

## Information Technology Supplier Management in Hospitals

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### ABSTRACT

In this study, we developed a document for managing Information Technology suppliers in hospitals. This document is used to ensure the proper management of IT suppliers in the hospital. Products and services in Information Technology have characteristics and specifications that are always up to date, making it difficult for non-IT people to understand. Hospitals whose main business in the health sector is often lack of human resources who understand IT. Observations and interviews were conducted in Indonesian hospital, to identify the characteristics and problems in supplier management. Control Objectives for Information and Related Technologies (COBIT), Information Technology Infrastructure Library (ITIL) and government regulations on supplier management were reviewed and combined as a benchmark and guidance on how supplier management activities are carried out. The result of the process is a Standard Operating Procedure (SOP) document. The parties involved in the supplier management process have evaluated the SOP document. From the results of the study, it is known that currently, the hospital is still focused on procedures procurement of goods and services that are government regulated. This study proposes some new activities that are not currently done by the hospital.

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## 1. INTRODUCTION

Although many studies have suggested that Information Technology (IT) can improve the quality of service and competitiveness [1]-[4], the applications of IT in hospitals are still lacking [5], [6]. The government encourages hospitals to leverage IT to support health services [7]. Although the IT implementation in hospitals is low, hospitals IT spending is increasing [8]. This is a challenge for hospitals to procure IT goods/services and manage suppliers. IT goods and services have special characteristics, but the majority of hospitals do not have adequate human resources [7]. This is an opportunities to introduce management of IT suppliers to hospitals. So that supplier management processes can put a priority on customer service.

Several studies related to organizational governance have been conducted, both for public organizations [9]-[14] and for health organizations [15], [16]. There are several frameworks and standar commonly used to help organizations implement IT such as Control Objectives for Information and Related Technologies (COBIT), Information Technology Infrastructure Library (ITIL), and International Organization for Standardization (ISO). COBIT that emphasizes governance [17], ITIL that help organizations create recipes to run excellent services [18], and ISO provides products, services and systems specifications to ensure quality, safety and efficiency [19]. In this paper, we will only focus on using the COBIT and ITIL framework rather than using ISO standard, this is because we want to use practices that are generally employed [20]. We propose to use ITIL and COBIT to assist hospitals to develop standard operational procedures related to supplier management. This will facilitate the hospital in managing the

supplier, from the procurement process, contracting, service operations, supplier evaluation, contract termination, to continuous improvement in supplier management. Suppliers in the hospital need to be well managed because it will affect the services to the public.

We will combine supplier management standards from ITIL and COBIT for hospital practice. Identify activities that have been done by the hospital to manage the supplier. Apply these standards to activities that are usually performed in hospitals. The purpose of this study is to establish working procedures to assist hospitals to manage suppliers in information technology. This document is important for the hospital in order to uphold the process for managing supplier. This minimizes the risks of service disruptions caused by contracts with suppliers. In this study, we conducted a case study at a government hospital located in Surabaya, Indonesia. We explore patterns based on activities undertaken at the hospital, to then integrate them with COBIT and ITIL standards regarding supplier management. We also consider government regulations related to procurement of goods/services.

## 2. RESEARCH METHOD

In this paper, we use the principle of design science research by creating an artifact to answer research questions [21]. Supplier management guide document is created to help the hospital to manage relationships with suppliers. To prepare the supplier management guide document, the steps taken are as follows: conducting observations and interviews in hospitals, Managing Suppliers based on IT Standards, Process Mapping, Preparation of New Procedures, and Evaluation of New Procedures. In this study, we conducted an observation, interview, and evaluation in one of the government hospitals located in Surabaya, Indonesia.

Interviews were conducted in a semi-structured manner [22]. We asked and observed how the contract management with suppliers is implemented. We use best practice from COBIT and ITIL as the checklist of questions, how is the process done, ask if there have been any rules governing supplier management issues within the hospital.

