Evaluation of Maturity Level of E-Procurement Application Systems

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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].

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

Fig 1 The Model of COBIT Cube
(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 = \( \sum (\text{sum of answers} \times \text{the maturity value}) \div (\text{number of questions} \times \text{number of respondents}) \)). The rounding index scales of the levels of the maturity model are shown in Table 1 [15].

**TABLE Rounding INDEX SCALES**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Maturity Level Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.51 – 5.00</td>
</tr>
<tr>
<td>2</td>
<td>3.51 – 4.50</td>
</tr>
<tr>
<td>3</td>
<td>2.51 – 3.50</td>
</tr>
<tr>
<td>4</td>
<td>1.51 – 2.50</td>
</tr>
<tr>
<td>5</td>
<td>0.51 – 1.50</td>
</tr>
<tr>
<td>6</td>
<td>0.00 – 0.50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level</th>
<th>Maturity Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Non-exist</td>
</tr>
<tr>
<td>1</td>
<td>Existent</td>
</tr>
</tbody>
</table>

**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].

**VI. GENERIC MATURITY MODEL**

<table>
<thead>
<tr>
<th>Level</th>
<th>Maturity Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Complete lack of any recognisable processes. The enterprise has not even recognised that there is an issue to be addressed.</td>
</tr>
<tr>
<td>1</td>
<td>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.</td>
</tr>
<tr>
<td>2</td>
<td>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.</td>
</tr>
<tr>
<td>3</td>
<td>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.</td>
</tr>
<tr>
<td>4</td>
<td>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.</td>
</tr>
<tr>
<td>5</td>
<td>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.</td>
</tr>
</tbody>
</table>

**VII. MATURITY LEVEL GAPS**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Process</th>
<th>Testing Result</th>
<th>Maturity Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS1</td>
<td>Define and Manage Service Levels</td>
<td>2.143</td>
<td>3</td>
</tr>
<tr>
<td>DS2</td>
<td>Manage Third-party Services</td>
<td>2.060</td>
<td>3</td>
</tr>
</tbody>
</table>
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).

### VIII. MATURITY LEVEL GAPS

<table>
<thead>
<tr>
<th>Domain</th>
<th>Process</th>
<th>Testing Result</th>
<th>Maturity Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS3</td>
<td>Manage Performance and Capacity</td>
<td>1.880</td>
<td>3</td>
</tr>
<tr>
<td>DS4</td>
<td>Ensure Continuous Service</td>
<td>1.750</td>
<td>3</td>
</tr>
<tr>
<td>DS5</td>
<td>Ensure Systems Security</td>
<td>1.900</td>
<td>3</td>
</tr>
<tr>
<td>DS6</td>
<td>Identify and Allocate Costs</td>
<td>1.998</td>
<td>3</td>
</tr>
<tr>
<td>DS7</td>
<td>Educate and Train Users</td>
<td>1.927</td>
<td>3</td>
</tr>
<tr>
<td>DS8</td>
<td>Manage Service Desk and Incidents</td>
<td>1.789</td>
<td>3</td>
</tr>
<tr>
<td>DS9</td>
<td>Manage the Configuration</td>
<td>1.860</td>
<td>3</td>
</tr>
<tr>
<td>DS10</td>
<td>Manage Problems</td>
<td>1.840</td>
<td>3</td>
</tr>
<tr>
<td>DS11</td>
<td>Manage Data</td>
<td>1.810</td>
<td>3</td>
</tr>
<tr>
<td>DS12</td>
<td>Manage the Physical Environment</td>
<td>1.874</td>
<td>3</td>
</tr>
<tr>
<td>DS13</td>
<td>Manage Operations</td>
<td>1.848</td>
<td>3</td>
</tr>
</tbody>
</table>

**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).
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)

<table>
<thead>
<tr>
<th>Domain</th>
<th>Process</th>
<th>Current Maturity</th>
<th>Expected Maturity</th>
<th>Difference</th>
<th>Priority Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS10</td>
<td>Manage Problems</td>
<td>1.840</td>
<td>3</td>
<td>1.160</td>
<td>Priority</td>
</tr>
<tr>
<td>DS11</td>
<td>Manage Data</td>
<td>1.810</td>
<td>3</td>
<td>1.190</td>
<td>Priority</td>
</tr>
<tr>
<td>DS12</td>
<td>Manage the Physical Environment</td>
<td>1.874</td>
<td>3</td>
<td>1.126</td>
<td>Priority</td>
</tr>
<tr>
<td>DS13</td>
<td>Manage Operations</td>
<td>1.848</td>
<td>3</td>
<td>1.152</td>
<td>Priority</td>
</tr>
</tbody>
</table>

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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