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Analysis of E-Government Governance in Bangli District's Government Using the COBIT 5 Framework

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***Abstract*— Evaluation of e-government governance in Bangli Regency was conducted to address the problems of efficiency and effectiveness of e-government management, thus providing an overview of the actual conditions with the results in the form of recommendations to improve the quality of e-government governance. Evaluation refers to the COBIT 5 framework by mapping domains on COBIT 5 to the results of the evaluation of the latest conditions. The results of the analysis focus on the COBIT Process, namely the domains EDM03, EDM04, APO01, APO02, APO03, APO04, APO07, APO10, APO13, DSS02, DSS02, DSS03, DSS04, MEA01. The overall capability level recapitalization of 3.077 still reaches 7.7% above level 3 (Established Process) or 92.3% towards level 4 where most activities in the domain have been carried out, policies and rules documented and communicated efficiently. The target level is Level 4, the Predictable Process by innovating and developing strategies to articulate and communicate any risk to the firm's value related to the use of IT as well as maximizing existing activities.**

Keywords—e-government analysis; COBIT 5; capability level; recommendations.

I. INTRODUCTION

The application of information and communication technology in the government sector, one of which is e-government in Bangli district government, has been developed by Dinas Komunikasi, Informasi dan Persandian as the leading sector of organizing electronic governance by utilizing the means and infrastructure of information and communication technology. The implementation of e-government aims to improve relations between the government and the community, government and business, and other activities. More specifically, government agencies in preparing the vision and mission of the application of information and communication technology can refer to the effectiveness and efficiency of the use of information technology to improve the quality of services to the community[1].

Implementation of e-government in the Dinas Komunikasi, Informasi dan Persandian of Bangli Regency requires the maturity of information technology design and competent human resources. Good and correct information technology governance can add competitive advantage and added value to the organization.

As development, e-government governance information systems need to be evaluated on existing information systems to address the problems of efficiency and effectiveness of e-government management, optimization of facilities and infrastructure as well as human resources so as to provide an overview of the actual conditions, mapping based on domains that produce recommendations to improve quality of e-government governance. Evaluation is carried out with reference to the COBIT (Control Objectives for Information and Related Technology) 5 framework with the aim of bridging the gap between technical issues and risks that might occur and the need for control in developing clear policies. In a comparison of several IT Governance framework tools, such as COBIT, ITIL, COSO, and ISO 17799, COBIT is an IT control framework that has the most comprehensive scope of analysis in terms of analyzing the needs of a control framework [2].

Evaluation is done through mapping the process domain in COBIT 5 to the results of the evaluation of the existing conditions so as to produce recommendations from the analysis of gaps and existing levels at the measurement level of the target capability level.

II. Literature Review

A. E-government of Bangli Regency

The implementation of e-government in Bangli Regency through proper and correct information technology governance can add competitive advantage and added value to the organization [3]. The Dinas Komunikasi, Informasi dan Persandian of Bangli Regency has operated various e-government applications used to support staffing performance such as SIMPEG, Licensing, LPSE, Open Data and the whole OPD information system within the Bangli district government environment. In this study, the author will describe the system of SIMPEG, LPSE and the official website of the Bangli district government.

SIMPEG is an information system that contains detailed employee data from the start of work until retirement including data on employee performance achievements and promotions/positions. Whereas LPSE or Electronic Procurement Service is the organization of procurement of government goods/services electronically. Both are actively connected to the e-government website built on the server farm on Diskominfosan.

B. Governance E-government

Information technology governance (IT) is a guideline, procedure, and collection of processes that aim to regulate and control the company in achieving company goals by providing additional business value, through balancing the benefits and risks of IT and the processes in it. E-Government is a system that provides facilities in the form of information and business services and other matters relating to the government for the community by utilizing information technology governance by the government. With the aim of increasing effectiveness and efficiency, a sense of comfort and better accessibility to community services is the most expected goal of e-government [3].