Conducting literature studies related to the management of suppliers such as COBIT, ITIL, and government regulations. Initially, we plan to only use Process Practice and Activity for Manage Supplier from COBIT5 and Activity of ITIL Supplier Management. But in practice, hospitals emphasize that the management of suppliers, especially on contractual issues must follow established rules and regulations. Therefore we have to include government regulations on the procurement of goods and services as the basis for supplier management guide document.

Mapping, compiling, and incorporating COBIT, ITIL, and government regulations are appropriate to the conditions and characteristics of the organization. We will evaluate the processes and activities of managing suppliers available in COBIT, ITIL and Government regulations. Each activity will be analyzed and grouped according to their similarity. It will be rearranged into new procedures documents.

The evaluation is conducted through meetings with the involved parties, such as the head of IT team, the head of the Budget Program Planning, and the staff of the Procurement Services Unit. Evaluation is done to find out the shortcomings and weaknesses of documents that have been prepared, in order to make improvements.

## 3. RESULTS

### 3.1. Observation and Interviews Results

The results of interviews and observations are as follows. Hospitals have no formal guidance for contract management for suppliers. Hospital relationships with suppliers are currently regulated in government regulations on the procurement of goods and services [23]. That regulation contains the detailed procedures for procurement of goods and services. There is a discussion of contract rules, but it does not fully cover what should be in the supplier contract. For IT contracts in hospitals, this exposes business risk. IT has an important impact on hospital services. However, hospitals do not have enough resources to effectively manage IT. Defining contract details becomes critical to avoid conflict. Some contract-related cases have occurred in hospitals, resulting in losses from both parties. A common obstacle is the lack of IT technical knowledge of the personnel responsible for contract management. Hospitals need to ensure that contract management with suppliers has passed the correct procedures. Hospitals need to ensure that contract management with suppliers has passed the correct procedures, including considering the contents of the contract. Hospitals have many IT services that need to be managed. This consists of three aspects: network, server, and software. Hospitals work with different external suppliers from initial assessment process to system installation.

### 3.2. Managing Suppliers based on IT Standars

In this study, we use COBIT5 and ITIL standards to identify best practices in supplier management. COBIT5 defines the best practice of supplier management in APO 10 manage supplier process. this process recommends 5 Key Management Practices (KMP) in supplier management. This KMP includes [17]: identify and evaluate supplier relationships and contracts, select supplier, manage supplier relationships and contracts, manage supplier risk, and monitor supplier performance and compliance. There are several activities that need to be done within each KMP. This activity proposes on what to do, not how to do. We use the ITIL framework to describe how to do. COBIT5 Procces Practice and Activity for Manage Supplier depicted in Table 1.

Table 1. COBIT5 Procces Practice and Activity for Manage Supplier [17]

