Analysis of Information System Audit Using Control Objectives for Information and Related Technology 5 Framework on Permata Hebat Application

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ABSTRACT

Permata Hebat application is an application created as a service to develop micro businesses among housewifes in Semarang City. However, to fulfill this expectation, of course, the application needs good IT management or governance, so that the application can be optimally utilized by its users. However, since its operation on March 23, 2021, it is not yet known how the quality or level of management capability or IT governance services run by the organization. Information system audit itself is an activity to evaluate and ensure that the system has met the standards. Meanwhile, one of the frameworks that can be used to conduct an audit is COBIT 5. COBIT 5 is a good practice whose processes have been adapted to current standards. As for the process control used is the Deliver, Services, and Support (DSS) domain. The results of the calculation show that for domains DSS01, DSS03, and DSS06 each received a maturity level value of 0.60, 0.52, and 0.61 or at level 1 performed. Meanwhile, domains DSS02, DSS04, and DSS05 each received maturity level values of 0.45, 0.35, and 0.42 or are still at level 0 incomplete. Therefore, there is still a need for a lot of improvement or improvement in each process. The goal is that the system can run in accordance with organizational expectations.

1   Introduction

The rapid development of information technology (IT) has an impact on business activities in various fields. The impact has resulted in changes or transitions in the style or habits of business processes that have usually been running, even often IT is considered as one of the resources that have an important role for institutions, companies, communities, and governments (Majid & Budiman, 2021). This phenomena certainly requires all parties, especially the Central Java Provincial Government, to be able to adapt to IT developments, so that they can run business processes and improve services better (Jhonatan & Budiman, 2021). The Permata Hebat organization through the Semarang City Women's Empowerment and Child Protection Agency (DPPPA) is aware of this. Therefore, a system or application named "Permata Hebat" was created.

This application was created as a form of service and facilities provided by the Semarang City government for the Permata Hebat forum to develop micro businesses among housewives. It is an effort from the Semarang City government for the welfare of its citizens. (Gasova & Stofkova, 2017). However, to meet these expectations, of course, the value or value in the system must be optimally utilized (Twizeyimana & Andersson, 2019). Therefore, it needs good management, so that the application can run well. But since its operation, it has not been known how the quality or level of management capability or IT governance services run by the organization. So it is necessary to measure to determine the level of management capabilities and IT governance services run by the

organization. One way or solution to overcome this problem is to conduct an information system audit.

Information system audit itself is an activity to evaluate and ensure that the system has met the standards (Rahmanto et al., 2020). Meanwhile, one of the frameworks that can be used to conduct an audit is the Control Objectives for Information and Related Technology (COBIT) (Agung & Andry, 2018). The selection of this framework is because COBIT 5 is a good practice whose processes have been adapted to current standards, besides that this framework also has a more general language (Solechan, 2021). The selected process control is the Deliver, Services, and Support (DSS) domain. This domain focuses on operational and information technology services that support the ongoing business processes (ISACA, 2012a). As for the measurement tool used is the maturity level. This measuring instrument is used to control IT processes in an organization (Wardani & Puspitasari, 2014). The measurement results can later be used to determine the quality of management and IT governance services that have been running in the Permata Hebat organization.

2   The Proposed Method/Algorithm

2.1   E-government

E-government is a process of utilizing information technology within the government that aims to assist government performance in providing services to the community. However, building an e-government is not an easy matter (Napitupulu et al., 2020; Twizeyimana & Andersson, 2019). Because e-government has a complex social system (Malodia et al., 2021). So there are many factors that affect the success of e-government implementation such as human resources, top management support, organizational size, ease of use, competitive pressure, compatibility, competitive pressure, and strategic relevance (Michael et al., 2018; Othman & Razali, 2018).

