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Using COBIT4.1 in Evaluating Hospital ITG Implementation

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INFORMASI ARTIKEL	ABSTRAK
Sejarah artikel: Diterima: 15 Juli 2020 Diterima revisian: 12 Oktober 2020 Diterima publikasi: 20 Oktober 2020	<i>This research has an intention to evaluate the implementation of IT governance in a private hospital (Hospital X) in Padang city by using COBIT 4.1 framework; and to recommend IT governance practices that can improve IT governance at the hospital in the future. COBIT 4.1 provides model of processes found in IT activities in 4 domain, Plan and Organize (PO), Acquire and Implement (AI), Deliver and Support (DS), and Monitor and Evaluate (ME). Data were collected by using document evaluation, interview and observations. The result showed that IT governance implementation at the hospital has not achieved the best practice yet. The existence of activities related to IT governance is defined, but inconsistency still happens. There are 28 IT processes out of 34 IT processes and 110 detailed control objectives exist out of 210 detailed control objectives. The identified IT processes show the existing IT activities in the hospital support the achievement of its strategy and objectives. Control objectives of each IT process needs to be implemented for more effective process. The hospital should optimize the practices of each IT process for optimal results.</i>
Kata Kunci: IT Governance COBIT 4.1 Maturity Models Self-Assessment	

1. INTRODUCTION

The advancement in Information Technology (IT) and its utilization increase over time. The accuracy and quick flow of information are demanded in business practice as well. IT provides opportunity to gain competitive advantage of an enterprise and offers the equipment to improve productivity. IT helps to improve the effectiveness and efficiency of the organization business process to achieve its goals. Meanwhile, the increased roles of IT has to be directly proportional to the investment on

IT, which is generally in large amount (Modissa and Rachmansyah, 2015). So, IT investment needs careful planning and optimum implementation.

As said by Pribadi (2015), when IT implementation does not get attention from the top management, it can lead to financial loss. The integrity of data is not assured if the incorrect data is processed which results in inaccurate information. A project reputation can be damaged by the over-budget on IT, overtime on practice, and under-specification of the IT. A company will be able to make sure that IT activities will support the achievement of its purpose by having IT governance. Furthermore, Abu-Musa (2007) said that integrated IT and institutionalized best practices through planning and organizing, acquiring and implementing, delivering and supporting, and monitoring IT performance will give opportunity to the company achieve its business objectives. IT governance makes the organization to take full advantage of its information. It will also can maximize its benefits, capitalize opportunities and gain competitive advantage. IT governance also identifies the deficiency of control and assures improvement of implementation that can be measured efficiently and effectively.

According to Information Technology Governance Institute (ITGI), a standardization, procedure, and evaluation on IT governance is needed to be the basis to assess how the enterprise is performing against generally accepted standards and its peers, or benchmarking, and to improve the utilization of IT in accordance with the enterprise's strategic purposes. IT governance needs to be evaluated to know the extent of IT governance implementation in current condition and potential development towards better IT governance (Nugraha, 2012). There are several frameworks exist as the reference of control and are developed to help entity to create good control system. They include COBIT, IT Infrastructure Library (ITIL), ISO 27000, ISO 9001:2000 Quality Management Systems-Requirements, Capability Maturity Model Integration (CMMI), and A Guide to the Project Management Body of Knowledge (PMBOK). Some evaluate using balance scorecard, STOPE and other methods adapting from existing frameworks.

COBIT 4.1 is considered to provide a measurement of the IT governance in an enterprise by using maturity model. The maturity model scales will help professionals explain to managers where IT process management shortcomings exist and set targets for where they need to be. Maturity model has no intention to measure levels precisely or try to certify that a level has exactly been met. A COBIT maturity assessment is likely to result in a profile where conditions relevant to several maturity levels will be met (ITGI, 2007).

COBIT is universally accepted as the best practice or practical guidelines in information control, IT and related risks (ITGI, 2007). COBIT provides the measurement, indicator, processes and collection of best practices to assist entities in its governance and develop control over IT management. The framework describes several specific IT control and security processes. The specific IT control may be able to enhance its ability to achieve its business goals and to improve internal control, finally can reduce the risk associated with IT. Management guidelines, as one of COBIT 4.1 component, provide required framework by management to control and measure IT performance by implementing IT capability measurement through 34 IT processes. COBIT 4.1 provides model of processes found in IT activities in 4 domain, Plan

and Organize (PO), Acquire and Implement (AI), Deliver and Support (DS), and Monitor and Evaluate (ME). Each IT process has detailed control objectives (ITGI, 2007).

