TÉCNICO LISBOA

Improving the IT Strategic Plan

for the Public Administration in Portugal

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Abstract

During the last two decades the Portuguese public administration was greatly modernized, using IT to increase some processes efficiency and scalability. This popularization of IT sparked multiple ad hoc technological projects inside ministries, which led to the creation of small and scattered IT departments. The Portuguese government, due to the current financial constraints, was forced to take action and rationalize the existing resources and align them with the public administration's needs in order to increase value production.

Currently a strategic plan (PGETIC) is in place mainly to increase the quality and usefulness of IT services and reduce the IT spending. That plan certainly is a great starting point; however we find that plan complex, limited and rigid. And without a successful plan IT costs will continue to grow as real value generation stagnates, hence there is a need for an improved strategic method.

We propose the detachment of strategy from its implementation into two distinct yet complementary plans. To outline the plan's structure, we used the best practices of COBIT and IT-CMF. Moreover we propose a formalized lifecycle, supported by COBIT's language and tools, to govern the creation and implementation of those plans. We evaluated our proposal using semi-structured interviews with practitioners and the scientific community appraisal. As a result, we concluded that our proposal is more collaborative, objective, value oriented, holistic and sustainable than PGETIC.

Keywords: governance, strategic thinking, lifecycle, IT department, public administration

Resumo

Durante as duas últimas décadas, a administração pública portuguesa modernizou-se, usando a informática para aumentar a eficiência e escalabilidade de alguns processos. Esta popularização da informática originou vários projetos tecnológicos ad hoc nos ministérios, dando origem a departamentos de informática pequenos e dispersos. O Governo português, devido às restrições financeiras atuais, foi forçado a agir e a racionalizar os recursos existentes e alinhá-los com as necessidades da administração pública, aumentando a geração de valor real.

Atualmente está em marcha um plano estratégico (PGETIC) para, principalmente, aumentar a qualidade e relevância dos serviços TIC e reduzir os seus custos. Esse plano é um excelente ponto de partida, no entanto concluímos que esse plano é complexo, limitado e rígido. E se esse plano não tiver sucesso os custos TIC continuarão a crescer enquanto a geração de valor real estagna. Há portanto necessidade de um método estratégico melhorado.

Propomos a separação da estratégia da sua implementação em dois planos distintos emas complementares. Para delinear a estrutura desses planos, utilizámos as melhores práticas definidas no COBIT e no IT-CMF. Além disso propomos um ciclo de vida formal, sustentado pela linguagem do COBIT, para governar a criação e implementação dos ditos planos. Avaliámos a nossas propostas fazendo entrevistas semiestruturadas a diretores de departamentos de informática públicos e também pela submissão de artigos científicos a conferências da especialidade. Como resultado, concluímos que a nossa proposta é mais colaborativa, objetiva, orientado ao valor, holística e sustentável que o PGETIC atual.

Palavras-chave: governance, pensamento estratégico, ciclo de vida, departamento de informática, administração pública

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List of acronyms

AMA	Agência para a Modernização Administrativa
BTM^2	Business Transformation Management Methodology
CEO	Chief Executive Officer
CIO	Chief Information Officer
COBIT	Control Objectives for Information and related Technology
DSRM	Design Science Research Methodology
GB	Governance Board
GPTIC	Grupo de Projeto para as TIC
ICT	Information and Communications Technology
IS	Information Systems
ISACA	Information Systems Audit and Control Association
IT	Information Technology
IT-CMF	IT Capability Maturity Framework
ITG	IT Governance
ITIL	IT Infrastructure Library
PA	Public Administration
PETIC	Plano Estratégico das TIC
PGETIC	Plano Global Estratégico de racionalização e redução de custos nas TIC
POTIC	Plano Operacional das TIC
TIC	Tecnologias de Informação e Comunicação

1. Introduction

The goal of this chapter is to introduce the current context of the public administrations and its ICT (section 1.1); what problem we aim to solve with this thesis (section 1.2) and why it should be solved (section 1.2.1); we then specify the objectives of a generic solution for the identified problem (section 1.3); and finally we present the research methodology that we used to propose and evaluate a specific solution (section 1.4).

1.1. Context

Over the years ICT kept evolving and spreading. Nowadays it plays a major role on increasing the efficiency and quality of organizations' processes – public and private alike. Our thesis is focused on the public sector, namely the public administration's ICT in Portugal.

The popularization of IT sparked numerous ad hoc technological projects inside ministries and public institutes, which led to the creation of small scattered technological infrastructures (e.g. data centers) and solutions (i.e. software). These multiple – and sometimes duplicated – infrastructures increased the global maintenance costs and the number of information systems that are not interoperable (Assembleia da República, 2012). Without economies of scale and the reuse of existing resources, the Portuguese State spent too much on these projects while not getting the maximum value they could yield.

The Portuguese Government started recently taking action with two major goals: increase the quality and usefulness of IT services and reduce the IT spending. The will to act came from the decrease in financial resources' availability and the commitment of the Portuguese Government to fulfill the measure 3.46 of the Memorandum of Understanding. This measure advises the optimization of the IT resources' utilization by reducing the number of IT departments in Ministries and public bodies through the implementation of shared services (GPTIC, 2011).

As a result, in 2011 the Portuguese Government wrote a strategic plan for the public administration's ICT called PGETIC. The plan comprises five strategic drivers: *Improving governance, Cost-cutting, Using ICT to foster change and modernization, Implementation of common solutions, Promote economic growth* (Assembleia da República, 2012). The plan started in 2012 and is scheduled to be executed on every IT department of each Ministry. The plan will be implemented over the following four years and is forecasted to reduce 500 million Euros of the total annual spending with IT, in addition to the functional improvements. More information about this plan is available in section 2.3.2.

The Portuguese public administration's ICT does not have a single problem but a set of correlated problems that have been adding up along the past years.

In 2011, the public administration's IT global spending was approximately 650 million Euros which, considering the preceding five years (2006-2011), represents a growth of 75% in IT spending (Vasconcelos, 2012). Moreover, a maximum of 800 million Euros was reached in 2010 (Vasconcelos, 2012). In these times of low availability of financial resources, the Portuguese state cannot afford such excesses.

Previous researches about the Portuguese public administration, including a survey with more than 100 public institutes (de Araújo, 2011), concluded that IT departments of small size do not have a structure capable of supporting the costs and resources required to deliver quality services or even to scale to satisfy growing business needs (Carracha, 2010, p. 62). The IT departments' size was measured using three main indicators: number of IT employees, IT budget, and number of IT services provided (Carracha, 2010). Therefore, there is a need to **study and implement a model** that permits to manage IT in a holistic fashion, putting an end to the spraying of IT function and reinforcing its maturity (GPTIC, 2011, p. 9).

Before PGETIC there wasn't a clear strategy or direction for the public administration's ICT on the long term. Without a holistic strategy there are no strategic drivers, and without those drivers there cannot be formal criteria for operational decisions. This leads to a divergent evolution at the numerous IT departments.

The shortage of common solutions is a problem that leads to more problems (Tavares, 2003; GPTIC, 2011). As one can see by the publication year of (Tavares, 2003), this is a problem reported at least in 2003 – and a decade later the public administration is still struggling with the issue. The existing IT departments frequently develop similar *ad hoc* solutions or buy different solutions to solve the same problem. The first case is a terrible waste of human resources, time and money. The second case reduces bargain power with suppliers and increases the maintenance costs (Vasconcelos, 2012; GPTIC, 2011), because now two different solutions must be supported. This gets even worse if the software is proprietary. Therefore redundant solutions for recurring problems and weak bargain power are two faces of the same problem.

As we mentioned before, without economies of scale and the reuse of existing resources the IT spending increases while the actual value generated is unchanged. If the public administration really wants to innovate and offer newer and better services, then it must avoid the so called *"abyss"* – when the entire IT budget is spent on maintaining the existing solutions, leaving no money available for improvement and innovation investments (Curley, Managing Information Technology for Business Value, 2004). Indeed PGETIC is forecasted to save 500 million Euros and most of its projects are aimed at cost-cutting. Therefore spending too much in comparison with the value generated is another problem.

PGETIC is an effort to solve these problems. Our thesis' problem is the PGETIC itself.

1.2. Problem

PGETIC is a meritorious plan that attempts for the first time to solve the previous problems using a holistic approach and encouraging the participation of all Ministries. It does so by defining five global strategic drivers (or programmes) and specifying concrete measures (or projects) to improve common operational problems.

When we were starting this thesis some public bodies told us that (1) PGETIC wasn't going to solve the problems it aimed to solve, (2) its implementation was behind schedule because a large part of the public administration was against the plan, and (3) the public IT function really needed a strategic plan but not *that* strategic plan.

Indeed, six months after PGETIC started (around the time when this thesis started), the work group responsible for coordinating the plan's implementation published a new document detailing some aspects of PGETIC and reviewing the implementation schedule (GPTIC, 2012) – 84% of PGETIC's projects were late or had their deadline extended from 2013 to 2016. Since that document was the public confirmation of part of what was unofficially admitted to us, we thought that maybe some of those claims had truth in them and that an improved plan was really missing.

Therefore, we decided to start by evaluating the plan's completeness and efficiency. By doing so we would get to know better the plan and its context. More importantly, that evaluation would enable us to pinpoint the plan's shortcomings and collect feedback about what should be improved. The research was accepted and presented at the International Conference on Exploring Service Science (IESS) 1.3.

That research (Nunes, Rosa, & Mira da Silva, Evaluating the IT Strategic Plan for the Public Administration in Portugal, 2013), explained in detail in section 2.3.2, found some relevant problems about PGETIC:

- First, the plan's scope comprises the entire public administration's IT function. That is **too much complexity for a single plan**; it is too hard to assure the same effectiveness of each project on all IT departments and also the engagement of all participants and stakeholders. Likewise, it is hard to ensure the engagement of all the different stakeholders
- Second, the plan improves a **limited subset of IT capabilities or processes.** That happens because the plan is focused on solving localized operational problems and frequently the improvement of certain capabilities' maturity is just an indirect consequence. Every project should be focused on solving the problem's cause rather than the problem's consequences.
- Third, that vast scope produced a **rigid monolithic plan, lacking effective feedback mechanisms**. It is rigid because the inclusion of improvements or changes to the plan may imply the creation of a new plan with different domains and differentiated objectives. It is monolithic because it does not have a lifecycle; no one knows what will follow the plan's conclusion.

Summarizing the problem that we will tackle in a single sentence and figure (Figure 1):

- **PGETIC is a vast and complex plan that uses a problem-oriented approach to improve a limited subset of capabilities. The plan lacks effective feedback mechanisms and a clear lifecycle.**
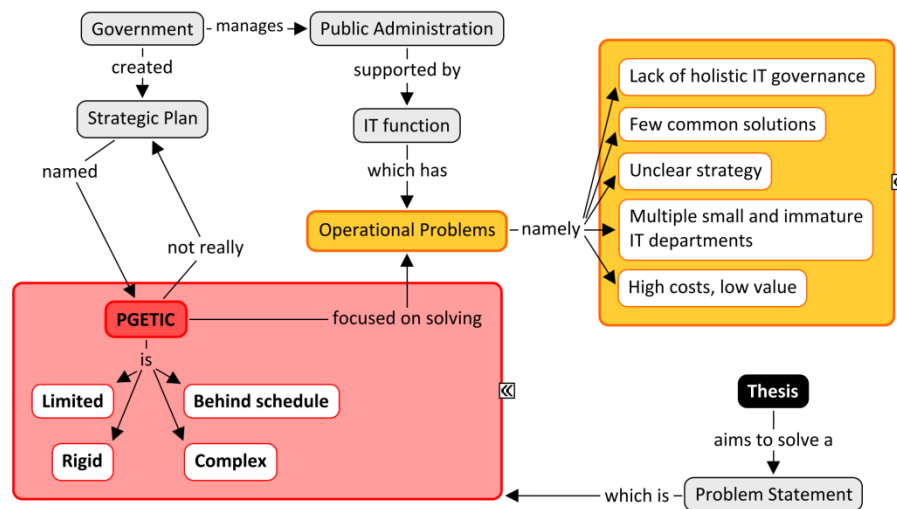
Figure 1. Concept map summarizing the thesis' problem

1.2.1. Relevance

We found a problem needing a solution; but does Portugal need that problem solved? *Yes*, urgently.

Let us invert the question; if this problem is not addressed then the public administration's ICT will not have a strategic plan specifying where it wants to be in the long-term and how the public administration should get there. And without a clear direction for the public administration's ICT the public IT function will continue to spread and multiply like mushrooms; the lack of common solutions will increase the complexity of managing IT; maintenance costs will rise as real value stagnates or decreases; and opportunities for innovation will be lost.

Moreover, the Portuguese Government is counting on saving 500 million Euros as a benefit of implementing PGETIC. If the implementation fails, those millions still have to be saved from somewhere else which probably implies a greater effort for everyone and a worse result.

1.3. Objectives

We already know quite well which are the main and most urgent problems affecting the public administration's ICT (section 1.1) and which problem we want to solve (section 1.2). Consequently, we now need to define what kind of solution would be capable of solving that problem.

According to (Hevner, March, Park, & Ram, 2004) a IS research artifact can be one of four types (see section 1.4, Research Methodology). Considering our problem, the most adequate artifact to solve our

problem is a **method** – i.e. a set of suggestions *(practices)* to improve the existing strategic plan, supplemented by a governing lifecycle *(algorithm)* specifying how to implement and outline the plan's programmes in a repeatable and sustainable way.

