Exploring Information Technology Governance (ITG) Practice in Research Institutions: An Empirical Study

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Abstract— **The twentieth century witnessed many spectacular developments that added great value to our societies. Information Technology (IT) was one development that is maintaining a major role in most - if not all - of today's organizations and having, accordingly, an obvious influence on business performance in general and on business management in particular. Such role of IT has brought the issue of IT governance (ITG) up to the surface to control IT resources, its sustainability, security, and availability as major requirements for business success. This paper examines the state of ITG in one of Egypt major public research institutions using the leading ITG framework – COBIT 5. Given the semi- autonomous nature of research units within the institution, the paper compares the level of ITG processes' maturity on the instructional level and on the level of a major research unit. Results reveal the relatively low level of achievement on almost all COBIT processes on the tow levels.**

Keywords-Information Technology; governance; egypt; higher education; public; research inistitutes; COBIT 5

I. INTRODUCTION

Throughout the last decade or so, it became evident that the role Information Technology (IT) plays in organizations worldwide has become far beyond process automation. IT became one key pillar upon which organizations cannot function without. The continual dependency of organizations on IT has shifted executives' thinking to focus how IT can be exploited in the manner that brings up the best benefit to their organizations' stakeholders [1]. Accordingly, there became a need for IT Governance (ITG) to clearly establish the business value of IT, to prove that IT investments can generate a positive return while supporting business objectives, and to define a set of recommended processes and controls that cause IT to perform better [2] [3]. The situation in universities and research institutions was indifference and the implementation of ITG gained much attention given major role IT offers to both education and research processes [3][4][5].

This paper aims to explore how ITG is practiced in one of Egypt public research institutes as a case study that shows how well ITG is being considered in Egypt higher education and research institutes. This paper builds on the work presented in [6] that covered the Central Laboratory for Agricultural Climate (CLAC) to include it parent organization; the Agriculture Research Center (ARC). By analyzing two organizational levels, results of the this paper will provide a wider scope of insights on how ITG is practiced in Egypt public research institutions. Following the introduction, the rest of this paper is organized as follows. Section II provides a brief background on ITG, differentiates between management and governance, and provides an introduction to COBIT 5. Section III proceeds to develop an understanding of ITG in higher education and research institutes, provides the need for it, and presents cases of ITG implementation in higher education worldwide. Section IV presents the case study of the institutes under consideration and Section V reports on the findings of the study. Finally, conclusions and future work are given in Section VI.

II. INFORMATION TECHNOLOGY GOVERNANCE

A. Governance and management

One major obstacle when aiming towards effectively applying an ITG framework in an organization is the perceived inability to differentiate between the roles of governance and those of management. Successful implementation would highly depend on a clear understanding of the difference between governance and management.

Simply speaking, on one hand, governance is about determining the "What?" - what the organization does and what it should become in the future. On the other hand, management is about the "How?" - how the organization will reach that future . Effective governing is, thus, associated with focusing on higher level, future-oriented matters of strategy and policy.

In more details, governance is concerned with the organizational structures, functions, and processes "to ensure that the program is run in such a way that it achieves its objectives in an effective and transparent manner [7] , page2." Governance is the "framework of accountability to users, stakeholders and the wider community, within which organizations take decisions, and lead and control their functions, to achieve their objectives [8] , Page 4."

Therefore, good governance aims to add value by focusing on enhancing organizational performance through more efficient management. Management, in turn, works with the day-to-day operations of the organization within the context of the strategies, policies, processes, and procedures that have been established by the governing body [9]. Governance, thus,

is concerned with "doing the right thing," while management is concerned with "doing things right [10], Page 8."

To avoid such pitfall, the COBIT 5 framework was sure to make a clear distinction between the two disciplines; governance and management. COBIT 5 defines the role of governance as "governance ensures that stakeholder needs, conditions and options are evaluated to determine balanced, agreed-on enterprise objectives to be achieved; setting direction through prioritization and decision making; and monitoring performance and compliance against agreed-on direction and objectives [11]." And defines role of management as "management plans, builds, runs and monitors activities in alignment with the direction set by the governance body to achieve the enterprise objectives [11]." Moreover, to ensure the complementary performance of the two disciplines, COBIT 5 proposed a process reference model which defines and describes in detail a number of governance and management processes [12]. As Fig.1 shows, these processes were designed to cover all aspects of IT governance and management, and can be organized accordingly to the size and nature of the implementing enterprise.