Hospital X is one of the hospitals that is located in Padang, West Sumatera. The hospital is a private grade C hospital. As a hospital that has a vision to improve to grade B, it has implemented IT as its tool to serve the community and improve public health. The IT system has to support the entity's purpose and act as a tool to assist performance achievement. However, health care systems are facing significant challenges associated with information systems management. Other problems faced by the hospital are poor management of the project, unappropriated allocation of IT budgets, lack of operational management of IT, and security management as well as data protection. By having IT governance, the hospital, through IT governance frameworks will be able to provide proper solution for many of such challenges (Kuhn et al., 2007). This research has an intention to evaluate the implementation of IT governance in Hospital X, Padang by using COBIT 4.1 framework; and to recommend IT governance practices that can improve IT governance in Hospital X in the future.

2. LITERATURE REVIEW

Information technology is a huge advantage to businesses by allowing organizations to work more efficiently and to maximize productivity. Kumar (2014) found out that there are several advantages of information technology, include: (1) Globalization: IT has brought the world closer together and allowed the world's economy to become a single interdependent system; (2) Communication: IT helps to make communication cheaper, quicker, and more efficient; (3) Cost effectiveness: IT has helped to computerize the business process thus streamlining businesses to make them extremely cost effective money making machines; (4) Bridging the cultural gap; IT can helped to bridge the cultural gap by helping people from different cultures to communicate with one another, and allow for the exchange of views and ideas, thus increasing awareness and reducing prejudice; (5) Creation of new jobs: IT has helped in the creation of new jobs, e.g., computer programmers, systems analyzers, hardware and software developers and web designers are just some of the many new employment opportunities created with the help of IT; (6) Automated processes; IT improves a company's efficiency by implementing automated processes and make employees more capable in handling a larger work load; and (7) Remote access or telecommuting.

2.1. IT Governace

The Information Technology Governance Institute (ITGI), defined IT governance as: "the responsibility of executives and the board of directors, and consists of the leadership, organizational structures and processes that ensure that the enterprise's IT sustains and extends the organization's strategies and objectives". Bermejo et. Al, (2014) found out the importance of the alignment between IT

and business. The alignment include practices that promote synergy between senior management, IT, and other organizational areas. The company should align business strategy with IT decision making, mix staff skills, both on business and IT. IT decisions made by managers in the company will have a big impact on the entire company successful. If IT governance is well-planned, it will provide a clear and transparent decision-making process, resulting in consistent and desirable behavior and organizational profits. Bermejo study suggested that factor relational mechanisms and business knowledge are crucial to provide satisfactory organizational and IT performance.

In order to encourage the proper functioning of processes and structures, relational mechanisms can be one of the first steps to develop appropriate IT governance in organizations. The development of an assessment tool to measure IT governance capacity and results can contribute in two ways. Firstly, the instrument provided by the company can be used to evaluate processes involving IT governance structures. It also can be used to evaluate relational mechanisms, informing organizational and IT actions. Secondly, from the academic point of view, the assessment tool assists in developing an explanatory model of IT governance and business performance results by considering the correlations among capacities in processes, structures, and relational mechanisms.

There are some evidences show that IT Governance (ITG) created value for organizations. Pereira and da Silva (2012) stated that there are evidences of the positive effect of good ITG implementation in organizations. With the help of well-organized ITG, organizations may increase their return on IT investments by as much as 40% (Weil and Ross, 2004). Enterprises that perform well in ITG may gain returns on IT investment 40% higher than their competitors; given the same business strategy, those with an average performance in ITG may make 20% more profit (Lingyu et al., 2010).

In spite of all these evidences about influence of ITG in organizations' success and returns, there are also evidences of IT continuously being badly managed and governed. For example study found by Lunardi et al. (2009). The study shows evidence that 72% of IT projects are late, over-budget, lacking in functionality, or never delivered. Besides, only 28% considered as "successful" projects, 45% were over budget, and 68% took longer than planned. Lunardi et al. (2009) highlight the fact that many companies spend about 50% of all their capital investment on IT. Gao et al. (2009) conclude and affirm that huge IT investment did not bring significant benefits. Most companies evaluate their IT governance implementation by using COBIT and CMMI, because they are the most well-known as frameworks and best practices. The result of the evaluation will reflect the condition of IT governance in present, and help the companies to know which part they can improve to reach their targeted performance of IT governance.

2.2. IT Governance in Hospital

Shahi et al. (2015) stated that many senior managers of organizations rely on IT based initiatives to control health care systems. Health Information Management Systems Society (HIMSS) suggested the use of information technology in hospital will improve hospital performance and

can reduce costs (HIMSS, 2008). According to Asadi & Mastaneh (2012), health care systems are facing significant challenges associated with information systems. In addition, the hospital's data are complex to manage conventionally without the help of Hospital Management Information Systems as called *SIMRS* (Handiwidjojo, 2009). Study conducted by Kuhn (2007) found out that most of hospital information systems lack of proper management that create unsuitable conditions for development of hospital information systems. In addition, information systems in health sector has poor management of the project; imbalanced allocation of IT budgets; poor operational management of IT; and security management and data protection. So, IT governance frameworks can provide proper solution for many of such challenges (Kuhn et al., 2007).

