Project Management and Maintenance on Information Systems Administration
Diogo Pinto - nº69905

Diogo.Reis.Pinto@tecnico.ulisboa.pt

Instituto Superior Técnico

Abstract. Information Systems administration on an organization requires handling requests for projects and maintenance operations, in a way it brings value to all concerned parties. For meeting this expectations, Information Systems management needs to implement processes for dealing with incoming requests, aligning it with business expectations and criteria (risk, priority, team capabilities). Frameworks like COBIT, ITIL or PMBOK provide guidance on achieving success in management operations on an IT organization, being an important asset to design and implement processes for project and maintenance requests. In this document we present the state of the art on management processes for IT organizations, as the basis for an initial proposal of a process to handle requests for projects and maintenance operations on information systems administration.

Keywords:

Project Management, Maintenance, Software lifecycle Processes, COBIT, ITIL, PMBOK

1 Introduction

Information technologies (IT) enable, enhance, and are embedded in a growing number of goods and services. They are connecting consumers and producers of services in ways previously not feasible, while contributing to the productivity of numerous sectors of the services industry such as financial services, communications, insurance, and retail services.3 Government agencies, too, have experienced similar gains associated with the use of IT.

Currently, organizations moved from the limited perspective of profitability to a more wider view of the business, trying to maximize the business performance by increasing client satisfaction, products quality and management efficiency in comparison with the concurrency.

Management on information systems is all about leadership, organizational structures and processes that ensure information systems support and alignment with organization's objectives. Information systems provide and competitive edge to concurrents, but an organization can only achieve management efficiency with well defined and matured processes.

One important aspect for an organization take advantage of its concurrency is the way how it deals with receipt and categorization of project and maintenance requests. There is a inherent necessity to classify a new request in terms of opportunities and value to the business as well as the risk associated with it, making it an important asset for the organization.

For achieving this goal, the organization needs to review its management processes, which can be at any level of maturity. In any case, there is need to establish a standardized process for managing incoming requests, in order to improve efficiency and define clear work procedures in the organization.

For establishing standards on this subjects, business professionals came across with several frameworks and practical guides, making an attempt to provide and standardize many practices around management on information systems.

Considering the state of the art, COBIT assumes a major position on good practices for information systems management. It provides a complete framework for implementing management and governance processes, taking in account a set of enablers and goals, from IT-related to business.

For a more technical approach, oriented to IT services, we have ITIL V3, consisting in a good practices manual for managing IT services, during its life cycle. ITIL is divided in four volumes, comprising all the life cycle of IT services: service Strategy, service design, service operation and service continual improvement,

PMBOK is the project management guide widely accepted by professionals from all areas of knowledge. It explores the processes that make part of the project life cycle, presenting them in a general way to all areas, making it universally applicable.

Assuming the project management and maintenance management as the main focus areas for this thesis, we need to take in account the project portfolio aspects of the organization. It corresponds to a centralized management of processes, methods and technologies, used by project managers and project management offices to analyze and manage a set of projects.

We can have two distinct approaches for this thesis. One approach is dealing with the problem considering the process necessary for receiving and managing an project or a maintenance operation, considering we have already defined all aspects related to project portfolio. The other approach is to consider also the alignment of this process with the business and technological goals of the organization for creating value. We will need to analyze the state of the art in addition with the expectations of the client to decide which approach will we assume. This will be presented in section XXX.

This thesis project is divided into the problem definition in section XXX, where we define the problem scope in more detail, in the state of the art in project and maintenance management in section XXX, taking as reference the manuals presented before and a set of standards, and a first approach to the solution to adopt in section xxx, achieved through interview method with the client in order to define some concrete aspects of the project.

2 Objectives

The main objective of this thesis is to design a process for project and evolving maintenance requests management that arrive to an information systems department of an organization.This process should be designed taking in account the background of a specific organization, but is as more interesting as more generally applicable it is.

Based in the process we want to design, we also need to define the activities that belong to it and assigning responsibilities through an RACI Matrix (Responsibility Assignment Matrix). These responsibilities need to take as basis the organization structure in terms of roles and responsibilities. The supporting artifacts to the process will also be defined according to its importance to each activity belonging to it.

After designing the process and the respective RACI matrix and supporting artifacts, the objective is to design an logical application architecture for supporting the process, based on the existent market solutions for project and maintenance management. This architecture must be able to fully support and integrate the designed processes in the global structure of the organization, being able to be directly applied.