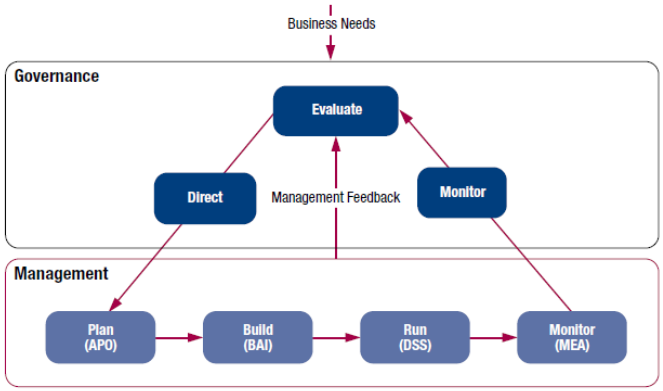

Figure 1. COBIT 5 Governance and Management Key Areas ([11])

B. COBIT 5

After 16 years of its first introduction in 1996, the Information Systems Audit and Control Foundation (ISACF) released the fifth generation of COBIT in 2012 to address governance and management of enterprise IT. The Control Objectives for Information and related Technology (COBIT 5) is "a comprehensive framework of globally accepted practices that helps enterprise leaders create optimal value from information

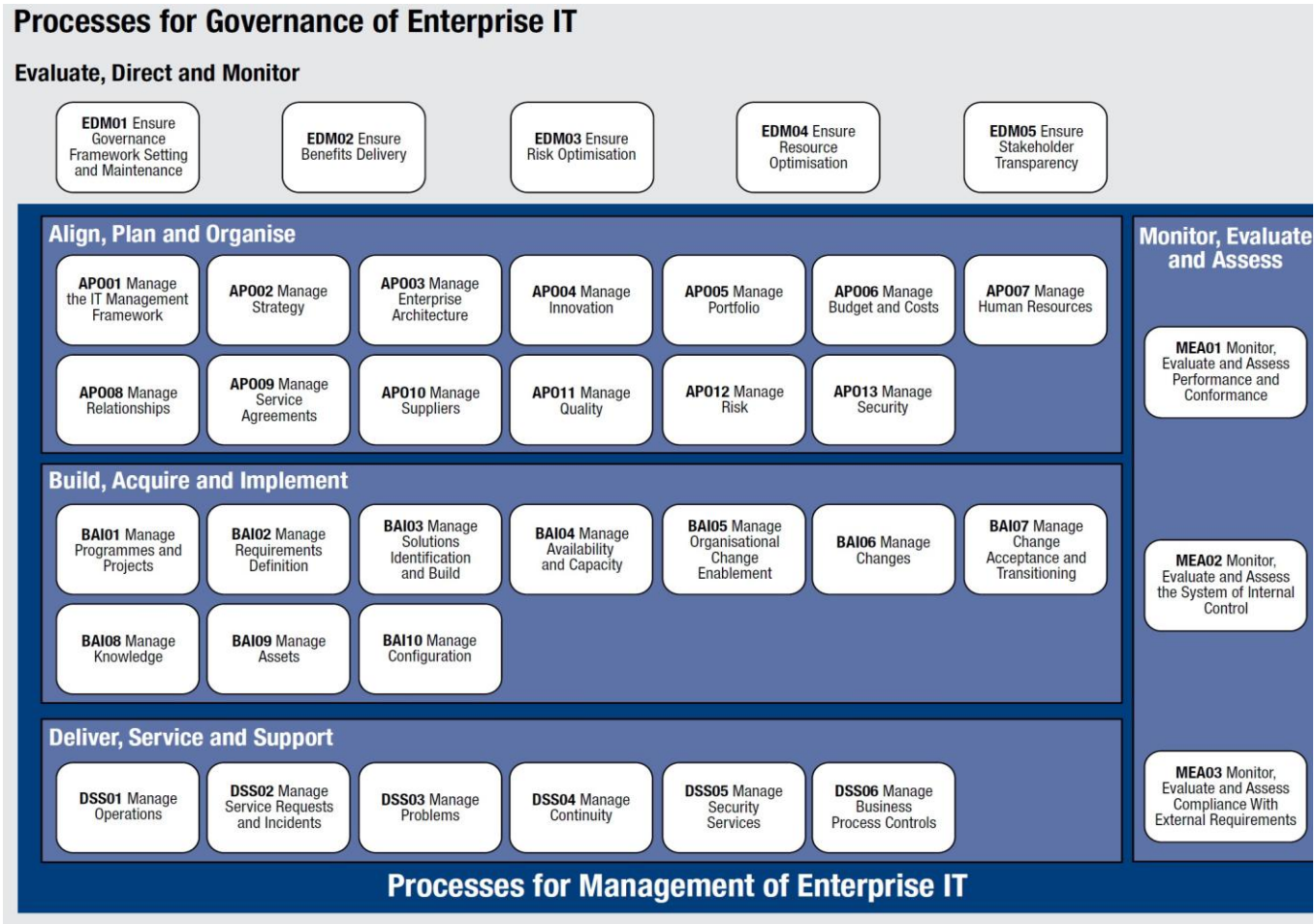

Figure 2. COBIT 5 Process Reference Model ([10])

and technology by maintaining balance amongst realizing benefits and optimizing risk levels and resource use" by providing needed structure and tools to deliver trust and value, manage risk, avoid potential public embarrassment and maximize opportunities [13].

COBIT 5 is guided by five principles that make it applicable to all industries and organizations: (1) meeting stakeholder needs; (2) covering the enterprise; (3) a single integrated framework; (4) a holistic approach; and (5) separate governance from management [13]. To cover all aspects of IT governance and management, COBIT 5 has developed its process reference model, which defines in details various related processes normally found in any enterprise. The model provides a common ground for all managers and, accordingly, incorporating such an operational model is one of the most important steps towards good ITG [11].

The COBIT 5 process reference model covers the two disciplines: governance and management. The first contains five governing process, each of which has its defined Evaluate, Direct and Monitor (EDM) practices. The later contains four domains associated with plan, build, run and monitor (PBRM), these are: Align, Plan and Organize (APO); Build, Acquire and Implement (BAI); Deliver, Service and Support (DSS); and Monitor, Evaluate and Assess (MEA). As shown in Fig. 2, COBIT has a total of 37 processes.

III. ITG IN HIGHER EDUCATION AND RESEARCH INISTITUTIONS

A. *The need*

A public higher education and/or research institution works within a set of constraints that have to be met and challenges that have to be crossed over; (1) to support society policies and issues; (2) to continually enhance the quality of its education and research activities; (3) to assist in professionalizing management practice of socially desirable sectors; (4) to provide technical support to business and industry; (5) to conduct research on the issues that are significant for the government, the industry, and other sectors and disseminate the research findings; and (6) to collaborate with other academic institutions with the aim of improving academic standards.

