Measuring the maturity of Information Technology Governance based on COBIT

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Abstract: Information Technology (IT) is critical to strengthening corporate governance. Thus, organizations require a well-designed and implemented IT governance framework. This paper aims to evaluate the maturity level of IT governance in Saudi Arabia, via the COBIT IT governance framework. Three processes were investigated: defining a strategic IT plan; assessing and managing IT risks; and project management. A questionnaire was developed, based on the COBIT maturity model, and distributed among IT workers at different levels. Results demonstrate that the private sector is the most mature within the investigated areas; more development is required for the government sector and even the semi-government sector. The paper explores different points of strength and weakness in terms of IT governance maturity in different sectors. Moreover, it presents steps that may improve the IT governance maturity level in government and semi-government sectors. This could lead to more future research and investigation in different variables that may affect the development and maturity of IT governance.

Keywords: IT governance, maturity, COBIT, strategic plan, risk, project management.

1. Introduction

Digital transformation is now underway in multiple sectors worldwide. In most developed countries, digital transformation allows organizations to reap the greatest benefits from information technology (IT) and associated services. Therefore, IT governance is crucial for all organizations, regardless of their sector or ambitions. High quality IT governance is required to accomplish successful digital transformation, but that governance must align IT resources and capabilities with business visions and strategies; thus, IT governance is at the forefront of both leveraging the greatest benefits from IT and attaining business goals.

However, it is important to note that the maturity of IT governance may vary widely between organizations, due to various factors including knowledge, executive support, employee resistance, training, and documentation (Grembergen & De Haes, 2008).

Saudi Arabian organizations are now deeply engaged in digital transformation across sectors, including public services such as education, health, and government. The nation's Vision 2030 describes how Saudi Arabia is transforming into a successful and pioneering model (Kingdom of Saudi Arabia, 2021). Very extensive digital transformation is now visible in many companies and government agencies. This study aims to measure the maturity level(s) of IT governance in Saudi Arabia, along with levels of awareness and implementation. The objective is to identify areas that are well governed and those that require further consideration and attention in order to achieve appropriate governance maturity and, consequently, their business goals and future development. As Radu & Petcu (2021) stated, the governance plays a key role in the current and future development of any country.

Several governance frameworks have been developed and are in use around the world. They vary in terms of features and criteria but share a common goal of supporting and/or expediting the achievement of business goals via the optimal use of IT resources. Some of the most popular frameworks are COBIT (ISACA, 2021), ITIL (AXELOS, 2019), ISO (Information Technology - Security Techniques -Information Security Management Systems Overview and Vocabulary, 2018), and the Capability Maturity Model Integration (CMMI) model, of which the latest iteration is version 2 (*CMMI V2.0 Adoption and Transition Guidance (Version 2.2)*, 2021). This paper uses the COBIT model to study Saudi Arabian organizations in government (public), semi-government and private sectors. The COBIT 4.1 maturity model allows scholars to measure how well IT process are performed and managed based on a defined scale of maturity (ISACA, 2021). The identification of maturity levels also helps to identify gaps, weaknesses, and strengths; in turn, this may lead to

process enhancements, and better performance and governance maturity. The COBIT framework and maturity model are described later in this paper.

This paper is organized as follows: Section 2 provides an overview of the COBIT framework and maturity model; Section 3 provides an overview of relevant work on measuring IT governance maturity; Section 4 gives the research methodology, followed by the results and discussion in Section 5, and Section 6 and 7 provide a final discussion and the conclusion of the paper, respectively.

2. Background

2.1. COBIT framework

COBIT stands for Control Objectives for Information and Related Technology, and is among the IT governance frameworks created by ISACA to suit every form or scale of business. It was published in response to organizations' need to clarify the value of IT and to monitor its various elements. These needs have arisen in the context of complex information management, which is an essential component of enterprise governance. COBIT offers models of best practice in terms of domain and process structure. It explains how relevant activities may be undertaken in a logical and manageable way, with a focus on overall controls rather than mere execution. These practices illuminate and support the optimization of IT investment, service delivery, and analysis following adverse events (ISACA, 2021).

