Project Management and Maintenance on Information Systems Administration
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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

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1   Introduction

Information Technology (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.

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 a 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 five volumes, comprising all the life cycle of IT services: service Strategy, service design, service transition, 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 project, we need to take in account the project portfolio aspects of the organization. It corresponds to a centralized management of processes, methods and technology, used by project managers and project management offices to analyze and manage a set of projects.

We can have two distinct approaches for this project. 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 X.

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

2 Objectives

The main objective of this project 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 assign 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 a 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 project is aligned with a real case of an organization with 600 collaborators where the information systems department administration 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.

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 X, 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 A State of the Art in Frameworks for Information Technology Governance and Management

In this section we will present a set of literature references on the subjects related to this project. We will present the most important frameworks on Information Systems Management and Governance

with the objective of coming up with a choice of a frameworks or a set of them to implement our processes for project and maintenance management.

Our choice is centered in three frameworks we consider the most relevant for this project: 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.

4.1 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 stakeholders' needs, conditions and options are evaluated to determine balanced, agreed-on enterprise objectives to be achieved. it sets direction through prioritisation and decision making and monitors performance and compliance against agreed-on direction and objectives.ï£ijOn the other hand, management plans, builds, runs and monitors activities in alignment with the direction set by the governance body to achieve the enterprise objectives.
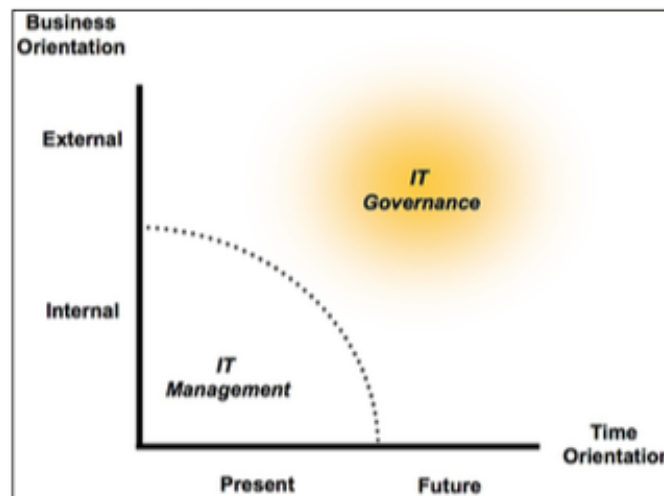
Fig. 1. IT Governance and IT Management

Considering both definitions and the figure 1, we can conclude that IT Governance has a bigger dimension that IT Management, but both need to be related and complementary to achieve success inside an organization. It is not possible for an organization to have well defined and matured management processes that are no related to governance aspects, but governance needs management to achieve goals and objectives settled to achieve success.
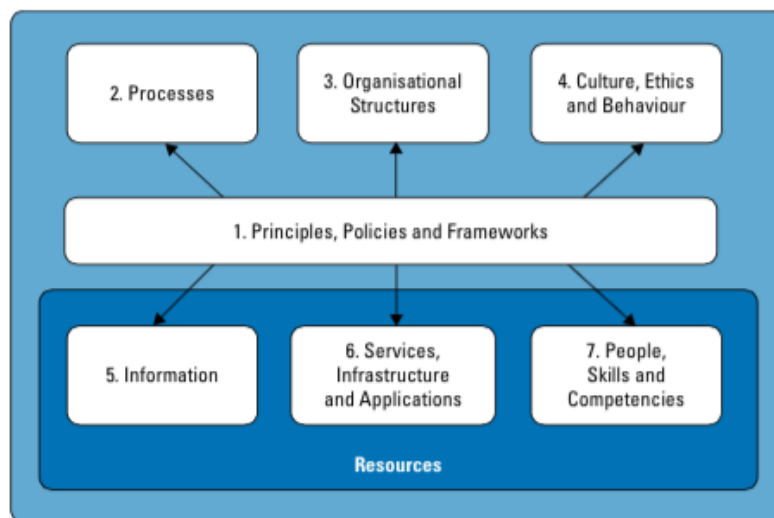
4.2 COBIT 5

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

Figure 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 can be defined good practices for each one.