The American Health Information Management Association (AHIMA) has also issued its "Information Governance Principles for Healthcare". AHIMA (2014) defines information governance as :

an organization-wide framework for managing information throughout its lifecycle and supporting the organization's strategy, operations, regulatory, legal, risk, and environmental requirements. Information governance establishes policy, prioritizes investments, values and protects information assets, and determines accountabilities for managing information, making it an imperative for healthcare.

Well-designed IT governance helps empower management and enable value across a healthcare organization. IT governance provides a means for a healthcare enterprise to validate that IT-related decisions are aligned strategically with where the business wants to go. It is not a stand-alone process, but a set of integrated practices and structures that enable oversight for all IT activity. By this definition, IT governance must be embedded in everything the IT function does (Haseley and Brucker, 2012). IT governance helps healthcare organizations keep strategic objectives in focus, while ensuring balanced and predictable IT delivery for the enterprise. Businesses in the healthcare field and their IT leadership, with guidance from internal audit, need to adjust their IT governance approach continuously to ensure IT decisions made in the enterprise are generating the desired business value. And having an effective IT governance approach in place can help you adapt to changing technology and business demands in the healthcare field with greater speed and confidence (Haseley and Brucker, 2012). According to PERMENKES RI No. 82 *Tahun* 2013, in the organization structure, the hospital should own a unit/installation of IT that consists of the head of *SIMRS*, and the staff of functional IT (e.g., system analyst, programmer, hardware, and network maintenance staffs).

2.3. IT Governance Frameworks and Evaluation

There are several frameworks that define the guidelines which an organization can implement, manage and monitor IT governance within an organization. Frameworks also provide measures to effectively utilize IT resources and processes within an organization. They primarily help organizations to evaluate the performance and effectiveness of the IT governance processes. Parts of them are IT Infrastructure Library (ITIL), Capability Maturity Model Integration (CMMI), and Control Objectives for Information and related Technology (COBIT).

ITIL is best practices framework for identifying, planning, delivering, improving, and supporting IT Service Management (ITSM) that focuses on aligning IT services with the needs of business. The framework shows processes, procedures, tasks, and checklists that can be applied by an organization for establishing integration with the organization's strategy, delivering value, and maintaining a minimum level of competency. The framework will allow the organization to establish a baseline from which it can plan, implement, and measure. It is used to demonstrate compliance and to measure improvement (<https://en.wikipedia.org/wiki/ITIL>). ITIL creates a communication path between IT organization and the business, because it enables IT organizations to deliver services that satisfy the business' needs and are aligned with the business' goals. It also aligns IT services to the needs and goals of the business. ITIL provides a structured approach to launching and maintaining IT services. It also provide a proactive management plan to assess operational health, predictability, and accountability for all IT services.

Capability Maturity Model Integration (CMMI) is a framework that can be used for appraising the process maturity of an organization. CMMI models provide guidance for developing or improving processes that meet the business goals of an organization. CMMI was developed by a group of experts from industry, government, and the Software Engineering Institute (SEI). According to the SEI (2008), CMMI will provide a guideline to integrate traditionally separate organizational functions, to set process improvement goals and priorities, to provide guidance for quality processes, and to provide a point of reference for appraising current processes. CMMI supports two improvement paths. The paths are associated with capability levels and maturity levels. The maturity level provides a way to characterize its performance and it will be able to show that organizations do their best when they focus their process improvement efforts on a manageable number of process areas at a time. Maturity levels in CMMI are followed by COBIT. Therefore, they have same characteristics, as explained before. However, CMMI has a scale from 1-5, while COBIT has a scales from 0-5. COBIT has added 0 to the scale due to it being possible that no process exists at all. These levels will be used the means to improve the processes corresponding to a given set of process areas.

