

Investigation of the COBIT Framework for Universities Information System

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Abstract— Administrations of universities need to be aware of the value in research, development, and technological innovations to keep ahead of the competition. Hence, universities have been encountered with the management challenges of information technology. Therefore IT governance becomes more important issue for university information systems. For providing IT governance in any corporate organizations, COBIT is a best guideline with good practices and processes. It provides the effective evaluations, indicators and business activity for corporate organizations. In this paper, we briefly introduced IT goals and business goals for universities. Also according to IT goals; we analyzed the contents of COBIT domains and suggested domain framework which specializes for university information system. The framework that we suggested will effectively utilize the minimum number of COBIT processes and solves various subjects of information systems in universities. Proposed framework are based on our COBIT knowledge and experience of university information system.

Index Terms— COBIT; it governance; computer science; information systems; information systems management

I. INTRODUCTION

Information technology (IT) is a very important run of business factor to the several thousands of students, academic staffs, and administrative staffs for a university. So the universities have to use IT in an effective way and manage IT related processes, such as students' affairs automation system, electronic document management system and library automation system etc. [1]

IT management requires high quality, ease of use and continuous service levels in low delivery time and cost. Universities must satisfy for their information for all assets, the requirements for confidence, security and quality. Thus, administrations of universities have to be responsible for information system governance. To perform these responsibilities, as well as to achieve its expectations, management must establish an adequate information systems control [2-3]. However, it is difficult to control information systems and manage according to university information system applications. Information system needs to monitor all services, their life-cycles, and resources by considering the administration expectations. To achieve this, corporate organizations, need to practical knowledge and well defined guidelines. The most well-known and generally accepted IT

governance framework is COBIT (Control Objectives for Information and Related Technology).

COBIT content has been prepared with cooperation of ISACA (Information Systems Audit and Control Association) and ITGI (IT Governance Institute). IT goals and business alignment is the main purpose of COBIT. It is proposed also by process owners not just by users and auditors. Day by day, universities have to improve their business processes so they have total responsibility for all aspects of the business process. In brief, COBIT includes of satisfactory controls. The COBIT provides a framework which facilitates the fulfill responsibilities of business process owner. COBIT is a framework which aims maximizing the utilization of information technology with best practices, indicators and measures. It provides IT process development and best practice for IT management for whole enterprises.

COBIT identifies seven information criteria; these criteria's are composed of availability, confidentiality, effectiveness, compliance, efficiency, integrity, and reliability (Fig. 1.). Planning and Organization, Acquisition and Implementation, Delivery and Support, and Monitoring and Evaluate (Fig. 3.) are domains which are grouped under COBIT framework. Under this framework have 34 high level control objectives.

Fundamental aim of COBIT framework is that harmonizing the IT investments in an organization's objectives. There are many frameworks as well for harmonizing the IT investments in an organization's objectives. However, COBIT tries to make link between IT and business process according to information criteria. These information criteria satisfies the business objective. They are as follows.

Effectiveness deals with information related to business processes and as well as being appropriate, timely, accurate, consistent delivered with a convenient way.

Efficiency (most of them are related to the provision of information through the optimal) and the efficient use of economic resources.

Confidentiality is related to the protection of sensitive information from unauthorized disclosure.

Integrity is related with completeness and accuracy of information and validity with business values and expectations.

Availability relates to information being available for the future when required by business processes. At the same time it is about the protection of resources and the necessary related capabilities.

Compliance deals with laws, regulations and contractual arrangements that govern business processes, that is concerned with compliance with internal policies as well as externally imposed business criteria.

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Reliability is concerned with ensuring the reliability of the necessary information for operating and asset management and governance responsibilities.



Fig. 1. Information criteria of COBIT Framework

In this paper, we have proposed of IT governance and appropriate COBIT domains for university information system. After an introduction, university information systems and COBIT domains are examined in a short and then, we have proposed COBIT processes for all university information system to utilize IT in an effective way. The information criteria (Fig. 5. and Fig. 6.). Then in Fig. 7. we created a matrix which

shows relationship between COBIT processes and IT goals: "P" represents a primary relation and "S" a secondary relation [8].

A. University Information Systems

Information technologies are becoming more important and indispensable in our lives. So universities should maximize resources of information technology to gain competitive advantage in the world. In universities, information system service provides a framework to run their business processes and stakeholders in an effective way. It supports business processes of administration, education, research and development. University information systems can consist of several applications [3].

