Developing a Method to Leverage FEAF by Deploying COBIT IT Governance Framework

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Abstract:- Because of the pervasiveness of information technology in today's dynamic and often turbulent business environments, ignore or avoid IT decisions is impossible in most sectors, industries and organizations now. In this circumstance, many organizations start to implement IT governance to achieve the stronger relationship between business and IT. Organizations with undergoing FEAF must start to the implementation of IT governance, although FEAF is one of the most integrated and robust frameworks in enterprise architecture which are suitable for a variety of government and also public and private sector organizations. But its focus on IT governance is not sufficient and reliable in most real cases. Thus, by this paper, we aim to propose developing a method to leverage FEAF as a candidate of EA framework by deploying a modern powerful IT governance framework called COBIT. By this trend we may expect to gain satisfying alignment of IT and Business processes and later to provide policies and best practices for monitoring the appropriate IT control and IT performance measurement in undergoing FEAF projects.

Keywords: IT Governance, Enterprise Architecture (EA), FEAF, COBIT, Framework.

1. Introduction

Information technology (IT) has become pervasive in today's dynamic and often turbulent business environments. While, in the past, business executives could delegate, ignore or avoid IT decisions, this is now impossible in most sectors and industries. In these circumstances, many organizations have started with the implementation of IT governance to achieve the fusion between business and IT and to obtain the needed IT involvement of senior management [1, 2].

Thus, due to increasing electronic business and technology dependence, it has become evident that there is a need for developing and managing internal controls and appropriate levels of security and control in information technology in organizations [3].

Therefore, IT governance and control over IT are issues that are high on the agenda in many organizations [4] and many organizations - whether public or private, large or small- start to implement IT Governance in their projects. Organizations with undergoing FEAF are not excluded from that matter and also they must implement IT governance. Whereas, FEAF Framework is such a tool and repository to collect common architecture information and build a repository for storing this information and focused on the design of future status in support of business [5].

Therefore, FEAF do not have the full spectrum of IT governance duties to control over IT and related technologies. Therefore organizations with undergoing FEAF projects need to apply modern robust frameworks and tools to implement control and applying IT Governance. This may lead us to COBIT as a well-known IT Governance framework to achieve better control and governance over IT. Only COBIT addresses the full spectrum of IT governance duties; however, several standards publications describe the duties in a more comprehensive manner than COBIT. Thus, we aim to develop a method to leverage control over IT in FEAF by deploying COBIT. With the deployment of COBIT in undergoing FEAF projects, IT is aligned with the business; IT enables the business and increases benefits; IT resources are used responsibly; and IT risks are managed appropriately.

In Section2 and section3 discusses FEAF and COBIT. Section4 and section5 present proposed work. The detailed results and discussions are given in section6.

2. Overview of FEAF

The Federal Enterprise Architecture Framework (FEAF) was developed by the Chief Information Officers (CIO), dated September 1999[6, 7]. In designing the framework, the CIO Council identified eight components necessary for developing and maintaining the Federal Enterprise Architecture [6]. The FEAF consists of four levels of increasing detail from a high level description of the FEAF eight components Level I with Levels II, III and IV providing increasing detail [5]. Level I is the highest level, or the strategic view of the FEAF. This view is appropriate for the executives and senior managers of government organizations, and cites eight fundamental components Federal organizations need to plan and develop FEAF-compliant enterprise architecture. The FEAF Levels II and III provide additional detail about

the information to be captured. In level III, the business and technical drivers become the catalysts that transform the as-Is (existing) architecture to the To-Be (future target) architecture. FEAF Level IV provides a low-level tactical view, and identifies the architectural models needed to describe and plan the organizational transformation [5]. Style of implement these levels can be summarized in two sections "Architecture Development" and "Architecture Maintenance". The sections provide step-by-step guidance to develop and maintain architecture for core mission areas and common services defined by FEAF compliant enterprise architecture. Architecture Development is including of Architectural Analysis, Architectural Definition, Investment and Funding Strategy, and Program Management Plan and Execute Projects. But Architecture Maintenance is including of new business and information requirements, and applies these drivers to update architecture work products [8].

3. Overview of COBIT

Control Objectives for Information and related Technology (COBIT) an open standard for control over information technology, developed and promoted by the IT Governance Institute, and published by the Information Systems Audit and Control Foundation (ISACF). The latest version is COBIT 4.1, published in 2007[10]. COBIT provides a framework that gives guidance on IT governance and the control of IT [3] and addresses a broad spectrum of duties in IT governance and management. [10] COBIT allows enterprises to use it as guidance to ensure a well-governed environment [3]. This framework has been structured into 34 IT processes clustering interrelated life cycle activities or interrelated discrete tasks. The processes have been split into four domains: Plan and Organize, Acquire and Implement, Deliver and Support, and Monitor and Evaluate [9, 10].