2.2   IT Governance

Information and Technology Governance or IT Governance is a structure or method that describes the management of IT resources in the organization. IT governance needs to be done by the organization to focus efforts on value creation, strategic goals, and manage the performance of each person in charge (Solechan, 2021). The innovation carried out by the organization by making IT one of the important tools or means in achieving organizational goals (Sofa et al., 2020). Therefore, IT governance in the organization must be done as well as possible, because poor management will cause weaknesses that can become a threat. (Usman, 2019).

2.3   Information System Audit

Audit is an investigation to achieve the desired goal with the findings of evidence found by the auditor. Information system audit is the process of collecting, verifying, and assessing evidence, this is done to determine whether the computer system can run properly and in accordance with company goals (Rahmanto et al., 2020). Audit frameworks, such as ISO 27001, COBIT, ITIL, FISCAM, CONNECT, can be used as references that must be aligned with information system audit processes and procedures (Zerbino et al., 2018). Information system audits are conducted to reduce the risk of loss due to errors, manipulation, or other illegal actions, as well as incidents that can cause the system to be damaged or unavailable (Jumalianto & Andarsyah, 2019). Moreover, the information generated can be used to support effective decision making (Otero, 2018).

2.4   COBIT

Control Objectives for Information and Related Technology (COBIT) is one of the standards or frameworks that can be used to conduct an information systems audit. COBIT was created by the Information System Audit and Control Association (ISACA) with the aim of assisting auditors in dealing with difficulties and as a work guide during the audit process (Okour, 2019). The COBIT 5 has two processes, namely in the fields of IT governance and management. In terms of IT governance, it consists of 5 processes related to Evaluate, Direct, and Monitor (EDM). While in management contains 32 processes which are divided into four domains namely Evaluate, Direct, and Monitor (EDM), Align, Plan, and Organize (APO), Build, Acquire, and Implement (Kumar *et al.*), Delivery, Service, and Support (DSS), Monitor, Evaluate, and Assess (MEA) (ISACA, 2012a). For more details can be seen in Figure 1.
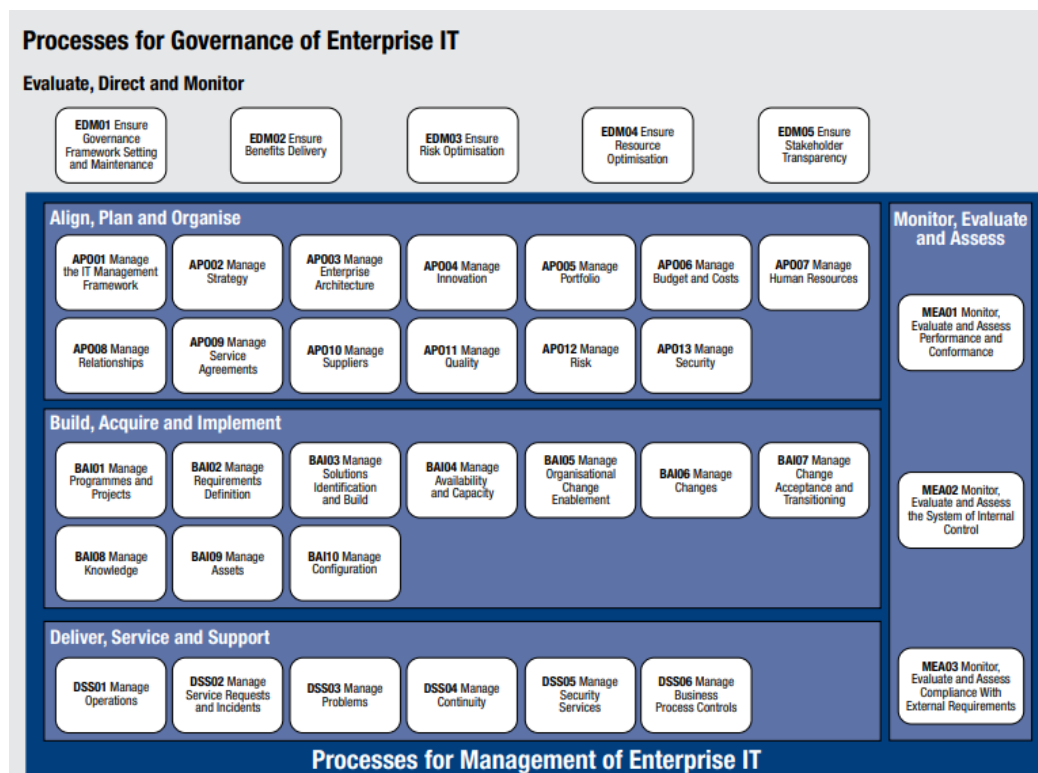
Figure 1. Domain process COBIT 5