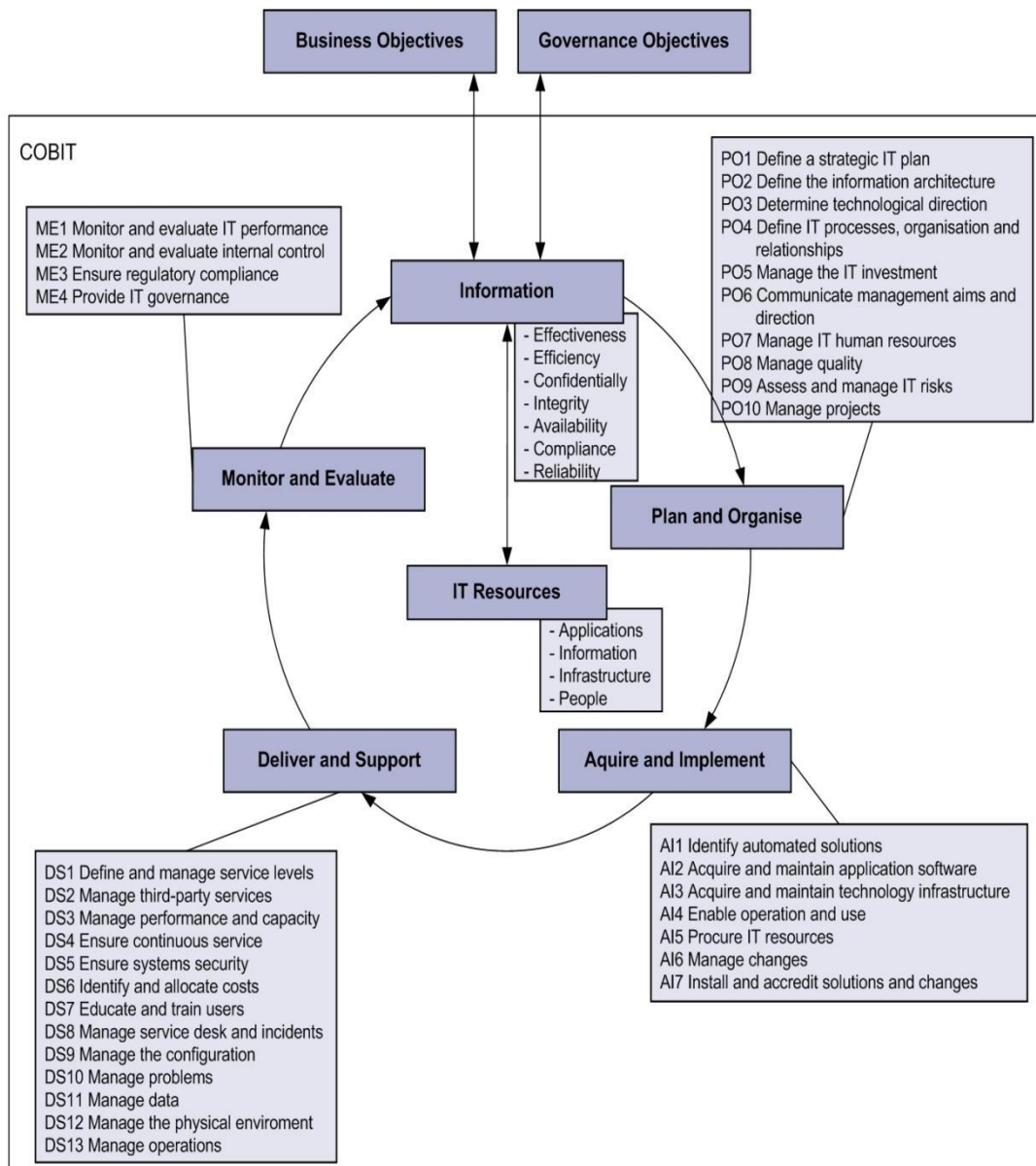
The mission of COBIT is to research, develop, publicize and promote an authoritative, up-to-date, internationally accepted IT governance control framework. The adoption will help day-

to-day usage by business managers, IT professionals and assurance professionals (ITGI, 2007). COBIT provides good practices across a domain and process framework and presents activities in a manageable and logical structure. These practices will help to optimize IT-enabled investments, ensure service delivery and provide a measure against which to judge when things do go wrong (ITGI, 2007). COBIT enables the development of clear policies and good practice for IT control throughout enterprises, also help senior management to understand and manage the risks associated with IT. COBIT does this by providing IT Governance framework and detailed control objective instructions for the management, business process owners, users and auditors (ITGI, 2007).

Hence, COBIT has become the integrator for IT good practices and the umbrella framework for IT governance that helps in understanding and managing the risks and benefits associated with IT. The process structure of COBIT and its high-level, business-oriented approach provide an end-to-end view of IT and the decisions to be made about IT (ITGI, 2007). The COBIT control framework contributes to these needs for IT to be successful in delivering against business requirements by: making a link to the business requirements; organizing IT activities into a generally accepted process model; identifying the major IT resources to be leveraged; and defining the management control objectives to be considered.

2.4. COBIT 4.1 Framework

Control Objectives for Information and related Technology (COBIT) is a generally accepted internal control framework for IT framework and supporting tool set that allow managers to bridge the gap with respect to control requirements, technical issues and business risks, and communicate that level of control to stakeholders. COBIT was created by the IT Governance Institute (ITGI) and Information System Audit and Control Association (ISACA) in 1992. COBIT 4.1 was released in 2007. Increasingly, top management is realizing the significant impact that information can have on the success of the enterprise. Management expects heightened understanding of the way IT is operated and the likelihood of its being leveraged successfully for competitive advantage. In particular, top management needs to know if information is being managed by the enterprise so that it is likely to achieve its objectives, enable to learn and adapt, judiciously managing the risks it faces, and appropriately recognizing opportunities and acting upon them (ITGI, 2007).