The effective role that IT plays in such institutions covers some or all of the following: (1) users of technology in the development of their skills and competencies through training and learning; (2) managing information as a corporate asset; (3) supporting business change through the innovative use of technology and; and (4) promoting and supporting the adoption of good practice across a number of important areas including project and program management and electronic service delivery [14].

A study conducted by the IT Governance Institute showed that around 50% of organizations have already implemented or are in the process of implementing ITG systems an average global value of ITG maturity of 2.67 (on a scale that ranges from 0 to 5) of those organizations that have an ITG framework in place [15]. The delayed adoption of the ITG in universities was reasoned to the lack of their own ITG framework [4]. As an example of developing countries similar to Egypt, ITG in South Africa universities showed low level of maturity that indicated the need to develop a set of criteria to be developed to assist with the selection of a suitable ITG standard / framework for the HE environment such as COBIT [16].

B. *Related cases*

The Joint Information Systems Committee (JISC) for universities in the United Kingdom introduced one of the first attempts to provide a reference to all the university system. This committee designed a reference model [17] and a toolkit [18] for the self-evaluation of ITG maturity. [18] developed a university oriented ITG Framework (ITG4U) for the Spanish Association of University Rectors (in Spanish). A following step was introduced in [17] [18] that focused on COBIT.

An ITG framework for use by higher education (HE) institutions in South Africa was proposed in [19]. This work aimed to understand the environment in which ITG operates with reference to the relationships between corporate governance, HE governance and IT governance and demonstrated the need for ITG in HE establishing the current level of maturity of ITG in the HE environment. How ITG is being implemented in four leading institutions of higher education in Australia was examined in [19] with a focus on the application of ITG processes in these institutions and examined how internationally recognized standards such as COBIT, ITIL and ISO17799 are being employed in this implementation.