This strategic method is mainly an evolution of PGETIC (aimed to be executed after its implementation) but it can also be an alternative (a substitute for PGETIC in case its implementation is aborted for some reason). For this method to succeed several objectives must be met. It should be:

- **Collaborative.** The previous approach of "one plan fits all" should be abandoned. The method should take into account the assets, shortcomings and priorities of each ministerial IT department. This not only leads to more efficient plans – suited to the needs and aspirations of each IT department – but also reduces change resistance – since IT departments play an active role in the process.

- **Objective.** To minimize resistance such method should be clear, well-supported and impartial. Each measure should have concise scopes, clear objectives and well-defined responsibilities. The participants must be able to clearly understand the rationale behind every strategic decision. For instance, by supporting the method on existing best practices the method's credibility and traceability (i.e. the mapping path from inputs to outputs) are increased. This transparency leads to higher acceptance rate, because people do not feel deceived.

- **Value oriented.** PGETIC was particularly focused on fixing operational problems. While that is important that should not be the focus of a strategic plan. A strategic plan deals with high-level concerns (Slater, 2002) therefore the method should be focused on generating long-term sustainable value and preventing future problems. To achieve that, the method should reason about which capabilities are strategic and which maturity levels are required, rather than which low-level operational problems need to be fixed – it is the IT department's responsibility to identify which problems must be solved and which practices must be implemented in order to achieve the desired maturity levels.

- **Holistic.** The high-level perspective recommended by the previous objective enables the identification of synergies; for instance, different IT departments may need to implement the same practice to attain a certain maturity level and should therefore collaborate to create a common solution to fulfill that practice. That perspective also enables the forecast of the impacts that a specific strategic decision may have across the organization. Moreover, by monitoring the public administration's capabilities, we can have an overview of the current and previous maturity levels of every relevant capability from all ministerial IT departments, further enhancing and evidencing the prioritization of capabilities' improvements.

- **Sustainable.** The method should have its own lifecycle. Transformational endeavors like this take decades to complete and to be successful they must be embedded in the organization's culture and operation. Also without solving the problems' root causes these transformation efforts will not be sustainable on the long-term (Uhl & Gollenia, 2012, p. 36). If the previous objectives are met, there is a high chance that the first iteration of the method will succeed – i.e. engaged participants and noticeable improvements that enhance their work or the overall

performance of the public IT function. If people get motivated with the method's results, then a second iteration will naturally occur and then a third and so on – thus emerging a process of continuous improvement.

Moreover, we also intend to follow the four principles proposed by (Österle, et al., 2010) in the design of such artifact:

- **Abstraction**: *"the artifact must be applicable to a class of problems"*. Hence, the proposed method should be applicable to organizations that need to align multiple IT departments with a single organizational strategy. Particularly, we want to implement the public administration's ICT strategy across the IT departments of different Ministries.
- **Originality**: *"the artifact must substantially contribute to the advancement of the body of knowledge"*. Thus, the model should be better than the current PGETIC and contribute to the body of knowledge with ideas and experiences about the governance of public administration's ICT;
- **Justification**: *"the artifact must be justified in a comprehensible manner and must allow for its validation"*. The necessity for the model was already justified (section 1.2.1). As for its validation, the model will indeed be evaluated (section 5);
- **Benefit**: *"each artifact must yield benefit – either immediately or in the future – for the respective stakeholder groups"*. In this case, the main stakeholder is the public administration (or Ministries). The benefit will be an improved method to outline and implement strategic plans.

1.4. Research Methodology

This thesis was conducted using the Design Science Research Methodology. DSRM comprises a set of principles, practices and procedures suggested to carry out a research. The design-science paradigm has its roots in engineering and seeks to create and evaluate "*IT artifacts intended to solve identified organizational problems*" (Pries-Heje, Baskerville, & Venable, 2004).

To overcome such organizational problems, (Hevner, March, Park, & Ram, 2004) proposes the creation and evaluation of artifacts which can either be a *"construct"* (e.g. vocabularies), a *"model"* (e.g. abstractions and representations), a *"method"* (e.g. algorithms and practices) or an *"instantiation"* (e.g. implementations and prototypes). As previously stated this research will focus on a method, since a method describes a process that offers guidance on how to solve a specific problem (Hevner, March, Park, & Ram, 2004).
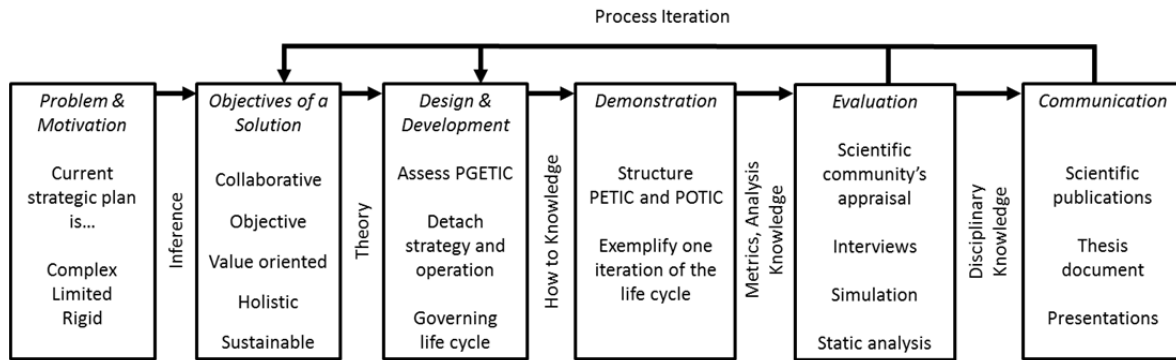
Figure 2. The DSRM process, adapted from (Peffers et al., 2008)

The usage of DSRM implies the adherence to strict practices required in both the construction and evaluation of the designed artifacts (Peffers, Tuunanen, Rothenberger, & Chatterjee, 2008). It is an iterative process that follows a sequential order as illustrated in Figure 2.

The process starts with the *problem identification and motivation*, which defines a specific research problem (section 1.2, Problem) and justifies the value of a solution (section 1.2.1, Relevance).

Based on the problem definition and using the related work and the knowledge of what is possible and feasible, we define the *objectives of a solution* (section 1.3**,** Objectives) which specifies the most important features that any solution for the chosen problem should have.

In the *design and development* step we propose an artifact aimed to satisfy the solution's objectives of the research problem (section 3, Proposal). The creation of such artifact was not only based on the existing body of knowledge about strategic plans and IT governance frameworks and practices (section 2, Related Work) but also our evaluation of PGETIC (section 2.3.2).

The *demonstration* step specifies how anyone can use the proposed artifact to solve a real and practical problem. Thus, in section 4, we exemplify the practicability of our method by explaining how it can be used to create an improved strategic plan for the public administration's ICT.

The *evaluation* step, as the name suggests, verifies if the proposed artifact solves or mitigates the research problem and checks if the initial *objectives of a solution* were satisfied. Our evaluation method is described in section 5.

The DSRM process ends with the *communication* step which presents the research to relevant audiences. This step was accomplished by submitting scientific papers and by writing this thesis.

Our thesis also followed the seven guidelines specified on (Hevner, March, Park, & Ram, 2004): Design as an Artifact; Problem Relevance; Design Evaluation; Research Contributions; Research Rigor; Design as a Search Process; and Communication of Research.

1.5. Thesis Structure

In chapter 2 we present the existing work related with our thesis' theme: we introduce the concept of strategy thinking and planning and the Business Transformation Management Methodology (section 2.1); we introduce IT governance and present two of its frameworks (section 2.2); we summarize how other countries are improving and governing their public ICTs using strategic plans (section 2.3); we present the results of our evaluation of the Portuguese PGETIC (section 2.3.2); and finally we summarize the useful contributions that these related works might have to our thesis (section 2.4).

In chapter 3 we describe our proposal of a solution to the thesis' problem. Our proposal has two assumptions (section 3.1) and consists of two artifacts: an improved strategic thinking and a lifecycle. The improved strategic thinking is materialized by the definition of two complementary plans (section 3.2): a strategic plan called "Plano Estratégico das TIC" (PETIC) and an operational plan called "Plano Operacional das TIC" (POTIC). We will also specify what each plan should contain and address (section 4.1). The lifecycle explains how these PETICs and POTICs are created, what tools could be used to assist that process, how participants should collaborate, and how to do so creating a cycle of continuous improvement (section 3.3).

In chapter 4 we demonstrate how our proposals can be used in practice. Hence we propose a structure (section 4.1) for both the strategic plan (PETIC) and the operational plan (POTIC), in agreement with the detachment of strategy and implementation mentioned in section 3.2. Finally, we demonstrate the usage of the proposed lifecycle by exemplifying a full iteration of the cycle using real data (section 4.2).

In chapter 5 we use semi-structured interviews (section 5.1) and the appraisal of the scientific community (section 5.2) to evaluate our thesis' proposal, i.e. the improved strategic thinking (section 5.1.1) and the governing lifecycle (section 5.1.2). Finally, we support our main design decisions by mapping them with the best practices recommended by three different frameworks (section 5.3).

Chapter 6 is the final chapter, summarizing the main contributions of our thesis and suggesting some future work.

There is a References chapter in the end followed by an Appendix.

2.   Related Work

In this chapter we present the existing work related with our thesis' theme: we introduce the concept of strategy thinking and planning and the Business Transformation Management Methodology (section 2.1); we introduce IT governance and present two of its frameworks (section 2.2); we summarize how other countries are improving and governing their public ICTs using strategic plans (section 2.3); we present the results of our evaluation of the Portuguese PGETIC (section 2.3.2); and finally we summarize the useful contributions that these related works might have to our thesis (section 2.4).

2.1. Strategy, Transformation and Change

Henry Mintzberg has an interesting article where he distinguishes strategic thinking and strategic planning (or programming, as he calls it). *Strategic programming* analyzes the strategy; transforms objectives into actionable steps and then details how those steps should be carried out (Mintzberg, 1994, p. 108). *Strategic thinking* synthesizes the strategy; based on a holistic view of the organization, it transforms the workers', managers', and executives' ideas and data into a vision of what the organization should be and do in the future (Mintzberg, 1994, p. 108).

PGETIC is an example of strategic programming; it stipulates a set of step-by-step instructions that hopefully will implement the strategy. Using an analogy with 20th century computers, strategic programming converts strategies into punched cards and assumes people are mainframes that execute instructions sequentially and without deviations (or complaints). That is the complete opposite of what Mintzberg perfectly emphasizes: "*the most successful strategies are visions, not plans*" (Mintzberg, 1994, p. 107).

Another important source of practices is the Business Transformation Management Methodology (BTM[2]). This methodology presents an approach to enhance the success and results of organizational transformation projects. The methodology aims to be holistic and adaptable by balancing both rational and emotional aspects of transformations (Uhl & Gollenia, 2012), having a strong focus on people's aspects since they are the ones who implement the transformation.

BTM[2] proposes a transformation lifecycle composed of four steps: (1) envision, which creates a vision, specifies a strategy, and infuses people with the desire to change; (2) engage, which creates the transformation roadmap and empowers people to implement the strategy through collaboration and communication; (3) transform, which is the transformation implementation, changing processes, technology and culture; and (4) optimize, which internalizes and optimizes the transformation and creates stability for the next iteration (Uhl & Gollenia, 2012). BTM[2] also refers that motivation is more than rewards and penalties – it is about providing autonomy to the transformation's actors; about encouraging the employees to move outside their comfort zone to grow, embracing new practices and improving their competences; and about developing on employees a sense of belonging and empathy for the team and the organization as a whole.

A book about generic change management (Heath & Heath, 2011) shares many of the ideas and practices of BTM[2] and refers three main factors that positively influence change: *"direct the rider"*, provide clear strategy and direction; *"motivate the elephant"*, engage people's emotional side to sustain change, otherwise people's self-control will run out and inertia flourish; *"shape the path"*, sometimes a problem that seems to be related with the people is really an environmental problem hence tweak the environment to foster change.

Critical Analysis.

Mintzberg's insights are very relevant to our research, since most of our proposal stands on the idea of separating the strategy's conception (thinking) of the strategy's rollout (programming). As he states: all feasible strategies are a combination of emergence and control, and not individually one or the other (Mintzberg, 1994, p. 111). The freedom associated with that emergence is what engages people in change; although they cannot change the destination, they can shape the path. That power energizes people, and strategies need to be fueled by the people's engagement (Mintzberg, 1994, p. 109).

BTM[2] practices are very interesting and useful for our thesis. Indeed, the public servant lacks the referred sense of belonging or the desire to move outside their comfort zone. Moreover, (Uhl & Gollenia, 2012) states that organizations with lower willingness to transformation frequently have predominantly local centers of power – which is precisely what happens in the Portuguese public administration (usually referred as "farms" of power).

