Evaluation of Maturity Level of E-Procurement Application Systems

Sandy Kosasi
Information System Department
STMIK Pontianak
Pontianak, Kalimantan Barat, Indonesia
sandykosasi@yahoo.co.id

I Dewa Ayu Eka Yuliani
Information System Department
STMIK Pontianak
Pontianak, Kalimantan Barat, Indonesia
dewaayu.ekayuliani@gmail.com

Vedyanto
English Teacher Training and Education Faculty
Tanjungpura University Pontianak
Pontianak, Kalimantan Barat, Indonesia
vedy91@gmail.com

***Abstract*—The availability of service levels and information technology governance supports immensely influences the performance and competitiveness of the companies. The value of the maturity level of the information technology governance is going to affect the simplicity and the smoothness of punctually obtaining relevant and accurate information in the process of managerial decision making. This research aims to cognise the maturity level and provides recommendations of the model of information technology governance, particularly the electronic application system of procurement at DS (Deliver and Support) Domain through the use of COBIT 4.1 Framework. The result of this research reflects that the lowest value of maturity level goes to DS4 (Ensure Continuous Service) Process, i.e. 1.750. The information technology governance of DS4 possesses the connection between the control objective inputs comprising PO2, PO9, AI2, AI4, and DS1, and the control objective outputs consisting of PO9, DS1, DS8, DS9, DS11, and ME1. To be more effective in reaching the third maturity level (i.e. defined process) with the rounding index of 2.50, processes linked to DS4 are required to build a relationship with the third party as the information service provider with a fine quality, to monitor the service delivery through verification, and to ensure sustainable conformity and compliance.**

Keywords—Information Technology Governance; Maturity Level; Deliver and Support; COBIT 4.1 Framework

I. INTRODUCTION

The existence of information technology in various companies always promises the whole stakeholders various benefits on the improvement of effective and efficient business performance, transparency and accountability of information, simplicity of decision making, structure and mechanism of business transparency, and governance modification of business process model. The implementation, however, is still apt not to provide an expected optimal result. The increasing operational cost leads to partial system integration, information technology development with unclear deadline, various internal and external resistances, unclearly measurable planning of information technology investment, complexity of synchronising and interoperating the business processes, and mechanism of information service provision with incomprehensive structure and mechanism [1].

The availability of relevant and accurate information is a prior necessity in providing services to the public and customers altogether to both the governmental organisations and the state-owned enterprises [2]. In a particular case, this applies to the companies engaged in the retail businesses of beauty cosmetics through the implementation of E-Procurement Application System (E-PAS). E-PAS aims to accelerate and simplify the online processing of all the transactional data of the retail businesses. The decision making of goods procurement is, therefore, also accelerated. The implementation of E-PAS can both generally and specifically yield several kinds of reports and information, covering the ordering system, the mechanism of the returns system, the issuance of the invoice, the scheduling of the delivery and receipt, and the demanding and the payment of the bills.

Regarding the importance of this application used to process all the transactional data of retail businesses and boost the maximal system performance, the value of the maturity level is, thus, needed to cognise since it can provide an amount of essential information particularly related to E-PAS performance of DS (Deliver and Support) Domain. DS Domain heavily emphasises on the correct implementation of information technology governance to ascertain the performance of each business process and manage the transactional data of the retail businesses to achieve the effectiveness and efficiency [3,4]. Hence, the accountability assurance and the transparency of financial data management definitely require the superfine service system of information technology. The availability of the service system and the information supports of DS Domain are fundamental due to the need of satisfying the performance target of an agency and work units, divisions, and other departments [5].

The previous studies on DS Domain are prone to discuss the cases applying to universities, the conformity of business and the information technology objectives, the application of local revenue, the distribution, and the banking. The average maturity levels of the service availability and the information technology supports are at scales 2 (repeatable but intuitive) and 3 (defined process). This evidence shows that there has not been procedure compliance ascertaining the sustainable service system, the system security, and the mechanism of data processing. In addition to this evidence, there is non-appearance of the implementation stages under the control

element of each procedure and the standard of interoperability, synchronisation, and information integration in providing and supporting the accurate information yielded through the decision making [6-10].

