IT Governance Audit and Determination of Work Priorities Using Analytical Hierarchy Process: Case Study the Government of North Maluku, Indonesia

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Abstract. In the planning stage of IT Governance, there are problems that are found, namely, how to recommend an order of improvement for given work priorities so that it matches the needs of the existing conditions. The goal to be achieved is to be able to provide recommendations in order of work priority, using Analytical Hierarchy Process (AHP). The results of the study are work priority recommendations that can be used as material for consideration at the ICT Department in the Government North Maluku, Indonesia. The results of the analysis give the 1st recommendation is the optimization of information technology utilization ranks highest with AHP score of 0.172, 2nd for improving the quality of apparatus resources with a score of 0.147, office administration services with a score of 0.119, third-order, improvement of communication and information and the use of mass media with a score of 0.117, and the last one is increasing the quality of public services with a score of 0.116. So that the recommendations for improvement in the order of work priorities can be an IT governance guide in the Government of North Maluku to move forward.

1. Introduction
The era of digitizing government services at this time every government agency should have used Information Technology to improve efficiency, effectiveness, transparency, and accountability in carrying out its duties to the public services [1-6]. In addition, the work carried out also must go through a process that should be done based on the needs in the field. Existing conditions to realize the orderly administration and regulations in the implementation of regional development when it is important, then maximizing the performance that should be done in carrying out the tasks it carries[7]. Therefore, we need good stages to maximize performance in the Information and Communications Technology (ICT) field of the North Maluku government [8].

Through a clear work priority phase, it is hoped that it can help improve Information Technology Governance (ITG) in the North Maluku government, especially the implementation phase of work in the ICT Department. One of the problems that occur in agencies that are not yet effective and efficient in ITG and performance of the agency itself, which business processes that are carried out are not in accordance with the stages of work needs, but what is happening right now is the performance process based on what can at present, not based on what needs to be done first, therefore what happens is that the work of the organizational performance process is not optimal[9]. To help provide technical guidance in providing solutions to problems that occur it is necessary to evaluate work priorities based on field needs. The results of the evaluation will be a compass or direction in determining the stages
that must be done so that it is clear what must be done first according to the order of work on performance indicators using the Analytical Hierarchy Process to determine work priorities. The process of evaluation results uses regulatory standards (masterplan organization) which are confirmed by interviews with the related structural government [10]. With the AHP concept, it is expected to be able to solve complex problems based on a hierarchy of criteria, based on stakeholders, by attracting various considerations in order to develop weights or priorities[11], especially in ITG in the ICT Department. The reason for conducting this study is based on the problems that occur at the agency that require technical guidance for better ITG planning, so as to understand the current conditions and make improvements forward [5], [7].

2. The Literature Review

2.1. IT Governance

The term IT Governance in business contexts refers generally to the set of policies, processes, and actions taken by management to define organizational strategy related to the use of technology information and operate the organization in a way intended to help realize its business goals and objectives [3], [4]. According to the IT Governance Institute[4], governance goals that apply to almost every organization include aligning IT governance with business strategies, allocating IT resources efficiently to support the achievement of organizational goals and realizing the anticipated value of IT investments, and effectively managing related risk management [2]. With the addition of performance measures to enable organizations to assess the extent to which they are achieving their goals, the Governance consists of management functions as shown in Figure 1.

![IT Governance Focus Area](image)

The IT Governance domain is about value delivery in organizations, paying attention to aspects of risk management, aspects of resource management, aspects of performance measurement, and strategic alignment. Which all of these domains is a package of processes in IT Governance [2], [3].

2.2. Analytical Hierarchy Process (AHP)

AHP method is a decision-making technique using objective calculations based on evaluating several specified criteria [11]. AHP defines several stages of analysis[11]: formulation of hierarchical structures, determination of priorities, calculation of priority weights of each criterion or alternative, and consistency checks. A hierarchical structure is defined by considering the scope, objectives, criteria, relevant actors, and alternatives. Priority is a value that determines the level of importance of an alternative or criterion[11]. AHP defines pairwise comparisons to determine priorities using a matrix to compare variables of the same pairwise level. Comparisons are implemented using the formulation scale. The priority weighting of each criterion or alternative is calculated using the Eigen value principle [11]. Calculations can be done with the Expert Choice AHP Template Tools.
Consistency checks are carried out to determine the possibility of conflicting inputs. Inconsistency value should not be more than 10%[11], [13].