According to the research finding after examining the status of the four institutes, they all implemented ITG through a mixture of structures, processes and relational mechanisms as suggested by the [16]. Gomes and Ribeiro [15] tried to prove the advantage of using COBIT in a high public Portuguese educational institution as a part of the development of a quality management system (ISO 9001 standard certification). It concluded based on other studies that after the examination of various standards and frameworks (ISO 9001, CMM, COBIT, COSO, ISO 27000) oriented to manage and control the IT field, the fact is that COBIT is a well—known framework and it was implemented and adopted in many countries and enterprises.

How the implementations of ITG in the context of the framework lead to improvement in the university /institute performance was the focus of [5]. It examined how ITG can be implemented through a number of structures, processes and relational mechanisms in that institution of higher education and discussed its evolving characteristics. ITG and its practices in the institution. Implementation of COBIT added value to the institution effort in ITG as it helped it to solve the problem it faced earlier like the disparity in ICT services across the institution which led to problems in managing the perceptions of students and staff, as it focused on the centralization of decision making process and helped to improve the communication between central IT and divisional IT groups which helped in the acceptance process of a central IT standards.

IV. The Case Study

A. Public research institutions in Egypt

In the early 70's, Egypt established the Academy for Scientific Research and Technology (ASRT) as the governmental body responsible for guiding Egypt scientific research – that was for a great extent funded by the government back then. The role of ASRT evolved with time to act as Egypt public house of expertise. Although ASRT supervises most of Egypt largest research institutions, several ministries proceeded to establish their own research institutions in a way that a ministry would have a research institution that focuses only on research topics related to the work of this ministry. Accordingly, in addition to public universities – that carries out research, and research institutions following ASRT directly, 13 ministries have their own research institutions (usually referred to as research centers).

B. Agricultural Research Center

Within this context, Egypt Ministry of Agriculture and Land Reclamation has established its Agricultural Research Center (ARC) in 1971 as its main body responsible for applied agriculture-related research in Egypt. ARC main objective is to achieve sustainable development through the implementation of modern technology which will attain the suitable use of agricultural natural resources, fulfill the people needs and requirements and improve the farmer's income.

Organizational-wise, ARC is a semi-autonomous research institution governed by a board of directors chaired by the Minister of Agriculture and comprises a well-distributed network of 16 institutes, 8 central laboratories, 10 regional stations and 46 specific research stations, 23 research administrations, 4 research extension and training centers to cover all agro-ecological zones of Egypt. ARC staff includes about 6582 researchers holding Ph.D., Master and Bachelor degrees, in different agricultural science branches, in addition to 27.4 thousand technician and administrative employees.

C. Central Laboratory for Agricultural Climate

One of ARC main constitutions is the Central Laboratory for Agricultural Climate (CLAC) established in 1996 with a major objective of establishing an agro-meteorological network covering the agricultural area including both old and newly reclaimed areas. CLAC conducts research and training related to different application of daily weather data on current and near future agricultural activities including utilization of mathematical models to estimate daily water requirements, fertilization, pest and disease forecasting.

The organization structure of CLAC consists of four main research departments: (1) Agro-meteorological application; (2) Biological agriculture; (3) Soilless culture; and (4) Climate modification. The number of researchers is 82 including Ph.D. and M.Sc. holders all of which are either form agriculture or science background.

The first step in implementing the adopted methodology was, typically, to select the sites for the study [21]. Given that stakeholders' cooperation was a key success factor for conducting such assessment, convenience sampling [22] let to the selection of the Agriculture Research Center being the employer of two members of the research team. ARC also is one of the oldest, largest, and most influencing public research centers in Egypt given the agricultural nature of Egypt. The study considered two levels: the institutional level (ARC) and organizational level (CLAC). The latter entity was selected as the researchers expected it to have the highest possible ITG practice in ARC given their nature of research and study areas that are closely related and highly dependent on IT.

D. The Role of IT

Given its huge size of the number of researchers and staff , size of business processes, and number of assigned project, ARC needs to be supported by a well-established and governed IT infrastructure. The services that ARC is capable of providing to its customers (farmers and researchers), suppliers, and employees are a direct function of its IT infrastructure. Preferably, this infrastructure should be backing ARC's business and information systems strategy. ARC must take into consideration that all new information technologies have a powerful impact on business having a clearly defined IT strategies will enhance the quality of services that can be delivered by ARC.

On ARC level, there is no specific IT unit in its organization structure. In CLAC, however, there are two units related to IT; the IT unit and the GIS unit. IT related activities include: maintenance, administration, software development, training, weather stations, and website.