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, 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].
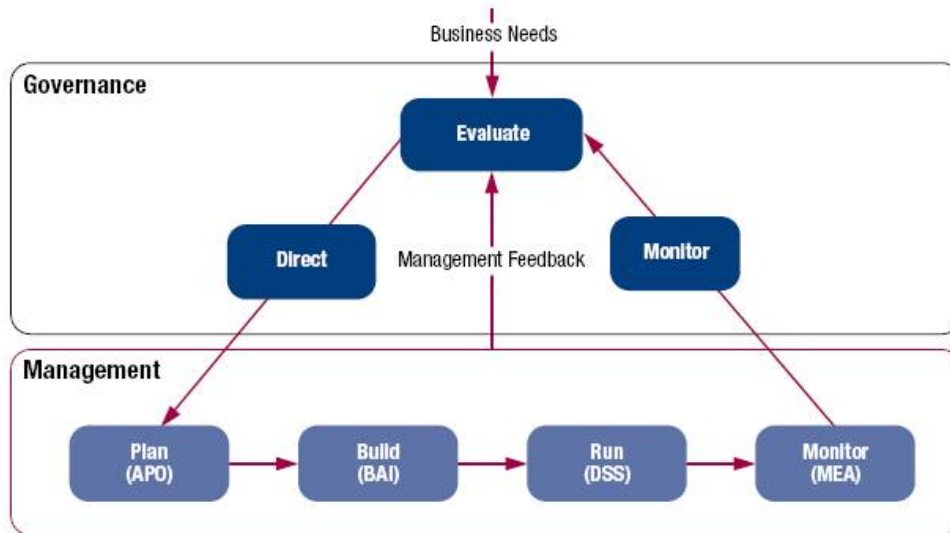
Fig. 3. COBIT 5 domains

COBIT 5 includes a process capability model based on ISO/IEC 15504 Software Engineering - Process Assessment standard. [REFERENCE HERE] This model 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 project's 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 will improve COBIT application and acceptance on organizations.

4.2.1   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, it is a complex framework that needs time and practice to be fully implemented.

For this 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[6, 7, 8, 9, 10, 11] 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[2].

4.3   ITIL V3

First developed in the 1980s by the actual Office of Government Commerce (OGC), a branch of the British Government, ITIL defines processes for IT Service management at a high level, being
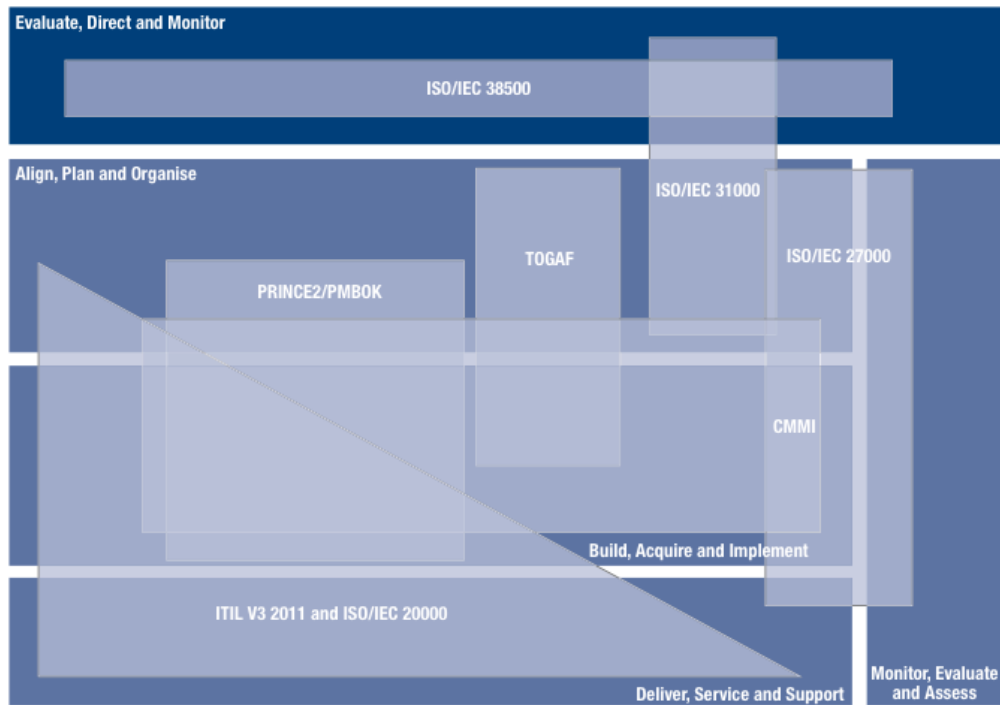
Fig. 4. COBIT 5 coverage on other frameworks

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.