Key Management Practice	Activity Code	Activities
Identify and evaluate supplier relationships and contracts	APO10.01-1	Establish and maintain criteria relating to suppliers and supplier contracts.
	APO10.01-2	Establish and maintain supplier and contract evaluation criteria
	APO10.01-3	Identify, record and categorise existing suppliers and contracts
	APO10.01-4	Periodically evaluate and compare the performance of existing and alternative suppliers
Select suppliers	APO10.02-1	Review all Supplier requests for information (RFI) and requests for proposals (RFP)
	APO10.02-2	Evaluate RFIs and RFPs
	APO10.02-3	Select the supplier that best fits the RFP
	APO10.02-4	In the specific case of software acquisition, include and enforce the rights and obligations of all parties in the contractual terms.
	APO10.02-5	In the specific case of acquisition of development resources, include and enforce the rights and obligations of all parties in the contractual terms.
	APO10.02-6	Obtain legal advice on resource development acquisition agreements regarding ownership and licencing of intellectual property
	APO10.02-7	In the specific case of acquisition of infrastructure, facilities and related services, include and enforce the rights and obligations of all parties in the contractual terms
Manage supplier relationships and contracts	APO10.03-1	Assign relationship owners for all suppliers and make them accountable for the quality of service(s) provided.
	APO10.03-2	Specify a formal communication and review process
	APO10.03-3	Agree on, manage, maintain and renew formal contracts with the supplier.
	APO10.03-4	Within contracts with key service suppliers include provisions for the review of supplier site
	APO10.03-5	Evaluate the effectiveness of the relationship and identify necessary improvements
	APO10.03-6	Define, communicate and agree on ways to implement required improvements to the relationship.
	APO10.03-7	Use established procedures to deal with contract disputes
	APO10.03-8	Define and formalise roles and responsibilities for each service supplier
Manage supplier risk	APO10.04-1	Manage risk relating to the supplier's ability to deliver service efficiently, effectively, securely, reliably, and continually
	APO10.04-2	When defining the contract, provide for potential service risk by clearly defining service requirements
	APO10.05-1	Define and document criteria to monitor supplier performance aligned with service level agreements
Monitor supplier performance and compliance	APO10.05-2	Monitor and review service delivery to ensure that the supplier is providing an acceptable quality of service
	APO10.05-3	Review supplier performance and value for money to ensure that they are reliable and competitive
	APO10.05-4	Request independent reviews of supplier internal practices and controls, if necessary.
	APO10.05-5	Record and assess review results periodically and discuss them with the supplier to identify needs and opportunities for improvement.
	APO10.05-6	Monitor and evaluate externally available information about the supplier.

ITIL described Supplier Management in the service design phase. Supplier Management is the process of ensuring all contracts with suppliers meet the organization's business needs, ensuring all suppliers meet their contract commitments, review contracts, and maintain relationships with suppliers. the activity of supplier management can be summarize in [18]: (a) definition of new supplier and contract requirement, (b) evaluation of new supplier and contracts, (c) supplier and contract categorization and maintenance, (d) establsiment of new supplier and contracts, (e) supplier, contract, and performance management, (f) contract renewal or termination. Activity of ITIL supplier management is depicted in Table 2.

We also consider government regulations (PP No. 54 th. 2010) on the procurement of goods and services [23] to ensure compliance with regulations. The regulation governs the procurement preparation process, selection planning for goods/services providers, controlling, monitoring, complaints, and sanctions.

Table 2. Activity of ITIL Supplier Management [18]

Activity	Code	Sub-Activity
Definition of new supplier and contract requirements	SM01-1	Identify Business need
	SM01-2	Produce a statement of requirement (soR) and invitation to tender (ITT)
	SM01-3	Ensure conformance to strategy/policy
Evaluation of new suppliers and contracts	SM02-1	identify method of purchase or procurement
	SM02-2	establish evaluation criteria
	SM02-3	evaluate altrmative options
	SM02-4	Select
	SM02-5	Negotiate contracts,targets, and the terms and conditions.
	SM02-6	agree and award the contract
Supplier and contract categorization and maintenance of the SCMIS	SM03-1	Assess or reassess the supplier and contract
	SM03-2	ensure changes progressed through service transition
	SM03-3	categoriza the supplier
	SM03-4	update SCMIS
	SM03-5	ongoing maintenance of the SCMIS
Establishment of new supplier and contracts	SM04-1	Set up the supplier service and contract
	SM04-2	transition the service
	SM04-3	establish contracts and relationships
	SM05-1	manage and control the operation and delivery of service/products
	SM05-2	monitor and report
Supplier, contract, and performance management	SM05-3	review and improve
	SM05-4	manage the supplier and the relationship
	SM05-5	review service scope against business need
	SM05-6	plan for possible closure/renewal/extension
contract renewal or termination	SM06-1	Review
	SM06-2	renegotiate and renew or terminate and/or transfer
	SM06-3	transition to new supplier or to internal resources

### 3.3. Process Mapping

We combine processes and activities within ITIL, COBIT, and Government Regulations. We use ITIL activity as a combination baseline. The result of activity mapping can be seen in Table 3.