The IT unit is under the department of applications and serves all the technical needs of the four research departments of the laboratory. This unit is responsible for managing the entire lab IT resources and especially the databases design, development and maintenance. It is also responsible for hardware maintenance, software testing and installation, security of the equipment, administration of the local area network, design and maintenance of the website. Its staff consists of the database administrator and his assistant. The shortage in staff is caused by the limited financial resources. The reports of the database administrator go directly to the lab head. These reports describe the status of work and any required new equipment or software.

Maintenance is one of the responsibilities of the IT unit. Although there are new equipment which still within supplier guarantee, the unit maintains the databases, networks, in-house developed software, website, and hardware. The IT unit collects and combines hardware components to build new PCs, so the unit is responsible for maintaining those PCs too.

The IT unit is very concerned with the administration of the databases because it contains all the important data the lab works on. There are two main databases; the first contains weather data, and the other one contains administrative data. Due to the importance of getting accurate weather data used in different Agro-met applications, 39 weather stations were installed to cover the majority of Egypt area to get the data as fast and accurate as possible. Finally, CLAC cooperates with four external (3rd party) consultants: expert systems laboratory,

GIS vendors, database applications vendors, and hardware vendors.

E. Methodology

The major research question this work is trying to answer is how ITG is being practiced in Egypt public research institutions? To answer this question, a case study methodology was adopted given that the two tests set by [21] were applicable, these are: (1) the main research question is "how"; and (2) the research team had no control over the research variables considered at the entity selected for the case study. The presented case is explanatory in nature as ITG is relatively new in Egypt and not much information could be found on its application scope and experience in Egypt. Accordingly, the focus on one major research institution was deemed sufficient by the research team and case study was bounded by the topic of ITG in the institution under consideration; ARC.

The methodology deployed was based on six major pillars: (1) using COBIT 5 maturity model as a base for assessing ITG practice; (2) conducting structured interviews with appropriate management and staff members to gain understanding of business requirement, roles and responsibilities, policies and procedures, and management reporting; (4) evaluating processes to determine the degree to which practices are performed; (5) assessing compliance to COBIT requirements; and (6) comparing results on two institutional levels; ARC and CLAC.

The paper used process capability model provided by COBIT 5 to measure the current (as-is) maturity institutional IT-related processes. Each process will have a specific designation based on how well its practices achieve the intended purpose of this process. COBIT 5 defines six levels of capability that a process can achieve: (0) Incomplete process; (1) Performed process; (2) Managed process; (3) Established process; (4) Predictable process; and (5) Optimizing process. Capability of all processes belonging to a specific domain will then be used to determine the achievement of this domain as a percentage. Finally, results were compared on the two institutional levels; ARC and CLAC to gain better insights that support answering the research question at hand

V. Results and Discussions

A. Overall

For both ARC and CLAC, Fig. 3, Fig. 4, and Table I report on the percentage achievement in each domain, the capability of the 37 processes, and number of processes per maturity level, respectively. For ARC, Fig.3 shows that the "Evaluate, Direct and Monitor" domain is the least achieved domain with only 0% followed by the "Deliver, Service and Support" with 7%. The "Build, Acquire and Implement" followed by 10, then 13% for the "Monitor, Evaluate and Assess" and, finally, the "Align, Plan and Organize" domain is the best achieving one with 15%.

As for CLAC, the "Monitor, Evaluate and Assess" domain is the least achieved domain with only 7% followed by the "Evaluate, Direct and Monitor" domain and the "Build, Acquire and Implement" domain achieving 8% and 12% respectively. The "Align, Plan and Organize" and the "Deliver, Service and Support" domains were the best achieving ones with 17%.

Generally, the figure shows clearly the low level of achievement on the five domains for both ARC and CLAC with a percentage ranging from 0% to only 17%. The figure also shows that CLAC achievement outperformed ARC on four domains: EDM, APO, BAI, and DSS with significant difference on the EDM and DSS domains. Only on the MEA domain, CLAC achievement was outperformed by ARC.

In the following subsections we will elaborate more on the performance on various processes with a focus on those processes witnessing a difference in performance between the two units; ARC and CLAC.