2.2. IT Governance

IT governance (ITG) is a somewhat new and growing concept, which is why there is a lack of a shared understanding of the term (Kan, 2004), with several definitions across articles and books although with minor differences (Pereira & Mira da Silva, Designing a new Integrated IT Governance and IT Management Framework Based on Both Scientific and Practitioner Viewpoint, 2012). Indeed there were past attempts (Webb, Pollard, & Ridley, 2006, p. 7) to create a final definition of ITG that resulted in the following: *"IT Governance is the strategic alignment of IT with the business such that maximum business value is achieved…"*

ITG is a major concern for CIOs during the last decade because it is seen as a tool to increase returns on IT investments and improve organizational performance (Pereira & Mira da Silva, A Literature Review: Guidelines And Contingency Factors For IT Governance, 2012). An important milestone was the emergence of ITG's frameworks. Today, several frameworks – e.g. COBIT, ITIL, and CMMI – exist to align IT with business or improve the quality and efficiency of the organization's processes.

ITG is the main area of the thesis because we aim to review and improve a strategic plan. ITG and strategic plans are related because both have shared goals: align IT's services with business' needs; define and communicate a vision and its strategic goals and drivers; and increase business value by prioritizing IT projects (IT Governance Institute, 2003).

However, governance is more high-level than strategic plans. Governance comprises generic mechanisms which provide a holistic view of the organization – containing both IT and business. It offers a set of generic best practices aimed to effectively manage the organization as a whole – its performance and risk. On the other hand, strategic plans are timely and locally bounded, that is, a strategic plan is tailored to address some specific local concerns during a specific temporal interval.

Usually one cannot take a strategic plan of some organization and apply it directly to another – the starting plan would suffer so many adjustments that in the end it could no longer be considered the same plan. That happens because different organizations typically have different concerns, resources, maturities (as-is) and visions (to-be). Likewise, the strategic plan that is being started today cannot be applied as it is in, let's say, five years because the plan's context and assumptions will be outdated.

In contrast, ITG frameworks are created so that any organization can implement it or customize it – whenever they want, whichever the context is and independently of their maturity. That's only possible because they are generic… after all they are *frameworks*. ITG frameworks are basically a set of best practices: to govern the IT and its relation with the Business (e.g. COBIT); to efficiently provide quality IT services (e.g. ITIL); to guide the improvement of processes, like IT services (e.g. CMMI); or to assess the maturity of IT capabilities and create a roadmap of improvement (e.g. IT-CMF).

For this related work we focused on COBIT and IT-CMF. We disregarded Information Technology Infrastructure Library (ITIL) mainly because it is focused on IT and doesn't provide the holistic and organizational perspective we needed. We disregarded Capability Maturity Model Integration (CMMI) mainly since it is focused on optimizing the software development process, and thus it does not outshine IT-CMF (which is more is more straightforward, complete and tailored for the entire IT function) or COBIT (which is more comprehensive and widely used) in any relevant aspect.

2.2.1. COBIT

ISACA, the organization which created COBIT, states that *"COBIT 5 provides a comprehensive framework that assists enterprises in achieving their objectives for the governance and management of enterprise IT"* (ISACA, 2012, p. 13). Indeed COBIT 5 has some interesting features that make it relevant to our research, such as: (1) providing a holistic structure of the organization through its interconnected processes; (2) describing a comprehensive set of best practices for each process; and (3) providing a common language across the organization. And since this is a generic framework, it can be adapted to our research's context – a big public organization.

The framework contains 37 high-level processes, categorized along four IT domains plus one Governance domain: *Align, Plan and Organize*; *Build, Acquire and Implement*; *Deliver, Service and Support*; *Monitor, Evaluate and Assess*; and *Evaluate, Direct and Monitor* (Figure 3).
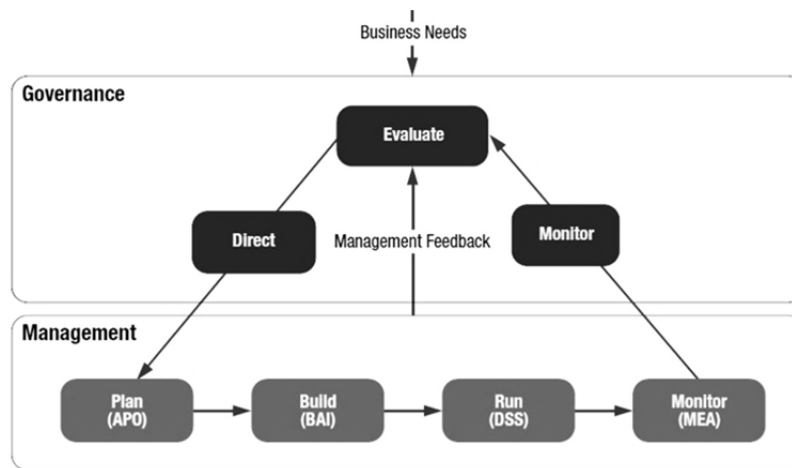
Figure 3. Overview of COBIT5's domains

COBIT's Critical Analysis.

We already mentioned some of the COBIT's features that please us. From all COBIT's processes the one that relates the most with strategic plans is, as the name suggests, *"APO02 Manage Strategy"* which is described to *"provide a holistic view of the current business and IT environment, the future direction, and the initiatives required to migrate to the desired future"* (ISACA, 2012). The process describes in detail the management practices related with the creation of a strategic plan, including its inputs and outputs.

Moreover, COBIT provides important tools such as the *"goals cascade"* (ISACA, 2012, p. 17) and the *"process assessment method"* (ISACA, 2013). Although COBIT gives insights and tools on how to create a strategic plan for one organization with one IT department, COBIT does not provide an end-to-end method to create and apply a single strategic plan across the multiple IT departments of one organization, which is the case of the Portuguese public administration. We shouldn't expect much more from a framework, which by definition is *"a skeletal support used as the basis for something being constructed; (…) a scaffold"* [1]. That is exactly what COBIT will be to our proposal, a solid scaffold.

2.2.2. IT-CMF

IT-CMF is a recent framework to assess, manage and improve IT in order to maximize business value. It categorizes the essential capabilities of the IT organization into four macro-capabilities: *Managing the IT budget*, *Managing the IT capability*, *Managing IT for business value*, and *Managing IT like a business* (Costello, 2010).

Each macro-capability breaks down into critical capabilities that *"represent the key activities and procedures that must be defined and mastered to enable an IT organization to plan and deliver IT*

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[1] www.thefreedictionary.com/framework

solutions, and to measure the business value outcomes of its initiatives" (Curley & Kenneally, Using the IT Capability Maturity Framework to improve IT Capability and Value Creation: An Intel IT Case Study, 2011). In total there are 33 critical capabilities (Figure 4).

Managing IT Like a Business			Managing the IT Budget			Managing the IT Capability			Managing IT for Business Value	
ITG	IT Leadership & Governance		FF	Funding & Financing		EAM	Enterprise Architecture Management		TCO	Total Cost of Ownership
BPM	Business Process Management		BGM	Budget Management		TIM	Technical Infrastructure Management		BAR	Benefits Assessment & Realisation
BP	Business Planning		PPP	Portfolio Planning & Prioritisation		PAM	People Asset Management		PM	Portfolio Management
SP	Strategic Planning		BOP	Budget Oversight & Performance Analysis		KAM	Knowledge Asset Management			
DSM	Demand & Supply Management					RAM	Relationship Asset Management			
CFP	Capacity Forecasting & Planning					RDE	Research, Development, & Engineering			
RM	Risk Management					SD	Solutions Delivery			
AA	Accounting & Allocation					SRP	Service Provisioning			
ODP	Organisation Design & Planning					UTM	User Training Management			
SRC	Sourcing					UED	User Experience Design			
IM	Innovation Management•					PPM	Program & Project Management			
SAI	Service Analytics & Intelligence					SUM	Supplier Management			
SICT	Sustainable ICT					CAM	Capability Assessment & Management			

Figure 4. List of IT-CMF's critical capabilities, grouped by macro-capabilities

IT-CMF then describes for each (macro and critical) capability five levels of maturity – from 1 (Initial) to 5 (Optimizing), just as CMMI's levels of maturity. Lastly the framework suggests *building blocks* that work as roadmaps to improve each capability's maturity.

IT-CMF's Critical Analysis.

To the question *"Is there a COBIT 5 competitor"*, Geoff Harmer – an accredited Trainer for COBIT and founder of Maat Consulting Ltd – stated that the *"nearest (framework) that includes governance and management is IT-CMF"* (Harmer, 2012). Indeed, IT-CMF shares some of COBIT's features like: (1) aligning IT with business; (2) providing a common language; and (3) providing best practices, although in less detail than COBIT.

Still, an advantage that IT-CMF has over COBIT is its softer learning curve; COBIT is much more complex and detailed, which makes it more complete but also more difficult to start using. Our first contribution to this thesis was the evaluation of PGETIC (section 2.3.2). We needed to carry out that evaluation as soon as possible, since all the following work would be based on that evaluation. Therefore, we chose IT-CMF as the ITG framework for that assessment since it was faster for us to understand it and get to apply it.

Nevertheless IT-CMF, as it is today, is not enough to solve our problem. Similarly to COBIT, there is a capability named *"Strategic Planning"* responsible for *"formulating a long-term vision and translating it into an actionable strategic plan for the IT organization. The goal is to (…) maximize IT value*

generation for the entire organization" (IVI, 2012). Like COBIT it describes the best practices to create a strategic plan, although is less detail. That lack of detail and tools led us to prefer COBIT. Nevertheless, IT-CMF is a fairly good ITG framework to conduct simple maturity assessments.

2.3. Public Administrations

E-government aims to provide quality public services efficiently to citizens, businesses or other public entities (Lee, Tan, & Trimi, 2005). Therefore, there are five main e-government practice categories: government to citizens (G2C), government to businesses (G2B), government to government (G2G), government internal efficiency and effectiveness (IEE), and overarching infrastructure and interoperability (Cross-cutting) (Lee, Tan, & Trimi, 2005).

Other countries used or are using strategic plans to shape the evolution of their ICT and adopt e-government practices. In 2004 the United States was considered a leading country in e-government practices, followed by the European Union (particularly Denmark) and some countries in Asia (particularly Singapore). Curiously, the reality in 2012 is quite different. According to the latest report (United Nations, 2012, p. 4) the Republic of Korea is now the world's leader in e-government, followed by the Netherlands, the United Kingdom and Denmark, *"with the United States, Canada, France, Norway, Singapore and Sweden close behind."*

An effective plan requires seamless integration of relevant ICT, quality information, engaged public servants, documented administrative processes, and strong government leadership; otherwise, the existing bureaucracy and ineffective processes may only be exacerbated by ICT (Lee, Tan, & Trimi, 2005).

A strategic plan usually covers three to five years and defines the desired future state of the organization (vision), including a high-level roadmap to achieve it (Slater, 2002). Governments all over the world (Diário da República, 2012; Cabinet Office, 2011; Lee, Tan, & Trimi, 2005; NSW Department of Finance & Services, 2012; Michigan Information Technology Executive Council, 2010) are creating strategic plans to improve their IT function and guide its evolution according to strategic goals, since *"strategic thought and action are increasingly important to the continued viability and effectiveness of governments"* (Bryson, 1988).

This strategic thinking approach helps organizations (1) clarify future direction, (2) make today's decisions considering its future consequences, (3) develop coherent criteria for decision making, (4) and solve major organizational problems taking advantage of synergies (Bryson, 1988). Strategic thinking is also a great tool to guarantee that technology investments are business driven and orchestrated across the company (Hayles, 2007).

Although most of these strategic plans are similar to each other, *"they cannot be generalized to all other governments"*, instead they can provide guidelines (Ke & Wei, 2004, p. 99). For instance,

Portugal's PGETIC has some commonalities with the UK's Strategy for ICT (Cabinet Office, 2011) but the overall starting point and objectives of UK's Strategy are totally unlike Portugal's.

Over the next two sub-sections we will evaluate the United Kingdom's and Portugal's strategic plans for their Government's ICT. We choose to evaluate the United Kingdom's plan because we can easily benchmark it with Portugal's plan (the one that really concerns this thesis): (1) the United Kingdom is also an European country, (2) it released the plan just a year before the Portuguese, and (3) the plan's structure and methodology is very similar with the one used by the Portuguese Government.

2.3.1. United Kingdom

In 2011 the United Kingdom (UK) wrote a Strategic Implementation Plan for the Government's ICT. The plan was forecasted to save 1.4 billion pounds (Cabinet Office) over the 4 years of its implementation. It contained four programmes: *"Reducing waste and project failure, and stimulating economic growth; Creating a common ICT infrastructure; Using ICT to enable and deliver change; Strengthening governance"* (Cabinet Office, 2011). The plan's objectives were to (Cabinet Office, 2012):

- *"Make Government ICT more open to the people and organizations that use our services, and open to any provider – regardless of size;*
- *Reduce the size and complexity of projects, and better manage risks;*
- *Enable reuse of existing ICT systems and "off the shelf" components, reducing duplication, over-capacity and saving money;*
- *Move towards a common infrastructure in Government, increasing efficiency and interoperability;*
- *Reduce procurement timescales and making it simpler for SMEs to compete for Government business;*
- *Improving the implementation of big ICT projects and programmes."*

This plan already has more than a year of implementation and the results are starting to show (Cabinet Office, 2012). The plan is well structured and thoroughly defined challenges, objectives, metrics, deadlines, risks and actions for their mitigation and who's accountable for what. The UK's Government is keeping a watchful eye on the plan's implementation – with a semiannual (The Cabinet Office, 2011) and annual (Cabinet Office, 2012) review – and making sure everyone is involved in this big transformation – asking the industry for advice, which for instance pointed out the necessity to simplify the procurement process so that SMEs can more easily apply for Government's contracts (National Audit Office, 2012).

