

RISK MANAGEMENT ANALYSIS OF BUS TRANSPORTATION APPLICATION USING COBIT 4.1

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Abstract: The role of information technology in transportation increases, namely in enjoying transportation services. One way to provide the best service for a transportation company to customers is to provide a bus booking application service. One of the companies that offer service applications is a bus transportation application located in Yogyakarta. Because the application system is considered necessary, stakeholders need IT risk management for the bus booking application. The purpose of this research is to analyze the risk management of the bus transportation application. In measuring IT risk management, the author uses the Control Objective for information and Related Technology (COBIT) 4.1 domain Plan and Organize (PO) framework, especially PO9 (Assess and Manage IT risk). The analysis results show that if the bus transportation application is at level 2 in maturity level. It means that the company knows that there are problems that need resolving. Standard risk management in bus transportation applications tends to provide failed access in the progress of its service. The problem is solving individually and not yet at the integrated completion stage. In general, the application management approach needs to improve better management in the field of information technology.

Keywords: COBIT; plan and organize; risk management

Abstrak: Peran teknologi informasi dalam meningkatnya angkutan yaitu dalam menikmati layanan angkutan. Salah satu cara untuk memberikan layanan terbaik bagi perusahaan angkutan kepada pelanggan adalah dengan menyediakan layanan aplikasi pemesanan bus. Salah satu perusahaan yang menawarkan aplikasi jasa adalah aplikasi angkutan bus yang berlokasi di Yogyakarta. Karena sistem aplikasi dirasa perlu, maka stakeholders membutuhkan manajemen risiko TI untuk aplikasi pemesanan bus tersebut. Tujuan dari penelitian ini adalah menganalisis manajemen risiko pada aplikasi angkutan bus. Dalam mengukur manajemen risiko TI, penulis menggunakan framework Control Objective for Information and Related Technology (COBIT) 4.1 domain Plan and Organize (PO), khususnya PO9 (Assessment and Manage IT risk). Hasil analisis menunjukkan bahwa penerapan angkutan bus berada pada level 2 pada tingkat kematangan. Artinya perusahaan mengetahui bahwa ada masalah yang perlu diselesaikan. Manajemen resiko standar dalam aplikasi transportasi bus cenderung memberikan akses yang gagal dalam kemajuan layanannya. Masalahnya diselesaikan secara individu dan belum pada tahap penyelesaian terintegrasi. Secara umum, pendekatan manajemen aplikasi perlu meningkatkan manajemen yang lebih baik di bidang teknologi informasi.

Kata kunci: COBIT; plan and organize; risk management

INTRODUCTION

Information technology (IT) is necessary for all work and human mobility activities [1]. Companies are willing to pay dearly for the benefits of IT [2]. One of the areas that take advantage of IT's use is the transportation sector [3]. Bus transportation is an example of a service that uses IT to support community mobility [4]. Bus transportation stakeholders need a bus booking application to facilitate bus ordering services and purchase online intercity inter-province bus travel tickets using a cell phone [5]. One of the bus transportation stakeholders made an application called 'ngebis'. This application is a solution for people who want to travel using bus transportation in the Central Java region. Stakeholders understand that bus transportation services require new information system technology to help business processes improve sales services [6]. Because in the service business world, service is essential [7]. To support the company's success in achieving its vision and mission, bus transportation stakeholders need to manage bus transportation application services through IT Governance (ITG). The hope is that companies will have a substantial risk analysis-based IT governance and support their business strategy [8].