3 Problem Contextualization

This thesis is aligned with a real case of an organization with 600 collaborators where the information systems department management has 15 elements including the director and the team leaders. This management is composed by the department of evolving maintenance and the department of projects execution, treated forward as projects department and maintenance department, respectively.

When a request is submitted to the information systems management, it must be classified into a maintenance operation or a project execution. A correct classification is fundamental, in the way it defines from which is the responsibility to deal with the request fulfillment.

The request classification will depend on many factors. We can decide it by taking in account aspects like the risk to the business or the financial impact for the organization. In the end, it depends on the organizational culture and how it considers what is a maintenance operation and what is a project.

After classified, we need to define the request fulfillment in terms of processes to consider and communication channels between the project and the maintenance department, assuming they are independent but need to be coordinated.

Considering the software life cycle processes, presented by the International Standard ISO/IEC 12207 presented in more detail in section xxx, we can divide this processes in two groups: Software Specific Processes and System Context processes.

The system context processes are more focused on systems engineering, providing a system context for dealing with a standalone software product or service

or a software system. The software specific processes are, on the other hand, used for implementing a software product or service that is an element of a larger system.

The main challenge of our problem is to identify and implement the necessary processes from the software life cycle processes that are important for our objectives, defining activities and responsibilities inside the organization.

As long as we are dealing with an established organization in the market, we need to take in account that our process will be implemented in an existent organizational structure. It is necessary to develop a logical application architecture, using market solutions from the area of Project management and IT service management, that will be architecturally integrated to support our process. We will need to assess the market solutions already available to conclude which are the best in terms of features and interest for the project.

4   Related Work

In this section we will present a set of literature references on the subjects related to this thesis. We will present the most important frameworks on Information Systems Management and Governance. This process has the objective to come up with a choice of a frameworks or a set of them to implement our processes for project and maintenance management

In terms of logical application architectures, we will provide an analysis of the main features of a set of Project Management and Information Technologies Service Management solutions available in the market. Our objective is to conduct an comparative analysis relating all the solutions and choose the ones that best fit our purposes for use on an logical application architecture.

4.1   Frameworks for Information Technologies Governance and Management

In this section we will present the three frameworks we consider the most relevant for this thesis: COBIT 5, ITIL V3 and PMBOK. This three frameworks provide, from different perspectives, guides and principles for IT Governance and Management, providing processes for achieving a successful implementation of this principles in an organization.

IT Governance and IT Management One important concept to define is the difference between IT Governance and IT management. They are many times confused and some authors already tried to explain the difference between the two concepts.

Considering the definition given by Van Grembergen *et al.*, ""IT Management is focused on the internal effective supply of IT services and products and the management of present IT operations. IT Governance in turn is much broader, and concentrates on performing and transforming IT to meet present and future

demands of the business (internal focus) and the business' customers (external focus)."".

Considering the COBIT 5 view for this question, it makes a clear distinction between governance and management, in the way these two disciplines encompass different types of activities, require different organizational structures and serve different purposes.

Governance ensures that stakeholder needs, conditions and options are evaluated to determine balanced, agreed-on enterprise objectives to be achieved; setting direction through prioritisation and decision making; and monitoring performance and compliance against agreed-on direction and objectives.ï£ijManagement plans, builds, runs and monitors activities in alignment with the direction set by the governance body to achieve the enterprise objectives.
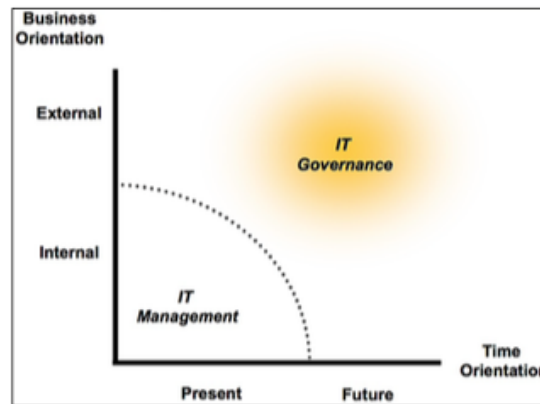

Fig. 1. IT Governance and IT Management

Considering both definitions and the figure 1, we can conclude that IT Governance has a bigger dimension that IT Management, but are disciplines that need to be related and complementary to achieve success inside an organization.