E-government will provide services to the public that can be accessed at any time, and from wherever the community is located. E-government also allows people not to meet face to face with government officials so that services become more efficient[4].

C. COBIT

COBIT (Control Objectives for Information and Related Technology) is an IT governance framework and a set of supporting tools that enable managers to bridge the gap between control needs, technical issues and business risk.

COBIT is one of the tools in analyzing IT governance published by ISACA (Naufal Labib)[5]. According to ISACA, COBIT 5 is one of the business frameworks for corporate IT management and management.

The flow of goals in COBIT 5 is a mechanism for translating stakeholder needs into specific goals at each level and every area of the company in supporting the company's main objectives and meeting stakeholder needs [6]. The COBIT 5 goal flow is illustrated in Fig 1 :

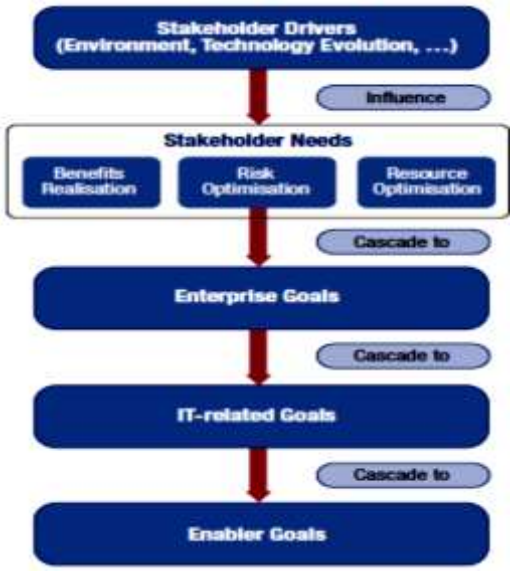

Fig 1. Destination Flow COBIT 5

Process capability measures the performance of every governance process or management process so that if there are areas that need to be improved in performance, they can be immediately identified. The process capability model in COBIT 5 can be seen in the following figure:

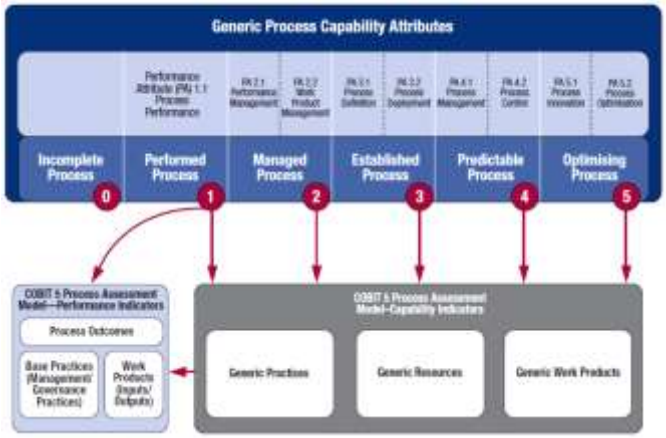

Fig 2. Process Capability Model in COBIT 5

In the process capability model or known as capability level in COBIT 5 consists of six levels that can be achieved, that is:

1) Level 0 Incomplete Process

At this level, it is stated that the process was not implemented or failed in achieving its objectives. This is indicated by the existence of little or no evidence that states that there is a systematic achievement of the objectives of the process.

2) Level 1 Performed Process

At this level, it is stated that the process is run but still uses one attribute so that the process implemented can be said to succeed in achieving its objectives.

3) Level 1 Performed Process

At this level, it is stated that an orderly process with two attribute indicators so that the process carried out has been implemented in a more orderly manner including planning, monitoring and adjusting, and the resulting product has been well established, controlled and maintained.

4) Level 3 Established Process

At this level, it is stated a fixed process with two attribute indicators so that the process that has been implemented uses certain predetermined processes, which are able to achieve the expected outcomes.

5) Level 4 Predictable Process

It is a process that can be predicted (two attributes) so that the process has been run within the limits specified to achieve the expected process outcome.