In measuring IT governance, COBIT 5 uses maturity level as a measuring tool. Maturity level is one of the measurement tools used to measure the extent to which the IT management process is running (Amali et al., 2020). When measuring the level of maturity using COBIT 5, there is a level scale ranging from level 0 incompleted to level 5 optimized (ISACA, 2012b). For more details can be seen in Table 1.

Table 1. Maturity level COBIT 5

Index	Maturity Level	Description
0 – 0,5	Level 0: Incomplete	Level 0 reflects that the process is not or has not been implemented.
0,51 – 1,5	Level 1: Performed	Level 1 states that the process has been implemented or is running, but there is no definite guarantee that the system is consistent.
1,51 – 2,5	Level 2: Managed	Level 2 explains that the running process has been managed, monitored, both input and output.
2,51 – 3,5	Level 3: Established	Level 3 means that the process has been defined and carried out properly and consistently, even though there are changes or changes in the person in charge.
3,51 – 4,5	Level 4: Predictable	The meaning of level 4 is that the process has been measured, controlled to produce the desired performance.
4, 51 - 5	Level 5: Optimizing	The process undergoes improvement, innovation, and improvement to increase efficiency, effectivity, and control.

In addition to the leveling scale, each work product (WP) collection process will get an assessment. The assessment is based on the percentage of actual WP achievement in the field, guided by the COBIT 5 standard WP (ISACA, 2012b). For the rating scale in COBIT 5 can be seen in Table 2.

Table 2. Rating scale in COBIT 5.

Code	Meaning	Percentage	Description
N	Not Achieved	0 – 15%	When WP are not found or few WP are found during the audit process
P	Partially Achieved	>15% - 50%	Some evidence of actual WPs or almost half of the COBIT 5 standard WPs found
L	Largely Achieved	>50% - 85%	There is evidence of significant WP findings, but there are still some COBIT 5 standard WPs that have not been found.
F	Fully Achieved	>85% - 100%	There is complete or nearly complete evidence of WP

2.5 Delivery, Services, and Support (DSS)

Domain Deliver, Service, and Support or DSS is one of the domains in COBIT 5. This domain is an extension of Domain Deliver and Support or DS in COBIT 4.1. The DSS domain deals with the actual delivery and support of the required services, which include service delivery, security and continuity management, service support for users, data management and operational facilities accompanied by support for effective and efficient implementation and integration of IT in a business process (ISACA, 2012a). The DSS domain consists of six control objectives as shown in Table 3.

Table 3. Domain delivery, services, and support (DSS)

Code Domain	Description
DSS01	Manage Operation
DSS02	Manage Services Requests and Incidents
DSS03	Manage Problems
DSS04	Manage Continuity
DSS05	Manage Security Services
DSS06	Manage Business Process Controls

2.6 Permata Hebat Aplication

Permata Hebat is a web-based application or e-catalog created by DPPPA Semarang City as a means or place to sell products and services from Permata Hebat UMKM in Semarang City. In addition, this application can also be a means of disseminating information. This is done by DPPPA Semarang City as a facilitator and representative of the Semarang City Government to support micro, small and medium businesses (UMKM) businesses in Semarang City.

3 Method

This research uses a quantitative descriptive method. This method is used so that the calculation results are more detailed, so that general readers can understand the calculation results easily (Khasanova et al., 2020). The data used are mixed data from primary data and secondary data. Primary data is collected from questionnaires and interviews, while secondary data is collected from literature studies and interviews. As this research focuses on operational management in IT governance, therefore the domain chosen is the DSS domain.