The core set, presented in figure 5 and the one we will consider for this project, 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 share the same conceptual structure, being composed by practice fundamentals and principles, life cycle processes and activities, supporting organization structures and roles, technology considerations, practice implementation and challenges, risks and critical success factors.

4.3.1 Service Strategy Service Stategy volume 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.[9] The processes included in Service Strategy volume are:

- Financial Management
- Service Portfolio Management
- Demand Management

4.3.2 Service Design Service Design volume provides guidance for the design and development of services and service management practices. It covers design principles and methods for converting
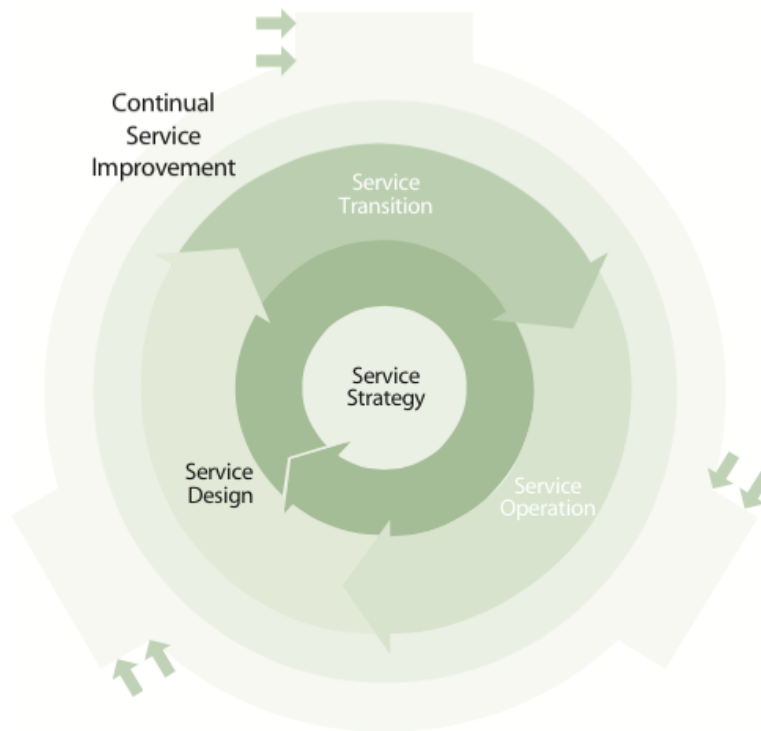
Fig. 5. ITIL V3 volumes

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 life cycle of services, the continuity of services, achievement of service levels, and conformance to standards and regulations.[7] 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

4.3.3 Service Transition Service Transition volume 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.[10] 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

4.3.4 Service Operation Service Operation volume 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.[8] The processes included in Service Operation volume are:

– Event Management
– Incident Management
– Request Management
– Problem Management
– Access management

4.3.5 Continual Service Improvement Continual Service Improvement volume 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.[10] The processes included in Continual Service Improvement 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 a research performed 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)[2] and COBIT[3], already presented. This are the standards we will cover for our project by being directly related to ITIL V3 and its implementation.

4.3.6 ITIL V3 critical analysis One crucial aspect for the importance of ITIL on this project 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 life cycle. 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 project 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).

4.4 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 concepts. It also describes the project management life cycle and its related processes, as well as the project life cycle.[2]

This guide is considered by many professionals in the area of business management as the main reference for processes and good practices in project management, 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 6

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

Another important aspect of PMBOK is that is a more general framework, making it necessary to complement with other frameworks or guides when applying 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.

4.4.1 PMBOK critical analysis The importance of PMBOK for this project is related 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 being more general and lacking in specificity to IT 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 project.

PMBOK presents processes for all phases of the life cycle of a project, being too extensive considering the theme of this project 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 project, present a mapping between processes covered on PMBOK relating with processes of COBIT and ITIL.