6) *Level 5 Optimising Process*

It is the optimization process (two attributes), the process continues to be improved continuously to meet current and future business goals.

III. Research Methods

The research was carried out at Dinas Komunikasi, Informasi dan Persandian of Bangli Regency with observation, literature study and questionnaire methods. The stages of research are as follows:

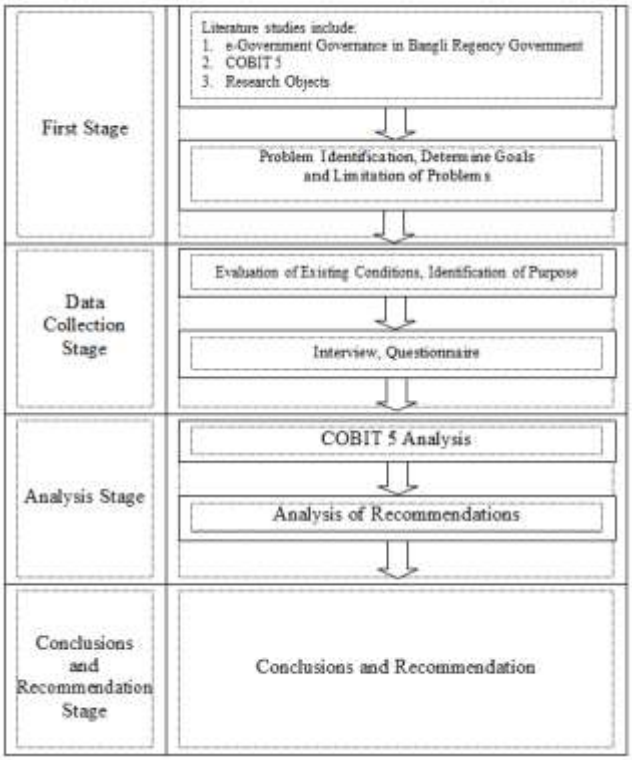

Fig 3. Research Stages

The stages carried out in carrying out an analysis of e-government governance in the Bangli Regency Government, include four stages, that is:

A. Early-stage

In the initial stage, a literature study is conducted which includes reading reference activities such as journals, articles, books relating to the object of research.

B. Data Collection Stage

At the data collection stage, an evaluation of the existing conditions of the e-Government of the Bangli Regency Government was followed by identification of the objectives by mapping the COBIT 5 itself. Mapping consists of Ethereal Goals, IT-Related Goals, Process Control.

C. Analysis Stage

The analysis phase is carried out in 2 (two) stages, namely the COBIT analysis phase and the recommendation analysis.

D. Conclusion and Recommendation Stage

The last step taken is conclusions and suggestions. The conclusions are a summary of the process and results of the study while the suggestions are input or recommendations for a follow-up to the next research.

The method used in this study is the COBIT 5. The analysis method is used to analyze the value of the maturity level of IT governance for the current and expected data management processes in e-government within the Bangli Regency Government.

IV. Results and Discussion

A. Overview of e-government in Bangli Regency Government

The infrastructure and resources of computer networks and data centers in the context of e-Government are the main basis in establishing data and information communication networks to support regional information systems. The condition of the computer and network hardware in the Bangli Regency Government of all existing computers consists of desktop/client computers, notebooks/laptops and servers (central computers), and each computer has a complete printer. Computer network infrastructure topology and data center can be seen in the following figure:

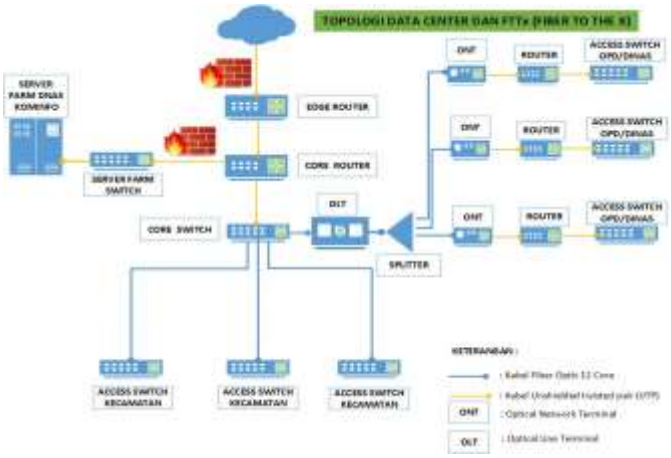

Fig 4. Data Center Computer Network Topology

Data Center network topology is centered on the Department of Communication, Information and Coding of Bangli Regency. Access of each OPD is connected to the Farm Office of the Communication and Information Agency through a farm switch server equipped with a firewall. Each switch on OPD and sub-district is connected via a router using UTP cable, from the router connected to the ONT (Optical Network Terminal) and all ONTs are connected to the OLT (Optical Line Terminal) by using fiber optic cable to the core switches in the Communication and Information Office.

The topology for each OPD and district can be seen in the following figure:

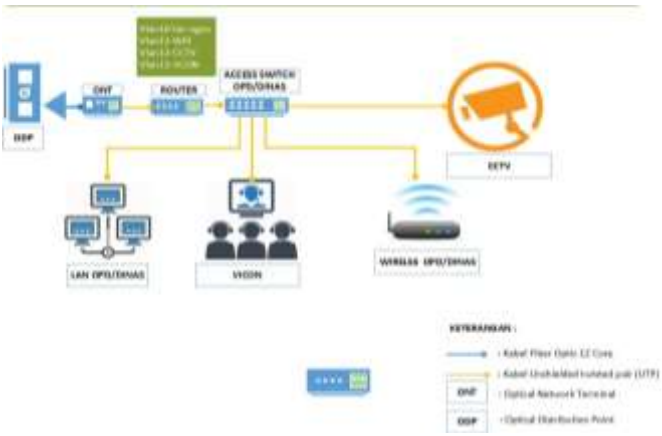

Fig 5. OPD Network Topology / Service, District

From the ODP (Optical Distribution Point) at the Communication and Information Agency connecting the server with each OPD / Service and sub-district via ONT, routers and switches at each OPD / Service and sub-district. From the switch is connected to a LAN (Local Area Network) using UTP, VICON (Virtual Conference) and Wireless (Access Point) cables.

B. Mapping and Selection of Domain Processes

1) Governance of Goals Enterprise

In COBIT 5, 17 Goals Generic is defined which lists company goals and how they relate to government goals. In the mapping table, explained 'P' stands for primary relationship and 'S' for secondary relationship.

TABLE I. ENTERPRISE GOALS MAPPING RESULTS TABLE

BSC Dimension	Enterprise Goal	Relation to Governance Objectives		
		Benefits Realisation	Risk Optimisation	Resource Optimisation
Financial	1. Stakeholder value of business investments	P		S
	2. Portfolio of competitive products and services	P	P	S
	3. Managed business risk (safeguarding of assets)		P	S
	4. Compliance with external laws and regulations		P	
	5. Financial transparency	P	S	S
Customer	6. Customer-oriented service culture	P		S
	7. Business service continuity and availability		P	
	8. Agile responses to a changing business environment	P		S
	9. Information-based strategic decision making	P	P	P
	10. Optimisation of service delivery costs	P		P
Internal	11. Optimisation of business process functionality	P		P
	12. Optimisation of business process costs	P		P
	13. Managed business change programmes	P	P	S
	14. Operational and staff productivity	P		P
	15. Compliance with internal policies		P	
Learning and Growth	16. Skilled and motivated people	S	P	P
	17. Product and business innovation culture	P		

The data that is going to be taken is part of Benefits Realization and Resource Optimization which focuses on primary (P) because this research focuses on the level of optimization of benefits and resources in the e-Government of Bangli Regency Government. The results of the identification of business goals can be seen in the following table:

TABLE II. IDENTIFICATION OF BUSINESS OBJECTIVES (ENTERPRISE GOALS)