In the sample selection, this research uses purposive sampling technique. purposive sampling is a non-random technique carried out by researchers. The aim is to ensure that the parties involved are in accordance with the focus of the discussion and have a high level of credibility (Lenaini, 2021). So that the data collected is valid and can be accounted for. For the audit implementation flow chart, see Figure 2.

Figure 2. Research structure

The design or implementation flow is a framework used by researcher as a plan in the process of doing research. That is because the research plan involves general assumptions, research strategies, data collection methods, and detailed analysis (Creswell, 2017). Therefore, by making a research flow or plan, the research is expected to run in a more structured manner.

3.1 Mapping

Before conducting an information systems audit, in COBIT 5 there is a mapping that needs to be done. Mapping here aims to translate organizational goals with enterprise goals in COBIT 5. So that researchers can understand how the relationship or relationship between process controls will be used. There are 3 stages of mapping in COBIT 5, including the following:

- Mapping between organizational goals and COBIT 5 enterprise goals
- Mapping between enterprise goals and IT related goals
- Mapping between IT related goals and process control, in this study using the DSS domain.

3.2 Maturity Level

After the data collection process has been carried out, the next step is to measure the maturity level value. But before that there are several measurements that need to be done first.

3.2.1 Index Questionnaire

The first step before calculating the maturity level is to find the index value of the questionnaire. To be able to find out the index value of the questionnaire, you can use Equation 1.

$$Index\ Questionnaire\ = \frac{\sum Questionnaire\ Answer}{\sum Questionaire\ Item} \tag{1}$$

3.2.2 Maturity Index

The next step is to find the value of the maturity index, at this stage it is necessary to observe the work product (WP) first. To find the maturity index value, you can use Equation 2.

$$Maturity\ Index\ = \left\{ \frac{WP\ Actual}{WP\ Standard} \right\} \times Index\ Kuesioner \tag{2}$$

3.2.3 Maturity Level

After getting the results of the maturity index calculation, the next step is to find the maturity level. To find the value at the maturity level, you can use the formula Equation 3.

$$Maturity\ Level\ = \frac{\sum Maturity\ Index}{\sum Domain\ DSS} \tag{3}$$

3.3 Gap Maturity

To find the gap maturity, it is done by subtracting the number of expected values from the maturity value in each process. To find the maturity gap value, you can use the formula Equation 4.

$$Gap\ Maturity\ = \sum(Level\ Target - Current\ Maturity) \qquad (4)$$

4 Results and Discussion

4.1 Mapping Results

After doing 3 stages of mapping, the mapping results can be seen in Table 4.

Table 4. Mapping results

Domain	IT-related Goals (ITG)															
	ITG01	ITG02	ITG03	ITG04	ITG05	ITG07	ITG08	ITG09	ITG10	ITG11	ITG12	ITG13	ITG14	ITG15	ITG16	ITG17
DSS01 Manage Operation		S		P	S	P	S	S	S	P			S	S	S	S
DSS02 Manage, Service, and Incidents				P		P	S		S				S	S		S
DSS03 Manage Problem		S		P	S	P	S	S		P	S		P	S		S
DSS04 Manage Continuity	S	S		P	S	P	S	S	S	S	S		P	S	S	S
DSS05 Manage Security Services	S	P		P		S	S		P	S	S		S	S		
DSS06 Manage Business Process Controls		S		P		P	S		S	S	S		S	S	S	S

Based on the mapping results in Table 4, it can be seen that all processes in the DSS domain can be used as the scope of the audit process. This can be because each process in the DSS domain gets the results of "P" which means primary, and "S" which means secondary.