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

5   Relevant International Standards

In this section we will present the international standards that are referenced or important to complement the frameworks previously presented. These standards will allow us to design processes in conformance with practices that are considerer as the reference in some areas of project management.

We will analyze the ISO/IEC 12207, an systems and software engineering international standard for Software life cycle processes. This standard will allow us to define the processes that are important to consider in the scope of this project. It will provide an high-level process reference for the complete life cycle of a software system

Relating to COBIT, we have standards that are directly related to it, as the ISO/IEC 20000, a set of international standards for IT service management, and ISO/IEC 27000, a set of international standards for information security management systems. COBIT also relates with CMMI, the Capability Maturity Model Integration that is a framework for process improvement in business comprising models, appraisal methods, and training.

For other standards more general to all frameworks we will present the ISO 31000, a set of standards that provide principles, framework and a process for managing risk, and ISO 19011, a international standard for providing guidelines for auditing management systems. This standards will complement complex areas of project management providing some additional and specific knowledge.

5.1   ISO/IEC 12207

ISO/IEC 12207:2008 establishes a common framework for software life cycle processes, with well-defined terminology, that can be referenced by the software industry. It contains processes, activities, and tasks that are to be applied during the acquisition of a software product or service and during the supply, development, operation, maintenance and disposal of software products.The purpose of this International Standard is to provide a defined set of processes to facilitate communication among acquirers, suppliers and other stakeholders in the life cycle of a software product.

This standard combines the processes to be performed during the life cycle of a software project into seven groups . Each process is described in terms of its objectives and expected results and presents activities to be undertaken to achieve these same objectives. The processes are grouped in 7 groups, related to the phase they are applied during the software life cycle. All processes are listed in figure XXX.

- Agreement processes
- Organizational Project-Enabling Processes
- Project Processes
- Technical Processes
- Software Implementation Processes
- Software Support Processes
- Software Reuse Processes

This standard may be used standalone or jointly with ISO/IEC 15288, and supplies a process reference model that supports process capability assessment in accordance with ISO/IEC 15504, a set of technical standards documents for the computer software development processes assessment.

This standard is important for this project in the way it standardize the processes for the whole life cycle of the software, grouping the processes for a better understanding its scope. We will use this standard, specifically figure 7, to present the processes that make part of the scope of this project, after what we will relate them with the frameworks previously presented.

5.2   ISO/IEC 20000

ISO/IEC 20000 corresponds to a standard on IT Service Management. Initially was developed to reflect best practice guidance contained in some frameworks like ITIL, COBIT or Microsoft operations. This standard in composed by 5 parts:

System Context Processes

Agreement Processes

Acquisition Process (Clause 6.1.1)

Supply Process (Clause 6.1.2)

Organizational Project-Enabling Processes

Life Cycle Model Management Process (Clause 6.2.1)

Infrastructure Management Process (Clause 6.2.2)

Project Portfolio Management Process (Clause 6.2.3)

Human Resource Management Process (Clause 6.2.4)

Quality Management Process (Clause 6.2.5)

Project Processes

Project Planning Process (Clause 6.3.1)

Project Assessment and Control Process (Clause 6.3.2)

Decision Management Process (Clause 6.3.3)

Risk Management Process (Clause 6.3.4)

Configuration Management Process (Clause 6.3.5)

Information Management Process (Clause 6.3.6)

Measurement Process (Clause 6.3.7)

Technical Processes

Stakeholder Requirements Definition Process (Clause 6.4.1)

System Requirements Analysis Process (Clause 6.4.2)

System Architectural Design Process (Clause 6.4.3)

Implementation Process (Clause 6.4.4)

System Integration Process (Clause 6.4.5)

System Qualification Testing Process (Clause 6.4.6)

Software Installation Process (Clause 6.4.7)

Software Acceptance Support Process (Clause 6.4.8)

Software Operation Process (Clause 6.4.9)

Software Maintenance Process (Clause 6.4.10)

Software Disposal Process (Clause 6.4.11)

Software Specific Processes

SW Implementation Processes

Software Implementation Process (Clause 7.1.1)

Software Requirements Analysis Process (Clause 7.1.2)

Software Architectural Design Process (Clause 7.1.3)

Software Detailed Design Process (Clause 7.1.4)

Software Construction Process (Clause 7.1.5)

Software Integration Process (Clause 7.1.6)