This research possesses the relevance to the previous researches, i.e. the implementation of information technology governance concerning the service availability and the information supports. In particular to the case of this research, nevertheless, the focus is more on a number of companies engaged in the retail businesses of beauty cosmetics in Pontianak. This research also discusses the managerial implications and the model of information technology governance viewed from control objective inputs and outputs based on the objective indicators and retail businesses performance with E-PAS.

The purpose of this research is to cognise the difference of the existing and the expected maturity level values viewed from DS Domain through the implementation of E-PAS to a number of companies engaged in the retail businesses. The yielded values will propose the recommendations of information technology governance model referring to the objective indicators and company performance linked through the processes of DS and others in relation to the information technology.

This research is formed through R&D (Research and Development) method. Thirty retail businesses having implemented E-PAS with a similar size scale are determined through a purposive sampling. Interviews and questionnaires are those used as the research instruments. The secondary data are derived from a number of last year's supporting documents. The data obtained through the questionnaire are processed through Guttmann scale. More practically, the respondents can mark their answers with checklists (√) in the provided columns. All the data obtained through the questionnaire are inputted into the table and the maturity level value of each process is calculated afterwards.

COBIT 4.1 Framework is applied to measure the maturity level. The research stages are started by calculating the maturity level of E-PAS and are continued by processing the maturity level of each information technology process. Following this stage, the maturity level aggregation is computed using an arithmetic average. Ultimately, the result of aggregation obtained through Microsoft Excel is presented in the tables and radar charts.

II. LITERATURE REVIEW

Information technology governance is an integral part of company governance comprising leadership, structure, and process applied to ascertain its sustainability and enhance the aims and the strategies of the company. Information technology governance specifies the right decision and the accountability framework to direct the expected behaviour of using information technology. Furthermore, it determines the ones systematically creating and contributing to the decision [11]. Its performance is intended to fulfil the conformity of information technology and company purposes, to enable the companies to have recent business opportunities, to get maximum benefits through a responsible management system, and to apply risk management.

To be successfully done, information technology is not only controlled by the department of information technology, but it has to be also managed by the corporate level to integrate all units of business processes [12].

COBIT 4.1 Framework

COBIT 4.1 Framework consists of four domains such as PO (Plan and Organise), AI (Acquire and Implement), DS (Deliver and Support), and ME (Monitor and Evaluate). Regarding the availability of service and information technology supports, the focus is merely on DS Domain. The maturity level evaluation of DS Domain reflects the readiness of utilising the information technology governance to achieve the conformity of the strategy and the goal of the company [13].

The implemented information technology has the models of business control and information technology. COBIT 4.1 Framework can bridge the gap between them through the control objective level covering activities and tasks, processes, and domains (see Figure 1). COBIT 4.1 Guidelines comprise Control Objectives, Audit Guidelines, and Management Guidelines. The focus is mainly characterised by the orientation of business processes and controls through a measurement to yield a more accurate result on the basis of the need [12-13].

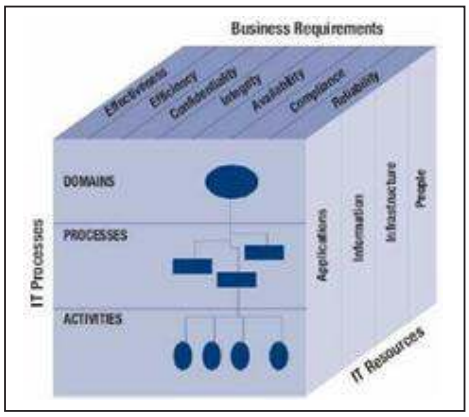


Fig 1 The Model of COBIT Cube

Doman Deliver and Support (DS)

This domain covers the delivery of the actual result and information, the security management, the service supports towards users, the data management, and the facility operation. On the viewpoint of a successful and critical factor, DS Domain encompasses the conformity of the information technology service and the business priority, the optimisation of the information technology costs, the capabilities of the users to productively and safely use the information technology system, the secrecy, the integrity, and the availability of the information flows [13].

DS1 (Define and Manage Service Levels), DS2 (Manage Third-party Services), DS3 (Manage Performance and Capacity), DS4 (Ensure Continuous Service), DS5 (Ensure Systems Security), DS6 (Identify and Allocate Costs), DS7 (Educate and Train Users), DS8 (Manage Service Desk and Incidents), DS9 (Manage the Configuration), DS10 (Manage Problems), DS11 (Manage Data), DS12 (Manage the Physical Environment), and DS13 (Manage Operations) are those included in the information technology processes on DS Domain [13-14].