Critical Analysis of UK's ICT Strategy.

Indeed there are some similarities between the problems that UK's ICT Strategy aims to solve and the problem of this thesis, thus the relevancy of this solution. Consequently the following question arises:

"Should the Portuguese Government implement the UK's Strategy in Portugal to solve its ICT's problems?" The answer is "No" because the starting point and objectives of UK's strategy are totally unlike Portugal's. Also the ICTs of UK's public administration are much more mature and modern than Portugal's. We still have a long way to go before having the same concerns as they have. However we should learn from their concern of ensuring that every participant of that transformation feels involved, asking for industry's feedback and publishing regular reviews of the plan's development. A comparison of UK's strategy and Portugal's strategy is shown in section 2.4.

2.3.2. Portugal

In 2011 the Portuguese Government wrote a strategic plan for the public administration's ICT called *"Plano Global Estratégico de Racionalização e Redução de custos nas TIC"*, which we will abbreviate by PGETIC. The plan started in 2012 and is scheduled to finish by the end of 2016.

PGETIC comprises five strategic drivers (or programmes): *Improving governance, Cost-cutting, Using ICT to foster change and modernization, Implementation of common solutions, Promote economic growth* (Assembleia da República, 2012). Each programme is composed by five projects, summing a total of 25 projects. Some projects are to be implemented on every ministry (e.g. project 2, that centralizes the multiple IT departments of a ministry into a single ministerial IT department), on a single pilot ministry (like project 16, that catalogs the public servants' skills and salaries), or globally with one or more public bodies overseeing or executing the implementation (like project 4, that establishes a new national center for cyber security).

Critical Analysis of Portugal's PGETIC.

In general terms a strategic plan is not an operational plan, but what is difference? *A strategy plan* should be *"visionary, conceptual and directional"* and the operational plan *"tactical, focused, implementable and measurable"* (Issa-Salwe, Ahmed, Aloufi, & Kabir, 2010). According to this definition PGETIC is an operational plan. First, all PGETIC's projects are meant to be implementable with specific objectives, actions and deadlines. Second, certain projects are just an enforcing of a policy – like project 11, 12, 13 and 21 – or localized optimizations/fixes – like 3.9, 3.10, and 3.20.

Also, a recent review of the literature (Chen, Mocker, Preston, & Teubner, 2010) identifies three main conceptions of Information Systems' strategy, which further refine the above definition: (1) *"IS strategy as the use of IS to support business strategy"*; (2) *"IS strategy as the master plan of the IS function"*; (3) *"IS strategy as the shared view of the IS role within the organization"*. The authors summarized the different conceptions and their characteristics into a single table. According to that table (Chen, Mocker, Preston, & Teubner, 2010, p. 239), PGETIC matches the second conception because it was developed in isolation from business strategy, is IS-centric and focused on what IS assets are required and how to allocate the existing ones efficiently. However the authors found the third conception to be the best fit with their definition of IS strategy.

José D. Coelho – president of the Association for the Promotion and Development of the Information Society (APDSI) – commented that PGETIC is complex, with numerous projects whose final result set isn't coherent, and without a target scenario (Coelho, 2012). He also warned that the deadlines were *"excessively optimistic"* (a month later, GPTIC would publicly acknowledge this) and that IT shouldn't be regarded as an expense to reduce as much as possible.

All these concerns led us to conduct a *"comparison of PGETIC with recognized IT Governance frameworks to find out where it excels and fails"* (Nunes, Rosa, & Mira da Silva, Evaluating the IT Strategic Plan for the Public Administration in Portugal, 2013), in order to uncover the plan's completeness and efficiency. Only after such a research we would be able to know the real shortcomings of the plan and suggest improvements.

For that comparison we chose IT-CMF as the ITG framework mainly because IT-CMF (1) is particularly focused on converting IT from a cost center to a value generator, (2) structures the organization into well-defined IT capabilities, and (3) offers a quick way to audit the capabilities' maturity with sufficient accuracy and enables benchmarking.

For every PGETIC project we questioned ourselves: if this project is successfully implemented which IT capabilities will be improved and, in that case, which maturity levels will be attained? To answer that question we mapped the project's description with the IT capabilities' description and maturity levels, looking for a match. The complete mapping is shown on Table 16 (see Appendix).

A full level of maturity is represented by a circle and an intermediate level by a semi-circle. Level 1 maturities were ignored and not represented, since IT-CMF assumes all IT capabilities to be by default on level 1. To give an example, PGETIC's project 1 will attain level 3 of maturity of the capability *IT Leadership & Governance* (ITG), level 2 of *Organization Design & Planning* (ODP), and finally level 1.5 of *Portfolio Planning & Prioritization* (PPP). A dark gray cell indicates a serious problem that must be solved urgently, e.g. a project which doesn't improve any capability; a light grey cell also alerts for something needing revision/correction but less severe than the previous case, e.g. a project that scarcely improves a capability.

To clearly illustrate and classify the research's results we analyzed our previous mapping (Table 16) using the same mapping analysis used in (Meertens, et al., 2012), which is based on an ontological evaluation (Fettke & Loos, 2003). That analysis, shown on Table 1, revealed projects that improve no capability (excess), multiple projects implementing the same maturity level for a specific capability (overload) and capabilities that are not improved (deficiency).

On the left column are the projects that improve a specific IT capability (middle column); on the right column is the result of the analysis. Exemplifying, the IT capability *Accounting & Allocation* (AA) is improved by project 7, 8 and 18 but all achieve the same level of maturity, hence there is an overload of level 1.5 of maturity. On the other hand, *Service Provisioning* (SRP) has two projects and no overload, since each project attains different maturity levels. It is important to note that projects classified as "excess" do not necessarily mean useless projects; it just means that those projects solve

a problem so operational or specific that they alone do not achieve any level of maturity. For instance projects 11, 12 and 13 are just the establishment and enforcement of a policy.

Table 1. Ontological evaluation of PGETIC's mapping with IT-CMF's capabilities

PGETIC's projects	IT-CMF	Analysis result	PGETIC's projects	IT-CMF	Analysis result
1	ITG	ok	20	KAM	ok
-	BPM	deficiency	22, 24, 25	RAM	ok
-	BP	deficiency	2, 6, 7, 14, 18, 23, 24, 25	RDE	overload (●● and ●●●)
-	SP	deficiency	-	SD	deficiency
-	DSM	deficiency	2, 18	SRP	ok
22	CFP	ok	20	UTM	ok
15	RM	ok	-	UED	deficiency
7, 8, 18	AA	overload (●◖)	6	PPM	ok
1	ODP	ok	7, 22	SUM	overload (●●)
15, 18, 21, 22	SRC	overload (●●)	-	CAM	deficiency
23, 24, 25	IM	overload (●●)	6, 17, 21	TCO	overload (●◖)
-	SAI	deficiency	6	BAR	ok
8, 9, 14, 18	SICT	overload (●◖)	-	PM	deficiency
-	FF	deficiency	4	-	excess
-	BGM	deficiency	5	-	excess
1, 3, 6, 17, 12	PPP	overload (●◖)	10	-	excess
-	BOP	deficiency	11	-	excess
3	EAM	ok	12	-	excess
7, 8, 15, 18	TIM	ok	13	-	excess
16	PAM	ok	19	-	excess

During that research, three public bodies were interviewed:

1) The first public body interviewed was an entity of the State's business sector. We spoke with the entity's chief of Information Systems, who leads 21 collaborators and has a budget of quite a few million Euros. The department had ITIL in place and was attaining ISO 20000.

2) The second public body interviewed was a general directorate. We spoke with the chief of Planning, Documentation and Information Systems department, who leads 10 collaborators and has a budget of less than a million Euros. The department had no ITG framework in place.

3) The third public body interviewed was a public institute. We spoke with the institute's chief of Information Systems, who leads 15 collaborators and has a budget bigger than one million Euros. The department had no ITG framework in place.

At each interview we identified the interviewees' discomfort on talking about PGETIC. When we asked the reason for their apprehension they vented that:

- The plan's creation was rushed and its implementation was being imposed by the Government without consulting the plan's executors or participants;
- The plan assumes that all public administration's IT departments are big and exist to satisfy stable requirements from the business, which is why small IT departments that serve ever changing business requirements – like continuously developing *ad hoc* solutions – have considerable difficulties implementing the plan;

- The overall plan looks more like a cost-reduction plan or a contingency than a strategic plan, therefore some public servants considered this plan an attack to their salary and/or internal power.

All these facts contribute to a high resistance, almost like a feeling of repulse, to implement the plan or collaborate with that implementation. That slowed down the plan's implementation. They also told us that one of the main causes of the delay was the insufficient number of qualified IT human resources (and also financial resources) both in quantity and quality. As (Uhl & Gollenia, 2012) states, these transformation projects usually fail because of non-technical causes such as the rejection of the new solution, communication problems and insufficient resources or skills to implement the project.

We designed a semi-structured questionnaire with a total of 28 questions, two of them open-ended. We used those questions to evaluate the correctness of our methodology and the relevance of our evaluation of PGETIC. Comparing the interviewees' answers we found some patterns and reached the following results:

- An evaluation of PGETIC's completeness and efficiency was indeed needed;
- The results of this research are clear, objective, relevant and with practical utility;
- PGETIC has "good intentions" but is insufficient to fully achieve its objectives, thus the plan needs improvements;
- With this research it is easier to suggest and evaluate improvements to PGETIC;
- The interviewees' opinion on PGETIC worsened after becoming aware of the research's results, acknowledging the plan's limitations or the need for improvements (or both).

Let us summarize our analysis: in terms of completeness, we found that 36% of IT-CMF's capabilities won't be improved by the plan. As for efficiency, we identified several redundant and excessive projects – 28% of PGETIC's projects improve no capability. As it is today the plan will hardly solve, in a sustainable way, the fundamental problems of public administration's ICT.

2.4. Discussion

In the end of each previous section we provided a critical analysis of the related work presented. We will now summarize those analyzes and specify which ones will be relevant for our proposal.

First, our proposal will be an example of *strategic thinking*, i.e. we will propose a high-level structure for an improved strategic plan. We will also specify the vision, i.e. which strategic drivers we consider to be more relevant for the future of the IT function.

Second, we do not consider the frameworks presented as solutions *per si* since they are too generic to be considered an off-the-shelf solution to our thesis' problem. However, we will use the COBIT framework and the tools it provides to support our proposal.

Finally, the UK's strategic plan for their public administration's IT cannot be used to solve our thesis' problem because it is not suited for Portugal's reality. The following comparison explains why.

UK's Strategy aims to:

- Save over one billion pounds;
- Reduce projects' size and complexity, decreasing their risk;
- Go towards a common ICT architecture;
- Simplify procurement for SMEs to compete for government business;
- Improve the implementation of big ICT projects.

Whereas Portugal's PGETIC aims to:

- Save over 500 million Euros;
- Establish criterions for project's prioritization, decreasing IT spending;
- Start modeling current architecture and reduce ICT infrastructure;
- Establish partnerships to create and export innovations;
- Define projects which modernize public administration.

3. Proposal

In this chapter we describe our proposal of a solution to the thesis' problem. Our proposal has two assumptions (section 3.1) and consists of two artifacts: an improved strategic thinking and a lifecycle.

The improved strategic thinking is materialized by the definition of **two complementary plans** (section 3.2): a strategic plan called "Plano Estratégico das TIC" (**PETIC**) and an operational plan called "Plano Operacional das TIC" (**POTIC**). We will also specify what each plan should contain and address (section 4.1). The lifecycle explains how these PETICs and POTICs are created, what tools could be used to assist that process, how participants should collaborate, and how to do so creating a cycle of continuous improvement (section 3.3).

3.1. Assumptions

Our strategic method has two assumptions:

1) We assume that PGETIC's project 1 will be successfully implemented, i.e. PETIC takes for granted that when its implementation starts, there are already governance mechanisms in place, namely a governance board. According to the latest scheduling of PGETIC, the implementation of project 1 will start in the second half of 2012 and it is so critical that it has precedence over all other measures of the plan (GPTIC, 2012). So it is reasonable to expect a rapid completion of this project. However, if project 1 fails then the CIOs of all Ministries must form a temporary governance board to discuss the strategic aspects of the plan.

2) We assume that PGETIC's project 2 will be successfully implemented, i.e. that the numerous IT departments of a Ministry are merged into a single ministerial IT department. Thus, when that project is completed there will be one ministerial IT department per Ministry. This assumption reduces the complexity of POTIC, since there will be one POTIC per Ministry. However, if project 2 fails then each POTIC will have to consider the capabilities and needs of every Ministry's IT department, instead of considering a single IT department.

3.2. Strategic and Operational Plans

To support and guide the definition of our proposal we used mainly COBIT and IT-CMF, including some practices and recommendations of BMT[2]. Although ITIL's book *"Service Strategy"* also deals with strategy we did not choose ITIL due to its focus limited on the IT's point of view. Our strategic plan is not defined by and for a specific IT department; it should be defined by a governance board to be applied across all ministerial IT departments.

Therefore, we need to use a systemic or organizational point of view; that is why we preferred COBIT instead. To define PETIC we based ourselves on the best practices specified by COBIT's *"APO02 Manage Strategy"* (ISACA, 2012) and in a lesser extent on IT-CMF's *"Strategic Planning"* (IVI, 2012). As mentioned in section 2.2.1, COBIT breaks down the process of creating a strategic plan into six clearly defined management practices, with their respective activities and inputs/outputs.