COBIT has been developed and evolved over the years to better support business and address changing business environments. According to ISACA (2021) and IT Governance Institute (2007), the first edition of COBIT was released in 1996; in 1998 this was updated by adding controls. In 2000 a further upgrade added management guidelines. In 2005, COBIT 4 was released; it was upgraded in 2007 as COBIT 4.1 which is considered the substantive version of COBIT as it involves 34 processes categorized into four domains, as introduced by (Grembergen & De Haes, 2008) and shown in Figure 1.
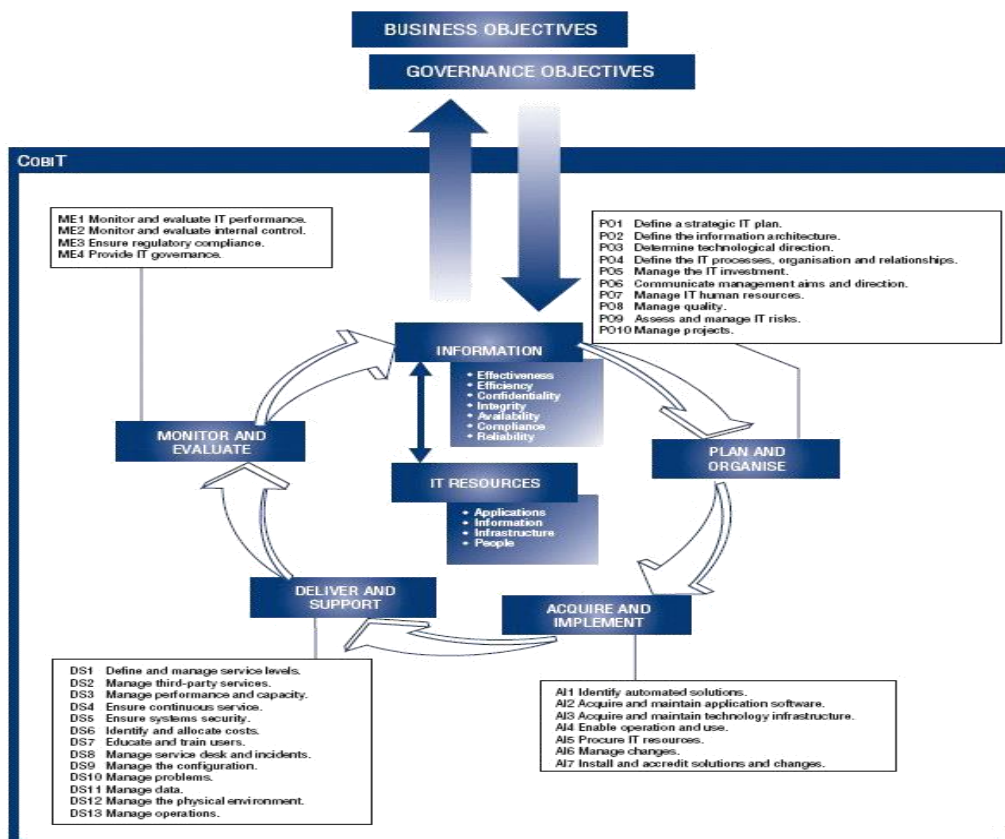

Figure 1. COBIT processes defined within the four domains (Grembergen & De Haes, 2008)
(reprinted with permission)

The 34 processes of COBIT 4.1 are categorized according to four domains: plan and organize (PO), acquire and implement (AI), deliver and support (DS), and monitor and evaluate (ME). Each process has a set of management priorities to meet the control objectives of that process. For each of the 34 processes the COBIT framework defines control objectives, management guidelines, and the maturity model (Grembergen & De Haes, 2008). Control objectives are defined to help the IT process owners build a proper control system into the IT environment. An IT control objective is a statement of the desired result for each IT activity. It comprises procedures, policies, practices, and organizational structures that are designed to expedite the achievement of business objectives, and prevention or detection and mitigation of adverse events and situations. COBIT defines one high-level control objective and several detailed control objectives for each process. Taken together, these controls provide a complete view of the control requirements, thereby identifying the process owner(s), repeatability, goals, roles and responsibilities, measuring and managing performance, and defining policies plans and procedures.

In 2012, COBIT 5 was released, reflecting changes in IT activities and controls; thereafter, COBIT 2019 was needed in light of the ongoing revolution in IT and digital transformation (Thomas, 2018). Notably, COBIT 2019 was developed in alignment with various available frameworks. It added new processes for data, projects, compliance, privacy and security. COBIT 19 contains 40 processes (up from 37 in COBIT 5); its domains are shown in Figure 2.
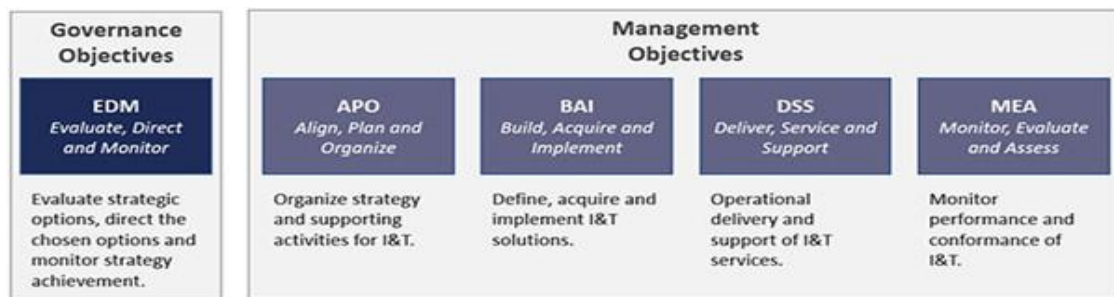

Figure 2. COBIT 2019 domains (Thomas, 2018)

2.2. COBIT maturity model

COBIT provides a maturity measurement model for each process in the framework. A maturity model is a scoring technique that allows organizations to assess the maturity level of a specific process as a rank from 0 to 5, where 0 refers to non-existent and 5 refers to optimized. Table 1 shows the generic maturity model that is adapted for each process to measure its maturity from 0 to 5.