4.2 Questionnaire Analysis Results

In this study, there were 11 respondents consisting of 6 internal DPPPA parties, 3 Permata Hebat organizations, and 2 application developers. Respondents who participated in this study were parties who had a relationship or interest in the creation of the Permata Hebat application. The results of the analysis of the questionnaire answers can be seen in Table 5.

Table 5. A tabel description analysis

Respodents	Score Min	Score Max	Average	Amount	Ideal Score	Percentage
Respondent 1	3	5	4,71	316		94,32
Respondent 2	3	5	4,62	310		92,53
Respondent 3	2	4	3,62	243	335	72,53
Respondent 4	2	4	3,56	239		71,34

Respodents	Score Min	Score Max	Average	Amount	Ideal Score	Percentage
Respondent 5	2	4	3,44	231		68,95
Respondent 6	4	5	4,94	331		98,8
Respondent 7	4	5	4,88	327		97,61
Respondent 8	3	5	4,16	279		83,28
Respondent 9	3	5	4,05	272		81,19
Respondent 10	3	5	4,55	305		91,04
Respondent 11	3	5	4,43	297		88,65

4.3 Interview Analysis Results

In this research there are 4 sources. The sources involved are parties who have an interest in and responsibility for the planning, management, and running of the application. The goal is to get as much as possible. The content of the interview is adjusted to the topic of research, namely regarding the audit of information systems using the COBIT 5 framework with the DSS domain as a measurement control tool.

4.4 Observation Analysis Results

Observation is used by researchers to directly observe how the application runs directly. In addition, in this method researchers make a self-assessment to facilitate the process of collecting WP in the organization. Observation results can be seen in Table 6.

Table 6. A table of observation analysis results

Domain	WP Standard	WP Actual	Achievement	Description
DSS01 Manage Operation	10	9	90%	F - Fully Achieved
DSS02 Manage Services Requests and Incidents	14	9	64,28%	L – Largely Achieved
DSS03 Manage Problems	11	8	72,72%	L – Largely Achieved
DSS04 Manage Continuity	18	9	50%	P – Partially achieved
DSS05 Manage Security Services	14	8	57,15%	L – Largely Achieved
DSS06 Manage Business Process Controls	11	9	81,81%	L – Largely Achieved

The lowest percentage value of achievement is known in the DSS04 domain, with a percentage of achievement of 50% or 9 out of 18 work products have not been fulfilled. Meanwhile, the largest percentage value of achievement is domain DSS01 with a percentage of 90%, or has reached fully achieved, which means that the work product is almost perfectly fulfilled. As for domains DSS02, DSS03, DSS05, and DSS06 have achieved largely achieved, which means that most of the work products are fulfilled.

4.5 Maturity Level Results

Before looking for the value of the maturity level, there are several calculations that need to be done first.

4.5.1 Index Questionnaire

In the first stage of measuring maturity level is to find the index value of the questionnaire. The method or formula used is as in Equation 3.1. The results of measuring the index value of the questionnaire can be seen in Table 7.

Table 7. Index questionnaire results

Domain	Index Questionnaire
DSS01 Manage Operation	3,98
DSS02 Manage Services Requests and Incidents	4,18
DSS03 Manage Problems	4,32
DSS04 Manage Continuity	4,23
DSS05 Manage Security Services	4,42
DSS06 Manage Business Process Controls	4,44

4.5.2 Maturity Index

After knowing the questionnaire index value for each process in the DSS domain, the next step is to find the maturity index value. To find the maturity index value, you can use Equation 3.2. The results of the maturity index measurement can be seen in Table 8.

Table 8. Maturity index results

Domain	Maturity Index
DSS01 Manage Operation	3,58
DSS02 Manage Services Requests and Incidents	2,68
DSS03 Manage Problems	3,14
DSS04 Manage Continuity	2,11
DSS05 Manage Security Services	2,52
DSS06 Manage Business Process Controls	3,63

4.5.3 Maturity Level

After knowing the maturity index value in each DSS domain, the next step is to find the maturity level value of the Permata Hebat application. To measure the maturity level, it can be done using the formula Equation 3.3. The results of measuring the maturity level value can be seen in Table 9.