II. UNIVERSITY INFORMATION SYSTEM AND COBIT

To apply COBIT to the University Information System, we first examined the IT goals and University's business goals according to their risk drivers and values. The first method shows the relationship between business and IT is according to

Because it need to overcome all required functions in a university. Some applications are developed by their own resources. On the other hand, some applications can develop by outsources Fig. 2.

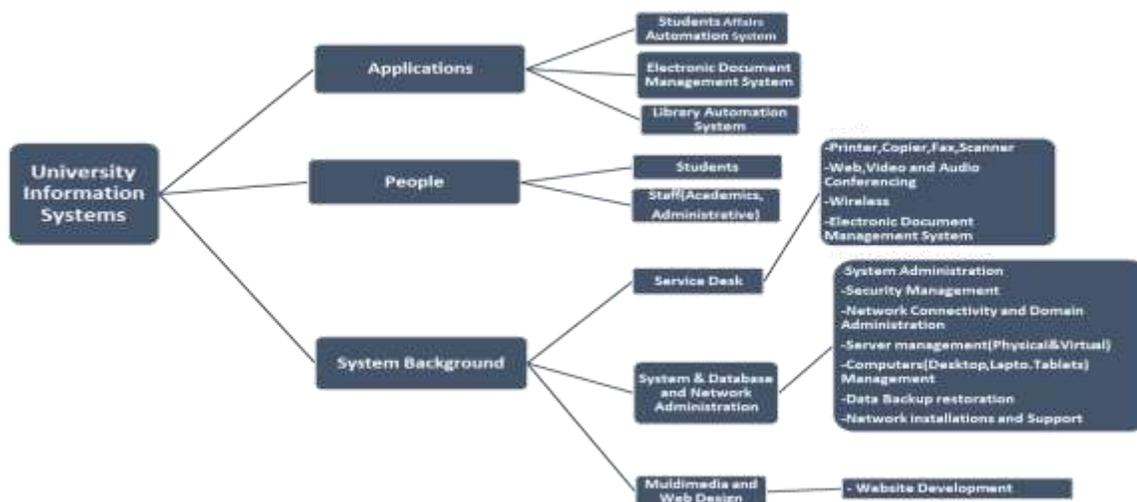


Fig. 2. An example of University information system

In general, we can say that the information system gives the following services.

- Developing and supporting students' affairs automation system.
- Developing and supporting electronic document management system.
- Developing and supporting library automation system.
- Support and administration of centralized systems, user accounts and troubleshooting.
- Educational online platform for e-learning support.
- Printing, scanning CD/DVD writing facilities.

- Design, deployment and administration of computer network.
- System administration
- Network connectivity and Domain administration
- Server Management (Physical & Virtual)
- Data Backup restoration and data access security
- Design, installation and maintenance of high end computing facilities and laboratories
- Preparation of documents and supporting materials for system use.
- Website deployment, management and support.

A. COBIT Domains

COBIT is a broad management framework which ensures compatibility between information technology and business goals in a corporate organization. It suggests best practice in IT management and control. COBIT framework defines 318 detailed control objectives under 34 processes and also four domains and associated audit guidelines.

Each domain has a number of different processes which completed necessary activities for IT governance PO has 10, AI has 7, DS has 13 and ME has 4 processes in Fig.3. Effectiveness, efficiency, confidentiality, integrity, availability, compliance and reliability are identified by COBIT framework which is called information criteria [4-7].

In Fig. 4. shows why we choose COBIT for establishing IT governance for universities. ISO/IEC 27002, ITIL, PMBOK and CMM standards are clearly defined by ISACA and ITGI for comparing COBIT. This figure shows us the most wide and detailed standard is COBIT.