Our strategic thinking learns from PGETIC's shortcomings:

- **Time frame.** PGETIC's implementation started in January 2012 and will last to the end of 2016. As we all know, nowadays technology change is frequent and happens fast (Hayles, 2007). *"Five year plans? Oh, that my crystal ball would work so well"* (Slater, 2002). According to (Overby, 2008), strategic plans *"should cover three to five years, with the most focus on the next 12 to 18 months"*. Hence, PETIC should be a four year plan with a biennial review. By doing so, forecasts are more reliable and the plan's execution more effective.

- **Communication.** The worst (strategic) plan is the one that no one cares about. There may be several reasons for that, we will cope with two of them: being too long and too technical. We are creating a strategic plan for ICT, thus at least *"all IT employees are required to read the plan"* (Slater, 2002). Unfortunately *"most IT strategy direction documents are so technical that business partners have a hard time understanding them"* (Hayles, 2007, p. 14). PGETIC had 144 pages (GPTIC, 2011); UK's ICT Strategy had 71 pages (HM Government, 2011). Hence, PETIC should have at most 70 pages. How can we achieve such optimization? Answer below.

- **Scope.** *"The strategic plan is a high-level document. It has the business imperatives, the problems we're trying to solve"* (Slater, 2002). A high-level strategic plan has two benefits: (1) non-technical people can read, understand and discuss the plan, which leads to transparency, engagement and aligned solutions; and (2) it leaves enough room for the plan's executors to *"change implementation details without rewriting the strategic plan"* (Slater, 2002). PGETIC was a mix of strategic plan with implementation guide. *"Don't sweat the details; the specifics of execution do belong in another document"* (Slater, 2002), and that other document will be POTIC.

- **Content.** PETIC will be a high-level plan, to all Ministries, more focused on improving strategic capabilities than fixing operational problems. It will contain a four year vision for the public administration's IT, justified by several drivers resulting from (1) the stakeholders' concerns and needs; (2) the public administration's environment; and (3) the technology's evolution. The vision is then detailed by several strategic goals, which address the gap between the IT's capabilities and services and the public administration's objectives and needs. To monitor the performance of the plan's implementation, metrics such as Key Performance Indicators (KPIs) should be defined for each strategic goal (as PGETIC currently does).

- **Implementation.** The high-level perspective of PETIC implies the existence of a more specific and detailed plan (Bryson, 1988). Therefore, for each PETIC there will be one POTIC per Ministry. Each POTIC also lasts four years, with a biennial review, and will be defined and implemented by the ministerial IT department in collaboration with the governance board

(Hayles, 2007). It will specify a detailed roadmap – with schedules, budgets, dependencies, responsibilities, etc. – to achieve the strategic goals. In addition, fixes to operational problems may be added as long as they are aligned with PETIC. This approach has three benefits over PGETIC, which was a top-down plan imposed from the top management to all Ministries and their IT departments: (1) the plan is tailored according to the resources and concerns of each Ministry (Uhl & Gollenia, 2012), thus increasing efficacy; (2) the quick-wins should be implemented until the biennial review, and progress about the long-term goals should provide feedback to review PETIC's goals; and (3) it fosters collaboration and reward, instead of authority and penalty, thus promoting synergies between participants and increasing the potential for value generation.

- **Sustainability.** The problems of public administration's ICT will not be solved with a single strategic plan. Moreover, if we want to go a step forward and prevent problems, we need to have in place a repeatable method responsible for reviewing and creating plans – both strategic and operational – which improve strategic capabilities, solve recently discovered problems and adopt emergent technologies. That cycle is address in section 3.3.

In section 4.1, we will detail the structure of both plans and how they could be implemented in practice.

3.3. Governing Lifecycle

As stated in section 1.3, transformational endeavors that deeply change the status quo require decades and multiple plans to yield the desired results. Hence we must define a formal and sustainable process to create these plans. By formalizing such process we increase transparency and predictability which reduces change resistance and enhances efficiency and chance of success, respectively.

To strengthen our formalization we supported our lifecycle with COBIT 5. We choose COBIT 5 because: (1) it is a mature and world-renowned set of best practices; (2) it is a holistic IT governance framework, spanning from stakeholders' needs and concerns to operational processes and deliverables; and (3) it features a precise and traceable mechanism named "*goals cascade*" which transforms "*stakeholder needs*" into "*enterprise goals*", then into *"IT-related goals"* and finally into "*enabler goals*" or IT processes (ISACA, 2012, p. 17).

The method we propose comprises the following steps:

1) **Measure.** The governance board assigns an auditing team to assess the *"capability levels"* (ISACA, 2013) of every IT process on each IT department, using COBIT 5's Process Assessment Model. The same auditing team also assesses which are the department's IT-related goals.
   Output: Capability assessment + IT-related goals assessment (per IT department)

2) **Evaluate.** The governance board compares the IT-related goals from all IT departments. That comparison provides data to calculate metrics such as the overall alignment between IT departments, and also enables the governance board to infer the most common issues and goals across the IT function. Both insights will be useful to the next step (the creation of PETIC).

   Input: Ministerial IT department's assessments => *Output:* Alignment ratio + Common issues

3) **Think.** The governance board evaluates the assessments, identifies common issues and strategic drivers, establishes strategic decisions (goals and policies) and stipulates minimum capability levels for prioritized IT processes (per IT department). Using the IT goals assessment, the governance board can calculate the alignment ratio of each IT department with the new global strategy, thus forecasting an effort rate to carry out PETIC.

   Input: Capability assessment + Common issues => *Output:* PETIC

4) **Plan.** IT departments compare their current capability levels with the minimum levels stipulated by the governance board on PETIC. Using COBIT 5's Process Assessment Model and Enabling Processes the IT departments realize which best practices and deliverables (called "*base practices*" and "*work products*", respectively (ISACA, 2013)) they need to implement to satisfy each of the required capability levels.

   Input: Capability assessment + PETIC => *Output:* POTIC (roadmap)

5) **Align.** The governance board reviews the IT department's roadmap, approving or requesting for changes on the improvement projects. IT departments with the same improvement goals are notified to collaborate, taking advantage of synergies.

   Input: POTIC (per IT department) => *Output:* Recommendations

6) **Transform.** Each IT department infuses its POTIC with the governance board's recommendations and starts implementing the revised operational plan.

   Input: POTIC + Recommendations => *Output:* Value

Figure 5 graphically summarizes these steps.
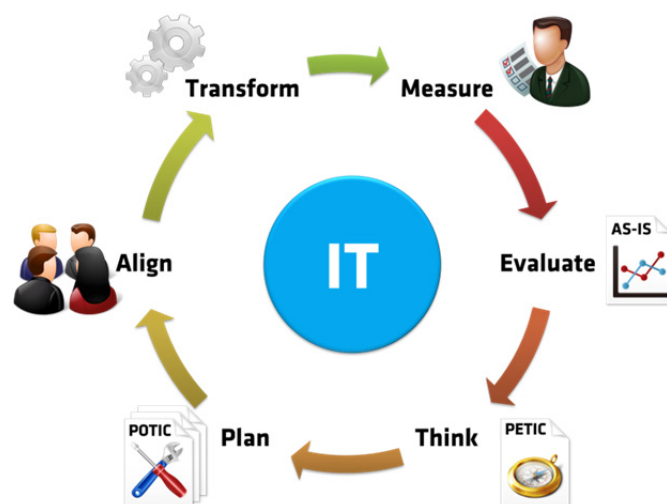
Figure 5. Summary of the proposed lifecycle

The third step comprises several steps. The governance board needs to discuss which are the main problems affecting the IT function, what are the improvement priorities for the next four years, benchmark the IT processes' capability levels across the IT departments, etc. By the end of that discussion, the governance board defines its strategic drivers or stakeholder needs.

Stakeholder needs are *"governance and management questions"* defined by COBIT 5; strategic drivers are statements custom-defined by the governance board that translate their concerns, needs and ambitions. Each strategic driver is in fact a simplified package of specific stakeholder needs; therefore, one can map a strategic driver into one or more stakeholder needs.

Next, the governance board needs to prioritize the IT processes according to the strategic drivers. To do so, we propose the usage of COBIT 5's goals cascade. Since the inputs of goals cascade are stakeholder needs, we have two options: one is to start with strategic drivers and then manually map them into stakeholder needs; the other is to use right from the start the stakeholder needs that COBIT 5 provides, picking only the most relevant ones. We decided to offer the option of starting with strategic drivers because they are more compact (e.g. one driver maps into several needs) and they provide more extensibility (e.g. the definition of custom stakeholder needs).

Let us detail how goals cascade could be used in this context, with some slight customizations:

a) Select which of COBIT 5's stakeholder needs are relevant to the current public administration's context. Prioritize the selected needs to ensure that only the 10 most relevant are used in the following steps.
Output: COBIT 5's stakeholder needs

b) Expand each stakeholder need into its respective enterprise goals (COBIT 5's Appendix D). Keep a counter for each enterprise goal to keep track of the number of times a stakeholder need referenced it. Repeated needs contribute equally to such counters. After all needs are processed, pick the five enterprise goals with the highest counters.
Input: COBIT 5's stakeholder needs => *Output*: COBIT 5's enterprise goals

c) Expand each enterprise goal into its respective IT-related goals (COBIT 5's Appendix B). Only primary relationships are considered. Keep a counter for each IT-related goal to keep track of the number of times an enterprise goal referenced it. Repeated goals contribute equally to such counters. After all enterprise goals are processed, pick the five IT-related goals with the highest counters.
Input: COBIT 5's enterprise goals => *Output*: COBIT 5's IT-related goals

d) Expand each IT-related goal into its respective IT-related processes (COBIT 5's Appendix C). Only primary relationships are considered. Keep a counter for each IT-related process to keep track of the number of times an IT-related goal referenced it. Repeated goals contribute equally to such counters. After all IT-related goals are processed, pick the five IT-related processes with the highest counters.
Input: COBIT 5's IT-related goals => *Output*: COBIT 5's IT-related processes

From step 3.b to step 3.d we prioritize the output. If we did not prioritize, the final outputs would have a high probability of always being the same, independently of the input. That could happen because with three steps of mappings there is an increased likelihood of promoting key and standard goals/processes. To mitigate this situation we prioritize in order to make sure only the more relevant goals/processes influence the final outcome. Note that too much prioritization increases the probability of ties, thus after some fine-tuning we chose the number five as a good trade-off.

Ties, like having two or more goals/processes with equal counters, are not always a problem. They become a problem when there is room for only a subset of the tied goals/processes at the top five. Example: assume we have eight goals from A to H with the respective counters: A (8), B (5), C (4), D (2), E (2), F (2), G (1), H (1). We have a tie between goal D, E and F and between G and H. The method needs to pick the five goals with the highest counters. Thus, the method will choose A, B, C …and now we have a problem! The fourth highest counter is number 2, but there are three goals with the same score and the method can only pick two. How to decide which goals to pick? Notice that the tie between G and H is irrelevant in this case. Also note that if either D, or E, or F had a counter different than number 2, there would not be a problem.

Therefore, this method requires a criterion to solve this kind of ties and continue its execution. We assume the default criterion to be human intervention, i.e. a person evaluates the tied goals or processes and chooses which ones are the most relevant regarding the starting strategic drivers. Better criteria could (and should) be used to resolve the tie problem (see section 6.2).

4. Demonstration

In this chapter we demonstrate how our proposals can be used in practice. Hence we outline a possible structure (section 4.1) for the strategic and the operational plans, in agreement with the guidelines mentioned in section 3.2. Finally, we demonstrate the usage of the proposed lifecycle by exemplifying a full iteration of the cycle using real data (section 4.2).

4.1. Outlining the Plans

The workgroup responsible for PGETIC's implementation defined a *"governance model"* comprising five entities responsible for the plan's governance. Those five entities are: (a) *Execution Committee for GPTIC*, (b) *Advisory Council*, (c) *Ministerial Implementation Representatives*, (d) *Technical Committee*, and (e) *Ministerial Technical Representatives* (GPTIC, 2012).

In the previous chapter we started using the concept of "governance board". We define such board as the trio of Execution Committee for GPTIC, Advisory Council, and Technical Committee. We chose these entities because, according to the responsibilities defined by (GPTIC, 2012, pp. 6-11), they are the ones responsible for making organizational and strategic decisions.

4.1.1. Strategic Plans

A possible structure for the PETIC document could be:

1) **Introduction**. This chapter explains what the document is (about).
2) **Executive summary**. This chapter summarizes the entire document in less than four pages.
3) **Where we stand**. This chapter contains the current context of the IT function.
    a) *Mission*. This section (re)defines the mission of the IT function.
    b) *Key stakeholders*. This section identifies and prioritizes the IT function's key stakeholders.
    c) *Strengths, weaknesses, opportunities and threats*. This section provides a SWOT analysis of the IT function, that is, it describes the current strengths and weaknesses and future opportunities and threats.
    d) *Technology assessment*. This section identifies emerging and declining technologies and presents the current technological tendencies and best practices.
    e) *IT maturity level assessment*. This section is crucial and provides the results of an IT-CMF assessment at each ministerial IT department.
4) **Where we want to be**. This chapter contains the desired future of the IT function and describes a strategy to reach it. The strategy must be objective, coherent, effective, efficient and traceable. This traceability is of most importance – every reader should be able to understand the strategy's rationale and relate the vision, with the drivers and the goals.

a) *Vision*. This section specifies a concise vision of what should be the IT function's focus during the next four years.

b) *Strategic drivers*. This section describes the main strategic drivers, which represent courses of action to attain the Vision.

c) *Strategic goals.* This section describes what goals the IT function must achieve by the end of the plan (i.e. in four years) to implement the Vision. A goal can be either an action or a policy: an action should be the achievement of specific maturity level for a certain IT capability – its implementation should be discussed with each ministerial IT department; a policy should define a desired way to act or behave, and its practice is mandatory, thus all or a set of ministerial IT departments must enforce it. The definition of each goal should follow the template specified on Table I.

d) *Strategic flowcharts*. This section should contain one or more flowcharts, which summarize graphically the policies defined above. These flowcharts improve the decision-making process by making it more objective, quicker and easier. They are also tools to guarantee the alignment between the operational decision-making and the Strategy specified in this document.

