criteria with alternatives of internal control framework

Criteria/Sub criteria/ Sub sub-criteria	Weight	COSO	COBIT	CoCo
pay attention to risk	26,8%	49,7%	31,6%	18,7%
can be applied in entity & transactional level	25,5%	36,5%	40,0%	23,5%
harmony with PP No. 60/2008	16,7%	57,2%	25,0%	17,8%
easy to apply	16,5%	42,0%	36,2%	21,8%
easy to understand	*5,1%*	44,5%	28,0%	27,5%
clarity of control elements	*5,3%*	45,7%	35,9%	18,3%
can be assessed its effectiveness	*6,1%*	36,9%	43,2%	20,0%
Design	*2,8%*	37,3%	42,6%	20,1%
Implementation	*3,3%*	36,5%	43,7%	19,8%
can be applied in IT environment	14,6%	38,2%	42,5%	19,3%
general control	*7,4%*	43,6%	35,2%	21,3%
application control	*7,2%*	31,6%	51,5%	16,9%

Summary of relationship between criteria/sub criteria/ sub sub-criteria with internal control framework presented in Table 3.

According to table 4, COSO gets the highest value compared to COBIT and CoCo from viewpoint of criterion "pay attention to risk" (49,7%), from viewpoint of criterion "harmony with PP No. 60/2008" (57,2%), and from viewpoint of criterion "easy to apply" (42,0%). While COBIT gets the highest value compared to COSO and CoCo from viewpoint of criterion "can be applied in entity & transactional level" (40,0%) and from viewpoint of criterion "can be applied in IT environment" (42,5%).

5. CONCLUSION

As a result of this paper, some suggestions related to system design of ICOFR on state finance management in Republic of Indonesia.

a. COSO is appropriately used as a control framework in accordance with icofr on state finance management in Indonesia.

b. Considering 'pay attention to risk' becomes a priority criterion hence system design should give attention to risk, for example by using method of risk control matrices.

6. ACKNOWLEDGMENT

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