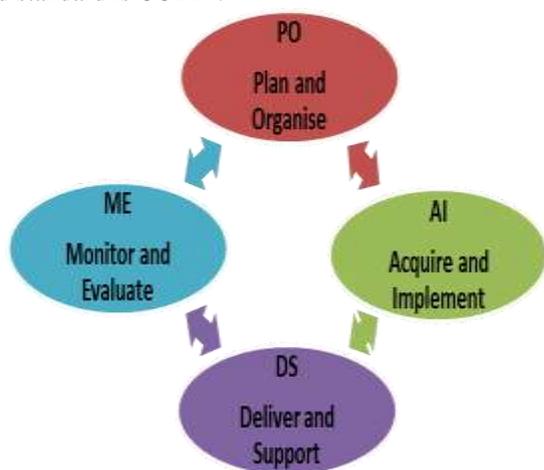


Fig.3. COBIT Domains

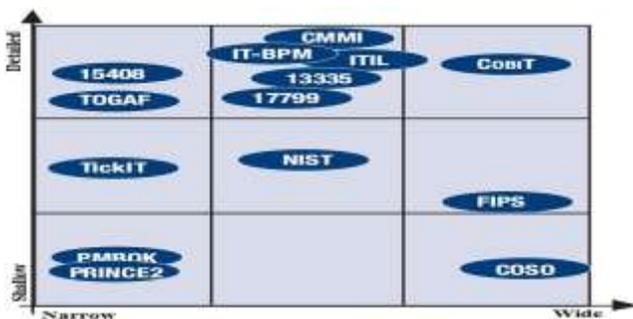


Fig.4. COBIT and other standarts

COBIT provides a broad framework that helps universities in succeeding their objectives for the management and governance of universities information and technology assets (IT). In other words, COBIT creates optimal and effective values from information technology by using resources of IT asset and risk levels. COBIT provides information technology to be managed in a holistic manner for all university units. Also it takes all responsibility of internal and external stakeholders of IT functional areas.

III. SUGGESTION OF COBIT FRAMEWORK FOR UNIVERSITIES

In general, every corporate organization will have their own different business and IT objectives. Priorities within these goals will differ depending on a variety of culture, industry, company size. University business goals are related business processes with integrated IT services that support students educational and improvement goals. Develop and maintain effective links between staffs to facilitate the successful provision of IT services. In Figure 5 shows the university goals also provide some control objectives and clearly define required activities and their responsible position for managing the information systems.

Information technology objectives are aligned considering the risk of IT and business goals of the university. Performance improvement, cost reduction, and IT compliance with laws, regulations and internal policies are some issue that we consider. In fig. 6. shows the IT goals which are important for improvement information system in universities.

In our study we build a relationship according to those information criteria which clarify the relation between business and IT goals.

Fig. 5. shows how university business objectives are related to IT objectives. From this figure it is easy to see some business goals are related with multiple areas of IT responsibilities.

For example the business objective #1 "Manage IT, related University business risk and business change" does support a wide scope on IT objectives. Then again, the business objective #5 "Develop skills and motivate people" and the IT objective #10 "Improve IT skills that respond to the IT strategy" show only relationship to each other, confirming their similar and narrowly defined scope [8].

Business objectives at Fig. 5. determined according to consultation of students, academic and administrative staff. These business objectives can be increased. However, 8 main objectives determined according to our COBIT knowledge and experience of university information system as shown in Fig.5. Proposed 8 fundamental objectives is classified according to information criteria of COBIT framework. Then each of the eight objectives of business process indicates that a subset of COBIT IT process. So each IT business objectives includes more than one goal. Some business goals are subfields of IT responsibilities. For example the business goal #4 "Improve the business functionality and staff productivity"

does support a wide scope on IT goals which numbers are #7, #8and #10. So we can say that aim of "Improve the business functionality and staff productivity" is subfields of IT goals which are "Optimize the IT infrastructure, resources and capabilities", "Integrate applications and technology solutions seamlessly in University processes" and "Improve IT skills that respond to the IT strategy". On the other hand, the business goal #8 "Improve service for students and staff." and the IT goal #3 "Make sure that IT services are available and secure" show only relationship to each other, confirming their similar and narrowly defined scope [8].

| University, Business Goals | Effectiveness | Efficiency | Confidentiality | Integrity | Availability | Compliance | Reliability | Related IT Goals |
|--|---------------|------------|-----------------|-----------|--------------|------------|-------------|------------------|
| 1 Manage IT, related University business risk and business change | ✓ | ✓ | ✓ | ✓ | ✓ | | | 1,6,8, |
| 2 Provide compliance with external laws and regulation | | | ✓ | | | ✓ | | 2,4 |
| 3 Establish service continuity and availability | ✓ | | | | ✓ | | | 9,3 |
| 4 Improve the business process functionality and staff productivity. | ✓ | ✓ | | | | | | 7,8,10 |
| 5 Develop skills and motivate people | ✓ | ✓ | | | | | | 10 |
| 6 Establish reliable and useful information process for strategic decision making. | ✓ | | | ✓ | | | ✓ | 2 |
| 7 Achieving cost optimisation and service delivery | | ✓ | | | | | | 9,5 |
| 8 Improve service for students and staff. | ✓ | | | | | | | 3 |