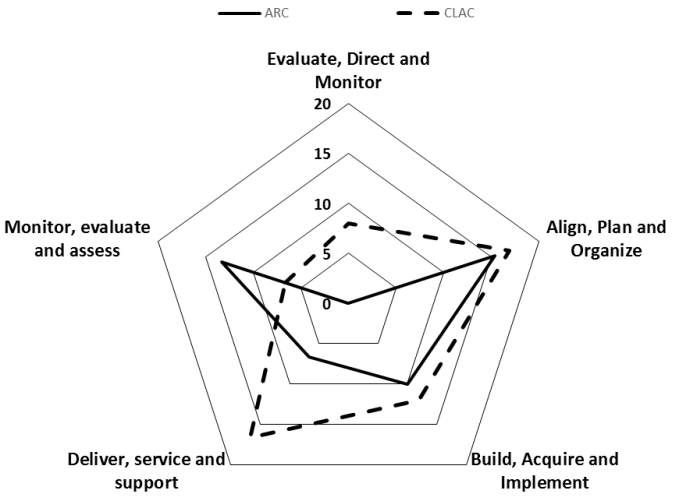

Figure 3. %achieved per domain

TABLE I. PROCESSES PER MATURITY LEVEL

	ARC Maturity Levels						CLAC Maturity Levels					
Domains	*0*	*1*	*2*	*3*	*4*	*5*	*0*	*1*	*2*	*3*	*4*	*5*
EDM	5	0	0	0	0	0	0	2	0	0	0	0
APO	8	2	1	2	0	0	7	3	1	2	0	0
BAI	6	3	1	0	0	0	5	4	1	0	0	0
DSS	4	2	0	0	0	0	1	5	0	0	0	0
MEA	1	2	0	0	0	0	2	1	0	0	0	0
Total	24	9	2	2	0	0	15	15	2	2	0	0

B. Evaluate, Direct and Monitor (EDM)

The "Evaluate, Direct and Monitor" (EDM) domain consists of five processes representing the governance part of COBIT. This domain, thus, assumes a higher importance for the successful implementation of ITG in an institution. Results revealed than EDM witnessed the lowest achievement for both

entities as the level of maturity scored 0 on the five processes in ARC and only two process scored maturity level 1 in CLAC; EDM02 EDM05.

To ensure governance framework setting and maintenance (EDM01), all efforts which had been done did not satisfy the standards of building a well-defined IT Governance system, although they can be considered on track considering the great effort of top management to raise the IT value in the organization. For CLAC, there had been a considerable effort done in sitting a base of alignment between IT and business started with initiation of an IT unit that follow the head of the laboratory directly and building a structure for it using a set of unfortunately poorly qualified personal considering the laboratory limited financial resources and governmental restrictions.

When considering ensuring risk optimization (EDM03), The concept of IT risk and its influence to the institution was weakly defined and, even, not well recognized with no available qualifications to adapt this thinking except to the minimal needs. In other words there isn't few established risk management practices with low tracking and reporting of problems. The case was indifference for ensuring resources optimization (EDM04) given the very limited financial resources, the effort done to maximize their added value can be seen in the optimization of their use of the IT resources but without applying any strategies to direct and monitor them, only a few baselines and structuring techniques.

For ensuring value optimization (EDM02), the evaluation let us realize that CLAC appreciated its IT resources more with great consideration and awareness of its members to the role of IT in helping CLAC achieving its goals and objectives with consideration of the IT as a business partner not a service provider. On contrary was the situation in ARC although it is the umbrella that CLAC work beneath. This can be reasoned to the distributed structure of ARC that allows the relative autonomy of its various units. ARC pays a little attention to the role that IT resources can play and to the improvement that its IT resources can achieved if they were considered appropriately not only as a service provider.

The performance of CLAC in ensuring stakeholder transparency (EDM05) shows the considerable consideration that CLAC stakeholders give to the importance of IT resources;