COBIT 5 Control Objectives for Information and Related Technology (COBIT) is a framework created by the Information Systems Audit and Control Association (ISACA) for IT Management and IT Governance.

COBIT 5 provides a comprehensive framework that assists enterprises in achieving their objectives for the governance and management of enterprise IT. Simply stated, it helps enterprises create optimal value from IT by maintaining a balance between realizing benefits and optimizing risk levels and resource use [3]. The framework is built on five basic principles:

– Meeting the Stakeholders Needs
– Covering the Enterprise End-to-end

- Applying a Single, Integrated Framework
- Enabling a Holistic Approach
- Separating Governance from Management

It also defines seven enablers, explained by COBIT as factors that, individually and collectively, influence whether governance and management over enterprise will work or not. This enablers can be categorized as:

- Principles, Policies and frameworks
- Processes
- Organizational structures
- Culture, ethics and behavior
- Information
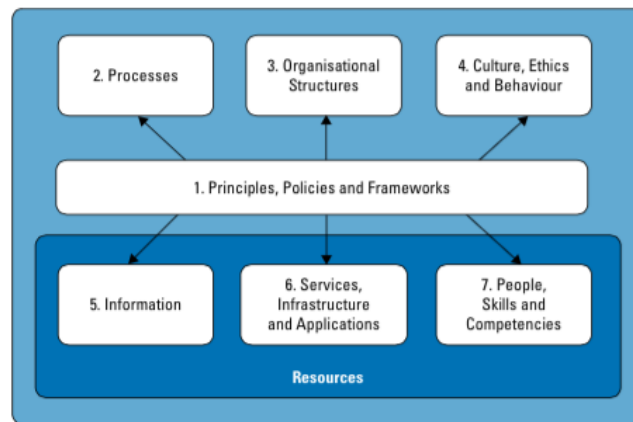- Services, infrastructure and applications
- People, skills and competencies

Fig. 2. COBIT 5 enablers

Image 2 presents the COBIT 5 enablers previous defined and how they relate among themselves int terms of its importance for organization. Each enabler has stakeholders, a set of goals, a life cycle and for each can be defined good practices.

Considering figure 3, COBIT 5 process reference model considers two big domains of processes: Governance and Management. The governance domain contains five processes in the domain evaluate, direct and monitor(EDM). The management domain has four internal domains of processes:Align, Plan and Organise(APO), Build, Acquire and Implement(BAI), Deliver, Service and Support (DSS) and Monitor, Evaluate and Assess(MEA).

All processes for management and governance are presented in the appendix and all the implementation details explained in COBIT 5: Enabling Processes,
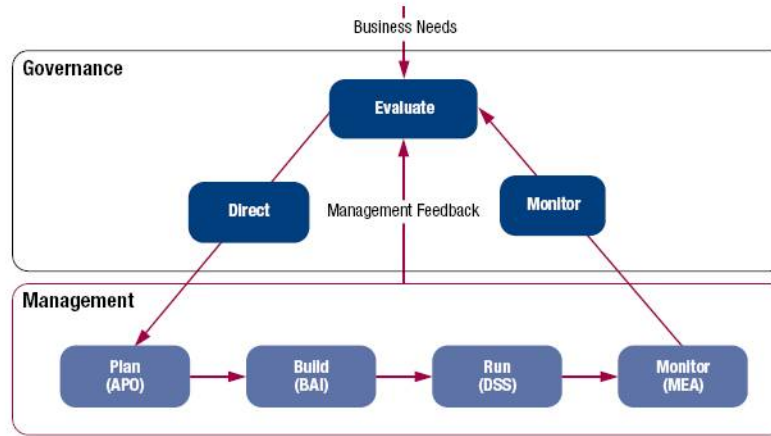
Fig. 3. COBIT 5 domains

A detailed reference guide to the processes defined in the COBIT 5 process reference model. This includes the COBIT 5 goals cascade, a process model explanation, governance and management practices, and the process reference model[4].

COBIT 5 includes a process capability model based on ISO/IEC 15504 Software Engineering - Process Assessment standard. [REFERENCE HERE] This models allow to measure the current level of maturity of enterprise processes, presenting the gap between the current level and the desired one the enterprise wants to achieve. This new capability model is an improvement of the previous on COBIT 4.1, being more simplified and compliant with a generally accepted process assessment standard.