Control Objective for information and Related Technology (COBIT) 4.1 is one of the measuring media to determine the progress of the management of bus transportation application services. The use of COBIT 4.1 is for analysis of IT governance in the risk management of bus applications for domain of Plan and Organize (PO) [9], [10]. IT governance ensures IT investment supports business strategy and reduces the risk from its use [11]. IT governance is part of corporate governance that focuses on IT manage-

ment in organizations, including IT system performance and risk management [12]. Cobit 4.1 provides managers, auditors, and IT users a set of generally recognized measures to maximize the benefits of using information technology [13]. COBIT 4.1 has the mission of conducting research, developing, publishing, and promoting papers and updating the order or provisions of IT Control Objectives that are generally accepted. Meanwhile, the vision of COBIT 4.1 is to make COBIT the only model for information technology management and control [14]. The following are 4 Domains of COBIT 4.1 variables:

1. Plan and Organize (PO)
2. Acquire and Implement (AI)
3. Delivery and Support (DS)
4. Monitor and Evaluation (ME).

Plan and Organize (PO)

This Domain includes strategies and tactics that involve identifying IT that can make the best contribution to achieving the organization's business goals so that a good organization with the right technology infrastructure. These domains have 11 Indicators, as in table 1

Table 1. Indicators of Plan and Organize

Indicator	Describe
PO1	Determine a strategic information technology plan.
PO2	Define the information architecture.
PO3	Specify technology direction.
PO4	Define IT organization and relationships.
PO5	Manage investment in information technology
PO6	Communicate management objectives and direction.
PO7	Manage human resources.
PO8	Manage quality
PO9	Assess risk.
PO10	Manage the project.