This structure covers all aspects of information and the technology that supports it. Furthermore, COBIT contains 318 detailed control objectives over all the 34 IT processes. The control objectives make a clear and distinct link to business objectives to support significant use outside the assurance community. Briefly, by addressing these processes and control objectives, the organization can ensure that an adequate control system is provided for the IT environment [3, 10]. Control system of COBIT framework is accordance with IT Governance cycle. IT governance cycle provides the structure that links IT processes, IT resources and information to enterprise strategies and objectives. This cycle in COBIT enables the enterprise to take full advantage of its information, thereby maximizing benefits, capitalizing on opportunities and gaining competitive advantage [3].

Organizations by using of COBIT IT Governance cycle can satisfy the quality, fiduciary and security requirements for their information, as for all assets and management can put an internal control system or framework in organization. Thereby, management can understand the status of its enterprise architecture for IT and decide what governance and control it should provide [9].

4. How to Form the Idea of Exposure Model of COBIT IT Governance Framework in FEAF

Although, FEAF has two strategic and tactical view, but its main view is strategic and in level IV has low level tactical view. Hence, FEAF is more about the design of future status in support of business and less about overt control over IT and related technologies. Since, FEAF is unable to provide the good level of IT security and control practices for undergoing FEAF projects. While, COBIT framework has a tactical view and in fact, it focus on control over IT, and also provides a generally accepted standard for good IT security and control practices to support the needs of enterprise management in determining and monitoring the appropriate level of IT security and control for their organizations. Thus, considering the above mentioned**,** the most important ambiguity that can be seen in FEAF, is the lack of full spectrum of IT governance and control system to establish control over IT and related technologies. But, COBIT provides business process owners with a framework, which should enable them to control all the different activities underlying IT deployment. As a result, on this basis they can gain reasonable assurance that IT will contribute to the achievement of their business objectives. Moreover, COBIT has a common focus on assessing, processing and reporting vital information to make decisions that move the IT Governance cycle to the next step. So, these two frameworks can be complementary one with focusing on strategic concepts (FEAF) and other with focusing on tactical concepts (COBIT). As organizations underlying FEAF through the utilization of COBIT framework to establish IT Governance can enable their executives to answer two key questions about Architecture (Are we doing them the right way?), Delivery (Are we getting them done well?), and to put an internal control system or framework in their organization. The benefits of implementing COBIT as a governance framework over IT in FEAF include:

- Making a link to the business requirements.
- Organizing IT activities into a generally accepted process model.
- Identifying the major IT resources to be leveraged.
- Defining the management control objectives to be considered.

According to aforesaid, in order to mature that idea, we try to establish a method to leverage FEAF by deploying COBIT IT governance framework.

5. Structure of the Proposed Method to Leverage FEAF by Deploying COBIT IT Governance Framework

Structure of the proposed method contains 4 phases. In phase1 we develop a mapping between the two frameworks. Next, in phase2 referring to the mapping results, a table is developing that contains some COBIT IT processes and control objectives as GAP. Afterwards, in phase3 we review FEAF practical guide until if necessary we deploy the processes from the gap for the implementation of IT governance in FEAF. Structure of the proposed method is described step- by- step. As following:

5.1. Developing the Mapping of FEAF to COBIT Framework

With reference to research documents published by the ITGI considering integration between COBIT and other frameworks, a method for mapping between COBIT and FEAF may consider novel and impressing. The mapping process identifies a direct link between the COBIT processes and control objectives its and FEAF components.

5.2. Developing the Table Including of Some COBIT IT Processes and Control Objectives

By considering the results of mapping in phase1, Table 1 illustrates a number of most important of COBIT IT processes and control objectives that are poorly referenced or not addressed in FEAF.