Fig. 5. Business Goals of Universities

| IT Goals | Effectiveness | Efficiency | Confidentiality | Integrity | Availability | Compliance | Reliability |
|--|---------------|------------|-----------------|-----------|--------------|------------|-------------|
| 1 Align the IT strategy to the University strategy | ✓ | | | ✓ | ✓ | | |
| 2 Maintain the security (confidentiality, integrity and availability) of information and processing infrastructure | | | ✓ | ✓ | ✓ | | |
| 3 Make sure that IT services are available and secure | ✓ | | | | ✓ | | |
| 4 Provide IT compliance with laws, regulations and internal policies | | | | | | ✓ | |
| 5 Improve IT's cost-efficiency | | ✓ | | | | | |
| 6 Account for and protect all IT assets | | ✓ | | | | ✓ | |
| 7 Optimise the IT infrastructure, resources and capabilities | | ✓ | | | | | |
| 8 Integrate applications and technology solutions seamlessly in University processes. | ✓ | | | ✓ | ✓ | | |
| 9 Manage successfully, third-party relationship. | ✓ | ✓ | | | | | |
| 10 Improve IT skills that respond to the IT strategy | ✓ | ✓ | | ✓ | | | |

Fig. 6. IT Goals of Universities

IT objectives at Fig.6 are proposed by considering University information system.

These IT objectives can be increased. However, 10 main objectives determined according to our COBIT knowledge and experience of university information system as shown in Fig.6.

Proposed 10 fundamental objectives is classified according to information criteria of COBIT framework. Each IT goals cover one or more than one business objectives.

A. *Business Goals/IT Goals and Information Criteria COBIT as a Framework for Enterprise Governance of IT*

| | | Effectiveness | Efficiency | Confidentiality | Integrity | Availability | Compliance | Reliability |
|------|--|---------------|------------|-----------------|-----------|--------------|------------|-------------|
| PO1 | Define a Strategic IT Plan | P | S | | | | | |
| PO2 | Define the Information Architecture | S | P | S | P | | | |
| PO3 | Determine Technological Direction | P | P | | | | | |
| PO4 | Define the IT Organisation and Relationships | P | P | | | | | |
| PO5 | Manage the IT Investment | P | P | | | | | S |
| PO6 | Communicate Management Aims and Direction | P | | | | | S | |
| PO7 | Manage Human Resources | P | P | | | | | |
| PO8 | Manage quality | P | P | | S | | | S |
| PO9 | Assess Risks | S | S | P | P | P | S | S |
| PO10 | Manage Projects | P | P | | | | | |
| AI1 | Identify Automated Solutions | P | S | | | | | |
| AI2 | Acquire and Maintain Application Software | P | P | | S | | | S |
| AI3 | Acquire and Maintain Technology Infrastructure | S | P | | S | S | | |
| AI4 | Enable operation and use | P | P | | S | S | S | S |
| AI5 | Procure IT resources | S | P | | | | S | |
| AI6 | Manage Changes | P | P | | P | P | | S |
| AI7 | Install and accredit solutions and changes | P | S | | S | S | | |
| DS1 | Define and Manage Service Levels | P | P | S | S | S | S | S |
| DS2 | Manage Third-Party Services | P | P | S | S | S | S | S |
| DS3 | Manage Performance and Capacity | P | P | | | S | | |
| DS4 | Ensure Continuous Service | P | S | | | P | | |
| DS5 | Ensure Systems Security | | | P | P | S | S | S |
| DS6 | Identify and Allocate Costs | | P | | | | | P |
| DS7 | Educate and Train Users | P | S | | | | | |
| DS8 | Manage service desk and incidents | P | P | | | | | |
| DS9 | Manage the Configuration | P | S | | | S | | S |
| DS10 | Manage Problems | P | P | | | S | | |
| DS11 | Manage Data | | | | P | | | P |
| DS12 | Manage the physical environment | | | | P | P | | |
| DS13 | Manage Operations | P | P | | S | S | | |
| M1 | Monitor and evaluate IT performance | P | P | S | S | S | S | S |
| M2 | Monitor and evaluate internal control | P | P | S | S | S | S | S |
| M3 | Ensure regulatory compliance | | | | | | P | S |
| M4 | Provide IT governance | P | P | S | S | S | S | S |

Fig. 7. COBIT processes and information criteria

Information criteria of COBIT processes is generic. It can be applied any organizations according to its own business objective. For example, first IT goal is stated as “Align the IT strategy to university strategy”. This goals is related “legal requirements and rules” so it could be translated into the information criteria of “effectiveness”, “integrity” and “availability”.