Table 3. Procces and Activity Mapping

Aktivitas Supplier Management	ITIL	COBIT 5	PP No. 54 Th 2010
Definition of new supplier and contract requirements	SM01-1	APO10.02-1	BAB VI Bag. 6 Ps. 64
	SM01-2	APO10.02-2	BAB VI Bag. 10 Ps. 79
	SM01-3	-	BAB IV Ps. 22
	SM01-4	-	-
	SM02-1	-	BAB VI Bag. 3 Par. 1 Ps. 35
	SM02-2	APO10.01-2	BAB VI Bag. 3 Par. 4 Ps. 48
	SM02-3	APO10.04-1	-
	SM02-4	APO10.04-2	-
Evaluation of new suppliers and contracts	SM02-5	APO10.01-4	-
		APO10.02-3	BAB VI Bag. 10 Par. 6 Ps. 79
			BAB VI BAG. 10 Par. 7 Ps. 80
		APO10.02-4	
		APO10.02-5	
	SM02-6	APO10.02-6	-
		APO10.02-7	
		APO10.03-4	
		APO10.03-8	
	SM02-7	APO10.03-3	BAB VI Bag. 10 Par. 11
Establishment of new supplier and contracts	SM03-1	-	-
	SM03-2	APO10.04-2	-
		APO10.02-3	-
	SM03-3	APO10.05-1	-
		APO10.05-5	-
	SM03-4	APO10.03-1	-
		APO10.03-3	-
	SM04-1	-	-
Supplier and contract categorization and maintenance of the SCMIS	SM04-2	APO10.01-1	-
		APO10.01-3	-
	SM04-3	-	-
	SM04-4	-	-
	SM05-1	APO10.05-1	-
		APO10.05-2	-
		APO10.05-3	-
	SM05-2	APO10.05-4	BAB XV Bag. 2 Ps. 116
Supplier, contract, and performance management		APO10.05-5	
		APO10.05-6	
	SM05-3	-	BAB XV Bag. 1 Ps. 115
	SM05-4	APO10.03-7	BAB XV Bag. 1 Ps. 115
	SM05-5	APO10.05-2	-
		APO10.05-3	-
contract renewal or termination	SM05-6	APO10.03-2	BAB VI Bag. 11 Par. 7 Ps. 94
	SM06-1	APO10.05-3	BAB VI Bag. 11 Par. 6 Ps. 93
	SM06-2	APO10.05-5	BAB VI Bag. 11 Par. 6 Ps. 93

### 3.4. Preparation of New Procedures

The new procedure is prepared based on the mapping of activities and processes from COBIT, ITIL, and government regulations. We made some adjustments in the preparation of the document. Some activities are changed, omitted, or combined. We defined there are 6 main processes of suppliers management in the hospital (Table 4), namely: identify business needs and business case preparation, procurement and evaluation of new suppliers contracts, initiation of new contract, categorization of supplier and contract, supplier and contract performance management, and contract renewal or termination. Standard Operating Procedure (SOP) document is then prepared based on identified processes and activities. We use the SOP format that has been used by the hospital.