Table 9. Maturity level results

Domain	Maturity Level	Level	Description
DSS01 Manage Operation	0,60	1	Performed
DSS02 Manage Services Requests and Incidents	0,45	0	Incompleted
DSS03 Manage Problems	0,52	1	Performed
DSS04 Manage Continuity	0,35	0	Incompleted

Domain	Maturity Level	Level	Description
DSS05 Manage Security Services	0,42	0	Incompleted
DSS06 Manage Business Process Controls	0,61	1	Performed

Table 9 shows the maturity level value for each domain in the DSS domain. Based on Table 4.28, it can be seen that the domain that has the lowest maturity level is domain DSS04 or manage continuity, with a maturity value obtained of only 0.35 or at level 0 incompleted. Meanwhile, the greatest level of maturity is obtained by the DSS06 domain with a maturity value of 0.61 manage business process controls or at level 1 or performed.

4.6 Gap Maturity Results

In this research, the determination of the target level or expectation is determined based on the level that is being aimed at from the current level. So based on the calculations discussed in the previous discussion, it is known that the DSS01 domain gets a maturity level value of 0.60 or is at the performed level. This means that the DSS01 domain has reached at least 10% of level 1 and is still less than 90% to go to level 2. Based on this explanation, the expected or target level in the DSS01 domain is level 2 or managed. The following is the maturity gap that exists in the Permata Hebat application.

Table 10. Recapitulation gap maturity domain DSS

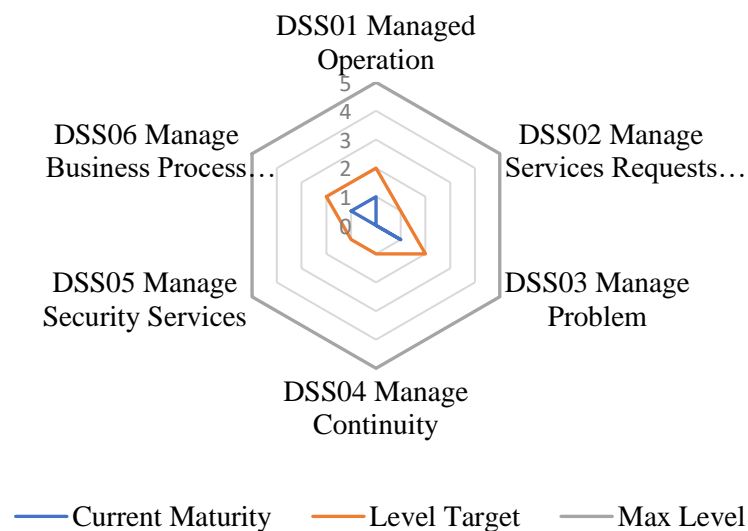| Domain	Level Actual	Level Target	Gap
DSS01 Manage Operation	1	2	1
DSS02 Manage Services Requests and Incidents	0	1	1
DSS03 Manage Problems	1	2	1
DSS04 Manage Continuity	0	1	1
DSS05 Manage Security Services	0	1	1
DSS06 Manage Business Process Controls	1	2	1

Figure 3. Gap maturity chart

In Table 10, it can be seen the value of the current level, the level of expectation or target to be achieved, and the maturity gap value in each sub-domain in the DSS domain. Based on the determination of the level of expectations or targets discussed in the previous discussion, therefore the maturity gap value in each sub-domain is 1 level. To achieve the target level, each domain needs to innovate in strategies or plans for developing activities and processes that exist in the organization, as well as optimizing activities and processes that have been running well. Meanwhile, Figure 3 is a level measurement radar that illustrates the current level with the level that is the target or expectation to be achieved in the Permata Hebat application with the maximum level in COBIT 5.