Software Qualification Testing Process (Clause 7.1.7)

SW Support Processes

Software Documentation Management Process (Clause 7.2.1)

Software Configuration Management Process (Clause 7.2.2)

Software Quality Assurance Process (Clause 7.2.3)

Software Verification Process (Clause 7.2.4)

Software Validation Process (Clause 7.2.5)

Software Review Process (Clause 7.2.6)

Software Audit Process (Clause 7.2.7)

Software Problem Resolution Process (Clause 7.2.8)

Software Reuse Processes

Domain Engineering Process (Clause 7.3.1)

Reuse Asset Management Process (Clause 7.3.2)

Reuse Program Management Process (Clause 7.3.3)

Fig. 7. ISO/IEC 12207 processes

- **ISO/IEC 20000-1:2011** - Corresponds to the most relevant part of the ISO/IEC 20000 standard. It specifies requirements for the service provider to plan, establish, implement, operate, monitor, review, maintain and improve an SMS. The requirements include the design, transition, delivery and improvement of services to fulfill agreed service requirements.

- **ISO/IEC 20000-2:2012** - Provides guidance on the application of service management systems (SMS) based on the requirements in ISO/IEC 20000-1. Enables organizations and individuals to interpret ISO/IEC 20000-1 more accurately, and therefore to use it more effectively. The guidance includes examples and suggestions to enable organizations to interpret and apply ISO/IEC 20000-1, including references to other parts of ISO/IEC 20000 and other relevant standards.

- **ISO/IEC 20000-3:2012** - Useful for service providers, consultants and assessors. It includes practical guidance on scope definition, applicability and demonstration of conformity to the requirements in ISO/IEC 20000-1. Guidance on the different types of conformity assessment and assessment standards is included.

- **ISO/IEC TR 20000-4:2010** - Facilitates the development of a process assessment model according to ISO/IEC 15504 process assessment principles. ISO/IEC 15504-1 describes the concepts and terminology used for process assessment. ISO/IEC 15504-2 describes the requirements for the conduct of an assessment and a measurement scale for assessing process capability.

- **ISO/IEC TR 20000-5:2013** - Implementation plan providing guidance on how to implement a service management system (SMS) to fulfill the requirements of ISO/IEC 20000-1:2011. The

intended users of ISO/IEC TR 20000-5:2013 are service providers, but it can also be useful for those advising service providers on how to implement an SMS.

This standard is a clear complement to the ITIL framework, providing a similar view for the framework previous presented but being more complete in terms of requirements identification and process assessment. ITIL lacks of a process assessment model and detailed implementation plans, being this standard a way to fulfill those problems.

5.3 ISO/IEC 27000

- We need to define if it is really in the scope of this project

5.4 CMMI

- We need to define if it is really in the scope of this project

5.5 ISO 31000

ISO 31000 is a set of standards related to risk management. ISO 31000:2009, Risk management âĂŞ Principles and guidelines, provides principles, framework and a process for managing risk. It can be used by any organization regardless of its size, activity or sector.Using ISO 31000 can help organizations increase the likelihood of achieving objectives, improve the identification of opportunities and threats and effectively allocate and use resources for risk treatment.

In figure 8, we can observe the purposed framework by ISO 31000:2009, assisting the organization to integrate risk management into its overall management system. Many organizations have already frameworks for implementing risk management, that can be evaluated and reviewed against this international standard in order to check its adequacy. In figure 9 are presented the processes for Risk management implementation.

This standard cannot be used for certification purposes, in the way it doesn't provide guidance for internal or external audit programmes, but can be used to compare the risk management processes of the organization with international standard benchmarks.

Risk management is a very complex area on project management. It is connected to the whole life cycle of a project and need to be controlled and assessed in many phases and by different forms. ISO/IEC 31010:2009, Risk management âĂŞ Risk assessment techniques focuses on risk assessment. Risk assessment helps decision makers understand the risks that could affect the achievement of objectives as well as the adequacy of the controls already in place.

The relevance of ISO 31000 for this project focuses on its orientation to an important and complex area of project and maintenance management, providing a framework for Risk management, as well as a set of processes to implement it. It is important to clearly define the scope of this standard related to this project, trying to reduce the complexity and increase its utility for the processes we pretend to design.