Design evaluation criteria based on organizational strategic planning documents or official local government documents that guide the organization to conduct evaluations. The resume of the design criteria used to evaluate IT Governance is based on official strategic plan documents and then validated to the related structural respondents. As shown in Table 1.

**Table 1. Summary of design criteria evaluation used in AHP.**

| Criteria                  | Alternative Criteria                  | Number of respondents | Status       |
|---------------------------|--------------------------------------|-----------------------|--------------|
| Organization Culture      | Traditions and personnel factors      | 2 from 9              | Eliminated   |
| Infrastructures Readiness | Quality Improvement and Employee Empowerment | 5 from 9              | Used         |
| The use of technology information | Optimization the use of ICT | 7 from 9              | Used         |
| Environmental and physical safety | Office Administration Service Improvement | 6 from 9              | Used         |
| Applications support system | Software and system standardization | 4 from 9              | Eliminated   |
| Public Services           | Enhancement of Public Services        | 5 from 9              | Used         |

3. Methods

The methodology used is based on a socio-technical approach namely social science and engineering approaches [14]. This means that the study was conducted with a deep interview of the structural related to the qualitative approach and confirmed the results to the affected parties. While the analysis uses AHP multivariate methods to provide weighting related to decision making in this context is the order of work priorities for IT Governance in the ICT department of North Maluku[1], [10].

3.1. Research Stage

The stages of research carried out are divided into a tree stage, pre-audit or initiated audit as the first stage, namely the stage of preparation of assessment documents, determination of audit objects and audit contracts or agreements for conducting audits and scheduling of interviews and evaluations of some official organizational documents [1], [2]. The second stage, namely conducting audit procedures, which starts evaluating IT governance based on official organizational documents and conducting deep interviews on related structural. Conduct data collection and access primary data sources for validation of assumptions with a questionnaire that was prepared in the first stage. The final stage is to analyse the audit procedures and the data collected, while the techniques and stages of data analysis using the AHP method. The analysis results are then confirmed back to the related structural for checking and approval of the results. After obtaining confirmation and final analysis, the data as material for the audit report is returned to the affected party. The description of the research stage is made in the flowchart of Figure 2.
3.2. Analytical Hierarchy Process (AHP) Technique

The next step, from data collections from a deep interview, survey and visited observations. Furthermore, analysing the data with steps based on the AHP method as described in the following process. The stages in the AHP analysis starting from P1 (Process 1) to P14 (Process 14) are as follows:

- **P1**: Defined the elements of consideration
- **P2**: Make Criteria weighted
- **P3**: Make a Criteria matrix
- **P4**: Make pairwise comparison matrix
- **P5**: Make addition matrix
- **P6**: Make a division matrix
- **P7**: Criteria value matrix
- **P8**: Multiplication matrix of priorities and elements
- **P9**: The sum matrix for each row
- **P10**: Consistency index (CI = $(\lambda_{\text{max}} - n) / (n - 1)$)
- **P11**: Consistency ratio (CR) = CI/CR
- **P12**: Checking CR >10%
- **P13**: Multiply the intensity priority by the criteria
- **P14**: The Recommendations Result
4. Result and Discussions

4.1. Data analysis

This stage the questionnaire data that has been distributed to office structural in the ICT department, where the number of respondents obtained amount to 9 people. The results of the questionnaire and interview were analysed later by the AHP method. The first step is to look for the average value of the questionnaire scores from 9 respondents. The average value is used as a comparison value of each criterion and an alternative by summing each score from each respondent then divided by the number of respondents. In table 2, below, a matrix of criteria and their alternatives, which will be multiplied between the priority values of the criteria and alternative priority values.