COBIT Framework
Source: ITGI, 2007

3. RESEARCH METHODOLOGY

This research was done by collecting data and studying what others have written about the research question and the topic in order to obtain further understanding. Data was obtained from sources such as books, literature, journals, and articles. In order to find related literature for this research, the key search related to COBIT, IT Governance, information system audit and *SIMRS* were used during January to June 2017. This research used qualitative data analysis in data analyzing technique. The steps to this technique were identifying Hospital X's business goals and map to COBIT business goals. The researcher analyzed the related organizational documents to identify business goals of the hospital. These documents are the cornerstone of business goals of the hospital. Primary data is a data which is obtained from first source through interview and observation. The secondary data are taken from documentation, i.e. the

organization structure, history, vision and mission, goals, strategy, policies regarding to IT and *SIMRS* and Standard Operating Procedure (SOP). All these data are needed to identify the goals and objectives of the company's business and to align them with company's IT Goals

After analyzing business goals of the enterprise, the researcher mapped them to Business Goals by COBIT 4.1. Business goals needed to be translated into IT goals, because they define the IT resources and capabilities required to successfully execute IT's part of the enterprise's strategy. The researcher identified COBIT IT goals by linking identified business goals to IT goals based on guideline in COBIT 4.1. The maturity level is provided in COBIT 4.1 by ITGI. The 0-5 scale is based on a simple maturity scale showing how a process evolves from a non-existent capability to an optimized capability. The scale includes 0 because it is quite possible that no process exists at all, while 5 is optimized. Table 1 shows the capability and explanation of each capability of each scale used in COBIT 4.1.

Table 1. Explanation of COBIT 4.1 Scale

Scale	Capability	Explanation of the Capability
0	Non-existent	Complete lack of any recognizable IT governance processes. The enterprise has not even recognized that there is an issue to be addressed and not even aware about the importance of IT governance by the management. No IT processes identified.
1	Initial/Ad Hoc	There is evidence that the enterprise has recognized that the issues exist and need to be addressed. There are, however, no standardized 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 disorganized. The planning, designing, and management is not organized well.
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 to happen. The existence of activities related to IT governance is defined, but inconsistency still happens.
3	Defined Process	Procedures have been standardized 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 formalization 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	Optimized	Processes have been refined to a level of good practice, as the results of continuous improvement and maturity modeling 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 enterprise has implemented IT governance that refers to the best practice or have been automated to the system based on planned and organized process and use the appropriate method.

Source: ITGI (2007)

4. RESEARCH RESULTS AND RECCOMENDATIONS

The existence of activities related to IT governance is defined, but inconsistency still happens. Based on the mapping result between the business goals of Hospital X and COBIT Framework 4.1, there are 28 IT processes out of 34 IT processes and 110 detailed control objectives exist out of 210 detailed control objectives. The absence of some IT processes does not necessarily indicate that the IT governance practices are not good. The identified IT processes show the existing IT activities in Hospital X that support the achievement of its strategy and objectives. Control objectives of each IT process needs to be implemented for more effective process. Hospital X should optimize the practices of each IT process by considering to implement complete control objectives of identified IT processes. In Hospital X, there are 5 IT processes in Managed and Measurable level, 14 processes in Defined level, 7 IT processes in Repeatable but Intuitive level, 1 process in Initial/adhoc level and 1 in Non-existence level. More than half of the IT processes are considered to be good practices and the remainder need improvement for effective IT governance practices in the future.

From the IT governance practices implemented in Hospital X, the enterprise has implemented 4 out of 5 IT governance focus areas. They are:

- a. Strategic alignment: The existence of IT and *SIMRS* helps Hospital X to operate and achieve its objectives. IT contributes through its capability to create the alignment of IT activities with enterprise's objectives and strategy.
- b. Value delivery: IT investments, assets and services delivers the value in supporting Hospital X's strategy and objectives.
- c. Resource management: Hospital X has standards in procurement IT resources and assesses them to ensure appropriate resourcing.
- d. Performance measurement: There are measurements of IT resources performance (IT personnel, application and infrastructure) and IT activities even though inconsistently conducted.

Meanwhile, the risk management cannot be identified. There is no process of defining, assessing and reporting IT risks to ensure that the actual IT risk does not exceed the board's risk appetite. Table 2 shows Maturity Level of each domain and the explanation for the domain.

Table 2. Maturity Level Per Domain

Domain	Maturity Level	Explanation
Plan and Organize (PO)	2.7	Repeatable but Intuitive
Acquire and Implement (AI)	3.1	Defined
Deliver and Support (DS)	3	Defined
Monitor and Evaluate (ME)	2.5	Repeatable but Intuitive
Average	2.8	Repeatable but Intuitive

Based on Table 2, the average maturity levels is 2.8 where the domains are in between 2.7 and 3.1. There are 2 domains such as Acquire and Implement (AI) and Deliver and Support (DS) are defined already. However, Plan and Organize (PO), Deliver and Support (DS), and Monitor and Evaluate (ME) are still Repeatable but Intuitive. They need to be improved more. The followings will explain the Maturity Level for Scoring of Plan and Organize (PO) Domain, Acquire and Implement (AI) and Deliver and Support (DS), and Monitor and Evaluate (ME).