Domains of COBIT 4.1	IT Processes of COBIT	Control Objectives
Plan and Organize (PO)	PO4	PO4.3, PO4.4, PO4.6, PO4.7, PO4.8, PO4.10, PO4.11, PO4.12, PO4.13, PO4.14
	PO5	PO5.1, PO5.2, PO5.3
	PO6	PO6.4, PO6.5
	PO7	PO7.4, PO7.5, PO7.7, PO7.8
	PO8	PO8.1, PO8.5, PO8.6
	PO9	PO9.1, PO9.2, PO9.3, PO9.5, PO9.6
	PO10	PO10.2, PO10.3, PO10.5, PO10.6, PO10.8, PO10.9, PO10.10, PO10.11, PO10.12, PO10.13, PO10.14
Acquire and implement (AI)	AI3	AI3.4
	AI4	AI4.2, AI4.3, AI4.4
	AI5	AI5.1, AI5.2, AI5.3, AI5.4
	AI7	AI7.9, AI7.1, AI7.2, AI7.4, AI7.5, AI7.6, AI7.7, AI7.8
Deliver and Support (DS)	DS1	DS1.2, DS1.3, DS1.4, DS1.6
	DS2	DS2.1, DS2.2, DS2.3, DS2.4
	DS3	DS3.5
	DS4	DS4.10, DS4.1, DS4.2, DS4.4, DS4.5, DS4.6, DS4.7, DS4.8, DS4.9
	DS5	DS5.1, DS5.2, DS5.3, DS5.4, DS5.5, DS5.6, DS5.7, DS5.8, DS5.9, DS5.10, DS5.11
	DS6	DS6.1, DS6.2, DS6.3, DS6.4
	DS7	DS7.1, DS7.2, DS7.3
	DS8	DS8.1, DS8.2, DS8.3, DS8.4, DS8.5
	DS10	DS10.1, DS10.2, DS10.3, DS10.4
	DS12	DS12.1, DS12.2, DS12.3, DS12.4, DS12.5
	DS13	DS13.1, DS13.2, DS13.3, DS13.5
Monitor and Evaluate (ME)	ME1	ME1.1, ME1.2, ME1.3, ME1.4, ME1.5, ME1.6
	ME2	ME2.1, ME2.2, ME2.3, ME2.4, ME2.5, ME2.6, ME2.7
	ME3	ME3.2, ME3.3, ME3.4, ME3.5
	ME4	ME4.3, ME4.4, ME4.5, ME4.6, ME4.7

TABLE 1: SOME COBIT IT PROCESSES AND CONTROL OBJECTIVES AS GAP

Then in step3, according to table1, Processes of COBIT that would been effective to establish IT governance in FEAF, being deploy in it.

5.3. Review FEAF Practical Guide to Deploy the Minor or Unrelated Match Processes of COBIT in FEAF

In order to implement IT governance and monitoring and controlling in FEAF framework, we review FEAF practical guide and by considering table 1 deploying the processes of COBIT in FEAF. As we have stated previously, FEAF practical Guide is including of two sections "Architecture Development" and "Architecture Maintenance". So, review of this two section is requirement of establish monitoring and controlling in FEAF framework, until we can deploy IT processes and control objectives of COBIT in it.

5.3.1. Architecture Development Section:

Architecture development consists of four steps, which IT processes of COBIT have been deployed in every step, as follows.

Step1: Architectural Analysis: The purpose of this step is to determine the business drivers and a simple and concise vision for the enterprise (the "as is" state of the architecture). [8] In total, this step is including of two activities "identify business drivers" and "determine scope of architecture" mainly. But in order to implement

IT governance and monitoring and controlling in FEAF framework in addition to determine the business drivers and the scope of architecture, we must determine the IT Governance drivers and the "as is" state of IT processes. Table 2 is showing added activities and processes of COBIT to architectural analysis step.

Activities of FEAF	Added activities and processes of COBIT4.1 to **architectural analysis** step	
	Added activities and processes of COBIT	*Control objectives of COBIT*
Identify architecture drivers	Identify IT governance drivers	✕
Determine Scope of architecture	Linking business goals to IT goals and determine information criteria and enterprise architecture for IT to create the current business processes more efficient and meet governance-related requirements.	✕
	Determine the IT Process Framework including current IT process structure, relationships and ownership by PO4.	PO4.1
	Understand the IT performance and evaluate the current IT processes and establish a general monitoring framework and approach to measure IT processes performance and monitor its contribution to the business by ME1.	ME1.1
	Obtain an understanding of the enterprise's present attitude toward risk to identify the current risks related IT for determine how it will impact the programmed by PO9.	PO9.1, PO9.2, PO9.3, PO9.4

TABLE 2: ARCHITECTURAL ANALYSIS INCLUDING ACTIVITIES AND PROCESSES OF COBIT4.1

Step2: Architectural Definition: The purpose of this step is to determine the performance goals for the architecture, define the "to be" state of the architecture and develop a plan for achieving that state mainly. [8] According to these activities of architectural definition step and the results from previous step, added activities and processes of COBIT are shown in table 3.