Table 4. Activity of New Procedures

No.	Work steps	Related unit
Activity for Identify business needs and business case preparation Procedure		
1	Identify the purchase / procurement method, arrange supplier selection method, and Set supplier selection method	Procurement Unit Commitment Maker Official
2	Arrange procurement documents, Review the procurement document.	Procurement Unit
3	Prepare the initial business case, including options (internal and external), cost, time range, target, profit and risk assessment etc, Communicate the initial business case to the IT / IT division, and make sure that business and IT parties approve the initial business case.	IT Unit
Activity for Procurement and Evaluation of New Suppliers Contracts Procedure		
1	Arrange the evaluation criteria of the procurement document that contains the supplier-related considerations (services, capabilities (both personnel and organization), quality and costs, etc.), Accept the procurement document criteria that have been prepared, Evaluate procurement documents according to predefined evaluation process / criteria and make sure they are in line with applicable business policies / policies, Maintain documentary evidence from the evaluation, and Verify references from potential vendors	Procurement Unit
	Evaluate the impact of suppliers / contracts and their potential risks to avoid errors that could result in losses (financial risks, business reputation, operations, regulators, laws), Plan how to address potential service risks by clearly defining service requirements, including software deed agreements, alternative suppliers, or standby agreements to mitigate possible supplier errors, intellectual property protection and security and legal and regulatory requirements. Compare the performance of suppliers and alternative suppliers. And Create an overall review.	IT Unit
2	Select suppliers and contracts that best match the results of the procurement document evaluation,	Budget Program Planning
3	Document the decision, Communicate the decision, In any supplier relationship, establish the relationship owner for all suppliers responsible for the quality of service provided	Procurement Unit
	Negotiate contracts, targets and terms and conditions (including liability, closure, renewal, extension, dispute, transfer). Use and launch roles and responsibilities for each service supplier. When multiple suppliers work together to provide a service, consider allocating the main contractor role to one of the suppliers to be responsible for the contract as a whole. Get legal advice on approval of resource acquisitions related to ownership and licensing of intellectual property	IT Unit
4		Budget Program Planning
5	Approve the Contract	Procurement Unit IT Unit
Activity for Initiation of New Contract Procedure		
1	Supplier and contract service configuration and their information in the SCD (Supplier and Contract Database) and other enterprise systems.	IT Unit
2	If the contract / project is the replacement of the old system, you should take and note the transition process so that the productivity of the system is not compromised.	IT Unit
Activity for Categorization of Supplier and Contract Procedure		
1	Create and maintain criteria based on type, significance and criticality of suppliers and supplier contracts, Document these criteria, Categorize suppliers, then determine how important the supplier is to the service providers and services provided by the business. Focus on the most important and priority suppliers.	IT Unit
2	Update SCD every change related to supplier and/or contract, Perform SCD maintenance	IT Unit
Activity for Supplier and Contract Performance Management Procedure		
1	Define criteria to supervise supplier performance in accordance with the applicable agreement, Document these criteria.	IT Unit
2	Monitor and Reporting	IT Unit
3	Review on a regular basis, Record and review the results periodically, Discuss with suppliers to identify needs and opportunities for improvement, and Implement planned improvements.	IT Unit
4	Perform supplier and relationship management (formal / non-formal communication, risk, change, failure, repair, contact, and interface). Use established procedures to handle contract disputes, first if possible, use effective relationships and communications to address service issues, and Plan for possible extensions / updates / extensions.	IT Unit
Activity for Contract Renewal or Termination Procedure		
1	If the contract is a Unit Price Contract and there is a possibility of extension, then Review, Record and value the results of the review, and Re-negotiate the results of the review and discuss with the supplier to identify needs and opportunities for improvement, renewal, or termination and / or transfer.	IT Unit

### 3.5. Evaluation

Evaluation is conducted to find out whether the SOP document of contract management has been well prepared and easy to understand. The evaluation also sees compatibility with field conditions in hospitals. The evaluation was done by reviewing the document using walkthrough method. A walkthrough is a type of document review which led by the author of the document and attended by peer groups [23]. The walkthrough held at the hospital on October 14, 2016. The walkthrough review was conducted by the head of IT team, head of the Budget Program Planning, and staff of the Procurement Services Unit. it aims to get a direct response from the person in charge of the activity in the SOP document of contract management. Comments and corrections to documents obtained in the review process.

During an evaluation, a sequence of unfavorable work steps was found in the business identification and business case preparation activities. Improvements are made based on input from peer group based on experience and regulation. It's also found some unfamiliar terms such as business case, system transition, and SCMIS (Supplier and Contract Management Information System). Some of those activities names and terms need to be adjusted. The person responsible for each activity is checked and adjusted.