Based on usage of the measurement of maturity level explained in Table 2, it is found out that the IT governance implementation in Hospital X is in level 2.8, it means that it is Repeatable but Intuitive. This means the IT governance implementation in Hospital X has not achieved the best practice yet. Almost all procedures are documented and communicated, but mostly are outdated. The minimum skill requirements are identified for critical areas. A formal training is established and the effectiveness of the training is assessed. Some responsibilities are assigned, and others are left to individual. There is inconsistent monitoring to IT resources. The use of automated tools is emerging.

Table 3. Maturity Level Scoring of Plan and Organize (PO) Domain

Plan and Organize		Level	Explanation
PO1	Define a strategic IT plan	2	Repeatable but Intuitive
PO2	Define the information architecture	3	Defined
PO3	Determine technological direction	2	Repeatable but Intuitive
PO4	Define the IT process, organization and relationship	3	Defined
PO5	Manage IT investment	3.5	Defined
PO6	Communicate management aims and direction	3.5	Defined
PO7	Manage IT human resources	4.5	Managed and Measurable
PO8	Manage quality	0	Non- existent
PO10	Manage projects	3	Defined

Average		2.7	Repeatable but Intuitive
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Table 3 shows that the average level of Plan and Organize (PO) Domain is 2.7. It means that it is repeatable but intuitive. Out of 10 sub Domain for Plan and Organize (PO) Domain, PO7 (Manage IT human resources) has the highest score in this domain. It means that Hospital X can manage IT human resources very well. However, PO8 (Manage quality) is still not exist. It means that management is still focus on human resource management but not toward the IT yet. The rest of the sub domain are still in between 2 to 3.5. There are 5 sub domains that are defined and 3 sub domains that are Repeatable but Intuitive. It means that the hospital need to improve its IT Plan and Objective. Based on the findings and analysis, recommendation needed for Plan and Organize (PO) Domain presented in Table 4.

Table 4. Recommendation needed for Plan and Organize (PO) Domain

IT Process	Recommendation
PO1	a. The responsibility to define IT strategic plan should be assigned. The plans should be formally documented and communicated to relevant stakeholders. Clear plans will help in evaluation and identification of required improvements. b. The IT tactical plans that derived from IT strategic plan as detail and describe required IT initiatives, resource requirements, and how the use of resources and achievement of benefits will be monitored and managed. c. Benchmarking against well-understood and reliable industry norms should take place and is integrated with the strategy formulation process.
PO2	a. Establish a team of supervisors who is responsible for monitoring and evaluating the implementation of the current information architecture and is a combination of IT staff and users so that they can have more comprehensive knowledge. b. Determine the effectiveness standards for the implementation of information architecture and quantity and quality required for the human resources. c. Perform periodic testing on implementation of information architecture based on predefined standards.
PO3	a. Formal procedure and assign responsibilities on technological direction planning and technology infrastructure plan b. Establish an IT architecture board to provide architecture guidelines and advice on their application, and to verify compliance. This entity should direct IT architecture design, ensuring that it enables the business strategy and considers regulatory compliance and continuity requirements. c. The direction of the technology infrastructure plan should be guided by industry and international standards and developments, rather than driven by technology vendors
PO4	a. Establish IT department that separates from HR department and focuses on IT planning, development and maintenance. It will lessen the segregation of duties issues. b. Assign responsibility for IT quality assurance.
PO5	a. The ROI of <i>SIMRS</i> should be calculated. b. The expected delivery value of IT investment should be determined. c. Implement a process to monitor the benefits from IT investments (benefit management). IT's contribution to the business, either as a component of IT investment program or as part of regular operational support that should be identified and documented. Then it should be monitored to identify opportunities to improve IT's contribution.
PO6	a. Develop and maintain a framework that defines the enterprise's overall approach to IT risk and control and that aligns with the IT policy and control environment and the enterprise risk and control framework. b. The monitoring and compliance checking of the management aims and direction to the current

	condition should be consistently conducted.
PO7	a. Establish standardized measures to allow identification of deviations from the IT human resources management plan. b. IT human resources management is integrated with technology planning, ensuring optimum development and use of available IT skills.
PO8	Establish and maintain a QMS that provides a standard, formal and continuous approach regarding quality management that is aligned with business requirements. The QMS should identify quality requirements and criteria, the policies and methods for defining, detecting, correcting and preventing non-conformity. The responsibility and tasks should be assigned to individual. All key areas should develop their quality plans in line with criteria and policies and record quality data. Monitor and measure the effectiveness of the QMS, and improve it when needed.
PO10	a. Maintain IT investment program by identifying, defining, evaluating, prioritizing, selecting, initiating, managing and controlling projects. Co-ordinate the contribution of all the projects within the program to expected outcomes, and resolve resource requirements and conflicts. b. Eliminate or minimize specific risks associated with projects with project risk management. c. Plan the project quality assurance methods in the final stage of the project.