The Model of the Maturity Level

Evaluation of the maturity level of each information technology process varies when referring to each of its fulfilment criteria. The maturity index value is obtained through this formula (Index Value = {∑ (sum of answers x the maturity value) ÷ (number of questions x number of respondents)}. The rounding index scales of the levels of the maturity model are shown in Table 1 [15].

TABLE ROUNDING INDEX SCALES

Scale	Maturity Level Model
1 4.51 – 5.00	2 5 – Optimised
3 3.51 – 4.50	4 4 – Managed and Measurable
5 2.51 – 3.50	6 3 – Defined Process
7 1.51 – 2.50	8 2 – Repeatable but intuitive
9 0.51 – 1.50	10 1 – Initial/Ad Hoc
11 0.00 – 0.50	12 0 – Non-Existent

Maturity Level Graphic

Levels of classifying the management capability of information technology processes starting from 0 (zero/non-existent) to 5 (optimised) emerge in the maturity level model of information technology governance (see Figure 2). It is helpful since management can easily have concise comprehension through the description of each maturity level in general (see Table 2) [11,15].

I. GENERIC MATURITY MODEL

Level	Maturity Criteria
0 ***Non existent***	Complete lack of any recognisable processes. The enterprise has not even recognised that there is an issue to be addressed.
1 ***Initial/Ad Hoc***	There is evidence that the enterprise has recognised that the issues exist and need to be addressed. There are, however, no standardised processes; instead, there are ad hoc approaches that tend to be applied on an individual or case-by-case basis. The overall approach to management is disorganised.
2 ***Repeatable but intuitive***	Processes have developed to the stage where similar procedures are followed by different people undertaking the same task. There is no formal training or communication of standard procedures, and responsibility is left to the individual. There is a high degree of reliance on the knowledge of individuals and, therefore, errors are likely.
3 ***Defined Process***	Procedures have been standardised and documented, and communicated through training. It is mandated that these processes should be followed; however, it is unlikely that deviations will be detected. The procedures themselves are not sophisticated but are the formalisation of existing practices.
4 ***Managed and Measurable***	Management monitors and measures compliance with procedures and takes action where processes appear not to be working effectively. Processes are under constant improvement and provide good practice. Automation and tools are used in a limited or fragmented way.
5 ***Optimised***	Processes have been refined to a level of good practice, based on the results of continuous improvement and maturity modelling with other enterprises. IT is used in an integrated way to automate the workflow, providing tools to improve quality and effectiveness, making the enterprise quick to adapt.

The research result of the maturity level can be considered when determining the criteria. The increment of the maturity level cannot be interpreted as the capability of the compliance of the lower level to rise to the higher level and identified as the compliance of several maturity criteria in several levels despite a similar process [15-17].

The Maturity of Information Technology Governance

The measurement result of the maturity level of information technology governance shows the current and expected conditions. All the maturity level values of DS Domain processes are at level 2 (repeatable but intuitive) and none of them reaches level 3 (defined process). DS1 and DS2 have maturity levels approaching 2.51 (see Table 3). In average, this DS Domain is valued at 1.898, not reaching the maturity level scale of 2.51 – 3.50.

The Analysis of the Maturity Gap

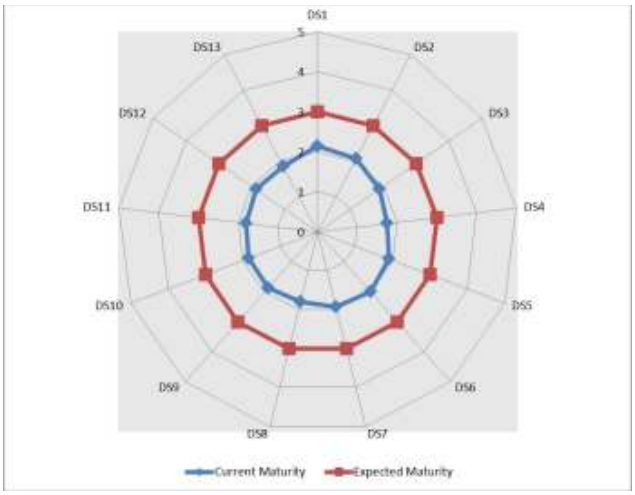
It should be noted that based on the computation of the maturity level of information technology governance, not all values reach level 3 (defined process). The highest maturity level value of DS1 Process (i.e. defining and managing the service level) is 2.143. It reflects that E-PAS has started showing the superfine service level of information technology. However, it is realised that the stated performance indicators are still necessary to fulfil.