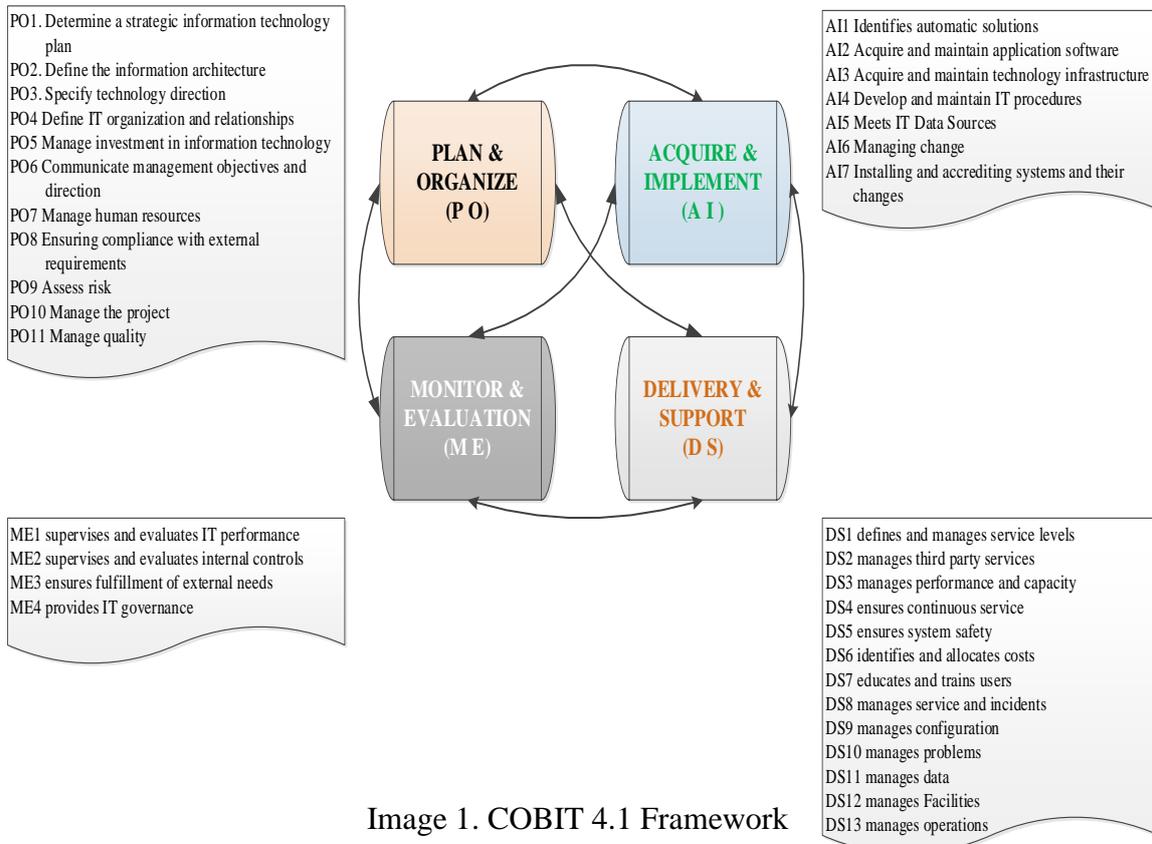


Image 1. COBIT 4.1 Framework

Based on the description of the four COBIT 4.1 domains PO9, as a main-tools to describe risk management assessment of the transportation bus application. The overall chart as in Image 1

Maturity Level of COBIT 4.1

COBIT 4.1 has a maturity level to control IT processes using the assessment method to assess their IT processes on a scale from 0 to 5. The maturity level of COBIT 4.1 in table 5

Table 5. Maturity Level of COBIT 4.1

Value	Describe
0 – 0.5	0: Not Existent
0.51– 1.50	1: Initial
1.51-2.50	2: Repeatable but Intuitive
2.51-3.50	3: Defined Process
3.51-4.50	4: Managed and Measurable
4.51-5.00	5: Optimized

Compliance Value

The measurement technique in the maturity level uses several questions, and each question has a group of appropriateness using a standard assessment as shown in table 6.

Table 6. Compliance Value

Scale	Statement of Compliance Value	Compliance Value
1	Not true	0
2	Little truth	0.33
3	Most of it is true	0.67
4	Correct	1

From the explanation of the research background, two research questions guide the implementation of the research.

RQ1: What is the risk management maturity level in terms of the Plan and Organize Domain in bus application?

RQ2: What recommendations are given based on risk management maturity level in bus application?

The research method process takes steps starting from the research procedure, determining and taking data samples, data analysis, discussion, and concluding. The analysis conducted is descriptive and inferential maturity level analysis, limitations, and research recommendations supported by other studies.

METHOD

The following image 1 describe the research procedures:

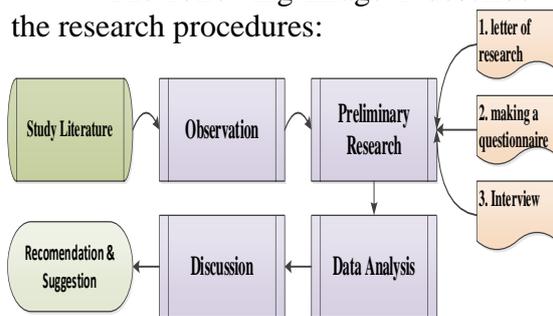


Image 1. Research Procedure

Study Literature

literature related to digital transportation services and media instruments COBIT 4.1 needs a deep understanding as a basis for research. The author requires an understanding of the maturity level of risk management for the PO9 domain as a reference for assessing digital bus transportation services.

Observation

The author made initial observations by conducting a questionnaire instrument test and interviewing several transportation staff members before the author distributed the revised questionnaire.

Preliminary Research

The author conducts preliminary research by obtaining research approval for the research object, making revisions to the questionnaire, becoming the leading research questionnaire, and conducting interviews with several new respondents. The author also tested the instrument to determine the validity and reliability of the questionnaire questions.

For the validity test, the authors used the product-moment correlation technique to test validity. The validity test helps know whether the measuring instrument measures what needs to be measured. The author uses the product-moment method by correlating each question with the total score for each variable. Correlation figures obtained statistically must be compared with the critical statistics of the correlation table of r values with a significant level of 95%. $r_{count} > r_{table}$ means that the data is substantial (valid) and suitable for hypothesis testing. And vice versa if $r_{count} < r_{table}$ indicates, the information data is not significant (invalid) and will not be included in testing the research hypothesis.

For the reliability test, the authors conducted this test to determine whether the data collection tool showed accuracy, stability, or consistency in expressing individuals' specific symptoms, even though it did at different times. Reliability test is on statements that are already valid. This test uses the Cronbach alpha technique because the answer value consists of a range of deals with the larger alpha coefficient. Reliability means trustworthy "That is, the instrument can give the right results.