Average score level based on analysis conducted on maturity level scoring of Acquire and Implement (AI) Domain is 3.1. Table 5 shows the Maturity Level Scoring of Acquire and Implement (AI) Domain. Out of 7 sub-domains analyzed in this category, the lowest score is 2 for acquire and maintain technology infrastructure, while the highest score is for procure IT Resources. While the rest of sub domains are defined. It means that it is defined and procedures have been standardized and documented, and communicated through training.

Table 5. Maturity Level Scoring of Acquire and Implement (AI) Domain

Acquire and Implement		Level	Explanation
AI1	Identify Automated Solutions	3	Defined
AI2	Acquire and Maintain Application Software	3	Defined
AI3	Acquire and Maintain Technology Infrastructure	2	Repeatable but Intuitive
AI4	Enable Operation and Use	3.5	Defined
AI5	Procure IT Resources	4.5	Managed and Measurable
AI6	Manage Changes	3	Defined
AI7	Install ad Accredited Solutions and Changes	3	Defined
Average		3.1	Defined

Based on the findings and analysis, recommendation needed for Acquire and Implement (AI) Domain in the hospital shows in Table 6.

Table 6. Recommendation needed for Acquire and Implement (AI) Domain

IT Process	Recommendation
AI1	a. Hospital X should have an established methodology for identification and assessment of IT solutions and use it for most projects. b. The IT solution identification methodology should be measurable or possessing effectiveness criteria.. c. Hospital X should make risk analysis report. It should identify, document and analyze risks associated with the business requirements and solution design as part of the organization's process for the development or requirements.
AI2	a. The IT staff should reassess if the software design from vendor has consider the technological direction, information architecture and needs of Hospital X Padang. b. Establish an application software maintenance procedure and schedule as preventive action. c. Develop the software quality assurance (QA) plan to obtain quality specified in the requirements and act as a monitoring tools in the future.
AI3	a. Develop formal acquisition and maintenance plans of technological infrastructure. b. Establish the QA procedure for IT infrastructure acquisition. c. Monitor the internal control and security of infrastructure resources.
AI4	a. The SOP should be updated and reviewed periodically to see any outdated and irrelevant SOP. b. Develop the effectiveness and effective criteria of manuals (SOP) to users.
AI5	a. Good relationships are established over time with most suppliers and partners, and the quality of relationships is measured and monitored. b. IT standards, policies and procedures for the acquisition of IT resources should be periodically reviewed.
AI6	a. Establish change management with the decision of the management so that the implementation has legal basis and commitment from the management of Hospital X. b. Hospital X should establish a tracking and reporting system to document changes, communicate the status of approved and in-process changes, and complete changes. c. There should be a consistent process for monitoring for the quality and performance of the change management process, since right now they are only checked if there's following problems.
AI7	a. Establish a test plan based on organization-wide standards that defines roles, responsibilities, and entry and exit criteria of the solutions and changes. b. Evaluation of meeting user requirements is standardized and measurable, producing metrics that can be effectively reviewed and analyzed by management. c. Post-implementation reviews should be standardized, with lessons learned channeled back into the process to ensure continuous quality improvement.

Table 7 shows Maturity Level Scoring of Deliver and Support (DS) Domain. The lowest score is for sub-domain 1 (DS1). The score is 1 and it still in the stage of initial or ad hoc. It means that there is evidence that the enterprise has recognized that the issues exist and need to be addressed. The highest score is 4 for sub domain DS2, DS7, DS13, where they are managed and measurable. However, the average score is 3 or defined. The result shows that procedures have been standardized and documented, and communicated through training.

Table 7. Maturity Level Scoring of Deliver and Support (DS) Domain

Deliver and Support		Level	Explanation
DS1	Define and Manage Service Levels	1	Initial/ Adhoc
DS2	Manage Third-party Services	4	Managed and Measurable
DS3	Manage Performance and Capacity	3.5	Defined

DS4	Ensure Continuous Service	2	Repeatable but Intuitive
DS6	Identify and Allocate Costs	3.5	Defined
DS7	Educate and Train Users	4	Managed and Measurable
DS8	Manage Service Desk and Incidents	2.75	Repeatable but Intuitive
DS10	Manage Problems	2.75	Repeatable but Intuitive
DS12	Manage the Physical Environment	3	Defined
DS13	Manage Operations	4	Managed and Measurable
Average		3	Defined

Based on the findings and analysis, recommendation needed for Deliver and Support (DS) Domain in the hospital shows in Table 8.