Table 2. Template for defining strategic goals

	Strategic goal's self-explanatory title		
Action / Policy	Concise description explaining what must be done		
	Long and short term benefits of achieving the goal		
	Negative consequences of not taking action		
	At least one metric to evaluate the goal's progress during its implementation		
	Priority	Due date	Strategic Drivers
	Entity responsible for its implementation		

4.1.2. Operational Plans

A possible structure for the POTIC document could be:

1) **Introduction**. This chapter explains what the document is (about). It also specifies the ministerial IT department, the plan's time frame and which PETIC it refers to.

2) **Executive summary**. This chapter summarizes the entire document in less than four pages.

3) **How we will get to where we want**. This chapter contains a set of strategic projects, which the ministerial IT department undertakes to implement along the next two years. These projects and their implementation details were discussed and agreed on in collaboration with the governance board.

   Strategic projects. This "template" section is repeated for every strategic project. A strategic project is a project focused on implementing a strategic goal defined on PETIC, which may be the implementation of an action or the enforcement of a policy.

a) *Objectives*. This topic specifies which strategic goal will be implemented and at least one metric to evaluate the project's progress and determine its completion.

b) *Implementation plan*. This subject provides a macro implementation plan containing an ordered list of actions to implement the action or enforce the policy. It should be high-level enough for the governance board to understand what will be done, and also low-level enough for the implementation team to figure out the implementation's details needed to carry out the project.

c) *Deadline and project manager*. This topic specifies the date when the implementation should end and who is responsible for ensuring that the project is successfully implemented on that date.

4.2. Lifecycle

Now that we have explained how the lifecycle works, we will exemplify its usage. For mere demonstration purposes we do not need to instantiate a full scale version of the method. Therefore, we will consider a real public IT department and one of its IT processes. That public IT department has 241 collaborators, a budget of almost 50 million Euros and no IT governance framework in place. We will perform the governance board role and the auditing team role.

Step 1 – Measure

As an auditing team we interviewed the Head of the IT department. Table 3 summarizes the results of our interview.

Table 3. Capability assessment and IT-related goals assessment

IT-related goals	IT-related processes
• Alignment of IT and business strategy;	• Ensure Benefits Delivery (EDM2);
• IT compliance and support for business compliance with external laws and regulations;	• Manage Service Agreements (APO9);
	• Manage Programmes and Projects (BAI1);
• Delivery of IT services in line with business requirements;	• Manage Availability and Capacity (BAI4);
	• Manage Changes (BAI6);
• Optimization of IT assets, resources and capabilities;	• Manage Assets (BAI9);
	• Manage Operations (DSS1);
• Competent and motivated business and IT personnel.	• Manage Service Requests and Incidents (DSS2);
	• Monitor, Evaluate and Assess Performance and Conformance (MEA1);
	• Monitor, Evaluate and Assess Compliance With External Requirements (MEA3).

Since we had to choose one IT process to assess we chose DSS1, because that is one of PETIC's strategic IT processes (see *Step 3.d*). The result of that assessment is summarized in Table 4.

Table 4. Practices' and deliverables' assessment associated with "DSS1 - Manage Operations" process

Base Practices	Check?	Work Products	Check?
Perform operational procedures	Yes	Operation and use plan	Yes
Manage outsourced IT services	Yes	SLAs	No
Monitor IT infrastructure	Yes	OLAs	Yes
Manage the environment	No	Service definitions	Yes
Manage facilities	Yes	Operational schedule	Yes
		Backup log	Yes
		Asset monitoring rules and event conditions	Yes
		Event logs	Yes
		Incident tickets	Yes
		Environmental policies	Yes
		Insurance policy reports	No
		Facilities assessment reports	Yes
		Health and safety awareness	Yes
		Independent assurance plans	Yes

COBIT 5 specifies which base practices and work products support each outcome. We used that information to calculate the outcomes' level of achievement. Finally, the process' level of achievement was calculated using a simple average of the outcomes' levels. Thus, level 1 of DSS1 process is *"Largely Achieved"* (ISACA, 2013, p. 14).

Table 5. Capability assessment of "DSS1 - Manage Operations" IT process

Outcomes	Achievement Level
Operational activities are performed as required and scheduled.	83%
Operations are monitored, measured, reported and remediated.	78%
TOTAL (average)	L (80%)

Step 2 – Evaluate

Since we only have the assessment of one IT department, we cannot compare assessments, thus we will have to skip this step.

Step 3.a – Think

As the governance board we establish the strategic drivers for the next four years. We are not pretentious thus we will infer the strategic drivers from the current PGETIC, which was indeed created by a governance board. The left column of Table 6 enumerates the strategic drivers. That same table contains the results of executing the method's first step. We looked for mappings between every strategic driver and each stakeholder need.

Table 6. Mapping strategic drivers with stakeholder needs

PETIC's strategic drivers	map	COBIT 5's stakeholder needs
Reduce the IT function's costs	=>	2, 4, 9, 17
Rationalize usage of existing resources	=>	4, 8, 9, 10, 19
Increase value generation	=>	3, 10, 18
Align the IT function with the public administration's needs	=>	1, 13, 14, 15, 16

Step 3.b

From now on, we started using COBIT 5's goal cascade. Using COBIT 5's Appendix D we mapped the previous stakeholder needs to enterprise goals, as shown in Table 7. The column on the right shows the unique enterprise goals cascaded from all stakeholder needs on that row. Their counters, i.e. the number of stakeholder needs that reference each enterprise goals, are displayed in Table 8.

Table 7. Cascading stakeholder needs to enterprise goals

COBIT 5's stakeholder needs	cascade	COBIT 5's enterprise goals
2, 4, 9, 17	=>	2, 5, 8, 9, 10, 11, 12, 14, 15, 16
4, 8, 9, 10, 19	=>	2, 5, 6, 8, 10, 11, 12, 14, 15, 16
3, 10, 18	=>	1, 2, 3, 8, 10, 12, 13, 14
1, 13, 14, 15, 16	=>	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17

Table 8. Counting the frequency of each enterprise goal

Enterprise goals	12	10	2	14	1	8	11	16	5	7	13	17	3	15	6	9
Count	12	9	8	8	6	5	5	5	4	3	3	3	2	2	1	1

Step 3.c

The five enterprise goals with the highest counters were goals number 12, 10, 2, 14 and 1 – these are the goals passed on to the next step of the method. Using COBIT 5's Appendix B we mapped the previous enterprise goals to IT-related goals, as shown in Table 9. The column on the right shows the IT-related goals cascaded from the enterprise goal on the left. Their counters are displayed in Table 10.

Table 9. Cascading enterprise goals to IT-related goals

COBIT 5's enterprise goals	cascade	COBIT 5's IT-related goals
14	=>	8, 16
10	=>	4, 6, 11
12	=>	5, 6, 11
2	=>	1, 5, 7, 9, 12, 17
1	=>	1, 3, 5, 7, 11, 13

Table 10. Counting the frequency of each IT-related goal

IT-related goals	5	11	1	7	6	9	12	17	8	16	4	3	13
Count	3	3	2	2	2	1	1	1	1	1	1	1	1

Step 3.d

The five IT-related goals with the highest counters were goals number 5, 11, 1, 7 and 6. Using COBIT 5's Appendix C we mapped the previous IT-related goals to IT-related processes, as shown in Table 11. The column on the right shows the IT-related processes cascaded from the IT-related goal on the left. Their counters are displayed in Table 12.

Table 11. Cascading enterprise goals to IT-related goals

COBIT 5's IT-related goals	cascade	COBIT 5's IT-related processes
11	=>	EDM4, APO1, APO3, APO4, APO7, BAI4, BAI9, BAI10, DSS1, DSS3, MEA1
7	=>	EDM1, EDM2, EDM5, APO2, APO8, APO9, APO10, APO11,BAI2, BAI3, BAI4, BAI6, DSS1, DSS2, DSS3, DSS4, DSS6, MEA1
6	=>	EDM2, EDM3, EDM5, APO6, APO12, APO13, BAI9
5	=>	EDM2, APO4, APO5, APO6, APO11, BAI1
1	=>	EDM1, EDM2, APO1, APO2, APO3, APO5, APO7, APO8, BAI1, BAI2

Table 12. Counting the frequency of each IT-related process

IT-related process	EDM2	EDM1	APO1	APO2	APO3	APO5	APO7	APO8	BAI1
Count	4	2	2	2	2	2	2	2	2

IT-related process	BAI2	APO4	APO6	APO11	EDM5	BAI9	BAI4	DSS1	DSS3
Count	2	2	2	2	2	2	2	2	2

IT-related process	MEA1	EDM3	APO12	APO13	APO9	APO10	BAI3	BAI6	DSS2
Count	2	1	1	1	1	1	1	1	1

IT-related process	DSS4	DSS6	EDM4	BAI10
Count	1	1	1	1

In the real world *problems happen*; pedagogically, this demonstration is great since a real world problem has just happened. As mentioned in section 3.3 ties may be problematic. In this case we cannot automatically prioritize five IT-related processes because we have 18 processes with the same score and we only have four slots. To resolve this tie we will use the default criterion, which is human intervention (see section 6.2, for an improved criterion). Considering those 18 processes with score two and relating them to the initial strategic drivers, we consider that DSS1, BAI4, APO5 and APO7 are the most relevant.

Therefore, the IT-related processes that most contribute to address PETIC's four strategic drivers are *Ensure Benefits Delivery* (EDM2), *Manage Portfolio* (APO5), *Manage Human Resources* (APO7), *Manage Availability and Capacity* (BAI4), and *Manage Operations* (DSS1). The governance board would now stipulate minimum capability levels for these IT processes. We will stipulate a *"fully achieved" "performed process"* as the minimum capability level, since that implies the implementation of basic best practices and the formalization of deliverables (ISACA, 2013, pp. 14, 115).

The IT-related processes of the IT department assessed on step 1 are 60% aligned with PETIC, i.e. three out of five of PETIC's strategic IT processes are already a concern of this specific IT department.

Step 4 – Plan

The IT department would now compare their current capability levels with the minimum levels stipulated by PETIC, in order to create a POTIC containing roadmaps for every IT process in need of improvement. Recalling that DSS1 was assessed as "Level 1 Largely Achieved", the IT department would need to create a roadmap to improve its DSS1 process to "Level 1 Fully Achieved". This specific case does not require much effort, since the IT department just needs to implement one base practice and formalize two work products.

Step 5 – Align

Just like the method states, the governance board would now receive a POTIC per IT department and review it. The governance board could, for example, notice that no IT department had "*Insurance policy reports*" formalized. Therefore, the board could recommend that all IT departments worked together to create a normalized template for such reports.

Step 6 – Transform

Finally each IT department would now merge the governance board's recommendations into their original POTIC and start implementing it. After the first two years of implementation, every IT department reports its progress to the governance board – specifying what is done, what were the main difficulties encountered, how the plan should be improved to mitigate such adversities, and what is scheduled for the next two years.

4.3. Summary

In this chapter we detailed our proposal by outlining a possible structure for the strategic and the operational plans. We also exemplified a single iteration of the proposed lifecycle based on real data. We hope that by doing so we clarified the reader on how our proposal can be implemented in the real world.