5.6 ISO 19011

This International Standard provides guidance on auditing management systems, including the principles of auditing, managing an audit programme and conducting management system audits, as well as guidance on the evaluation of competence of individuals involved in the audit process, including the person managing the audit programme, auditors and audit teams. It is applicable to all organizations that need to conduct internal or external audits of management systems or manage an audit programme.

In figure 10 is presented the process flow for the management of an audit programme, described in this international standard. This process can be specially important for out project if we pretend to introduce the auditing processes in the scope of the processes to design. We can use the process flow presented in figure 10 to help designing a auditing process.
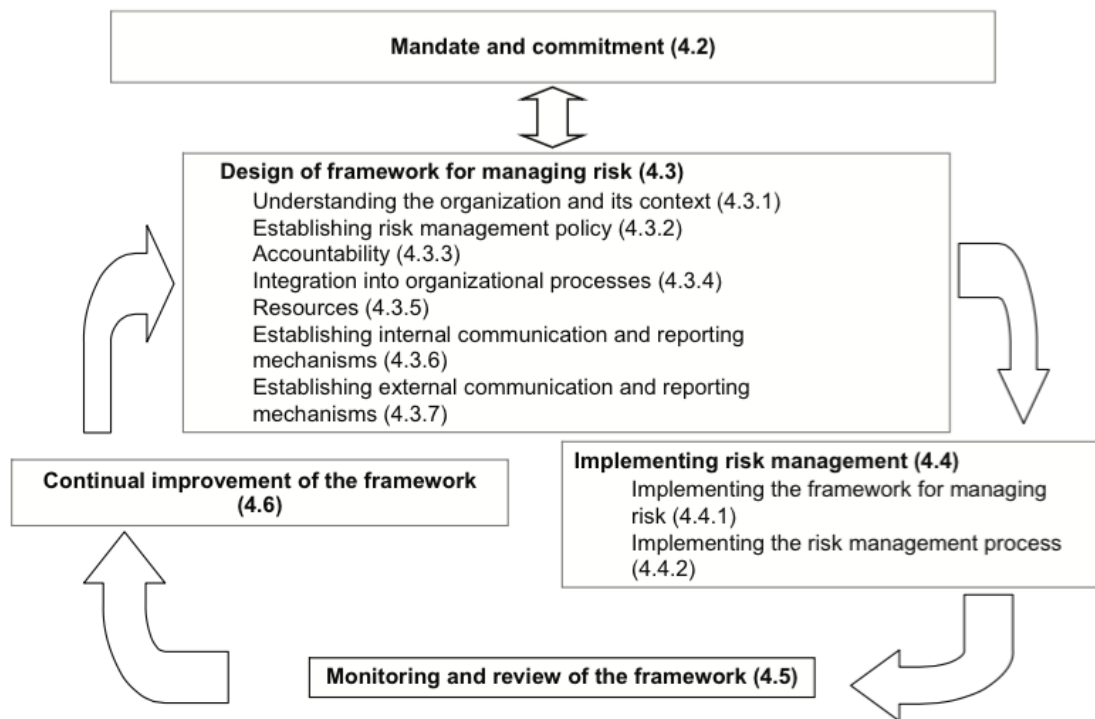
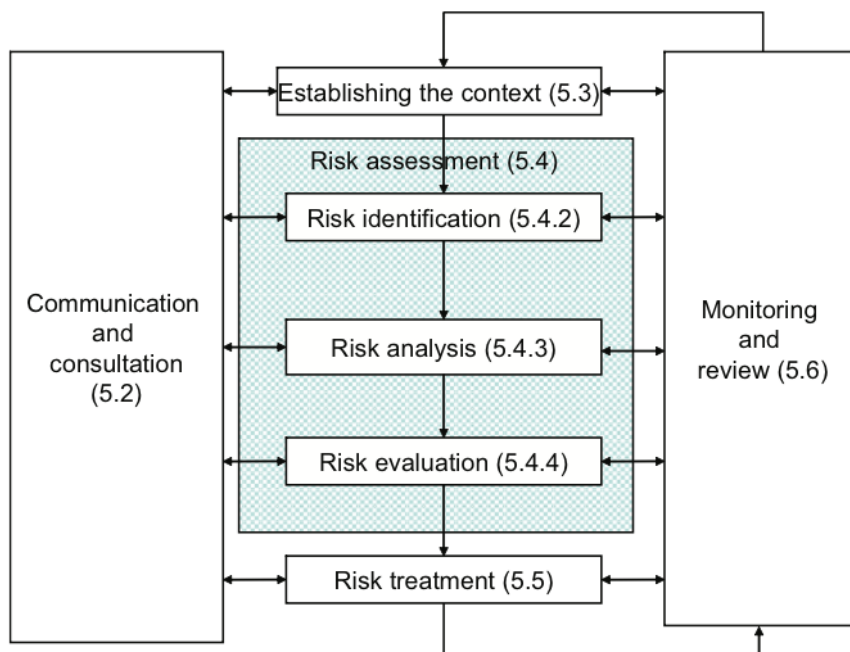**Fig. 8.** ISO 31000:2009 framework for Risk Management