Table 1. COBIT 4.1 Generic maturity model (ISACA, 2021)

0 Non-existent—	Complete lack of any recognizable processes. The enterprise has not even recognized that there is an issue to be addressed.
1 Initial/*Ad Hoc*—	There is evidence that the enterprise has recognized that the issues exist and need to be addressed. There are, however, no standardized processes; instead, there are *ad hoc* approaches that tend to be applied on an individual or case-by-case basis. The overall approach to management is disorganized.
2 Repeatable but Intuitive—	Processes have developed to the stage where similar procedures are followed by different people undertaking the same task. There is no formal training or communication of standard procedures, and responsibility is left to the individual. There is a high degree of reliance on the knowledge of individuals and, therefore, errors are likely.
3 Defined Process—	Procedures have been standardized and documented and communicated through training. It is mandated that these processes should be followed; however, it is unlikely that deviations will be detected. The procedures themselves are not sophisticated but are the formalization of existing practices.
4 Managed and Measurable—	Management monitors and measures compliance with procedures and takes action where processes appear not to be working effectively. Processes are under constant improvement and provide good practice. Automation and tools are used in a limited or fragmented way.
5 Optimized—	Processes have been refined to a level of good practice, based on the results of continuous improvement and maturity modelling with other enterprises. IT is used in an integrated way to automate the workflow, providing tools to improve quality and effectiveness, making the enterprise quick to adapt.

COBIT's maturity model has evolved as a qualitative model based on the following attributes, which are embodied in each process and control (Brand & Boonen, 2010). These attributes are: 1) Awareness and communication, 2) Policies, standards and procedures, 3) Tools and automation, 4) Skills and expertise, 5) Responsibility and accountability, 6) Goal setting and measurement.

The awareness and communication attribute of a process indicates whether the organization completely comprehends the significance of the process and whether management communicates problems arising with this process using mature communication techniques. The policies, plans, and procedures attribute indicate whether the process is sound and complete, i.e., all relevant policies and procedures have been agreed, followed, and reported. The tool and automation attribute indicates whether or not the company uses standardized software to automate and control the operation. The skills and expertise attribute indicates whether the organization maintains the necessary skills for the operation, such as training plans, certifications, and information sharing. The accountability and responsibility attribute indicates whether processes have been established to encourage a rewarding culture by effective process behavior. Finally, the goal setting and measurement attribute shows whether the organization tests the efficacy and performance of the process, and ties the outcomes to the business strategic objectives (Brand & Boonen, 2010).

The objective of the current study is to investigate the maturity level of IT governance in several Saudi institutions of government, and in the semi-government and private sectors, using the COBIT framework. The paper aims to evaluate three processes within the plan and organize (PO) domain. These processes are: PO1: define a strategic IT plan, PO9: assess and manage IT risks, and PO10: manage projects. The authors believe that understanding the level of capability required to fulfil business requirements in the planning and organization domain is critical to IT success. In addition, the three processes measured in this study are at the core of many organization activities, because defining a strategic plan (PO1) and assessing and managing risks are essential for achieving business goals (PO9), and for managing projects well (PO10). The strategic vision must be prepared, communicated, and controlled from various angles. It is essential to establish a proper organizational framework as well as technical infrastructure.

The evaluation of process capability with COBIT maturity models is an important aspect of IT governance. Maturity modelling allows weaknesses to be detected and quantified in terms of critical IT processes and controls. Intelligent organizations then develop action plans to bring these processes up to the targeted level (IT Governance Institute, 2007).

3. Related work

IT governance has recently drawn much attention; however, to the best of the authors' knowledge, few studies have measured the maturity of IT governance. Khadra et al. (2009) evaluated IT governance implementation in 23 Jordanian domestic banks in terms of the six major COBIT attributes as identified by (Grembergen & De Haes, 2008). The study data was gathered via a self-administered questionnaire using a nominal scale to assess the presence of the attributes of the maturity model dimensions. The questionnaire was based on a preliminary observation of practice and review of the literature, and participants were qualified and knowledgeable. The study found that Jordanian domestic banks applied some dimensions effectively (awareness and communications, responsibility and accountability, skills and expertise.) However, they fell short on other dimensions (tools and automation, goal setting and measurement, policies, plans and procedures). The main recommendation of the study for domestic banks was to give more attention to IT governance to improve the governance strength for all dimensions.

Campbell et al. (2010) presented case studies of IT governance in seven agencies (in both the private and public sectors), investigating their maturity level according to COBIT 4.1. This study highlights the importance of establishing strong IT governance procedures to avoid failure, and of doing this while delivering the benefits of IT. The study found private organizations to have greater maturity than those in the public sector, which indicates that private sector organizations had better IT practices than public agencies. The authors concluded that this was due to (a) bureaucratic cultures and a hierarchical management style in public organizations and (b) the fact that profit

is the primary goal of the private sector, which allowed IT governance to be perceived as an investment.