4.7 Recommendation

Based on the results of field observations made by researchers, several recommendations were made based on each process and domain in the DSS domain. The maturity gap for the whole in each domain is 1, that is because the determination of the target level is based on the level that is being addressed. Of course, the maturity gap value will be greater if the target level that you want to set is the highest level or level 5 optimized. Based on the results of the recommendations given by researchers in each domain, the following are general recommendations regarding all processes in the DSS domain.

- Optimize all forms of business process activities that have taken place

- Make innovations to the course of business processes. This needs to be done so that the application can be of interest to many people, so that it will have a positive impact on the sustainability of the system

- Based on the results of the calculation of maturity level and maturity gap, it is necessary to prioritize handling. Priorities can be based on domains that have the lowest maturity values such as DSS04, DSS05, and DSS02, which have maturity values of 0.35, 0.42, and 0.45, respectively, or are still at level 0.

- Improve and be consistent in recording the process of managing, monitoring, and improving business processes. So that the organization can control and evaluate the course of business processes properly.

5   Conclusion

Based on the information system audit process that has been carried out on the Permata Hebat application using COBIT 5 as a framework, and the DSS domain as a process control, the conclusions of this final project are as follows: Based on the results of the mapping carried out in 3 stages, namely mapping between enterprise goals and organizational goals, mapping IT-related goals with enterprise goals, and mapping between the DSS domain and IT-related goals, it can be seen that all processes in the DSS domain have a "P" or primary relationship. This shows that all processes in the DSS domain are bound to each other and have a strong relationship with organizational goals. The audit results show that there are 3 processes that are still at level 0 or incomplete and there are 3 processes that are at level 1 or performed. Processes that are still at level 0 or incompleted include domains DSS02, DSS04, and DSS05. Meanwhile, the processes that are already at level 1 are domains DSS01, DSS03, and DSS06.

The target level or expected level that the organization wants to achieve is determined based on the level that is being addressed from the maturity level obtained at this time. So that the target level for DSS01, DSS03, and DSS06 is level 2 or managed. While the target level for domains DSS02, DSS04, and DSS05 is level 1 or performed. So that each domain has a gap value of 1. The measurement results show that the management of service requests and incidents, management of system continuity, and management of security services carried out by the organization has not been implemented properly. Meanwhile, operational management, problem management, and business process control management have been running well, but there is no consistency in their management. Based on the results of maturity level and maturity gap measurements, the organization needs to make improvements and evaluations by prioritizing. The goal is that the organization can determine which processes need to be improved or handled first.

6   References

Agung, H., & Andry, J. F. (2018). Audit sistem informasi akademik menggunakan kerangka kerja cobit 5 pada domain edm pada universitas xyz. *Journal of Business Audit Information Systems*, *1*(1).

Amali, L. N., Katili, M. R., Suhada, S., & Hadjaratie, L. (2020). The measurement of maturity level of information technology service based on cobit 5 framework. *Telkomnika*, *18*(1), 133-139. https://doi.org/10.12928

Creswell, J. W. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Gasova, K., & Stofkova, K. (2017). E-government as a quality improvement tool for citizens' services. *Procedia engineering*, *192*, 225-230. https://doi.org/10.1016/j.proeng.2017.06.039

ISACA. (2012a). *Enabling processes*   www.isaca.org/cobit

ISACA. (2012b). *Process assessment model (pam): Using cobit 5*   www.isaca.org/cobit

Jhonatan, E., & Budiman, K. (2021). User experience analysis of satisfaction of job seekers (pencaker) in the city of semarang manpower department in using the siker application using the user experience questionnaire (ueq) method. *Journal of Advances in Information Systems Technology*, *3*(2), 42-54. https://doi.org/10.15294/jaist.v3i2.53714

Jumalianto, M. F., & Andarsyah, R. (2019). Audit sistem informasi rise (radio integrated broadcasting system) web pada pt. Zamrud khatulistiwa technology dengan menggunakan metode cobit 5. *Jurnal Teknik Informatika*, *11*(3), 39-46.