IT BSC	NO	COBIT 5 Enterprise Goals	Bangli Regency e-Government Business Objectives
Financial	1	Stakeholder value of business investments	Improving the quality of public services in the process of government administration
	2	Porfolio of competitive product and service	
	4	Compliance with external laws and regulations	The formation of a government that is clean, transparent and able to respond effectively to changes in demand The formation of a transparent government
	5	Financial Transparency	
Custumer	6	Custumer-oriented service culture	
	8	Agile responses to a changing business environment	
Internal	11	Optimisation of business process functionality	Improving the quality of public services in the process of government administration
	13	Managed business change programmes	Provide improvement in organizational programs, management systems and governance work processes
	14	Operational and staff productivity	
Learning and Growth	16	Skilled and motivated people	
	17	Product and business innovation culture	

The results of the identification of IT objectives owned by the Government of Bangli Regency e-Government based on the results of interviews and literature study with related parties can be seen in the following table:

TABLE III. IT-RELATED GOALS TABLE

IT BSC	NO	COBIT 5 IT-Rellated Goal	The e-Government IT Objectives of the Bangli Regency
Financial	1	Alignment of IT and business strategy	Public services that can be accessed easily and cheaply by the community
	6	Transparency of IT costs, benefits and risk	
Custumer	7	Delivery of IT Service in line with business requirements	Management of data, information, management systems and work processes electronically
	8	Adequate use of applications, information and technology solutions	
Internal	9	IT agality	
	10	Security of information, processing infrastructure and applications	
	11	Optimisation of IT assets, resources and capabilities	

2) Mapping Details Enterprise Goals to IT-Related Goals

At this stage, the results of determining the stages of governance of Enterprise Goals and IT-Related Goals proceed to the detailed mapping step between Enterprise Goals to IT-Related Goals. The results of the second mapping are seen by the existence of several IT goals that have strong links (symbolized by P which means strong) between IT Goals and IT Goals (Enterprise Goals).

3) Mapping Process Control with IT-Related Goals

this stage is the result of determining the mapping of Company Details to Process Control in COBIT 5. The COBIT 5 method consists of 5 domains and 37 processes. In this study only took the domain based on the results of Mapping IT-Related Goal to Process, i.e (1) EDM (Evaluate, Direct and Monitor) those are EDM03, EDM04, on the domain (2) APO (Align Plan and Organize) those are APO01, APO02, APO03, APO04, APO07, APO10, and APO13, in the DSS (Deliver, Service and Support) domain, those are DSS02, DSS02, DSS03, and DSS04, in the MEA (Monitor Evaluate and Asses) domain that is MEA01.

C. Analysis of Questionnaire Results

Processing of the questionnaire results is done in determining the level of each activity by selecting the mode value or the value that appears the most in each activity. And if the value that appears is 2 levels or maybe more, then the chosen value is the smallest level in between. After analyzing the results of the questionnaire, the values obtained for each activity that is in each domain. The next action is to find the average value of each process to find out how the conditions of each process exist by adding up all the selected levels and then dividing by the number of question items in each domain.

The capability level value is obtained by rounding off the average yield for each process with the aim of making it easier to find the latest conditions based on the established capability level criteria. The technique used in rounding is to use a certain capability process determination technique, which is a process will reach Level k if all attributes at level k have been fulfilled largely (> 50% to 85%) or fully achieved (> 85%) [7]. To describe the current conditions in this study the writer uses the choice of fulfilling the criteria of fully achieved or Level fulfilled with values above 85%.

From the data obtained from the results of capability level assessments carried out in each process, the next step is to perform calculations to find out the average capability level that has been achieved as a whole with the following calculation formula:

$$capability\ level = \frac{(0*y0)+(1*y1)+(2*y2)+(3*y3)+(4*y4)+(5*y5)}{z}$$

Information:

Yn (y0…y5): The number of processes that are at level n

Z: Number of processes evaluated

Referring to the results of the attainment of the capability level process, the overall capability level value in the Bangli Regency SIMPEG application can be obtained with a capability level value of 3.00 with a levelling round of level 3, in the LPSE application, a capability level value of 3.08 with a rounding level is obtained. level 3 and on the e-government website the Bangli Regency Government obtained a capability level value of 3.15 with rounding level 3. So overall the e-government system is at level 3.