Amali et al. (2020) used COBIT 5 to assess the maturity level of IT in an educational sector. Measurement was mainly within the domain of delivery, service, and support (DSS). Data were obtained through a quantitative questionnaire, observation, and documentation. Results found the average maturity level of IT services to be at level 3; and enhancements were recommended. Sabatini et al. (2017) also measured IT governance maturity level and also found maturity to be at level 3.

4. Methodology

4.1. Instrument

The COBIT maturity model is used for benchmarking and targeting desired process maturity levels, and to encourage process improvement through gap analysis (IT Governance Institute, 2007). The formulation of this study's instrument for selected processes within the plan and organize (PO) domain is based on the COBIT maturity model. Six questions were designed for each process, describing the maturity level as given by Brand & Boonen (2010). Each question represents a maturity level from 0 to 5. The questionnaire has 18 questions to measure the three processes, and was designed to be answered by IT specialists within organizations. It was created using Microsoft Forms and distributed to selected recipients through various media such as email and WhatsApp. The maturity level was assessed according to participants' views on how each statement applied to their own organization. The following legend for ranking was given to all participants:

- 0 – Management processes are not applied at all;
- 1 – Processes are ad-hoc and disorganized;
- 2 – Processes follow a regular pattern;
- 3 – Processes are documented and communicated;
- 4 – Processes are monitored and measured;
- 5 – Good practices are followed and automated.

Being limited to three of the most common COBIT processes in large and small organizations in the planning and organization domain, the study lent itself to a speedy assessment of current process capability. Each process was assessed through several questions. To compute the maturity level for each process, the respondents' scores were combined for each question in the process. Based on this, the mean was calculated for each question and the skewness of answers for each question was reported in this paper. The assessment scale is shown in Table 1.

4.2. Study sample

The audience for this study comprised IT employees in private, government, and semi-government sector organizations who worked at operations, management, and executive levels. 26 responses from 26 institutions in Saudi Arabia were received. To ensure accuracy and validity, respondents were asked their employment status and the responses of non-working participants were excluded from the study. Moreover, each participant's job position, sector type, and their awareness of the concept of IT governance frameworks were recorded to enhance measurement of the maturity levels of Saudi IT governance.

5. Results, analysis, and discussion

Data were collected through the questionnaire and analyzed using descriptive analysis. The questions were divided into four sections. Section 1 asked for demographic information. Section 2 focused on assessing the maturity level of PO1 (defining a strategic IT plan). Section 3 focused on assessing the maturity level of PO9 (IT risk management), while Section 4 focused on assessing the maturity level of PO10 (project management).

The original number of participants was 28, but two were not currently employed so their answers were excluded. That left 26 participants as the sample for this study. Analysis of the data collected for Section 1 of the questionnaire revealed that 11 participants were working in the public (government) sector; this was followed by the private sector (8 participants), and the semi-governmental sector (7 participants). All participants worked in the IT department at various levels; 14 worked at the operational level, 10 at the management level, and 2 at the executive level. 24 of 26 respondents claimed knowledge of the concept of IT governance.

5.1. PO1 (define a strategic IT plan)

Section 2 sought to measure the maturity of PO1. Table 2 shows the numbers of the questions used in the questionnaire, and the relevant maturity levels based on the COBIT model.

For each process, responses were classified and analyzed according to the sector in which the respondents worked. For the private sector, 7 responses were received from IT specialists in different organizations (see Table 3). This table also shows the distribution of respondents' rank selection for each question and the mean and standard deviation for each question (i.e., maturity statement) of total ranks.

Table 2. Survey questions for assessing PO1 (define a strategic IT plan)

Q#	Maturity level	Questions
1	0 – Non-existent	1. Strategic IT planning is performed
2	1 – Initial/*Ad-hoc*	2. IT planning is performed on an as-needed basis in response to a specific business requirement. Alignment of business requirements, applications and technology takes place reactively rather than based on an organization-wide strategy.
3	2– Repeatable	3. Strategic decisions are driven on a project-by-project basis, without consistency with an overall business or organizational strategy.
4	3 – Defined Process	4. IT strategic planning follows a structured approach, which is documented and known by all staff with IT-related roles and responsibilities.
5	4 – Managed & Measurable	5. Management is able to monitor the IT strategic planning process, make informed decisions based on it and measure its effectiveness.
6	5 – Optimized	6. IT strategic planning is a documented, living process; it is continuously considered in business goal setting, and results in discernible business value through investments in IT.

It can be noticed from Table 3 that most private sector respondents gave a rank of 3 in response to this study's questions. This could indicate that the maturity level of the private sector for PO1 is around the maturity level 3 as measured by the COBIT model. Although some participants gave a ranking of 5 to some questions, the results are highly dependent on each organization's behavior and a generalized maturity level cannot reflect the status of a specific organization.

