



## Information Technology Governance Self-Assessment Application Using Cobit 5 for Supporting Smart Cities

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### ARTICLE INFO

#### Article history:

Received: 01/11/2020

Revised: 09/11/2020

Accepted: 25/11/2020

#### Keywords:

IT Governance, Self-Assessment, Application, COBIT 5, Cities

### ABSTRACT

Information technology governance self-assessment application aims to align the evaluation process that requires a large enough resource both in human resources, cost, and time. By knowing the portrait of information technology governance conditions, a City can control the information technology investment that has been issued so that it is in line with the goals of the City and supports the implementation of a Smart City. The research method used is a qualitative method with COBIT 5 as the Information Technology Governance Evaluation framework. Meanwhile, the software development method used is Rapid Application Development (RAD) with the Unified Modeling Language (UML) design model. The result obtained is a ranking of the maturity level of information technology governance with application media as a means of collecting assessment data so that it can help improve the efficiency of the implementation of Information Technology Governance Evaluation in Cities.

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## 1. Introduction

The examination of the relationship between Smart City and ICT Governance Assessment starts from knowing the definition of a smart city, namely a city with advanced technology and is able to be competitive and sustainable [1], so that it is expected to be able to solve various city problems well, but unfortunately many cities do not evaluate city programs. intelligence that has been implemented [2]. In implementing the Smart City concept, many programs have been carried out by both the central and city governments. In line with this, the need for information on the application of smart cities forces cities to make large investments in fulfilling their information resources such as the internet of things, data analytics, smart city clouds, security, and governance, etc [3] so there is a need for Information Technology Governance because can accommodate will optimize the value of investment development, use of information technology, and protect information [4].

In supporting the improvement of information technology governance, an evaluation is needed [5]. In this study, researchers used Best Practice COBIT 5 (Control Objective for Information and Related Technology 5) as the information technology governance assessment, a measurement framework for assessing the capability of the COBIT 5 process defined by ISO 15504-2. Process capability consists of a 6-point scale starting from 0 to 5. This scale represents an increase in the capabilities of the implemented process, from processes that have not reached the goal of processes that meet current and future business objectives [6].

It is increasingly convincing researchers that the role of evaluation of information technology governance is needed, but to fulfill this, a city requires considerable resources both in terms of human resources, costs, and time due to the large number of regional instruments involved. The regional apparatus itself is an organization that supports all City operational activities in achieving City goals [7]. Therefore, to align the evaluation process, a medium in the form of an application is needed. Applications are standalone programs for solving specific business needs. Applications in this field process business or technical data in such a way as to facilitate business operations or technical/technical decision making. Besides, software applications are used to control business functions in real-time [8], so the independent assessment of information technology governance is carried out by the Regional Apparatus itself regarding the alignment between the actual conditions in the Regional Apparatus with questionnaire questions with the application media.



## 2. Method

At the prototype-making stage, the researcher made a basic design that was adjusted to the chosen research method, namely qualitative and RAD (Rapid Application Development) software development methods. According to Sugiyono, qualitative research methods are research methods based on the postpositivism philosophy used or interpretive, used to examine the conditions of natural objects, where the researcher is a key instrument, data collection techniques are carried out in triangulation, the data obtained tends to be qualitative data, analysis the data is inductive/qualitative and the results of qualitative research are intended to understand the meaning, understand the uniqueness, construct phenomena, and find hypotheses [9] whereas according to the pressman that the implementation of the RAD method will run optimally if the application developer has formulated the needs and scope of application development well [10]. This is in line with this research case study which focuses on making applications.

Whereas the system development model uses UML (Unified Modeling Language), a modeling language that can help analysts determine, visualize, and document software system models, including their structure and design, by meeting all software needs and helping to analyze and design appropriate solutions [11]. In this study, the UML diagrams used are usecase, activity diagram, class diagram and sequence diagram.

The picture below shows the stages of the research carried out.

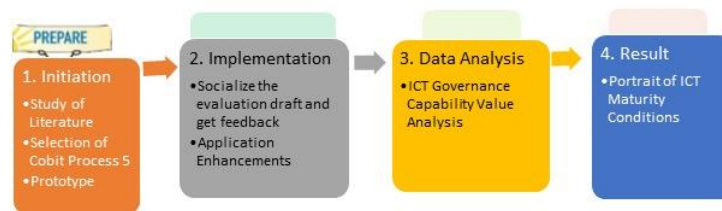


Fig 1. Research Stages

## 3. Result and Discussion

### 3.1 Cobit 5 Mapping

In selecting the Cobit 5 process, it has been carried out by examining the relationship between the Smart City and the ICT Governance Assessment, it is necessary to have a match between the questionnaire and data sources in each predetermined process. The following is the relationship between the selected process by mapping the base practices and work products indicators in the Cobit 5 Process Assessment Model (PAM) [7]:

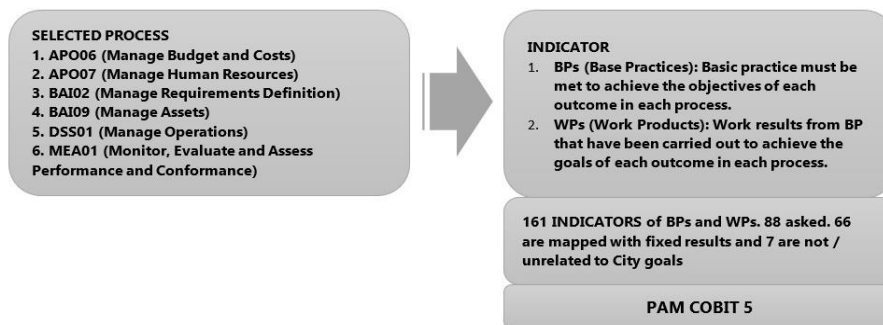


Fig 1. Cobit 5 Mapping

### 3.2 Efficiency in the implementation of information technology governance

Efficiency analysis of the implementation of information technology governance assessment using the application is from the comparison of cost and time between manual assessment and using the application, namely as follows:

Estimated Cost and Time required in performing manual governance assessments per regional device.

Table 1.

Manual Assessment Costs Estimated for Each Regional Apparatus		
No.	Component	Cost
1	HR Assesor (One team/Regional Apparatus)	Rp. 4.500.000
2	Transportation Activities (estimated 5 working days)	Rp. 500.000
3	Activity Consumption (estimated 5 working days)	Rp. 750.000
Total		Rp. 5.750.000

**Table 2.**  
Manual Assessment Time Estimated for Each Regional Apparatus

No.	Component	Time (days)
1	Data Gathering	5
2	Data analysis	5
Total		10

For example, Surabaya City has 70 Regional Apparatus [12] then the following is an estimate of the expenses and time needed.

Table 3. Manual Assessment Cost and Time Estimates for an Area

No.	City's Name	Number of Regional Apparatus	Estimated Cost	Total Cost	Estimated Time (days)	Total (days)
1	Surabaya	70	Rp. 5.750.000	Rp 402.500.000	10	700

The presence of different conditions in the field, such as the busyness of resource persons coupled with the presence of special conditions such as Covid 19 can affect the length and cost of implementing the assessment.

Estimated Cost and Time required in conducting governance assessment using the application:

**Table 4.**  
Application Assessment Costs Estimated for Each Regional Apparatus

No.	Component	Cost
1	HR Assesor and Analyst	Rp. 60.000.000
2	HR Application development	Rp. 60.000.000
3	Socialization	Rp. 50.000.000
Total		Rp. 170.000.000

**Table 5.**  
Application Assessment Time Estimated for Each Regional Apparatus

No.	Component	Time (day)
1	Governance Assessment Study	30
2	Application Development Analysis	30
3	Application Development	60
4	Data Dissemination and Gathering	60
5	Analysis of Assessment Results	30
Total		210

**Table 6.**  
Percentage Efficiency Reduction

No.	Object	Manual	Application	Percentage Efficiency
1	Cost	Rp 402.500.000	Rp. 170.000.000	57,7 %
2	Time	700	210	70%

From the simulation of comparison above, the efficiency of information technology governance assessment using applications in terms of cost can be reduced by 57.7% while in terms of time it is reduced by 70%. Surely this is different from other cities adjusted to the number of regional devices involved.

At the analysis stage of the value of information technology governance capability in a City, additional calculations are needed so that researchers expand to level of the rating. Then to calculate capability values in each process using the following formula: Average Number of Total Outcomes 1st, Total Outcomes 2nd etc. [7].

Formula of the ranking:

- a) Rank per process:  $=\text{SUMPRODUCT}((\text{array})/\text{COUNTIF}(\text{Array})) + 1$   
Comparing values on a given array (highest to lowest) results plus 1 with sequence results
- b) Calculates the rank value per process:  $=(\text{MAX}(\text{array})+1-\text{existing values})/\text{MAX}(\text{array})$   
Existing rank+1-value result/maximum ranking value result
- c) Final Result:  $=\text{SUM}(\text{Array})$   
Sum the ranking results of all processes
- d) Ranking: Sort ranking

### 3.3 Design System

The system requirements analysis that describes the user and system interaction functionality is described as follows:



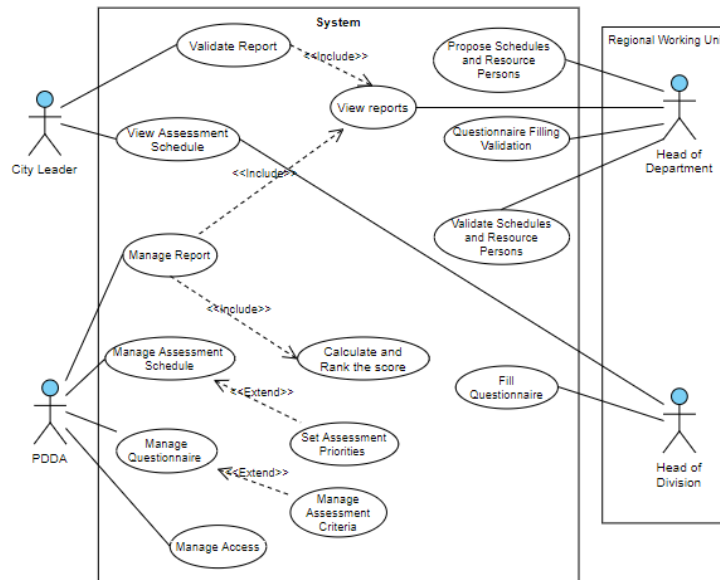


Fig 2. Use Case Diagram

In the picture 3 it has been explained that there are four actors who interact with the system. two actors are still in the same scope of performance, namely the Regional Work Unit. The system built has functions for managing assessment reports, managing assessment scheduling, managing assessment questionnaires, ranking assessment scores. This application is designed to be able to perform a questionnaire scheduling system, a system for making questionnaires and the division of tasks for regional heads who are assigned an Assessment assignment and a system for assessment reports carried out by regional heads and field heads. So that the application can help us to evaluate and make improvements and planning on the process of assessing ICT governance.

### 3.4 IT Governance Self-Assessment Application

The implementation of the development of a self-assessment application for information and communication technology management using Cobit 5 for efficiency in supporting of smart cities are as follows:

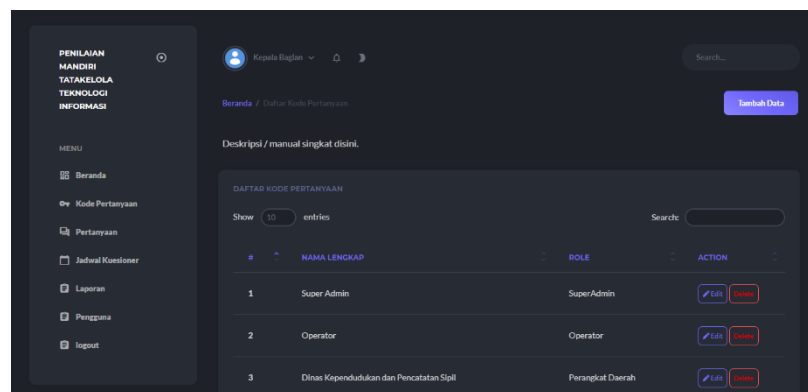


Fig 3. Interface Access Control

Picture 4. there is a function to control the access rights of the user so that they can get the required data according to the authorization level.

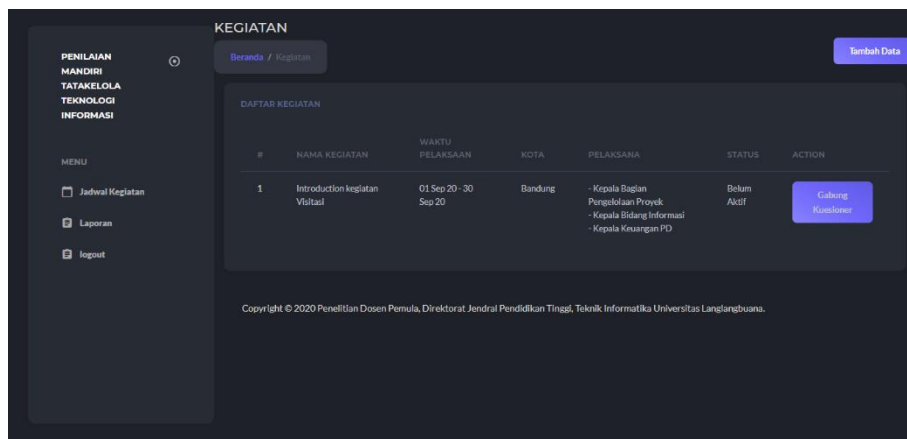


Fig 5. Interface Schedule of Activities

In Figure 5, there is a display of the activity page that is used to manage the assessment schedule, which consists of the name of the activity, time of day, executor, status, and gathering questionnaire.