Fig. 9. ISO 31000:2009 Risk Management Processes

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┌─────────────────────────────────────────────┐
│ 5.2 Establishing the audit programme objectives│
└─────────────────────────────────────────────┘
                     │
                     ▼
┌─────────────────────────────────────────────┐
│ 5.3 Establishing the audit programme          │
│                                               │
│ 5.3.1 Roles and responsibilities of the person│
│ managing the audit programme                  │
│                                               │
│ 5.3.2 Competence of the person managing the audit│
│ programme                                     │
│                                               │
│ 5.3.3 Establishing the extent of the audit programme│
│                                               │
│ 5.3.4 Identifying and evaluating audit programme│
│ risks                                         │
│                                               │
│ 5.3.5 Establishing procedures for the audit   │
│ programme                                     │
│                                               │
│ 5.3.6 Identifying audit programme resources   │
└─────────────────────────────────────────────┘
                     │
                     ▼
┌─────────────────────────────────────────────┐      ┌──────────────────────┐
│ 5.4 Implementing the audit programme          │      │ Competence and       │
│                                               │      │ evaluation of auditors│
│ 5.4.1 General                                 │◄────►│ (Clause 7)           │
│                                               │      └──────────────────────┘
│ 5.4.2 Defining the objectives, scope and criteria for│
│ an individual audit                           │
│                                               │
│ 5.4.3 Selecting the audit methods             │
│                                               │      ┌──────────────────────┐
│ 5.4.4 Selecting the audit team members        │      │ Performing an audit  │
│                                               │◄────►│                      │
│ 5.4.5 Assigning responsibility for an individual audit│    │ (Clause 6)           │
│ to the audit team leader                      │      └──────────────────────┘
│ 5.4.6 Managing the audit programme outcome    │
│                                               │
│ 5.4.7 Managing and maintaining audit programme│
│ records                                       │
└─────────────────────────────────────────────┘
                     │
                     ▼
┌─────────────────────────────────────────────┐
│ 5.5 Monitoring the audit programme            │
└─────────────────────────────────────────────┘
                     │
                     ▼
┌─────────────────────────────────────────────┐
│ 5.6 Reviewing and improving the audit         │
│ programme                                     │
└─────────────────────────────────────────────┘
```

PLAN

DO

CHECK

ACT

Fig. 10. ISO 19011 process flow for the management of an audit programme

6 A State of the Art in Market Solutions

6.1 Project Management

6.2 IT Service Management

7 Solution's Architecture

7.1 Stakeholders

7.2 Processes

8 Work's Evaluation Methodology

9 Conclusions

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 (PM-BOK® 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.

[6] Great Britain. Cabinet Office. *ITIL Continual Service Improvement.* Best management practice. TSO, The Stationery Office, 2011.

[7] Great Britain. Cabinet Office. *ITIL Service Design.* Best Management Practice. TSO, The Stationery Office, 2011.

[8] Great Britain. Cabinet Office. *ITIL Service Operation.* Best Management Practice. TSO, The Stationery Office, 2011.

[9] Great Britain. Cabinet Office. *ITIL Service Strategy.* Best management practice. TSO, The Stationery Office, 2011.

[10] Great Britain. Cabinet Office. *ITIL Service Transition.* Best management practice. TSO, The Stationery Office, 2011.

[11] Great Britain. Cabinet Office. *The Official Introduction to the ITIL Service Lifecycle.* Best management practice. TSO, The Stationery Office, 2011.