Relating to other frameworks and standards, COBIT tries to establish a framework that is compliant with the most widely accepted standards in IT Governance and Management. In figure 4 we can see the standards COBIT 5 relates by processes domain, with special attention to ITIL V3, ISO/IEC 20000, PMBOK and CMMI, that are closely related to this thesis problem. This compliance with other standards is fundamental for a widely adoption of COBIT 5, in the way it tries to establish goals, metrics, practices, roles, inputs and outputs for each process, making it necessary being compliant with international standards. This is will improve COBIT application and acceptance.

COBIT 5 critical analysis The COBIT 5 is one of the most interesting frameworks widely accepted by organizations in the IT management and Governance Area. It arises as the main framework for establishing processes to guide us on management and governance and establish ways to control them. However, its a complex framework that needs time and practice to be fully implemented.

For this thesis project, we will consider only the domains relevant for our objectives, making a selection of the processes we pretend to implement. This will allow us to get the bigger value COBIT has to offer, making it possible, in the time-frame available, achieve our implementation objectives.

One important aspect of the use of COBIT is that it provides a more business and strategic view of IT on organizations, presenting a lack of operational approach to some themes that are relevant for our project. To overcome this, we will analyze a more operational framework on IT service management, the ITIL V3 framework and a project management guide considered by the main specialists on the area as the reference for project management, the Project Management Book of Knowledge.
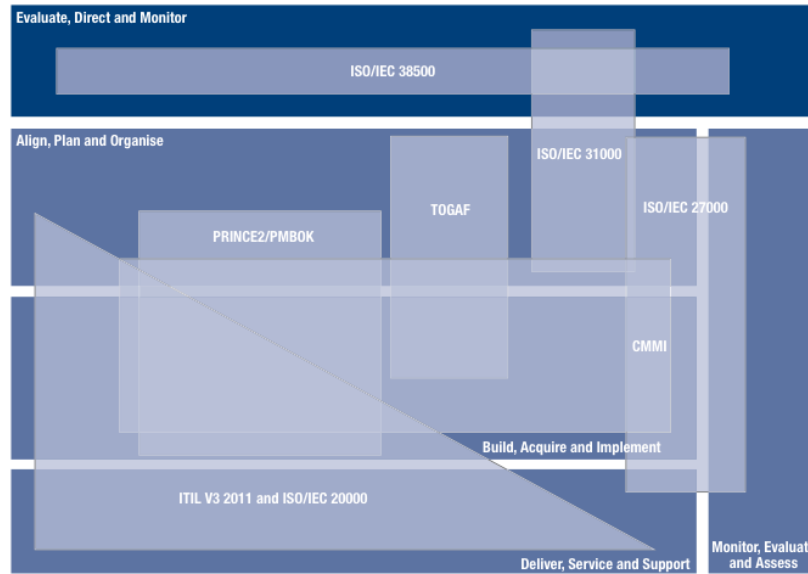

Fig. 4. COBIT 5 coverage on other frameworks

ITIL V3 First developed in the 1980s by the Office of Government Commerce (OGC), a branch of the British Government, ITIL defines processes at a high level. It is left to the organizations to implement the processes in the manner most suitable to their particular situations and needs.

ITIL is becoming a de facto standard worldwide as organizations adopt it as their guideline for establishing IT service management (ITSM) processes. IT organizations can use the guidance provided by ITIL to transform their service management capabilities into strategic assets, those that provide the basis for

core competence, distinctive performance, durable advantage, and qualifications to participate in business opportunities.