Data Analysis

The author analyzes the data using COBIT 4.1 specifically for the do-

main in PO9 to determine the maturity level of risk management.

The author needs to normalize value data to calculate the maturity level of the PO9 domain. The author gets the normalized value from each group by dividing each compliance value by the total compliance value. The author needs to get the contribution value of each group by multiplying the respective compliance values to the individual level values. The calculation of contribution value is the maturity level index.

$$NV = \frac{CV}{TCV} \quad (1)$$

NV: Normalize data Value

CV: Compliance Value

TCV: Total Compliance Value

$$CONV = \frac{CV}{LV} \quad (2)$$

CONV: Contribution Value

CV: Compliance Value

LV: Level

$$ML = \sum CONV \quad (3)$$

ML: Maturity Level

CONV: Contribution Value

Discussion

The author clarifies by comparing the results of research data analysis by comparing them with previous research by experts regarding risk management and digital bus transportation applications.

Recommendation and Suggestion

The author concludes the discussion results and makes positive recommendations for bus transportation digital service institutions. The author also provides suggestions for ongoing research for researchers who are interested in continuing this research.

RESULT AND DISCUSSION

The first step in data analysis is to identify the respondent's profile. In table 2, questionnaire respondents in the bus transportation application Yogyakarta environment have various education levels, work types, computer skills.

Table 7. The Respondent Profile

Standard	Indicator	%
Job position	Manager of bus Apps	25
	staff of bus Apps	75
Education level	Doctoral	25
	Magister	12.5
	Bachelor	62.5
Computer Skill	Good	25
	Enough	62.5
	Less	12.5

Validity Test

The data obtained and inputted into the validity formula for the validity test instrument results, as shown in Table 8;

Table 8. Validity Test PO9 (Level 0-5)

Level	N od Items	Average r_{count}	r_{table}	result
0	3	0.887	0.561	Valid
1	7	0.882	0.573	Valid
2	3	0.898	0.561	Valid
3	6	0.904	0.570	Valid
4	11	0.909	0.585	Valid
5	7	0.906	0.573	Valid

Reliability Test

The results of the reliability test were coming from the research data. It input into the reliability formula as in Table 9

Table 9. Reliability Test PO9 (L 0-5)

Cronbach Alpha's	Cronbach Alpha's based on standardized items	N of items
.945	.930	3
.962	.950	7
.943	.940	3
.945	.940	6
.961	.960	11
.945	.960	7

Maturity Level Test

The maturity level test results of risk management at bus transportation application using the COBIT 4.1 domain of PO9 (Asses Risk) as in Table 10; Table 11; Table 12; Table 13; Table 14; Table 15

Table 10. Compliance Level 0

No	Maturity Level 0 Statement	0	0.33	0.66	1	
1	RA does not occur.	2	1	1	3	3.99
2	the organization does not consider security vulnerabilities	4	1	2	1	2.65
3	RA is not relevant to acquiring IT solutions	4	1	2	1	2.65
Total						3.29
Compliance Value						3..1

Table 11. Compliance Level 1

No	Maturity Level 1 Statement	0	0.33	0.66	1	
1	an ad hoc manner that considered IT risks	3	4	1	3.31	
2	each project determines assessments of project risk	2	1	5	2.32	
3	RA are rarely assigned to specific managers.	3	2	1	2	5.33
4	a project uses RA at occasionally management meetings seldom discuss RA	3	1	1	3	3.32
5		4	2	1	1	3.39
6	where risks have been considered, mitigation is inconsistent.		1	3	4	2.32
7	It is are important to understand IT risks	3	4	1	5.64	
Total						26.23
Compliance Value						3.75

Table 12. Compliance Level 2

No	Maturity Level 2 Statement	0	0.33	0.66	1	
1	there is a RA by project managers	6	2		0.66	
2	only to major projects response the RA	3	2	1	2	3.32
3	If there is risk then starting mitigation	1	2	3	2	4.64
Total						8.62
Compliance Value						2.87