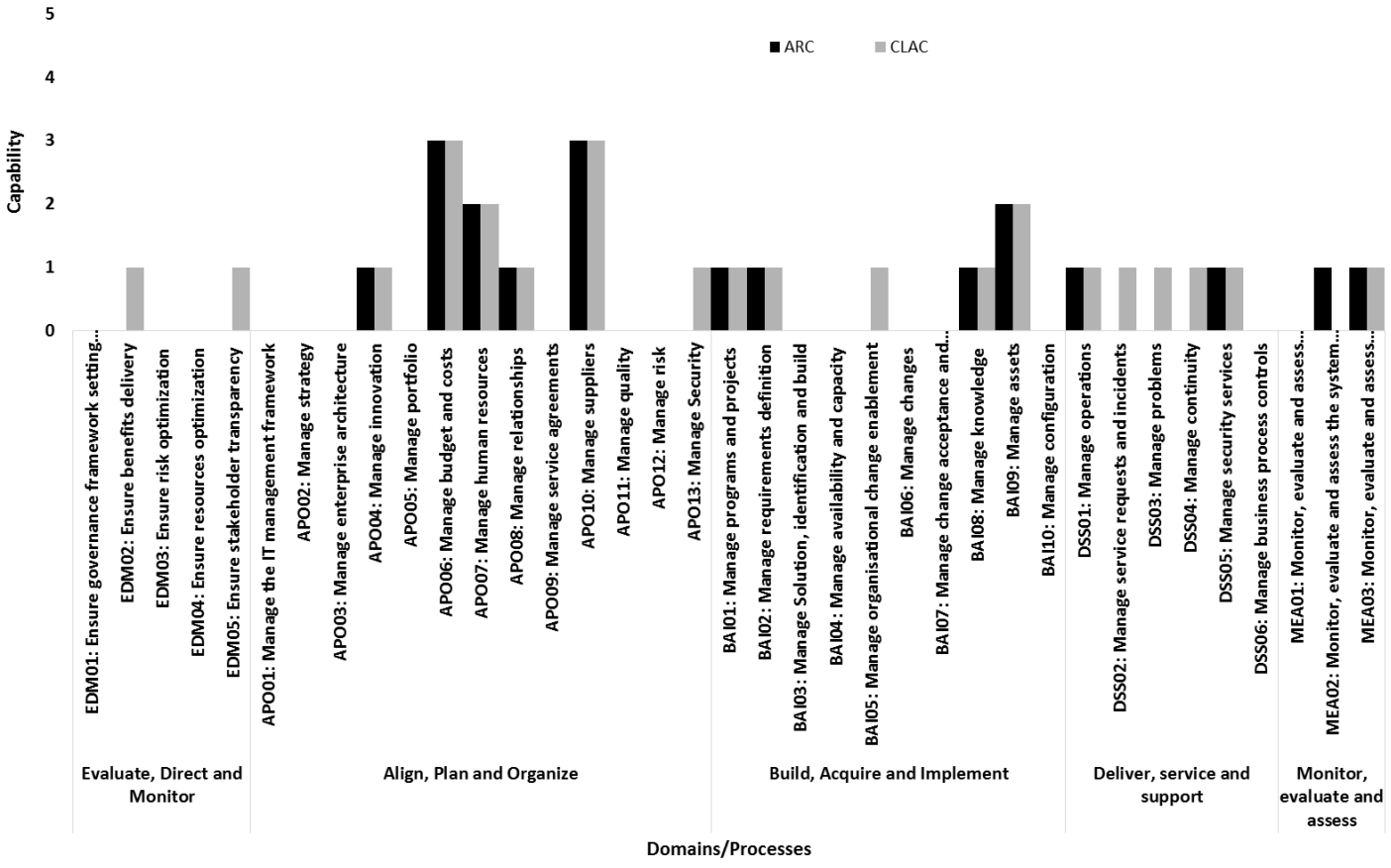

Figure 4. Process capability assessed.

they communicate their needs depending on a mature mechanism maybe not the most efficient way but they intensively try to enhance their performance regarding their IT resources and how to manage it in the most appropriate way on contrary was the case in ARC. ARC stakeholders don't communicate regarding their IT resources , they don't consider how to increase performance or to identify areas for improvement except in case of failure, they don't consider that their IT unit needs to have a set of objectives and the stakeholders have to consider it as a part of their enterprise's strategy.

C. Align, Plan and Organize

For ARC, 8 out of the 13 processes were in the level 0, 2 processes scored level 1, 1 process scored level 2, and 2 processes scored level 3. For CLAC, the same processes' performance except APO13: manage security score 1 compared to 0 in ARC.

In 7 common processes, both ARC and CLAC scored level 0. When considering managing the IT management framework (APO01), there was no clear identification of the IT vision or mission not in a documented way but it is considered. There isn't any applied IT control framework to ensure that the right mechanisms (polices, strategies processes, procedures), authorities (roles, responsibilities) are put in place. The same goes to managing strategy (APO02) with no developed IT plan or even considered strategy to manage the execution of the IT processes, but the IT is consistent with the business objectives and try to achieve business plans but without any structuring form.

Both entities didn't consider an IT- enterprise suitable and possible architecture (APO03) supported with a portfolio of services based on a set of standard baselines approved and maintained but it developed a base of approved principles to follow and apply concerning their IT. On the program level (APO05: Manage portfolio), there was no such a level of commitment to programs size, or an IT-enabled investment program to help achieve business objectives by trying to identify, define, evaluate, priorities, select, initiate, manage and control programs.