D. GAP Analysis

GAP analysis is done to find the difference from the capability level obtained from the target level to be achieved. In determining the target level, determined by the level being addressed from the average level obtained. Example for EDM03 obtained an average level of 4.029 then EDM03 is in the stage of going to Capability Level 5 and still reaching 0.029 or 2.9% above level 4 or still less 0.971 or 97% towards Capability Level 5, so the target level is set at level 5.

Based on an analysis of the results and the determination of the overall Capability Level is at level 3, which is the condition of the Established Process which means that activities, policies and rules have been documented and communicated to collect, validate, evaluate the organization's processes and objectives, performance monitoring and reporting.

TABLE IV. OVERALL GAP ANALYSIS

Process Name	LPSE			SIMPEG			e-Gov		
	Existing level	Target Level	GAP	Existing level	Target Level	GAP	Existing level	Target Level	GAP
Overall analysis of GAP	3,00	4	1,00	3,08	4	0,92	3,15	4	0,85

From the table above it can be seen that the target level to be achieved is Level 4, the Predictable Process. To get to level 4, what needs to be done is to create innovations and strategies to collect, validate, evaluate the processes and objectives of the organization, monitor performance and reporting according to the results of the analysis of previously standardized activities and also maximize activities that have been running quite well.

E. Recommendations

Based on the results of the COBIT analysis of the e-government of the Bangli Regency Government obtained the target level to be achieved, the following recommendations can be given to improve the quality of the Bangli Regency Government e-government system as follows:

1) Recommendations in Terms of Resource Analysis

The recommendations in terms of resources in the Bangli Regency Government environment from the results of the COBIT 5 domain analysis are in the EDM04 and APO07 domains as follows::

- Determine principles to guide the allocation and management of resources and capabilities so that IT can meet the needs of the company, with the capabilities and capacities needed in accordance with agreed priorities and budget constraints.
- Assign responsibilities for carrying out resource management.
- Monitor the allocation and optimization of resources according to the goals and priorities of the company using agreed objectives and metrics.

- Communicating and encouraging the adoption of strategies, principles, and resource management strategies, as well as the agreed corporate architecture strategy.
- Monitor IT sourcing strategies, corporate architecture strategies, resources and IT capabilities to ensure that current and future company needs are met.
- Monitor the performance of resources against targets, analyze the causes of irregularities, and initiate corrective actions to address the underlying causes.
- Evaluate staffing requirements regularly or on major changes to ensure that the IT function has adequate resources to adequately and appropriately support the company's goals and objectives and as well as business controls and initiatives that support IT.
- Maintain the recruitment and retention process of business and IT personnel in accordance with the overall company personnel policies and procedures.
- Minimizing dependency on an individual who performs important work functions through gathering knowledge (documentation), sharing knowledge, succession planning, staff reserves, cross-training initiatives and job rotation.
- Define the skills and competencies of internal and external resources needed and currently available to achieve company, IT and process objectives.
- Conduct periodic reviews to ensure that the contractor's role and access rights are in accordance with and in accordance with the agreement.
- Develop and provide training programs based on organizational and process requirements, including requirements for company knowledge, internal control, ethical behavior, and security.

2) Recommendations in Terms of Network Infrastructure Analysis

The recommendations in terms of network infrastructure in the Bangli Regency Government environment from the results of the COBIT 5 domain analysis are on the EDM04 and APO04 domains as follows:

- Provide infrastructure that can be a trigger for innovation, such as collaboration tools to improve work between geographic locations and divisions.
- Create an environment that is conducive to innovation by maintaining relevant HR initiatives, such as the introduction of innovations and reward programs, appropriate job rotations, and discretionary time for experiments.
- Consult with third party experts were needed to confirm research findings or as a source of information about emerging technologies.
- Evaluate the technology identified, consider aspects such as time to reach maturity, risks inherent in new technology (including potential legal implications), according to the architecture of the company, and the potential to provide additional value.
- Identifying and evaluating potential values that will be realized from the use of innovation.