For the public (government) sector, 11 responses were received from IT specialists in different organizations. Table 4 shows the details of their responses, and it can be seen that most respondents answered all questions with a rank of 0. This indicates that the maturity of IT governance in government sector is still in its infancy and greater consideration is required.

Table 3. IT specialist workers' perspectives (private sector) on PO1: IT strategic plan

Ranking Questions	Distribution of respondents' selection for each rank						Mean	SD
	(0)	(1)	(2)	(3)	(4)	(5)		
Q1	0	2	1	2	0	2	1.96	1.68
Q2	0	0	1	5	0	1	1.71	1.53
Q3	0	0	2	4	0	1	1.82	1.82
Q4	0	2	0	3	0	2	2.10	1.85
Q5	1	1	1	3	0	1	1.75	1.71
Q6	1	1	0	4	0	1	1.96	1.73

Table 4. IT specialist workers' perspectives (government sector) on PO1: IT strategic plan

Ranking Questions	Distribution of respondents' selection for each rank						Mean	SD
	(0)	(1)	(2)	(3)	(4)	(5)		
Q1	5	2	2	1	0	1	1.78	1.70
Q2	5	1	2	2	0	1	1.60	1.58
Q3	4	4	1	0	0	2	1.60	1.80
Q4	4	1	2	2	0	2	2.04	1.87
Q5	6	1	2	0	0	1	1.47	1.70
Q6	4	1	2	2	0	2	1.78	1.70

In regard to the semi-government sector, 7 responses were received from IT specialists from different organizations. Table 5 shows their responses. It can be noticed that most respondents gave a ranking of 1 in response to all questions. This indicates that the maturity level of IT governance in semi-government sector is quite low but better than that of the governmental (public) sector. Therefore, more consideration of IT governance generally and specifically for PO1 (IT strategic planning) is required in the semi-government sector.

Table 5. IT specialist workers' perspectives (semi-government sector) on PO1: IT strategic plan

Ranking Questions	Distribution of respondents' selection for each rank						Mean	SD
	(0)	(1)	(2)	(3)	(4)	(5)		
Q1	1	2	0	3	0	1	2.04	1.74
Q2	2	3	1	1	0	0	1.47	1.47
Q3	4	2	0	0	0	1	1.52	1.74
Q4	2	2	1	0	0	2	2.04	1.96
Q5	2	2	1	0	0	2	1.71	1.73
Q6	1	3	0	2	0	1	1.85	1.62

5.2. PO9 (assess and manage IT risks)

Table 6 shows the questions used to assess maturity levels in terms of PO9. Analysis of the collected data revealed some variation between the different sectors. Table 7 details the results for the private sectors, and it is notable that respondents awarded a high rank in response to most of the questionnaire statements. This suggests that most participants believe IT risk assessment is well governed and managed in private organizations.

Table 6. Survey questions for assessing PO9 (assess and manage IT risks)

Q#	Maturity level	Questions
1	0—Non-existent	The organisation performs IT risk assessment for IT process and business decision
2	1—Initial/*Ad Hoc*	Specific IT-related risks, such as security, availability and integrity, are occasionally considered on a project-by-project basis.
3	2—Repeatable	The risk management is usually at a high level and is typically applied only to major projects or in response to problems.
4	3—Defined Process	Risk management follows a defined process that is documented and the methodology for the assessment of risk is convincing and sound and ensures that key risks to the business are identified.
5	4—Managed and Measurable	Management is able to monitor the risk position and make informed decisions regarding the exposure it is willing to accept. All identified risks have a nominated owner, and senior management and IT management determine the levels of risk that the organisation will tolerate.
6	5—Optimized	Good practices are applied across the entire organisation. The capture, analysis and reporting of risk management data are highly automated.

Of the 11 respondents from the public (government) sector, most gave a low rank in response to all of the questions as shown in Table 8. Thus, it seems that the maturity level of PO9 in government sector is weak and requires proactive improvement.

Table 7. IT specialist workers' perspectives (private sector) on PO9 (Risk Assessment)

Ranking Questions	Distribution of respondents' selection for each rank						Mean	SD
	(0)	(1)	(2)	(3)	(4)	(5)		
Q1	1	3	0	1	0	2	2.39	1.64
Q2	0	1	1	1	1	3	3.25	1.53
Q3	0	1	0	4	0	2	2.64	1.54
Q4	0	1	1	2	1	1	2.67	1.41
Q5	0	1	3	1	0	2	2.21	1.37
Q6	0	2	2	1	0	2	2.28	1.62

Table 8. IT specialist workers' perspectives (government sector) on PO9 (Risk Assessment)

Ranking Questions	Distribution of respondents' selection for each rank						Mean	SD
	(0)	(1)	(2)	(3)	(4)	(5)		
Q1	1	3	1	3	1	2	2.17	1.58
Q2	1	2	2	1	4	1	3	1.53
Q3	2	2	2	3	1	1	2.34	1.49
Q4	1	2	3	3	0	2	2.47	1.37
Q5	1	3	3	2	2	0	1.95	1.22
Q6	3	3	2	0	1	2	2.13	1.63

Finally, 7 responses to this question were received from workers in the semi-government sector, and these are shown in Table 9. These responses are diverse; however, the mean values are low (between 2 and 3). This indicates that PO9 maturity is attained in the semi-governmental sector, but is typically applied only to major projects and in response to problems.