Table 13. Compliance Level 3

Maturity Level 3		0	0.33	0.66	1	
No	Statement					
1	there is wide RM policy.			1	7	7.66
2	there is a RA training to all staff	7	1			0.33
3	every individual has own decisions to follow the RM process and receive training.			5	2	5.3
4	the RA ensures that key risks to the business are identified.	4	3	1		1.65
5	once the risks are identified then a process to mitigate key risks is on.	1	4	2	1	3.64
6	there is a job description consider RM responsibilities.	1	1	2	4	5.65
Total						24.23
Compliance Value						4.04

Table 14. Compliance Level 4

Maturity Level 4		0	0.33	0.66	1		
No	Statement						
1	the RA are standard procedures			2	1	5	6.32
2	ITM need the RM process reporting.	7	1				0.33
3	IT RM is a SMt-level responsibility.	5			1	1	1.66
4	risk is assessed and mitigated at the individual project level.			4	2	2	4.64
5	Management receives advise on changes in the business and IT.			2	2	4	5.98
6	Management monitors the risk position			2	1	5	6.32
7	SM and ITM determine the levels of risk			1	2	5	6.65
8	ITM develops standard measures	7	1				0.33
9	there is a management budgets for an operational risk	4	3		1		1.65
10	there is a RM database and part of the RM processes is beginning to be automated	7	1				0.33
11	ITM considers risk mitigation strategies.	1	2		1	4	5.32
Total						39.53	
Compliance Value						3.59	

Table 15. Compliance Level 5

Maturity Level 5		0	0.33	0.66	1	
No	Statement					
1	RM develops to the stage organization well managed	3	2	1	2	3.32
2	good RM practices across the entire organization.	4	1	1	2	2.99
3	reporting of RM data are highly automated.	4	2	1	1	2.32
4	RM guidance is drawn from leaders in the field	1	4	2	1	3.64
5	RM is truly integrated	8				0
6	Management detects and acts without consideration of the RM plan.	2	3	1	2	3.65
7	Managment continues to assess risk mitigation strategies.	3	2	1	2	3.32
Total						19.2
Compliance Value						2.75

Table 16 Maturity Level of Asses risk

PO9 maturity level calculation (level 0-5)			
level	Compliance	Normalize	Contribution
0	3.1	0.15	0
1	3.75	0.19	0.19
2	2.87	0.14	0.29
3	4.04	0.20	0.60
4	3.59	0.18	0.71
5	2.75	0.14	0.68
	20.1	ML	2.47

DISCUSSION

This respondent profile shows the strength of reliable, accurate, and appropriate research data [15]. COBIT 4.1 P09 domain maps the communication and control relationships in IS development projects to analyze risk management in bus transportation applications. The development of information systems through service applications significantly influences application development companies [16], [17]. This research uses quantitative study analysis in the literature review to analyze through a data processing approach using statistical or mathematical methods [18]. The use of quantitative techniques also pays attention to ethics in research analysis so that ethical quality is also maintained [19]. The study of the IT risk assessment's maturity level in the bus transportation service application shows the results are repeatable but intuitive, meaning that the risk assessment process is still in the procedural stage. A risk assessment method study needs to identify aspects of IT system sustainability through the COBIT model, which provides a detailed analysis of how organizations use the framework, identify and mitigate organizational IT risks through better governance [20].

CONCLUSION

The test results show that the maturity level of risk management for bus transportation applications in Yogyakarta is 2.46. Nilia explained that the risk assessment process is still in the procedural stage because there has been no specific IT risk training. The possibility of application errors in the system is risky in IT. The recommendation that needs to be there is to start implementing particular IT risk training to all members in each process unit to provide an overview of how to mitigate IT risks. Suggestions for further research on IT risk management's object are the need to add a monitor and evaluation domain as additional domains when researching so that monitoring and analysis are more accurate.

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