Table 8. Recommendation needed for Deliver and Support (DS) Domain

IT Process	Recommendation
DS1	a. Develop a formalized service level management process that includes creating service requirements, service definitions, service level agreements (SLA), operating level agreements (OLA) and funding sources. b. Establish formal SLA for all critical IT services based on customer requirements and IT capabilities. It should include service support requirements, quantitative and qualitative metrics for measuring the service, funding and commercial arrangements, and roles and responsibilities, including oversight of the SLA. c. Define OLAs that explain how the services will be technically delivered to support the SLA(s) in an optimal manner. d. Continuously monitor the service level achievements and reports should be made. e. Regularly review SLAs to ensure they are effective and up to date and any changes required are identified.
DS2	a. Establish supplier risk management to identify and mitigate risks relating to suppliers' ability in delivering effective service in a secure and efficient manner on a continual basis. The management of Hospital X also has to ensure that contracts conform to universal business standards in accordance with legal and regulatory requirements. b. There should be periodic review and feedback on performance of vendor and suppliers provided to improve service delivery. It would support early detection of potential problems with third-party services.
DS3	a. There should be evaluation and monitoring on performance of IT infrastructure and application, not only IT personnel. b. Conduct performance and capacity forecasting of IT resources at regular intervals to minimize the risk of service disruptions due to insufficient capacity or performance degradation, and identify excess capacity for possible redeployment. Identify workload trends and determine forecasts to be input to performance and capacity plans. c. Metrics for measuring IT performance and capacity should be fine-tuned into outcome measures and performance indicators for all critical business processes and are consistently measured.
DS4	Develop a framework for IT continuity to support enterprise-wide business continuity management using a consistent process. The framework is also to assist in determining the required resilience of the infrastructure and to drive the development of disaster recovery (DRP) and IT contingency plans. The management should address the tasks and responsibilities, the planning process, the test and execution of DRP and IT continuity plans.
DS6	a. The ROI for <i>SIMRS</i> should be calculated. b. The identified IT costs should be mapped to IT services to support a transparent cost model.
DS7	a. IT should be used in an extensive, integrated and optimized manner to automate and provide tools for the training and education program.

	b. Benchmarks of industry good practices are used for guidance in educating and training users.
DS8	a. Establish standard procedure of help desk and incident management, along with the responsibility. b. Conduct monitoring after the incident has been resolved, records and report to management.
DS10	a. Establish formal procedure for problem management. b. Track the resolved problems and make reports. c. The assigned personnel should implement regular monitoring so problems are anticipated and prevented.
DS12	a. Establish IT security team who will be responsible for the installation of IT security tools and measure the effectiveness of the control environment. b. Standards should be defined for all facilities, covering site selection, construction, guarding, personnel safety, mechanical and electrical systems, and protection against environmental factors (e.g., fire, lighting, flooding). c. There should be smoke detector and CCTV in the IT HR room and the archive room in the corridor.
DS13	a. Revise current SOP to be relevant with the current condition and procedures. b. In co-operation with vendors, equipment should be analyzed for age and malfunction symptoms, and maintenance is mainly preventive in nature.

Analysis conducted for Maturity Level Scoring of Monitor and Evaluate (ME) Domain shows in Table 9 that the average domain is 2.5. It means that the domain is repeatable but intuitive. In this domain, processes have developed to the stage where similar procedures are followed by different people undertaking the same task.

Table 9. Maturity Level Scoring of Monitor and Evaluate (ME) Domain

Monitor and Evaluate		Level	Explanation
ME1	Monitor and Evaluate IT Performance	3	Defined
ME4	Provide IT Governance	2	Repeatable but Intuitive
Average		2.5	Repeatable but Intuitive

Based on the findings and analysis, recommendation needed for Monitor and Evaluate (ME) Domain in the hospital shows in Table 10.

Table 10. Recommendation needed for Monitor and Evaluate (ME) Domain

IT Process	Recommendation
ME1	a. There should be evaluation process to IT infrastructure and application. Therefore, their performance criteria should be established. b. Regular monitoring should be done to detect deviations and if possible, prevent them.
ME4	a. Socialize the implementation of T governance to all staff. b. Define IT risk management practices to ensure that the IT risk does not exceed Hospital X's risk appetite. The assigned team should assess and report IT-related risks and their impact and that the enterprise's IT risk position is transparent to all stakeholders. c. Hospital X should obtain independent assurance about the conformance of IT with relevant laws and regulations; the organization's policies, standards and procedures; generally accepted practices; and the effective and efficient performance of IT. Hospital X should attempt conducting IT or information system audit.

5. CONCLUSION

Based on analysis, it shows that there is an effort to integrate the IT application (*SIMRS*) to all levels in Hospital X. It is supported by the management, also sufficient training and well-managed process of IT human resource and third-party management and IT acquisition. The procedures are known, monitored and evaluated. However, IT performance evaluation and monitoring needs to be improved because there is an absence of IT and IS audit conducted in Hospital X. There is no established QMS (Quality Management System) implemented to assure that IT in Hospital X provides added value to enterprise's operational. There is no IT governance guideline used as reference, so, attention needed, especially for Plan and Organize (PO) and Monitor and Evaluate (ME) Domain.

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