SOP document improvements are made to correct the deficiencies and errors found at the evaluation stage. Improvement of SOP document of supplier management including: Improvement of terms, sentence arrangement and word selection in SOP documents, Role and responsibilities mistakes were fixed, and improvement the sequence of activities steps. Peer group states that some processes are helpful in managing supplier's contracts because they are very specific to IT issues, such as software, infrastructure, and development resources.

#### 4. DISCUSSION

Based on observations and interviews, the hospital does not have standard procedures for managing IT suppliers. Procurement process of goods and services are still the main focus for the hospital in managing IT supplier. This is because the procurement procedure of goods and services has been regulated by the government; it makes the hospital prioritize to follow the regulation. The hospital is still done intuitively and unstructured procedure to manage supplier, except for the procurement process.

The results of activity mapping using COBIT and ITIL indicate that the following activities of suppliers management should be performed: identify business needs and business case preparation, procurement and evaluation of new suppliers contracts, initiation of new contract, categorization of supplier and contract procedure, supplier and contract performance management, and contract renewal or termination. The majority of those activities have not been systematically conducted by hospitals. All those activities are formalized into SOP documents for IT supplier management.

The IT supplier management SOP document is recognized to be very helpful to ensure technical specifications and quality of goods/services in the field of IT (software, infrastructure, development resources). This document provides discourse to the relevant parties regarding supplier management based on international standards. However, this work procedure can not be fully applied in the hospital yet. This is due to some limitations of rules and authority in applying new procedures.

Implementation of SOP documents within organizations is problematic and often requires great effort; the complexity will increase according to the size of the organization. It takes willpower from top management to implement those changes [25]. In this study, we do not discuss the documents application into organization operation. Our scope of research is to create SOP documents to manage suppliers according to COBIT and ITIL standards. In its application, it is still necessary to adjust to the current conditions and need to consider some elements of IT success factors in organizations such as people, work processes, data, networks, and software. The toughest challenge of implementing The IT supplier management SOP document is the hospital's characteristics of implementing IT in its organization. As in research [26][27], the adoption of technology in healthcare organizations is bound to encounter obstacles such as organizational structures and legal restraints. Government hospitals tend to wait for regulations to implement a policy, not because of the need for competitive advantage [5]. This paper provides a perspective from the point of view of IT management in managing suppliers. there are several papers discussing supplier management from a technical point of view, for example [28] using integrated fuzzy MCDM to select and evaluate suppliers, selecting coal-fired supplier[29], and optimization of enterprise alliance in supply chain[30].

There are possibilities and opportunities to make the document into community practice. By making this document open to the community, readable by stakeholders at the hospital, and receiving advice on improvement based on hospital experience. In this way, knowledge of the IT suppliers' management can be understood by interested parties.

In general, the processes of procurement of goods and management of suppliers in hospitals have many in common. We believe that the document of supplier management procedures can be a model of supplier management in Indonesian hospitals. The application of information technology in Indonesian

hospitals has poor reception, less than 5% have adopted the Hospital Information System [5]. The government's impetus regarding the application of IT into the hospital will have an impact on the need for infrastructure preparation. It requires quality improvement in the procurement process of goods / services and supplier management.

## 5. CONCLUSION

Supplier management guide document was produced for the hospital. This document was derived from the merger of activities on supplier management (COBIT, ITIL, and Government Regulations on the procurement of goods and services). The limitation of this study is that the guidance document is still a model, based on case studies at a government hospital. Other than that this document can only be applied in Indonesia because it uses government regulation as a source of document-making. But we believe that our model is ready to be applied in other hospitals with little adjustment. In the process of making it, we have considered the general pattern of supplier management and government regulations regarding the procurement of goods and services. There is an opportunity to make this procedure document a community practice for managing IT suppliers in hospitals. By combining best practices in COBIT, ITIL, and government regulations, this document is useful for those who handle suppliers, especially IT.

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