Activities of FEAF	Added activities and processes of COBIT4.1 to **Architectural Definition** step	
	Added activities and processes of COBIT	*Control objectives of COBIT*
Determine the performance goals for the architecture	Management guidelines' IT process (key goal indicators) KGIs and IT key activity (key goal indicators) KPIs for defining process metrics.	✕
Define the "to be" state of the architecture	Define Quality Management System by PO8.	PO8.1
	Define Internal Control System and Establishing an effective internal control system for IT requires by ME2.	ME2.1
	Define IT Governance Framework includes defining target organizational structures, processes, leadership, roles and responsibilities to ensure that enterprise IT investments are aligned and delivered in accordance with enterprise strategies and objectives by ME4.	ME4.1
Develop a plan for achieving "to be" state (Transition strategy)	Establish and communicate roles and responsibilities for IT personnel and end users. Define a competent workforce for the creation and delivery of IT services to the business by PO4 and PO7.	PO4.3, PO4.6, PO4.7, PO4.8, PO4.10, PO4.11, PO4.13, PO4.14, PO7.3
	Define, Identify and maintain standards, procedures and practices for key IT processes to guide the organization in meeting the intent of the QMS by PO8.	PO8.2, PO8.5
	Place the IT function in the overall organizational structure with a business model contingent on the importance of IT within the enterprise, specifically its criticality to business strategy and the level of operational dependence on IT by PO4.	PO4.4
	Determine Risks by KGIs and KPIs inversed as risk indicators.	✕

TABLE 3: ARCHITECTURAL DEFINITION INCLUDING ACTIVITIES AND PROCESSES OF COBIT4.1

Step3: Investment and Funding Strategy: The purpose of this step is to define a funding strategy for project execution and develop the business cases to justify investments. [8] By considering the results of gap, only PO5 process can be deployed into this step. The PO5 process and PO5.1, PO5.2, and PO5.3 control objectives fosters partnership between IT and business stakeholders; enables the effective and efficient use of IT resources; and provides transparency and accountability into the total cost of ownership (TCO), the realization of business benefits and the ROI of IT-enabled investments. So, implement a cost management process comparing actual costs to budgets and a process to monitor the benefits from providing and maintaining appropriate IT capabilities. Outcomes of Investment and Funding Strategy step considering activities and processes of COBIT4.1 deployed into this step include beneath: IT investment portfolio with an approved funding strategy from Investment and Funding Strategy. Cost-benefit reports from PO5.

Step4: Program Management Plan and Execute Projects: The purpose of this step is translating the target architecture and funding strategy into a program management plan. The program management plan should be developed to a sufficient level of detail to allow project managers and system developers to understand the scope and duration of individual projects and the relationships between implementation tasks and activities. [8]Also, after execute projects, we are checking our progressing towards achieving performance goals by defining and monitoring

performance measurement indicators and target performance measures to verify performance improvements.

In total, this step is including of tree activities "Program Management Plan", "Execute Projects" and "defining and monitoring performance measurement indicators" mainly. Table 4 is showing added activities and processes of COBIT to program management plan and execute projects step.

Activities of FEAF	Added activities and processes of COBIT4.1 to **Program Management Plan and Execute Projects** step	
	Added activities and processes of COBIT	*Control objectives of COBIT*
Program Management Plan	Establish and maintain a project management framework that defines the scope and boundaries of managing projects by PO10.	PO10.2
	Establish a project management approach commensurate with the size, complexity and regulatory requirements of each project by PO10.	PO10.3
	Define and document the nature and scope of the project to confirm and develop amongst stakeholders by PO10.	PO10.5
	Project Phase Initiation by PO10.	PO10.6
	Define the responsibilities, relationships, authorities and performance criteria of project team members by PO10.	PO10.8
	Prepare a quality management plan and a change control system for each project and Identify assurance tasks required to support the accreditation of new or modified systems during project planning by PO10.	PO10.10 PO10.11 PO10.12
	Transfer knowledge to business management, end users, and operations and technical support staff by AI4.	AI4.2, AI4.3 AI4.4
	Develop and follow a set of procedures and standards of Procure IT Resources by AI5.	AI5.1, AI5.2, AI5.3, AI5.4
	Train the staff members of the affected user departments and the operations group of the IT function by AI7.	AI7.1
	Establish a test plan, a secure test environment, a System and Data Conversion by AI7.	AI7.2, AI7.4 AI7.5