Khasanova, K., Babadjanova, G., & Isanova, V. (2020). Professional-oriented teaching foreign language at a non-language university and the role of descriptive methods in the lessons. *Mental Enlightenment Scientific-Methodological Journal*, *2020*(2), 167-174.

Kumar, S., Baishya, K., Sadarangani, P. H., & Samalia, H. (2020). Cultural influence on e-government development. *The Electronic Journal of Information Systems Evaluation*, *23*(1), pp17-33-pp17-33. https://doi.org/10.34190/EJISE.20.23.1.002

Lenaini, I. (2021). Teknik pengambilan sampel purposive dan snowball sampling. *Historis: Jurnal Kajian, Penelitian dan Pengembangan Pendidikan Sejarah*, *6*(1), 33-39.

Majid, M. N., & Budiman, K. (2021). Acceptance analysis of technology-based personnel management information systems (simpatik) in supporting the implementation of e-government in the semarang city manpower service. *Journal of Advances in Information Systems Technology*, *3*(2), 21-31. https://doi.org/10.15294/jaist.v3i2.53708

Malodia, S., Dhir, A., Mishra, M., & Bhatti, Z. A. (2021). Future of e-government: An integrated conceptual framework. *Technological Forecasting Social Change*, *173*, 121102. https://doi.org/10.1016/j.techfore.2021.121102

Michael, P., Dimitriou, S., Glyptis, L., & Zarifis, A. (2018). E-government implementation challenges in developing countries: The project manager's perspective. *International Journal of Public Administration and Management Research*, *4*. https://doi.org/10.36758/ijpamr

Napitupulu, D., Lubis, M. R., Revida, E., Putra, S. H., Saputra, S., Negara, E. S., & Simarmata, J. (2020). *E-government: Implementasi, strategi dan inovasi*. Yayasan Kita Menulis.

Okour, S. (2019). The impact of the application of it governance according to (cobit 5) framework in reduce cloud computing risks. *Modern Applied Science*, *13*(7), 25. https://doi.org/10.5539/mas.v13n7p25

Otero, A. R. (2018). *Information technology control and audit* (5 ed.). Auerbach Publications. https://doi.org/10.1201/9780429465000

Othman, M. H., & Razali, R. (2018). Whole of government critical success factors towards integrated e-government services: A preliminary review. *Jurnal Pengurusan*, *53*, 73-82. https://doi.org/10.17576/PENGURUSAN-2018-53-07

Rahmanto, Y., Randhika, M. F., Ulum, F., & Priyopradono, B. (2020). Aplikasi pembelajaran audit sistem informasi dan tata kelola teknologi informasi berbasis mobile. *Jurnal Teknokompak*, *14*(2), 62-67.

Sofa, K., Suryanto, T. L. M., & Suryono, R. R. (2020). Audit tata kelola teknologi informasi menggunakan kerangka kerja cobit 5 pada dinas pekerjaan umum kabupaten tanggamus. *Jurnal Teknologi Dan Sistem Informasi*, *1*(1), 39-46. https://doi.org/10.33365/jtsi.v1i1.50

Solechan, A. (2021). *Audit sistem informasi*. Yayasan Prima Agus Teknik.

Twizeyimana, J. D., & Andersson, A. (2019). The public value of e-government–a literature review. *Government information quarterly*, *36*(2), 167-178. https://doi.org/10.1016/j.giq.2019.01.001

Usman, S. H. (2019). Mit governance implementation in enterprise: A review. *International Journal of Research in Electronics and Computer Engineering*, *7*(2).

Wardani, S., & Puspitasari, M. (2014). Audit tata kelola teknologi informasi mengunakan framework cobit dengan model maturity level (studi kasus fakultas abc). *Jurnal Teknologi Dan Sistem Informasi*, *7*(1), 38-46.

Zerbino, P., Aloini, D., Dulmin, R., & Mininno, V. (2018). Process-mining-enabled audit of information systems: Methodology and an application. *Journal Expert Systems with Applications*, *110*, 80-92. https://doi.org/10.1016/j.eswa.2018.05.030