Table 9. IT specialist workers' perspectives (semi-government sector) on PO9 (Risk Assessment)

Ranking Questions	Distribution of respondents' selection for each rank						Mean	SD
	(0)	(1)	(2)	(3)	(4)	(5)		
Q1	1	1	1	3	0	1	2.14	1.52
Q2	0	1	1	1	2	2	3	1.58
Q3	0	3	0	1	1	2	2.33	1.49
Q4	0	1	3	2	0	1	2.47	1.28
Q5	0	2	3	0	2	0	1.95	1.16
Q6	0	3	0	2	2	0	2.09	1.57

Overall, this assessment indicates that risk management is understandable to stakeholders and may be expressed in financial plans, especially in the private sector. It is crucial for businesses to bring IT risks within an acceptable level of tolerance, and to accept damages and losses (Brand & Boonen, 2010). This can be achieved by putting strategies in place to mitigate risks to an acceptable degree, and maintaining a risk management framework that documents an agreed level of IT risk (with mitigation strategies for residual risks). In this way, any potential risk to the organization's objectives resulting from an unplanned event is identified, analyzed, and evaluated.

5.3. PO10 (project management)

IT project management is one of the most crucial and effectual tasks for business and organization success. In order to ensure the best project management and delivery of value to the business, the process should include: (i) a master plan, (ii) resource allocation, (iii) defined output, (iv) users' approval, (v) a phased approach to delivery, (vi) quality assurance, (vii) a formal testing plan, (viii) testing and (ix) post-implementation review (Brand & Boonen, 2010). Project management conveys a range of benefits to the project: it reduces the risk of unforeseen costs and project cancellations, improves communication between companies and end-users, maintains the value and quality of project outputs and increases the percentage of the contribution to IT investment programs. Table 10 shows the questions used to assess PO10 maturity in this study's questionnaire.

Table 10. Survey questions for assessing PO10 (project management)

Q#	Maturity level	Questions
1	0 – Non-existent	Organization considers business impacts associated with project mismanagement & development project failures.
2	1 – Initial/*Ad-Hoc*	There is management commitment to project ownership & project management.
3	2 – Repeatable	There are documented project management guidelines, but their application during the project lifecycle is left to the discretion of individual project managers.
4	3 – Defined Process	IT projects being monitored with defined milestones, schedules, budget, & performance measurements for each project.
5	4 – Managed and Measurable	Standardized project metrics are applied, and lessons learned to be reviewed.
6	5 – Optimized	Project management office established within IT; roles & responsibilities defined.

Once again, the data gathered on the maturity level of PO10 was diverse. Table 11 shows the results for the private sector. Most of the participants working in this sector gave a rank within the range of 3 to 5 for all the relevant questions, which indicates a coherent, repeatable level of maturity in private organizations.

From the government (public) sector, 11 responses were received from IT specialists working in various organizations. Table 12 shows their responses, and it can be seen that these participants gave divergent ranks to the maturity questions; however, the mean value is around 2–3 which indicates that the maturity level of PO10 in government bodies is at a repeatable level.

Finally, turning to the semi-government sector, 7 responses were received, and Table 13 shows the details. Most respondents gave a rank of 3, which indicates that the maturity level of PO10 in the semi-government sector is operating at a repeatable level, as in the case of the government sector.

Table 11. IT specialist workers' perspectives (private sector) on PO10 (project management)

Ranking / Questions	Distribution of respondents' selection for each rank						Mean	SD
	(0)	(1)	(2)	(3)	(4)	(5)		
Q1	0	0	2	2	0	3	2.67	1.58
Q2	0	0	1	3	1	2	3.17	1.36
Q3	0	0	3	2	0	2	2.64	1.68
Q4	0	0	1	3	1	2	2.78	1.59
Q5	0	1	0	3	1	2	2.75	1.55
Q6	2	0	0	3	0	5	2.53	1.75

Table 12. IT specialist workers' perspectives (government sector) on PO10 (project management)

Ranking / Questions	Distribution of respondents' selection for each rank						Mean	SD
	(0)	(1)	(2)	(3)	(4)	(5)		
Q1	2	1	1	4	1	2	2.56	1.64
Q2	2	0	2	1	4	2	3.08	1.44
Q3	3	2	1	2	2	1	2.34	1.61
Q4	3	2	0	2	1	3	2.65	1.69
Q5	2	2	1	2	1	3	2.73	1.60
Q6	2	3	0	2	2	2	2.39	1.69

Table 13. IT specialist workers' perspectives (semi-government sector) on PO10 (Project Management)