3) Recommendations in terms of information security analysis

The recommendations in terms of network security in the Bangli Regency Government environment from the results of the COBIT 5 domain analysis namely in the APO13 and DSS05 domains obtained the following data:

- Maintain as part of the company architecture and inventory of solution components available to manage security-related risks.
- Provide input for the design and development of management practices and solutions selected from information security risk treatment plans.
- Recommend information security training and awareness programs.
- Conduct periodic reviews of the effectiveness of the information security management system (SMKI) objectives including meeting policies and the ISMS, and reviewing security practices. Consider the results of security audits, incidents, results of effectiveness measurements, suggestions and feedback from all interested parties.
- Record actions and events that can impact the effectiveness or performance of the ISMS.
- Communicate an awareness of malicious software and enforce preventative procedures and responsibilities.
- Install and activate malicious software protection tools in all processing facilities, with malicious software definition files updated as needed (automatically or semi-automatically).
- Filter incoming traffic, such as e-mail and downloads, to protect against unsolicited information (e.g. Spyware, phishing e-mail).
- Only allow devices that are allowed to have access to company information and company networks. Configure this device to force password entry.
- Encrypt information on its way according to its classification, implement agreed security protocols for network connectivity, configure network equipment in a secure manner.
- Manage remote access and control.
- Maintain user access rights in accordance with business functions and process requirements. Align management of identity and access rights to assigned roles and responsibilities, based on the principle of privilege, the need to be owned, and need to be known.
- Establish access rights for sensitive documents and output devices based on the principle of privilege, balancing risks and business requirements.

V. CONCLUSIONS

Based on the evaluation results of the current conditions of e-government governance in the Bangli Regency Government, the following results can be obtained:

1. Application architecture technology applied in the development of information system applications in the Bangli district government environment is Client-Server

and some applications with N-Tier architecture. Application development to date is still oriented towards meeting the needs of the internal processes of each agency that has a service function. The programming software used in Borland Delphi, Visual Basic, Visual Foxpro, PHP, ASP and Visual Dbase.

2. From the analysis of COBIT 5 domains that are used only focus on the primary data "P" relating to the COBIT Process in accordance with the objectives i.e. (1) EDM (Evaluate, Direct and Monitor) those are EDM03, EDM04, on the domain (2) APO (Align Plan and Organize) those are APO01, APO02, APO03, APO04, APO07, APO10, and APO13, in the DSS (Deliver, Service and Support) domain, those are DSS02, DSS02, DSS03, and DSS04, in the MEA (Monitor Evaluate and Asses) domain that is MEA01.
3. Determination of the level in each of these activities is done by selecting the mode value or the value that appears the most in each activity. And if the value that appears there are 2 levels or maybe more, then the chosen value is the smallest level in between.
4. From the Capability Level obtained rounding is done to facilitate the search for the latest conditions based on predetermined Capability Level criteria. In rounding off, the concept of determining certain Capability Processes is used, which is a process that will reach Level k if all attributes before Level k are fully achieved and all attributes at level k have been fulfilled largely (> 50% to 85%) or fully achieved (> 85%).
5. The overall capability level obtained based on an average is level 3, which is in the Established Process, which means that most activities in the domain have been carried out, policies and rules documented and communicated.
6. The target level to be achieved in the LPSE, SIMPEG and e-gov systems is Level 4, the Predictable Process. To get to level 4, what needs to be done is to create innovations and strategies for the development of articulating and communicating any risk to the firm's value related to the use of IT according to the results of the analysis of previously standardized activities and also maximizing activities that have been running quite well.

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