The ITIL service management practices are comprised of three main sets of products and services: ITIL service management practices (core guidance), ITIL service management practices (guidance specific to industry sectors, organization types, operating models and technology architectures) and ITIL web support services.
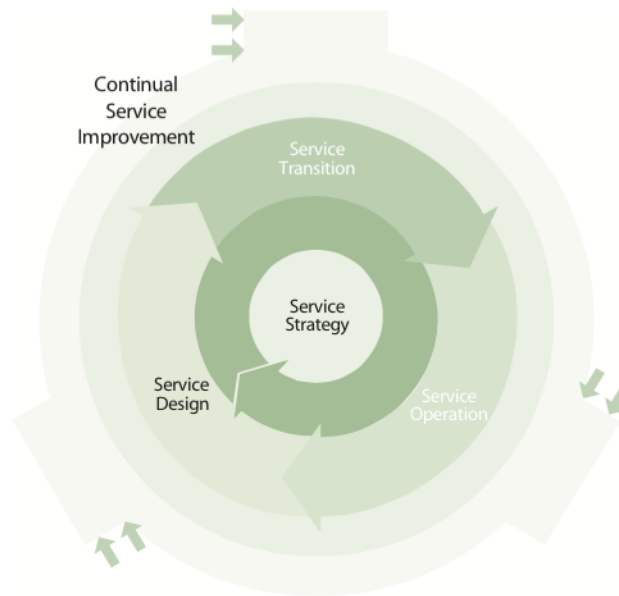

Fig. 5. ITIL V3 volumes

The core set, presented in figure XXX and the one we will consider for this thesis, consists of six publications: Introduction to ITIL Service Management Practices, Service Strategy, Service Design, Service Transition, Service Operation and Continual Service Improvement. Each one of this volumes is composed by practice fundamentals and principles, Lifecycle processes and activities, Supporting organization structures and roles, Technology considerations, Practice implementation and Challenges, risks and critical success factors.

Service Strategy provides guidance on how to view service management not only as an organizational capability but as a strategic asset. Guidance is provided on the principles underpinning the practice of service management which are useful for developing service management policies, guidelines and processes across the ITIL Service Lifecycle. The processes included in Service Strategy volume are:

- Financial Management
- Service Portfolio Management
- Demand Management

Service Design provides guidance for the design and development of services and service management practices. It covers design principles and methods for converting strategic objectives into portfolios of services and service assets. The scope of Service Design is not limited to new services. It includes the changes and improvements necessary to increase or maintain value to customers over the lifecycle of services, the continuity of services, achievement of service levels, and conformance to standards and regulations. The processes included in Service Design volume are:

- Service Catalogue Management
- Service Level Management
- Capacity Management
- Availability Management
- IT service Continuity Management
- Information Security Management
- Supplier Management
- Application Management
- Data and Information Management
- Business Service Management

Service Transition provides guidance for the development and improvement of capabilities for transitioning new and changed services into live service operation. This publication provides guidance on how the requirements of Service Strategy encoded in Service Design are effectively realized in Service Operation while controlling the risks of failure and disruption.The processes included in Service Transition volume are:

- Change Management
- Service asset and Configuration Management
- Release and deployment Management
- Knowledge Management
- Stakeholder Management
- Transition Planning
- Support and Service Evaluation

Service Operation embodies practices in the management of the day-to-day operation of services. It includes guidance on achieving effectiveness and efficiency in the delivery and support of services to ensure value for the customer and the service provider. Strategic objectives are ultimately realized through Service Operation, therefore making it a critical capability. Guidance is provided on how to maintain stability in service operations, allowing for changes in design, scale, scope and service levels.The processes included in Service Operation volume are:

- Event Management
- Incident Management
- Request Management
- Problem Management
- Access management

Continual Service Improvement provides instrumental guidance in creating and maintaining value for customers through better design, transition and operation of services. It combines principles, practices and methods from quality management, change management and capability improvement. Organizations learn to realize incremental and large-scale improvements in service quality, operational efficiency and business continuity. Guidance is provided for linking improvement efforts and outcomes with service strategy, design and transition. The processes included in Service Operation volume are:

- The 7-Step Improving Process
- Service Level Management

Not different from COBIT, ITIL takes public frameworks and standards as a form of the organization to have advantage on the market. Organizations should build their proprietary knowledge on top of a body of knowledge based on public frameworks and standards. Collaboration and coordination across organizations are easier because of shared practices and standards. According to research by the UK Department of Trade and Industry (DTI), the value to the UK economy from standards is estimated to be about £2.5 billion per annum [5].

For related standards and frameworks to ITIL V3, we have ISO/IEC 20000 (service management system standards), ISO/IEC 27001 (standard providing requirements for an information security management system), PMBOK (manual for a set of standard terminology and guidelines for project management) and COBIT, already presented. This are the standards we will cover for out thesis by being directly related to ITIL V3 and its implementation.