II. MATURITY LEVEL GAPS

Domain	Process	Testing Result	Maturity Level
DS1	Define and Manage Service Levels	2.143	3
DS2	Manage Third-party Services	2.060	3
DS3	Manage Performance and Capacity	1.880	3
DS4	Ensure Continuous Service	1.750	3
DS5	Ensure Systems Security	1.900	3
DS6	Identify and Allocate Costs	1.998	3
DS7	Educate and Train Users	1.927	3
DS8	Manage Service Desk and Incidents	1.789	3
DS9	Manage the Configuration	1.860	3
DS10	Manage Problems	1.840	3
DS11	Manage Data	1.810	3
DS12	Manage the Physical Environment	1.874	3
DS13	Manage Operations	1.848	3

As it can be seen, the lowest maturity level is at DS4 (Ensure Continuous Service) with 1.750. This is due to the uncertainty of E-PAS sustainability that most of the retail business companies have. This condition reflects that the responsibilities to ensure the provision sustainability and information supports do not completely have the conformity and the compliance of the standard, and the structure yet. Besides, the report of the availability is partial. Despite the fact that the mechanisms of the documentation, the system, and the components exist, they are not reliable. Finally, the sustainable service practices having been applied only rely on the individuals. Probable risks that might emerge are that the existing applications can only be used for current activities, costs are covered for new applications, and the architecture of the information technology service has not become the result of agreement between the users and the service providers.

The model of this maturity level shows that the processes have been developed into stages participated by different parties with a similar profession. There is strong belief of individual knowledge to reduce the errors that might occur. Nevertheless, there is no formal training or communication of procedures, standards, and responsibilities directed to the individuals. The procedures themselves are incomplete but have formalised ongoing practices (see Figure 3).



Maturity Level Model

Implications of Managerial Aspects

The implementation of information technology governance at the retail business environment of beauty cosmetics is expected to reach the third level (defined process). However, based on the computation, the maturity level of information technology governance has not exceeded the maximal limit value (i.e. 2.50). This indicates that there are a number of gaps that should be omitted to reach a fine maturity level. Hence, the whole DS Processes of information technology should be enhanced by referring to the control objective detail of each DS process (see Table 4).

As it is resulted from this research, the whole process specification has different types (i.e. priority and super priority) in terms of need immediacy of enhancement. There are two information technology processes mainly prioritised such as DS4 and DS8. The others that should get priority of enhancement are DS1, DS2, DS3, DS5, DS6, DS7, DS9, DS10, DS11, DS12, and DS13 (see Table 4).

III. MATURITY LEVEL GAPS

Domain	Process	Current Maturity	Expected Maturity	Difference	Priority Type
DS1	Define and Manage Service Levels	2.143	3	0.857	*Priority*
DS2	Manage Third-party Services	2.060	3	0.940	*Priority*
DS3	Manage Performance and Capacity	1.880	3	1.120	*Priority*
DS4	Ensure Continuous Service	1.750	3	1.250	*Super Priority*
DS5	Ensure Systems Security	1.900	3	1.100	*Priority*
DS6	Identify and Allocate Costs	1.998	3	1.002	*Priority*
DS7	Educate and Train Users	1.927	3	1.073	*Priority*
DS8	Manage Service Desk and Incidents	1.789	3	1.211	*Super Priority*
DS9	Manage the Configuration	1.860	3	1.140	*Priority*

Domain	Process	Current Maturity	Expected Maturity	Difference	Priority Type
DS10	Manage Problems	1.840	3	1.160	*Priority*
DS11	Manage Data	1.810	3	1.190	*Priority*
DS12	Manage the Physical Environment	1.874	3	1.126	*Priority*
DS13	Manage Operations	1.848	3	1.152	*Priority*