We analyzed the results of university information system according to their risks, values [9]. We created a matrix which shows of how business processes support IT goals. COBIT provides, specific processes according to information criteria selected. According to those selections in Fig. 7. maps our proposed IT goals to the 14 most important COBIT processes for universities.

| Process | Goal 1 | Goal 2 | Goal 3 | Goal 4 | Goal 5 | Goal 6 | Goal 7 | Goal 8 | Goal 9 | Goal 10 | Goal 11 | Goal 12 | Goal 13 | Goal 14 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------------|
| Plan and Organize | | | | | | | | | | | | | | |
| PO2 Define the Information Architecture | P | | | | | P | P | | | S | P | | | |
| PO5 Manage the IT Investment | | | | | | P | P | | | P | | | | |
| PO9 Assess Risks | S | P | | P | S | P | S | S | P | | S | S | | |
| Acquire and Implement | | | | | | | | | | | | | | |
| AI4 Enable operation and Use | S | | | P | S | P | P | P | P | P | P | P | P | P |
| AI5 Procure IT resources | | | | | S | P | P | P | | | S | S | S | S |
| AI6 Manage Changes | P | | | P | | P | P | P | P | P | P | P | P | P |
| AI7 Install and accredit solutions and changes | S | | | | | P | S | P | P | P | P | S | | |
| Deliver and Support | | | | | | | | | | | | | | |
| DS2 Manage Third-Party Services | S | S | | S | S | P | S | P | S | P | S | P | S | |
| DS3 Manage Performance and Capacity | | | | S | | P | P | P | | | P | | | |
| DS4 Ensure Continuous Service | | | | P | | S | S | S | | | P | | | |
| DS5 Ensure System Security | | P | | | S | | P | | | | | | | |
| DS12 Manage the Physical Environment | | | | | | S | P | S | | | | | | |
| Monitor and Evaluate | | | | | | | | | | | | | | |
| ME1 Monitor and evaluate IT performance | S | S | | S | S | P | S | P | S | S | P | P | P | P = Primary |
| ME3 Ensure regulatory compliance | S | | | | P | | | S | | | S | | | S = Secondary |

Fig. 8. Proposed COBIT Framework for Universities

IV. CONCLUSION

We build up a relationship of business goals and IT goals for universities by this way we obtain a better insight in the business/IT alignment issue.

After evaluating the 34 processes, 14 were carefully selected that are constructively aligned to the university's goals. Although COBIT provides direction to IT governance, it rarely defines the implementation details. These 14 processes provide a comprehensive detailed IT governance for universities information system. These achievements can be briefly summarized as follows.

- Reduce organizational IT risk and business in a holistic manner
- Enhance the security
- Facilitate audit and compliance burden
- Reduce cost while improving the consistency of IT delivery

Conclusion is just our suggestion because they are based on our COBIT knowledge and experience of university information system. For providing detailed research, we needed a large number of expert suggestions. However, this goals and proposed COBIT processes would more closely represent a real life university business and IT scenario.

V. REFERENCES

- [1] Kwon,H.Y. "Security Engineering in IT Governance for University Information System", ISA, 2008,2008 International Conference on Information Security and Assurance , pp. 501-504, doi:10.1109/ISA.2008.93
<https://doi.org/10.1109/ISA.2008.93>
- [2] Kwon,H.Y. "Case Study on Implementation and Operation of University ERP Systems abroad", Research Materials RM 2006-68, KERIS, 2006.
- [3] 2007 Performance Evaluation Report for University ERP, Ministry of Education, Korea, Dec. 2007.
- [4] IT Governance Institute, COBIT 5.0, 2012
- [5] Lainhart, J. "COBIT: a methodology for managing and controlling information and information technology risks and vulnerabilities," Journal of Information
- [6] Bodnar, G. "What's new in COBIT 4.0.," Internal Auditing, vol. 21, no. 4, pp. 37-44, 2006.
- [7] Hardy, G. "Using IT governance and COBIT to deliver value with IT and respond to legal, regulatory and compliance challenges," Information Security Technical Report, vol. 11, no. 1, pp. 55-61, 2006. <https://doi.org/10.1016/j.istr.2005.12.004>
- [8] Van Grembergen W., De Haes S. Enterprise governance of information technology: achieving strategic alignment and value – 2009
- [9] Van Grembergen W., De Haes S., Moons J., IT Governance: linking business goals to IT goals and COBIT processes, 2005, Information Systems Control Journal, Vol.4.