Ranking / Questions	Distribution of respondents' selection for each rank						Mean	SD
	(0)	(1)	(2)	(3)	(4)	(5)		
Q1	0	2	2	1	2	0	2.33	1.55
Q2	0	1	1	3	2	0	2.90	1.33
Q3	1	1	2	1	0	2	2.47	1.72
Q4	0	2	2	3	0	0	2.33	1.49
Q5	0	2	3	2	0	0	2.38	1.49
Q6	1	1	1	2	0	1	2.04	1.68

6. Discussion

6.1. IT Strategic plan process

The importance of strategic IT planning lies in the extent to which the business strategy and its priorities align with the management and direction of all IT resources. A strategic plan improves the main stakeholders' understanding of the opportunities and limitations associated with IT, the assessment of current performance, the identification of capabilities and human resource requirements, and permits clarification of the level of investment required to achieve optimum value from the portfolios of projects and services (Brand & Boonen, 2010). The results of the present study show that the private sector is the most mature at level 3 (defined process) in terms of PO1(define a strategic plan). Meanwhile the average PO1 maturity level of the governmental and semi-governmental sectors is quite low (does not exceed level 1).

Figure 3 shows that, based on the mode answers, it can be stated that the most mature sector in terms of undertaking an IT strategic plan is the private sector.
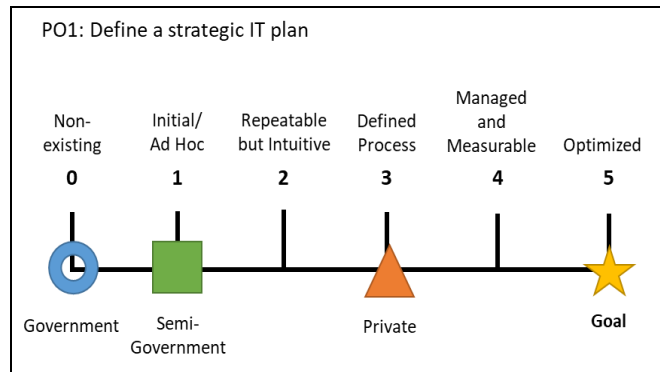
Figure 3. Maturity model – IT strategic plan process

It can also be noticed that some private sector organizations have repeatable and intuitive practices in the performance of IT strategic planning, which means that this process is well defined and initiated. Most private organizations have defined and documented practices for each activity within the strategic planning process, which are based on business requirements and follow a structured approach. Although some lack proper management, several operate at an optimized level in this process.

In contrast, the government organizations considered in this study are still behind in most activities, which indicates a lack of IT strategic planning behaviors in this sector. This may be due to a lack of comprehensive business strategy and a failure to align with business goals. A few such organizations have some initial practices or defined plan documentation and even fewer have an optimized practice in this process.

The semi-government sector's situation resembles that of the government sector, meaning that organizations very rarely make strategic decisions that are based on business strategy, and some make ad-hoc decisions that are not based on defined documentation. However, the situation is not uniform: some semi-government organizations have a defined strategy for IT, while others' basic practice remains ad-hoc. Few have optimized their practice.

6.2. Risk assessment and management process

In private sector organizations, IT-related risks are considered and practice ranges from *ad-hoc*/disorganized to managed and measured, and even (in some cases) optimized.

In the government sector, organizations' practice ranges between *ad-hoc* and those having defined and documented maturity when it comes to performing and managing risk assessment. However, this study has found managed and measurable practice where the risk assessment is considered at a project level. It was found that, in major projects, the process of risk assessments is a defined and documented practice. Participants ranked the risk assessment methodology and sufficiency to identify risk between 2 and 3, indicating that practice is defined and well documented. However, rankings for the monitoring of performance ranged from 0 to 1, which indicates that monitoring practice for risk assessments in the public sector requires improvement.

For the semi-government sector, responses were distributed across the levels. IT risk assessment is managed and measured, and optimized and mostly considered at project level. Some semi-government organizations measure risk assessment performance as repeatable/intuitive practices and others follow unorganized practice. Differences are driven by the organization's activities and business goals, as well as by the extent to which it is an independent, standalone organization.

Based on the mode answers of participants' perspectives, it can be stated that the most mature sector in the process of risk assessment (PO9) is the private sector, as shown in Figure 4.
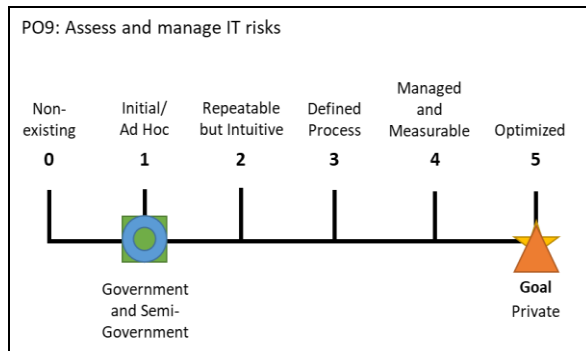
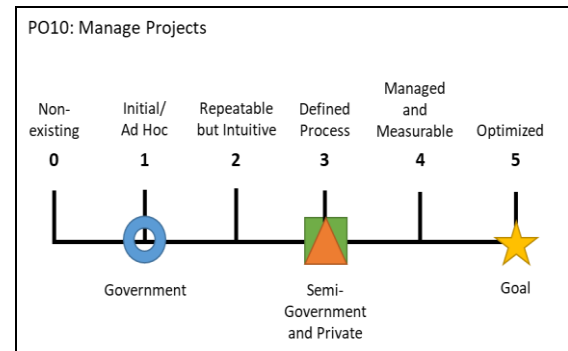**Figure 4.** Maturity model – risk assessment process (PO9)