	Perform Test changes independently in accordance with the defined test plan, Final Acceptance Test by AI7.	AI7.6 AI7.7
	Following testing, control the handover of the changed system to operations by AI7.	AI7.8
Execute Projects	Project Risk Management by PO9.	PO9
	Project Closure by PO10.14.	PO10.14
Defining and monitoring performance measurement indicators	KPIs, indicate whether goals are likely to be met and KGIs, indicate whether the goals have been met and key performance indicators.	⊠
	Employee Job Performance Evaluation by PO7.	PO7.7
	Define, plan and implement measurements to monitor continuing compliance to the QMS by PO8.	PO8.6
	Measure project performance against key project performance scope, schedule, quality, cost and risk criteria by PO10.13.	PO10.13
	Post-implementation Review by AI7.	AI7.9
	Monitor and evaluate IT Performance and monitor and evaluate internal control by ME1 and ME2.	ME1.1, ME1.2, ME1.3, ME1.4, ME1.5, ME1.6, ME2.1, ME2.2, ME2.3, ME2.4, ME2.5, ME2.6, ME2.7
	Review compliance with external requirements and architecture for obtaining assurance that the requirements have been complied with and, finally, integrating its compliance reporting with the rest of the business by ME3.	ME3.2 ME3.3 ME3.4 ME3.5
	Review Programmed effectiveness and assess the results and experience gained from the programmed.	ME4.3 ME4.6 ME4.7

TABLE 4: PROGRAM MANAGEMENT PLAN AND EXECUTE PROJECTS INCLUDING ACTIVITIES AND PROCESSES OF COBIT4.1

5.3.2. Architecture Maintenance Section: architecture maintenance monitors and assimilates new business and information requirements, and applies these drivers to update architecture work products. This maintains clear relationships between agency strategic

goals, business and information management solutions, and measurable performance improvements. [8] But what we are need to continue the COBIT IT governance cycle only to identify these needs, is not limited. Yea in addition to identify the new or revised change drivers and define the impact of new drivers on existing architecture work products, FEAF should be able to maintain the IT Governance framework. Therefore FEAF must be able to Build Sustainability and Identify New Governance Requirements. By considering aforesaid**,** added activities and processes of COBIT are shown in table 5.

Activities of FEAF	Added activities and processes of COBIT4.1 to **Architectural Definition** step		
	Added activities and processes of COBIT		*Control objectives of COBIT*
Identify the new or revised change drivers	Build Sustainability	Define new IT organizational structure that reflects new business needs by PO4	PO4.1
		Communicate awareness and understanding of business and IT objectives to support the IT governance by PO6	PO6.5
		Ensure Continuous Service and Develop a framework for IT continuity by DS4	DS4.1, DS4.2, DS4.4, DS4.5, DS4.6, DS4.7, DS4.8,
			DS4.9, DS4.10
		Ensure Systems Security and Manage IT security at the highest appropriate organizational level by DS5	DS5.1, DS5.2, DS5.3, DS5.4, DS5.5, DS5.6, DS5.7, DS5.8, DS5.9, DS5.10, DS5.11
		Effective education of all users of implemented IT systems by DS7	DS7.1, DS7.2, DS7.3
	Identify New Governance Requirements	Identification of External Legal, Regulatory and Contractual Compliance Requirements by ME3	ME3.1

Table 5: Architecture Maintenance Including Activities and Processes of COBIT

As yet COBIT processes are deployed into FEAF for implementation of IT Governance. But as we have previously expressed, COBIT IT processes follow a cycle. So that each process receive the information of the results of processes before it or processes after it (in the previous iteration) and then it provide outputs for other processes (before or after it). Putting these processes throughout the FEAF framework is enforced to adherence this framework from a cycle**.** So entering this cycle in FEAF answers to all FEAF needs to have an IT control framework. Thus well-managed enterprises employ IT Governance to ensure that the enterprise is achieving its strategic and operational goals. IT governance enables the enterprise to take full advantage of its information, thereby maximizing benefits, capitalizing on opportunities and gaining competitive advantage.

6. Conclusion

In this paper, we focused on one of the most integrated and robust EA frameworks, called FEAF. Despite of all the benefits of FEAF, risks and opportunities related to IT aren't managed in a clear and straightforward way while it is done by COBIT framework. This may lead us to a COBIT as a completing well-known IT Governance framework to achieve better control and governance over IT. In order to mature that idea, we tried to develop a method to leverage control over IT in FEAF by deploying COBIT. To acquire the method, we proposed a structure for the implementation of COBIT IT Governance Framework. Then according to the proposed structure, we put the COBIT IT processes in FEAF step-by-step. So, putting these processes throughout the FEAF framework is enforced to adherence this framework from a cycle. The development of this cycle in FEAF is cornerstone for effective progress in the field of information and related technology controls in Organizations with undergoing FEAF. Thereupon, with the deployment of COBIT in undergoing FEAF projects, IT is aligned with the business; IT enables the business and maximizes benefits; IT resources are used responsibly; and IT risks are managed appropriately.

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