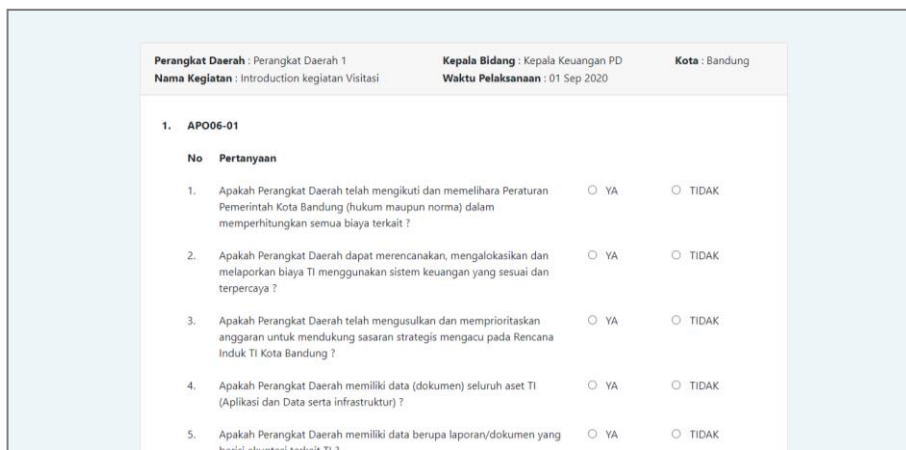


Fig 6. Interface Fill in a Questionnaire Form

In Figure 6, there is a display for filling out the questionnaire which will be used as a medium for obtaining data that will be processed to obtain the value of the capability process.

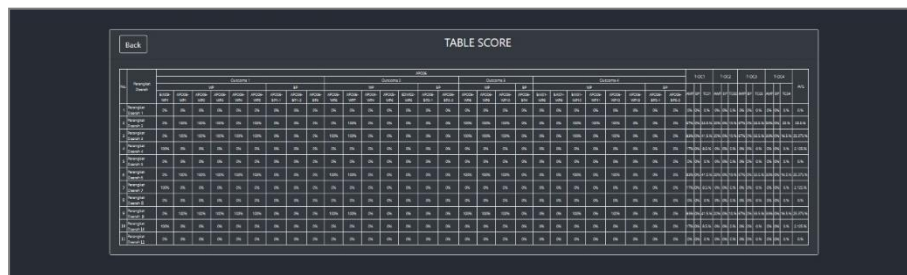


Fig 7. Interface Questionnaire Scores

In Figure 7, there is a score from filling out the questionnaire that has been processed and produces a value that can be used as a support for the evaluation.

No	Perangkat Daerah	TUGAS				JAWAB				RAG
		1	2	3	4	1	2	3	4	
1	Perangkat Daerah 1	75%	75%	75%	75%	75%	75%	75%	75%	75%
2	Perangkat Daerah 2	75%	75%	75%	75%	75%	75%	75%	75%	75%
3	Perangkat Daerah 3	75%	75%	75%	75%	75%	75%	75%	75%	75%
4	Perangkat Daerah 4	75%	75%	75%	75%	75%	75%	75%	75%	75%
5	Perangkat Daerah 5	75%	75%	75%	75%	75%	75%	75%	75%	75%
6	Perangkat Daerah 6	75%	75%	75%	75%	75%	75%	75%	75%	75%
7	Perangkat Daerah 7	75%	75%	75%	75%	75%	75%	75%	75%	75%
8	Perangkat Daerah 8	75%	75%	75%	75%	75%	75%	75%	75%	75%
9	Perangkat Daerah 9	75%	75%	75%	75%	75%	75%	75%	75%	75%
10	Perangkat Daerah 10	75%	75%	75%	75%	75%	75%	75%	75%	75%
11	Perangkat Daerah 11	75%	75%	75%	75%	75%	75%	75%	75%	75%
12	Perangkat Daerah 12	75%	75%	75%	75%	75%	75%	75%	75%	75%

Fig 8. Interface Ranking Score

In Figure 8, it can be seen that the results of the assessment that have been sorted can be sorted by ranking.

#### 4. Conclusion

Based on the research that has been done, it can be concluded that:

- Regarding the simulation, the efficiency of the assessment of information technology governance using applications is 57.7% in terms of costs while the time it reaches 70%.
- The application can calculate the maturity value of information technology governance of regional devices in the city and perform ranking results.
- Applications can be an alternative media in assessing information technology governance and assisting the city in controlling the suitability of information technology investments issued with smart city goals based on the maturity level obtained.

#### Acknowledgment

We would like to thank the Directorate of Research and Community Service from the Ministry of Research, Technology and Higher Education for funding this research through the "skim hibah penelitian dosen pemula", the City Government, and Langlangbuana University.

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