Figure 5. Maturity model – project management process

6.3. Project management process

Many organizations in the private sector ranged from having defined to optimized practices in terms of project management. That reflects a high maturity level for the project management process in this sector. The average of the respondents' ratings reveals that private organizations have defined documentation related to all activities in project management, and even reach optimization in the automation of performance reports.

In the government sector, most organizations have defined practices for performing project management activities, with associated management commitment. The practice of leaving project management instructions to the discretion of project managers was at a very low, almost non-existent, level. This indicates limited flexibility and very strict process in terms of project management application, which may hinder the process. In terms of performance monitoring, respondents' perspectives varied, perhaps due to the variety of organizations and their experiences in applying this process. Although performance monitoring was found to be varied, most respondents believed that their organization was learning from experience at the completion of each project.

In the semi-governmental sector, rankings ranged from *ad-hoc* to having a repetitive and defined project management process. Management commitment and performance monitoring were both found to have attained a defined level of maturity, with lessons learned after the completion of each projects.

Based on the mode answers of participants' perspectives, it was found that semi-governmental and private sectors have the same level of maturity in terms of project management, while government sector maturity remains in its infancy and more consideration is required. This result is shown in Figure 5.

The advice offered by the IT Governance Institute (2007) is that, when using the COBIT maturity model, practitioners should not necessarily aim to achieve the highest level in all 34 processes. Such ambition may not be compatible with the optimal cost/benefit ratio for the organization in question, or with its operating environment or organizational structure. For example, some organizations may (in holistic terms) operate best if they restrict the highest levels of sophistication for crucial systems, but attain some form of happy medium for others.

However, a 'maturity gap' exists and therefore it is appropriate from some businesses to proactively improve their IT process maturity. This may be so where firms fail to move from maturity level 2 to maturity level 3, which is effectively the point at which maturity has been diffused throughout the organization. Such failure can be due to a lack of skilled personnel, or the siloed working of such staff, or a focus on process at the expense of process management (Heller & Varney, 2013).

As it was discussed the maturity level of IT governance in government and semi-government sector is still in its early stage of maturity. This may be due to various reasons such as the late adoption of IT governance in government sectors comparing to the private sectors or the presence

of possible pitfalls in management and continuous monitoring of the governance implementation process. Based on that the present work supports the idea that improving the maturity level of IT governance in government and semi-government sectors should be taken with consideration to certain proposed steps as can be seen in Figure 6. It is expected that considering these steps may lead to improve the maturity level of IT governance and future research and investigation can be conducted to validate this.
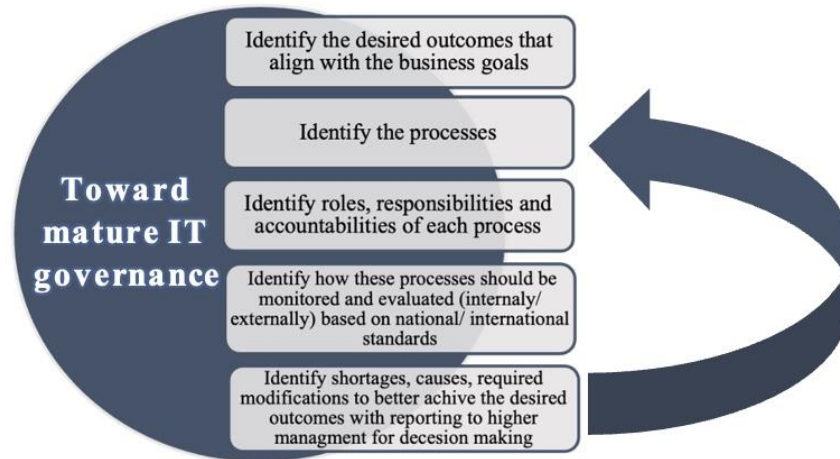

Figure 6. Steps to improve the maturity level of IT governance in government / semi-government sectors

7. Conclusion

This paper presents a study of IT governance maturity levels based on the COBIT framework. Assessments have been made from the perspectives of IT specialist workers in the private, government (public) and semi-government sectors, therefore data was subjective, and findings may vary by organization.

All studies have limitations, and this one is no exception. For example, a quantitative approach was used to assess a theoretical model, and the respondents were not interviewed in great depth. The limitation of this study to a Saudi context may restrict the extent to which findings may be generalized, and future scholars may well be able to extend the scope and depth of this work. Nonetheless, this study has provided valuable insights into the current state of maturity in IT processes that can serve as a basis for future development and discussion of theory, practice and policy in a range of sectors.

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