| Criteria & Alternative | Infrastructures Readiness | The use of Technology Information | Environmental and Physical Safety | Public Services |
|------------------------|---------------------------|-----------------------------------|----------------------------------|-----------------|
| Quality Improvement and Employee Empowerment | 0.15 | 0.138462 | 0.142857 | 0.164606 |
| Optimization the use of ICT | 0.15 | 0.192308 | 0.190476 | 0.185928 |
| Office Administration Service Improvement | 0.12 | 0.115385 | 0.114286 | 0.133617 |
| Enhancement of Public Services | 0.12 | 0.115385 | 0.114286 | 0.103198 |
| Improved Communication and Information of Mass Media | 0.12 | 0.115385 | 0.114286 | 0.109737 |

Table 2 shows that the Infrastructures Readiness highest weight in several alternatives: Quality Improvement and Employee Empowerment and Optimization the use of ICT. The use of TI gets the highest weight in the Optimization of the use of ICT alternatives. Environmental and Physical Safety gets the highest weight for the Optimization of the use of ICT alternatives. The last one, Public Services gets the highest weight for the Optimization of the use of ICT alternatives.

4.2. Recommendations and Discussions

The last step is to determine the work priorities that will become research recommendations for the ICT department's implementation strategy, which is to calculate the priority of the weight multiplication of each criterion with alternatives. As shown in Table 3 below.

| Work Priorities | Infrastructures Readiness | The use of Technology Information | Environmental and Physical Safety | Public Services | Total |
|-----------------|---------------------------|-----------------------------------|----------------------------------|-----------------|-------|
| Quality Improvement and Employee Empowerment | 0.071 | 0.036 | 0.026 | 0.013 | **0.147** |
| Optimization the use of ICT | 0.057 | 0.030 | 0.021 | 0.008 | **0.116** |
| Office Administration Service Improvement | 0.057 | 0.030 | 0.021 | 0.011 | **0.119** |
| Enhancement of Public Services | 0.071 | 0.050 | 0.035 | 0.015 | **0.172** |
| Improved Communication and Information of Mass Media | 0.057 | 0.030 | 0.021 | 0.009 | **0.117** |
Based on the results of the work priority matrix calculation table 3, the recommended work priority sequence in the ICT department is as follows: Optimizing the use of information technology with a score of 0.172, Quality Improvement and Employee Empowerment with a score of 0.147, Office administration services with a score of 0.119, Increased communication and information and the use of mass media with a score of 0.117 and Improving the quality of public services 0.116. This is a priority recommendation for the work as illustrated in Figure 3.

**Figure 3. Work Priorities based on AHP.**

Figure 3 explains work priorities based on AHP methods that are re-validated by confirming interview documents (questionnaires) with related parties (ICT department). So that the first order recommendations obtained are how to optimize the use of ICT, second: quality improvement and employee empowerment, third: improve office administration services, fourth: how to be improved communication and information and the use of mass media and the last one is how to improve the quality of public services.

5. Conclusion
The results of the AHP method analysis are the main recommendations in determining work priorities that have the highest score, where to get the score or the score is calculated steps starting from comparing the scores of each alternative. Then the results are calculated again to get the final grade. Recommendations for the first major improvement are how to optimize the use of ICT, second: quality improvement and employee empowerment, third: improve office administration services, fourth: how to be increased communication and information and the use of mass media and the last one is how to improve the quality of public services. However, the results above are not final, because they are still in the form of a recommendation concept, the decision depends on the structural decision maker of the ICT Department, Government of North Maluku, Indonesia.

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Acknowledgments
Authors wishing to acknowledge assistance or encouragement from Smart Islands Research Group in the Faculty of Engineering, Universitas Khairun and Laboratory of the E-Government and E-Business Faculty of Computer Science, Universitas Indonesia. This research has been funded by the LPDP (Educational Fund Management Institute) 2019, Ministry of Finance, Indonesia.