Considering managing service agreement (APO09), there was no documentation or organization of the IT services, the IT services are not well-defined they are done in response to the laboratory needs without considering of performance indicators. Quality management (APO10) as known in the IT field is not well considered on high levels, but CLAC IT management consider the delivery of technical solutions and services to meet business needs and stakeholders satisfaction without applying the required steps from controlling, monitoring ,using of well-established practices and standards. Again, for risk management (APO13), neither units consider classifying, evaluating and reducing IT-related risks within acceptable levels of the units administrative executives.

Manage Security (APO13) is is one of the major issues that take a great attention and consideration due to its importance to ARC as a governmental utility but because of their technical staff limited professional capabilities and managerial support, they can't apply it correctly, they don't follow the required procedures of documentation, measurements, network configuration, they don't follow the defined procedures that organize dealing with the receipt, use, removal and disposal of special forms, no conduction of regular physical security awareness training to prepare them for one of the considered security issues.

D. Build, Acquire and Implement

For ARC, 6 out of the 10 processes were in the level 0, 3 processes scored level 1, and only 1 process scored level 2. For CLAC, the same processes' performance except BAI05: manage security score 1 compared to 0 in ARC.

When considering the management of solutions identification and build (BAI03), there was no established procedures to guarantee solutions capability of supporting strategic and operational objectives. In general, deployed applications are ready made, off-the-shelf products and in case of customized ones administration can handle this easily by asking the specialized supplier to handle the required modifications depending on the requirements of the business without consideration of design and development phases in other words depend greatly on the outsourcing of solutions. The financial unit is the one responsible for the purchasing process after studying the feasibility study represented by the requesting personnel/department.

For managing availability and capacity (BAI04), through the last few months CLAC suffered from achieving below the normal of responses to clients' needs concerning performance and availability due to the lack of the qualified expertise to handle the laboratory needs of solving its daily technical problems and performance issues, Without planning for performing an assessment to the impact of delay and addressing of the reasons and solutions to them.

Both ARC and CLAC showed low managing change (BAI06) performance. The planning of any changes is a major issue considering the availability of resources but to manage these changes is a more complicated issue. Managing change acceptance and transitioning (BAI07) is also given low attention by the administration in both units. For example, the perception is that the attachment of CLAC to different IT new implementation doesn't need all these complications and expenses it is done in the simplest form without any mitigation of the risks considering its small size and limited resources. Finally, managing configuration (BAI10) is also given low attention. It is not within the administration focus to consider having a complete and up-to-date configuration repository; also it may add a lot of value to the management process of its IT resources but they don’t have the qualifications and resources financially and technically to do so.

E. Deliver, service and support

This domain showed a large difference between the achievement of processes in CALC and those in ARC. For ARC only 2 processes reached level 1 while the other 4 were in level 0. CLAC, however, was much improved with 5 processes in level 1 and only 1 process in level 0.

Concerning managing business process controls (DSS06), a set of controls is performed occasionally over the business processes and their information but not in a systematic way or even well-defined so it can be generalized all-over ARC business processes. Roles and responsibilities are pre-defined and authority levels are identified but they are not well-employed. The management of errors is at its minimal level. Tractability of information regarding different events lacks liability. Information assets aren't protected appropriately.

F. Monitor, evaluate and assess

For ARC two processes were in level 1 and one process in level 0. CLAC, two processes in level 0 and only one process in level 1. As for the monitor, evaluate and assess performance and conformance (MEA01), there is no established monitoring approach to monitor the performance (MEA01) and assess whether satisfies ARC and CLAC business needs. There are no roles that control the reporting system or an implementation of well-defined corrective actions.

VI. CONCLUSIONS

As the wide and large variety of information technology (IT) applications increasingly playing a vital role in supporting business processes across higher education and research institutes, maintaining a strong IT governance (ITG) that ensures organizational ability to meet its goals is a must. This research is motivated by the need for effective ITG in Egypt higher education and research institutes.

The paper used the leading ITG framework; COBIT 5 to assess the extent to which ITG practices is being performed in one of Egypt research institutes on two levels; the institute itself and in one of its major research units. On both levels and with minor differences, results showed a relatively low capability of IT processes on the average with minor exception of those processes that are governed by regular laws; e.g. procurement.

Future work will include examining more cases in Egypt public research and higher education institutes to better understand the overall picture of ITG in such context and to provide the launching point towards setting up an appropriated ITG framework public universities and research institutes in Egypt.

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