ITIL V3 critical analysis One crucial aspect for the importance of ITIL on this thesis is the operational view that it provides for IT Service Management. ITIL tries to focus on more management details, providing a more practical guidance for implementation. It is focused on IT Service Management and presents concrete guidance for managing services during its lifecycle. De Haes and Van Grembergen state that COBIT tells what to do and ITIL explains how to do it, what makes COBIT adopting a process-focused approach and ITIL a service level-oriented one [1].

The main objective to include ITIL knowledge for this thesis is to provide a complementary guidance on IT management, enhancing the business oriented view of COBIT with a operational view. COBIT 5 will allow us to take advantage of this complementarity, related to the concern of ISACA to make it more compliant with other frameworks, including COBIT, on the new version (relating to COBIT 4.1).

PMBOK: A Guide to the Project Management Book of Knowledge
The Guide to the Project Management Body of Knowledge provides guidelines
for managing individual projects and defines project management related con-
cepts. It also describes the project management life cycle and its related pro-
cesses, as well as the project life cycle.[2]

This guide is considered by many professionals in the area of business man-
agement as the main reference for processes and good practices in project man-
agement, in the way it defines the knowledge that are applicable to most project
most of the time, and there is consensus about their value and usefulness.

The processes are presented relating them with the knowledge area they
belong. The PMBOK presents the following areas of project management:

- Integration Management
- Scope Management
- Time Management
- Cost Management
- Quality management
- Human resource management
- Communications management
- Risk management
- Procurement management
- Stakeholder management

Each group of processes is related with the life cycle of a project, being
also grouped in five categories: Initiating, Planing, Executing, Monitoring and
Control and Closing, directly related to the phase they are applied on the life
cycle. For each process, it is presented the inputs, tools, techniques and outputs
that are required to successfully implement it. All processes organized by group
and area are presented in figure XXX

This guide also provides some background on the project management area,
defining common vocabulary and establishing concepts necessary to fully under-
stand all processes. Presents characteristics of projects, programmes and port-
folios, roles of project managers and organizational aspects that influence the
management process, like organizational structures, culture, assets or stakehold-
ers.

Another important aspect of PMBOK is that is a more general framework,
making it necessary to complement with other frameworks or guides when apply-
ing to a specific area. This guide only presents the general processes for project
management, lacking on implementation details for specific areas, like the area
of IT Management.

PMBOK critical analysis The importance of PMBOK for this thesis is re-
lated to its widely acceptance and adoption as the reference guide to project
management by many professionals in the area, being tested and evaluated its
importance in terms of good practices adopted in project management. Despite

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
9. Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

Fig. 6. PMBOK processes organized by group and area of knowledge

being more general and lacking in specificity to Information Systems Management, it can be complemented with the two previous frameworks presented (COBIT and ITIL), using some more detailed guidance of ITIL and COBIT to improve PMBOK focus to this thesis.

PMBOK presents processes for all phases of the life cycle of a project, being too extensive considering the theme of this thesis and the time-frame available. For this scope, we will only be able to consider a subset of all processes presented, being necessary, in the solution's architecture phase of this thesis, present a mapping between processes covered on PMBOK relating with processes of COBIT and ITIL.

5 Architecture (2/3pgs)

Your proposed architecture. Can have lots of pictures and bullet points so it is easy to understand.

6 Evaluation (1/2pgs)

Explain how you are going to show your results (statistical data, cpu performance etc). Answer the following questions:

– Why is this solution going to be better than others.
– How am I going to defend that it is better.

7 Conclusions

Wrap up what you wrote.

A   Appendix

Appendix files and refs will go here. Such as your thesis work scheduling.

A.1   Work Scheduling Example

Simple work schedule is presented in Table **??**. You can do something more fancy link a Gantt chart or whatever.

References

1. Steven De Haes and Wim Van Grembergen. It governance and its mechanisms. *Information Systems Control Journal*, 1:27–33, 2004.
2. Project Management Institute. *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*. PMI Standard. Project Management Institute, Incorporated, 2013.
3. ISACA. *COBIT 5: A Business Framework for the Governance and Management of Enterprise IT*. COBIT® 5. ISACA, 2012.
4. ISACA. *COBIT 5: Enabling Processes*. COBIT® 5. ISACA, 2012.
5. Paul McNeillis. Three good questions. *ITNOW*, 47(6):14–15, 2005.