Figure 6 is a Business Process Model and Notation (BPMN) (White, 2004) choreography diagram that summarizes the lifecycle, graphically representing the interactions between the governance board and two exemplary ministerial IT departments.
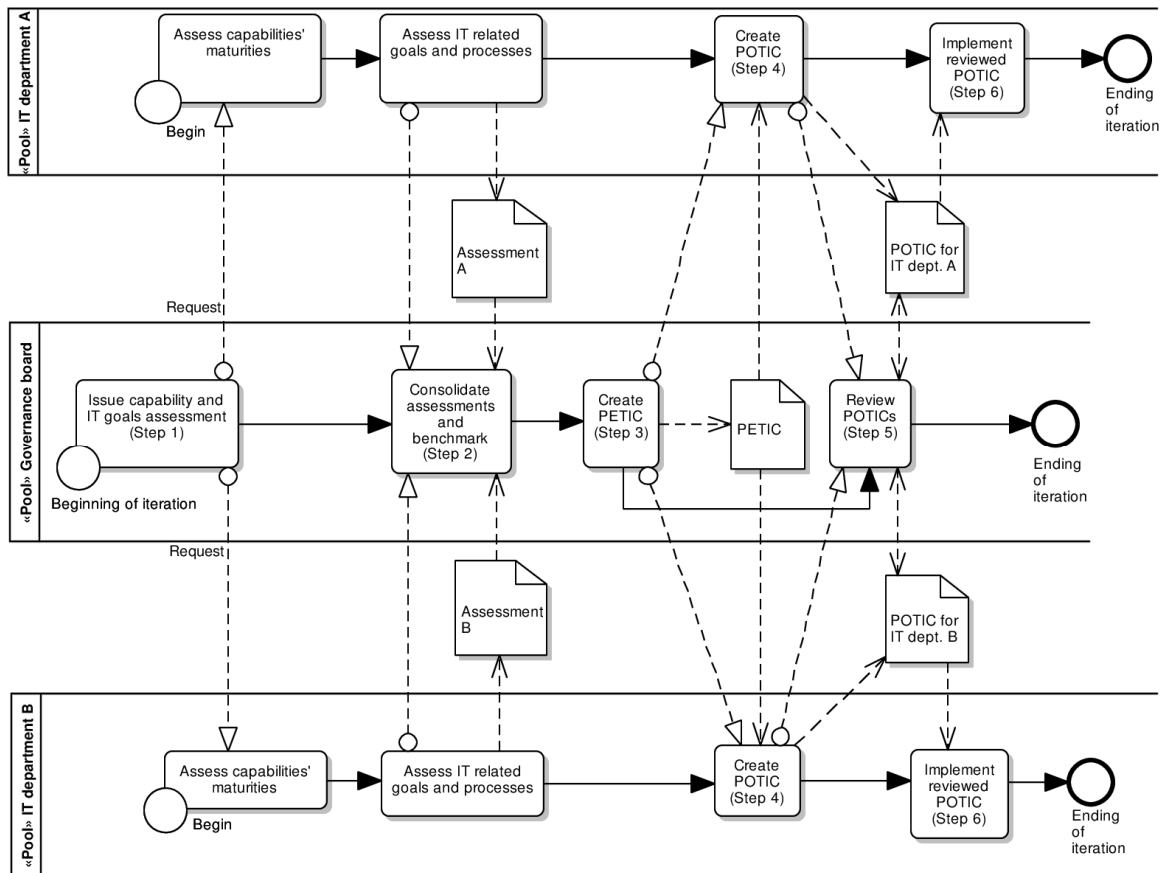
Figure 6. BPMN choreography summarizing the proposed lifecycle

5. Evaluation

In this chapter we use semi-structured interviews (section 5.1) and the appraisal of the scientific community (section 5.2) to evaluate our thesis' proposal, i.e. the improved strategic thinking (section 5.1.1) and the governing lifecycle (section 5.1.2). Finally, we support our main design decisions by mapping them with the best practices recommended by three different frameworks (section 5.3).

5.1. Interviews

In order to evaluate our proposal (Österle, et al., 2010) and to get some feedback on our design decisions, we used semi-structured interviews (Drever, 1995). In the next two sub-sections we explain how we conducted those interviews and present the main results.

5.1.1. PETIC and POTIC

During the interviews we explained our proposal (PETIC and POTIC) and collected the interviewees' overall evaluation and feedback. We identified three main roles related to PGETIC and we conducted a total of eight interviews with representatives of those roles.

The first role was "creator of PGETIC". This role represents the actors who defined the content of the strategic plan and how it should be implemented. The second role was "enforcer of PGETIC". This role represents actors, mostly public bodies (e.g. AMA, CEGER, ESPAP or even GPTIC), responsible for implementing the plan or enforcing it on the respective public IT departments. The third role was "public IT department". This role represents all the ICT departments that implement or are affected by PGETIC. Table 13 summarizes all the interviews we conducted.

Table 13. Summary of interviewees

Interviewee	Role	Number of employees	Budget (€)	ITG framework
Member of GPTIC's advisory board	creator of PGETIC	-	-	-
Head of a public body's IT department	enforcer of PGETIC	241	50 million	None
Head of information systems and security	public IT department	21	6 million	ITIL (attaining ISO 20000)
Head of planning, documentation and information systems at a general directorate	public IT department	16	< 1 million	None
Head of information systems at a public institute	public IT department	15	1 million	None
Head of a public university's IT department	public IT department	70	2 million	None

Head of capacity management at a shared services public body	public IT department	302	65 million	ISO 20000
Head of operations and communications management at a public body	public IT department	180	40 million	None

We designed a semi-structured questionnaire with a total of 14 questions; two of them open-ended. With these questions we evaluated the proposal's quality, validated the solution's objectives and collected suggestions for improvement. The questionnaire (shown on Table 18, Appendix) was divided into three groups.

The first group contained eight design decisions about our solution – four about PETIC and four about POTIC. For each design decision the interviewee had to choose if that design was better, worse or similar to PGETIC. For example, the first decision was about PETIC and stated "Separate strategy from its operational implementation".

The second group contained four statements, more precisely the four objectives of our solution. Now the interviewee had to select for each one his or her level of agreement – totally disagree, disagree, agree, totally agree. For example, the first statement was "The proposal is more effective, because it is capability-oriented thus preventing problems".

The last group contained two open-ended questions, asking about the strengths of our solution and the shortcomings of PGETIC or our solution.

These were the results of the interviewee's answers to the first and second group:

- In general, the role "enforcer of PGETIC" had less positive opinions about the proposal than "public IT departments".
- The vast majority agreed that it is better to separate the strategy from its operational implementation, to define a four-year vision (instead of six years as in PGETIC), and to focus on improving skills or capabilities (instead of problems).
- Most agreed that every ministerial IT department should have its own operational plan, which aligns its reality with the global strategy, that this plan (POTIC) must be created in close collaboration between the IT department and the governance board, and that the operational problems should be solved while implementing the operational plan.
- Two interviewees suggested that POTIC should last four years, the same as the strategic plan. The justification was that most transformational projects take more than two years to implement, and to break their implementation into two plans could introduce unnecessary inefficiencies. *We agreed and tweaked our proposal.*
- One interviewee mentioned that PGETIC's project five is similar to the proposed POTIC, however not as formalized. He suggested the creation of a formalized lifecycle. *We agreed and included such lifecycle on our proposal.*

Finally, these were the last group's main results (the one containing two open-ended questions):

- Public IT departments agreed that PGETIC is too focused on problems and it is essentially operational. There is insufficient information or guidelines about how to implement the strategy.
- The quantity, quality and support of public servants are essential for the success of PGETIC or our proposal.
- The main causes for PGETIC's delay are the insufficient number of qualified public servants and the clash of concerns between different public bodies (e.g. cloud security related issues).
- For any plan to succeed it must be supported top-down (to give it legitimacy/authority), but mainly bottom-up because it is the people at the base who implement the plan. The public bodies must feel that it is also their plan, and not an imposed plan.
- Before creating any strategic plan it is of most importance to know the reality (as-is). Only then we have the required information to make strategic decisions. Moreover, when deciding one should focus first on functional aspects (e.g. business processes), then on technological aspects, and finally on financial aspects (e.g. cost-benefit evaluation).
- The best improvements over PGETIC are the separation between the strategy and its implementation and the collaboration between the ministerial IT departments and the governance board.
- It is beneficial to give each ministerial IT department the freedom to implement the strategy according to their skills and resources, but one must establish commitments so that ultimately the various implementations are cohesive.

5.1.2. Lifecycle

In order to evaluate the practicability of our lifecycle we interviewed the director of a real public IT department. That public IT department has 241 collaborators, a budget of almost 50 million Euros and no IT governance framework in place. We performed a total of three interviews with the same person.

On the first interview we introduced our thesis' problem, our evaluation of PGETIC, and our proposal (PETIC and POTIC). We then explained that we were also proposing a lifecycle to govern the creation and implementation of these two complementary plans. We mentioned that our lifecycle was based on COBIT 5 and, since they did not know in sufficient detail what COBIT 5 was, we gave a brief introduction to the COBIT 5 framework. Only then we were able to proceed with the interview itself. Using COBIT 5's Appendix D (ISACA, 2012) we checked which stakeholder needs were relevant to the IT organizations. We then applied COBIT 5's goals cascade to obtain the IT-related goals, since that was an IT department:

- (1) *Alignment of IT and business strategy;*
- (2) *IT compliance and support for business compliance with external laws and regulations;*
- (7) *Delivery of IT services in line with business requirements;*
- (11) *Optimization of IT assets, resources and capabilities;*

- (16) *Competent and motivated business and IT personnel.*

For the second interview, we picked three IT-related processes to assess. Those three were not only the most common IT processes cascaded by the previous IT-related goals, but also the IT processes most relevant for a typical IT department – e.g. it did not make sense to assess an enterprise/governance process at an IT department. We chose to assess using COBIT 5's Process Assessment Model the following IT processes: *Manage configuration* (BAI10), *Manage operations* (DSS1), and *Manage service requests and incidents* (DSS2). We then used the data collected during this interview and the first to perform the lifecycle's demonstration in section 4.2.

Finally, on the third interview we presented the results obtained with the data collected during the second interview, including the lifecycle's demonstration. The interviewee was positively impressed by the usefulness and practicability of COBIT. He also positively evaluated our lifecycle as: (1) objective, since it is supported by a framework and every step is clearly described using traceable actions; (2) feasible, because similar versions of steps 2, 3 and 4 were already executed during PGETIC, the novelty is the collaboration introduced on step 4 and 5 adds complexity but also contributes for the lifecycle to be…; (3) sustainable, by adding collaboration between participants, which will increase engagement and accountability, and suggesting a clear repeatable method to create new plans.

5.2. Scientific Appraisal

This evaluation method also maps with DSRM's last step *Communication*. During the writing of this thesis we compiled specific parts of our problem and proposal into scientific papers, not only to receive scientific appraisal but also to communicate our findings to the scientific community. In total we submitted three papers.

The research that led to the evaluation of PGETIC using and ITG framework (section 2.3.2) was condensed into a paper and submitted to the **International Conference on Exploring Service Science (IESS) 1.3**. That research was accepted (Nunes, Rosa, & Mira da Silva, Evaluating the IT Strategic Plan for the Public Administration in Portugal, 2013) and presented in Porto on the 8th of February 2013.

We also condensed the proposal of PETIC and POTIC (section 4.1) into a second paper, this one submitted to the **IEEE Conference on Business Informatics (CBI) 2013**. This research was also accepted (Nunes, Rosa, & Mira da Silva, Improving IT Strategic Plan for the Portuguese Public Administration, 2013) and will be presented in Vienna on the 17th of July 2013.

Lastly, we created a third and final paper, condensing the research about our lifecycle supported by COBIT 5 (section 3.3). This research was submitted to the **International Conference on Information Systems (ICIS) 2013**. We are currently waiting for the result of this submission.

5.3. IT Governance Frameworks

We mentioned throughout the document that our proposals were based on or directly supported by IT governance frameworks' best practices and recommendations. Table 14 shows the traceability of our proposals' main design decisions and the supporting best practices recommended by the main ITG frameworks that we used on this thesis (i.e. COBIT, IT-CMF, and BTM[2]).

Table 14. Mapping main design decisions with frameworks' best practices

Proposal	COBIT 5 (APO02 process)	IT-CMF (SP capability)	BTM[2]
Governance board	---	Coordinate IT strategic planning's resources and responsibilities within the enterprise	---
Governing lifecycle	---	A formal methodology is used to communicate with stakeholders	Establish governance process (p. 158)
Lifecycle: step 1 (Measure)	---	Existing data is gathered from processes as input to Strategic Planning	AS-IS data collection (p. 35); Evaluation of current IT capabilities and services (p. 149)
Lifecycle: step 2 (Evaluate), step 3 (Think)	Define high-level IT goals; Identify gaps between current business and IT capabilities and services	Translate selected strategic options into a portfolio of prioritized IT projects; Detailed actions and targets are defined for all stakeholders	---
Lifecycle: step 4 (Plan), step 5 (Align)	Determine overlaps and synergies amongst initiatives and prioritize	Translate strategy and decisions into operating actions	Hand over roadmap to program management (p. 154)
PETIC: Where we stand, Where we want to be	Provide a holistic view of the current organization; the future direction; and the initiatives required to migrate to the desired state	Develop options for action and prioritize options	Prioritize gaps between current and required capabilities (p. 154)
PETIC: Mission	---	---	Mission statement (p. 35)
PETIC: Key stakeholders	Identify key stakeholders and obtain insight on their requirements	Key stakeholders are involved	People have the opportunity to formulate their wishes and concerns (p. 171)
PETIC: SWOT	Identify issues, strengths, opportunities and threats in the current environment, capabilities and services	Identify IT challenges and opportunities	Select and define relevant IT performance areas (p. 158)

PETIC: Technology assessment	Identify opportunities and threats from current, potential and declining technologies	---	Identification of drivers for transformation, e.g. technology trends (p. 35)
PETIC: IT maturity assessment	Identify gaps between current business and IT capabilities and services	---	Manage the quality of critical IT and data assets (p. 158);
PETIC: Vision	---	IT vision is established and focuses on enablement of business	Decide which maturity level is best for the organization (p. 158)
PETIC: Strategic drivers	---	Formulate long-term scope and objective of IT vision and derive high-level guidelines for the IT evolution	---
PETIC: Strategic goals	Define high-level IT goals and how they will contribute to the enterprise's business objectives	---	---
PETIC: Strategic goals	Consider the high-level implications of all gap, i.e. the value of potential changes and the implications of no changes	---	Identify organizational requirements to operate the solution (p. 154)
PETIC: KPIs, Strategic flowcharts	Translate the objectives into metrics and targets	Clearly communicate goals and targets to all stakeholders	---
POTIC is defined by each ministerial IT department	Create a roadmap, in cooperation with relevant stakeholders	---	Empowerment (p.171); People must be given responsibility and freedom to enact the transformation (p. 28)
Biennial review of PETIC and POTIC	---	Continuously evaluate strategy realization and generate input for strategy review	---

6. Conclusion

This last chapter summarizes our thesis' main contributions and limitations.