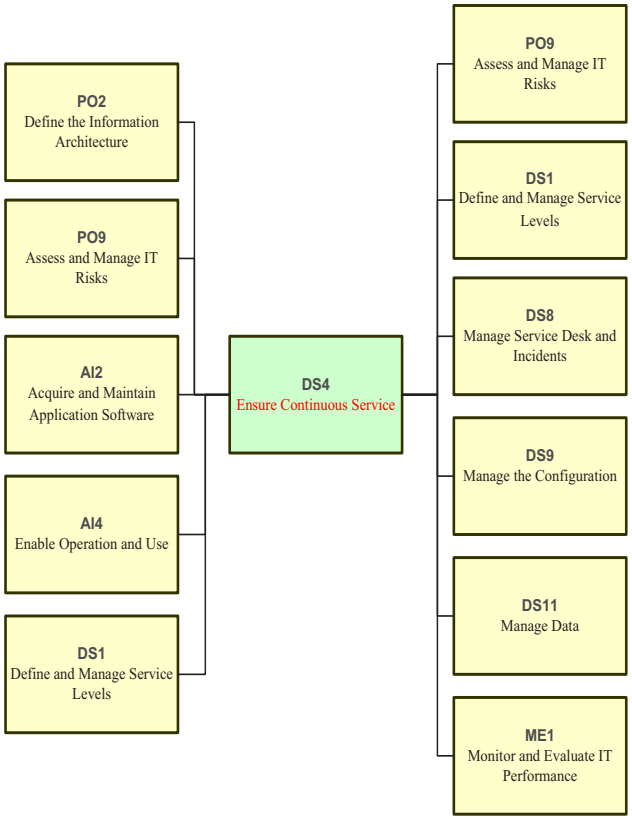
The measurement results present the need of defining the process maturity level indicating that the better the measured performance is or the more fulfilled the size of the defined process is, the higher maturity level of the process is. The maturity level is determined by adjusting the measurement results and the existing standard in COBIT 4.1 Framework, defining and redefining all the policies and procedures, changing the value of the performance indicators, adding control objectives, and completing the information technology processes until there is assurance that the process management has fulfilled the standard of fine information technology management.

In addition to the process enhancement, management, particularly the heads of the companies are required to correct the inappropriateness of the existing and standardised business processes in order to avoid the similar thing happening in the future. Because the processes are necessary to enhance, there should be capabilities to determine the performance measurement indicators and understand the current condition through the maturity level determination. Also, sustainable involvement of the heads of the companies, the users, and the public in information technology processes is obviously needed to ascertain the steps taken match the actual occurrences.

Recommendations of Information Technology Governance on DS4

Key Performance Indicators (KPI) of DS Domain, particularly those related to the control objective of DS4 Process are made to ensure the sustainable service with other control objectives in information technology governance. The control objective inputs consist of PO2 (Define the Information Architecture), PO9 (Assess and Manage IT Risks), AI2 (Acquire and Maintain Application Software), AI4 (Enable Operation and Use), and DS1 (Define and Manage Service Levels), while the control objective outputs comprise PO9 (Assess and Manage IT Risks), DS1 (Define and Manage Service Levels), DS8 (Manage Service Desk and Incidents), DS9 (Manage the Configuration), DS11 (Manage Data), and ME1 (Monitor and Evaluate IT Performance).

The focus of DS4 Domain is on enhancing the processes of redefining and stating the tasks and the responsibilities to ascertain the sustainability of the service system and the information supports. Possessing a sustainable plan and E-PAS service to punctually provide the information of the goods procurement, specific documentation of all the system needs and work activities, and periodic information system can show consistent procurement of goods carried out by interrelated work units (see Figure 4)



Interrelationship between DS4 Process and Other Information Technology Processes

CONCLUSION AND PERSPECTIVE

The maturity level of information technology governance of a number of retail businesses engaged in beauty cosmetics indicates that the average value of DS Domain is 1.898. Descriptively, it means that not all values specifically reach the third level (defined process). Meanwhile, the lowest value is found at DS4 (Ensure Continuous Service) Process with 1.750.

DS4 (Ensure Continuous Service) Domain has interrelationship that can be seen from the control objective inputs comprising PO2, PO9, AI2, AI4, and DS1. Meanwhile, the control objective outputs consist of PO9, DS1, DS8, DS9, DS11, and ME1. The evaluation of the maturity level must be measured periodically in any domains to have the unity of information in achieving the expected maturity level.

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Fig. 2. Measured S-parameters of the antenna prototypes.