The results we obtained during our Evaluation step were quite positive and encouraging. Taking into consideration these results, we consider that our solution met its initial objectives (section 1.3):

- **Collaborative.** Our lifecycle requires collaboration between the governance board which specifies what should be done and the IT departments which propose how it could be done.
- **Objective.** Our strategic and operational plans' structure was based on the best practices of two ITG frameworks (COBIT 5 and IT-CMF). Moreover, most of the lifecycle's steps are supported by tools of COBIT 5, making the method traceable and objective.
- **Value oriented and holistic.** Our proposed strategic plan (PETIC) is focused on assessing and improving capabilities. The assessment provides an overview of the capability levels across the public administration's IT departments. Such information enables the public administration to create effective shared services centers, making different IT departments specialized in different capabilities thus reducing overlapping services and redundant expenses. Moreover, by aiming at maturity levels the improvement projects are much more focused on generating tangible and sustainable value to satisfy genuine needs – instead of solving every operational problem, IT departments can now prioritize their improvement projects by verifying if the problem's resolution contributes to the improvement of any capability' maturity level.
- **Sustainable.** We created a formal and repeatable lifecycle that governs the creation of future strategic and operational plans. By incorporating collaboration in that lifecycle we made it sustainable, since a transformation project needs engagement of all participants and collaboration fosters such commitment. The usage of both our proposals (strategic thinking and lifecycle) enables the emergence of a continuous improvement cycle. Moreover, the steps of our lifecycle can easily be mapped with the other continuous improvement cycles like Plan-Do-Check-Act (PDCA) (International Organization for Standardization, 2008) or BTM[2]'s transformation lifecycle (Uhl & Gollenia, 2012).

Table 15. Mapping the proposed lifecycle with PDCA and EETO

PDCA (ISO 9001)	Lifecycle proposed	EETO (BTM[2])
Plan	Step 1 – Measure	Envision
Plan	Step 2 – Evaluate	Envision
Plan	Step 3 – Think	Envision
Do	Step 4 – Plan	Envision, Engage
Check	Step 5 – Align	Engage
Act, Check	Step 6 – Transform	Transform, Optimize

6.1. Contributions
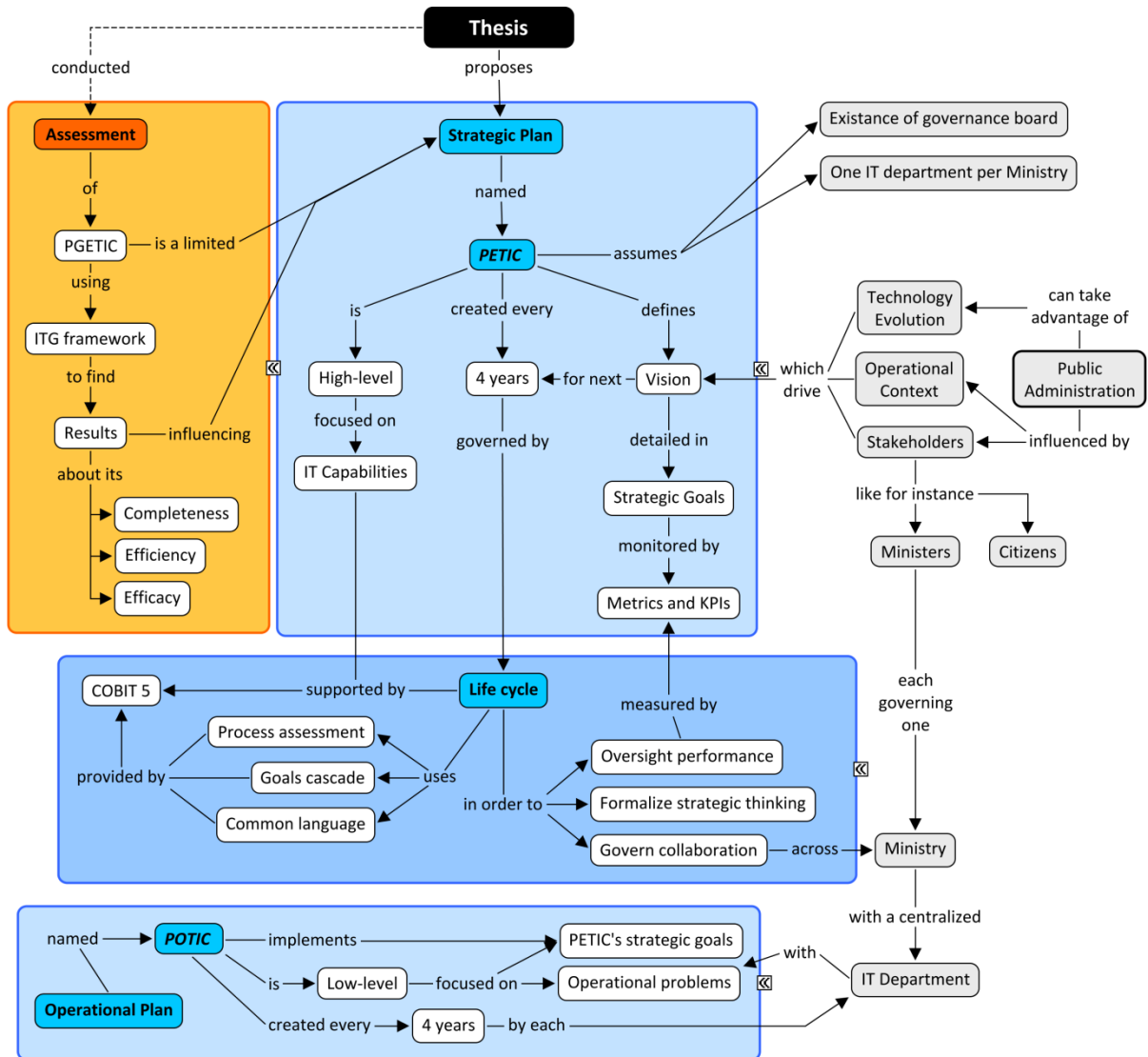
Figure 7. Summary of the thesis' contributions

Our thesis has three main contributions to the existing body of knowledge. Figure 7 is a concept map that summarizes the thesis' contributions:

- **Assessment of PGETIC.** As detailed in section 2.3.2, before proposing the thesis' solution we conducted an evaluation of PGETIC. We mapped each PGETIC's project with the IT capabilities that the project would improve and the maturity level that would be achieved. We also collected the feedback of IT department's chiefs about PGETIC. This allowed us to infer the plan's completeness and efficiency and also to identify what should be improved about the plan's implementation.

- **Detachment of strategy and its implementation.** As detailed in section 3.2, one of our proposals is the separation of strategy from its implementation into two distinct yet

complementary plans, PETIC and POTIC respectively. This detachment increases the IT departments' engagement by giving them an active voice in the process and fostering collaboration with the governance board.

- **Governing lifecycle.** As detailed in section 3.3, we also proposed a formal lifecycle to govern end-to-end the process of improving the public administration's ICT. We supported that work flow with the latest version of COBIT and increase its traceability by using the tools already defined by COBIT 5.

6.2. Future Work

Although we suggested a structure for the strategic plan and the operational plan, we did not mentioned what should be the actual contents of those plans – i.e. we did not suggest specific improvement measures or projects. That would imply extensive expertise about the public administration and its IT departments (van der Walt, Coetsee, & von Solms, 2013), which we could not acquire during the time period of this thesis. An interesting future work would be the instantiation of one or both the plans: assessing the maturity of an IT department; specifying strategic drivers; suggesting concrete projects to address those drivers; etc.

We discovered BTM^2 a bit late in this thesis, so there is plenty of room to infuse PETIC, POTIC and mainly the lifecycle with more of the methodology's practices and recommendations.

The whole lifecycle, or at least the sub-steps of step 3, could be modeled and automated by software. Moreover, the ties encountered during the execution of step 3 could be mitigated by more efficient criteria. A better strategy to prioritize goals/processes and avoid ties would be the usage of multiplying weights during calculations, associating higher weights to the goals/processes of greatest importance. For instance, from section 4.2 the output of step 3.b was five enterprise goals. In that case we would associate the weight 2.5 to goal 12 (the goal with the highest counter), the weight 1.5 to goal 10 and the neutral weigh 1 to the remaining goals. That way, the IT-related goals cascaded from the enterprise goal 12 would count as 2.5 instead of 1, and the goals cascaded from 10 would count as 1.5. These weights we used are illustrative; obviously the number of different weights and their absolute values must be fine-tuned. We do know that a higher variety of weights leads to a higher diversification during calculations, thus lowering the probability of problematic ties.

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Appendix

Table 16. Mapping PGETIC's projects to IT-CMF's critical capabilities
* Level 3 is reached if projects 3.7, 3.8, 3.15 and 3.18 are successfully completed. Otherwise Level 2 is achieved instead.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
ITG	●●●																									
BPM																										
BP																										
SP																										
DSM																										
CFP																						●◖				
RM															●◖											
AA							●◖	●◖										●◖								
ODP	●●																									
SRC															●●			●●			●●●◖	●●●				
IM																							●●	●●	●●●●◖	
SAI																										
SICT								●◖	●◖					●◖				●◖								
FF																										
BGM																										
PPP	●◖		●◖			●●●											●◖				●◖					
BOP																										
EAM			●●◖																							
TIM							●●●	●●●							●●●			●●●								*
PAM																●●										
KAM																				●◖						
RAM																						●●		●●●◖	●●●	
RDE		●●				●●●	●◖							●●				●●					●●	●●	●●●	
SD																										
SRP		●●																●◖								
UTM																				●◖						
UED																										
PPM						●●●																				
SUM							●●															●●				
CAM																										
TCO						●●											●◖				●◖					
BAR						●●																				
PM																										

Table 17. Questionnaire used to evaluate with specialists our evaluation of PGETIC

	Statements	Totally disagree	Disagree	Agree	Totally agree
Problem relevance	It is necessary to reduce the cost of Public Administration's ICT				
	It is necessary to rationalize the use of PA's ICT				
	It is necessary to increase the value generated by PA's ICT				
PGETIC's evaluation	PGETIC is a step towards achieving these goals				
	PGETIC is sufficient to achieve these goals				
	PGETIC needs to be improved to achieve these goals				
	PGETIC is a strategic plan that aims to improve the maturity of PA's ICT				
	PGETIC defines the priorities of PA's ICT				
Proposal's quality	It's easy to understand what the mapping represents				
	The mapping objectively identifies failures in PGETIC				
	The mapping clearly identifies careless areas				
	The gaps identified are relevant (worrying)				
Proposal's relevance	There was a necessity to analyze the effectiveness and completeness of PGETIC				
	The results of this analysis have practical utility				
	With this mapping it's easier to suggest improvements to the plan				
	With this mapping it's more objective to select improvements to the plan				
Framework choice	I know IT-CMF's capabilities				
	I understand IT-CMF's capabilities				
	Using IT-CMF has not hindered my understanding of the mapping				
	I would have understood better the mapping with the use of another framework				
	The analysis would have more practical utility with the use of another framework				
PGETIC's reevaluation	PGETIC is a step towards reducing costs and increasing the value of ICT AP				
	PGETIC is sufficient to achieve the goals it sets itself				
	PGETIC needs to be improved to achieve the goals it sets itself				
	PGETIC is an operational plan aimed at solving local problems				

After PGETIC, would you use IT-CMF to manage and improve the capabilities of your IT department?
YES / NO, currently I use…

Which are your main concerns about PGETIC? Do you have any suggestion to improve the plan?

Global evaluation of the mapping presented (plus comments and suggestions):

Table 18. Questionnaire used to evaluate with specialists our proposal of PETIC and POTIC

		Worse	Similar	Better
Evaluation of decisions (PETIC)	Detach strategy from its operational implementation			
	Strategy specifies a four year vision			
	Strategy focused on improving capabilities and not on solving specific problems			
	Strategy is defined based on a capability and problems assessment, one per ministerial IT department			
Evaluation of decisions (POTIC)	PETIC is implemented by two operational plans (POTIC) each lasting two years			
	Each IT dept. has its own POTIC, aligning the dept.'s reality with the global strategy (PETIC)			
	POTIC is defined by each IT dept. in collaboration with the governance board			
	The resolution of operational problems is carried out by implementing the strategic projects			

		Totally disagree	Disagree	Agree	Totally agree
Evaluation of objectives	The proposal is more effective, since it is focused on capabilities thus preventing problems				
	The proposal is less susceptible to resistance, since it is created in collaboration with the IT depts.				
	The proposal is less susceptible to delays, since the implementation deadlines are shorter				
	The proposal is easier to implement, since the strategy does not for a specific implementation				

Positive aspects (main improvements over PGETIC)

Negative aspects (what still needs to be improved, in PGETIC or our proposal)

Number of employees:	
Size of budget:	
IT Governance framework used:	