

**SHORT THESIS FOR THE DEGREE OF DOCTOR OF
PHILOSOPHY (PHD)**

**The Power of IT Governance When Applied on
Key Divisions in Financial Institutions
(I.T- I.S- Risk - Audit)**

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Table of Contents

1. Introduction.....	4
2. The objective of the dissertation.....	5
3. Conceptual framework.....	7
4. Methodology.....	8
4.1 IT Governance.....	8
4.2 Cloud Computing.....	9
4.3 IT Operational Risk.....	10
4.4 COBIT 5.....	13
5 Results and Findings.....	14
5.1 IT Governance.....	14
5.2 Cloud Computing.....	17
5.2.1 Discussions & Comparison Study.....	17
5.2.1.1 Regulatory Considerations & International Stand.....	17
5.2.1.2 Risk Management.....	17
5.2.1.3 Data Security and Data protection.....	18
5.2.1.4 Effective Access to Data & Business Premises.....	18
5.2.1.5 Change Management and Continuity Plan.....	18
5.2.1.6 Exit plan.....	18
5.3 IT Operational risk.....	20
5.4 COBIT 5 Framework.....	23
6 CONCLUSIONS AND RECOMMENDATIONS.....	26
6.1 IT Governance – Conclusion.....	26
6.2 Cloud computing – Conclusion.....	27
6.3 IT Operational Risk – Conclusion.....	30
6.4 COBIT 5 – Conclusion.....	31

7	REFERENCES	33
8	LIST OF FIGURES	34
9	LIST OF TABLES	35
10	LIST OF PUBLICATIONS	35

1. Introduction

The era of innovation and investment in Information/Communication Technology has become increasingly sophisticated, especially in the business and the economic sectors. Nowadays, Information Technically is considered one of the areas that are most concentrated on, and one of the new technological trends in the market is Cloud Computing. The use of such a method of cloud services solidifies a positive role in facilitating business processes and simplifying information storage methods, as well as saving time/effort while enabling companies to reduce expenses allocated to cover the needs of the IT Department. However, this choice would roughly elevate the level of threats, and thus, lead focus on increasing the security level of controls that is highly essential in order to mitigate all risks. Therefore, both IT Audit and IT Risk topics have become crucially necessary in order to obtain a reasonable assurance level of risk mitigation by setting up high-level controls aligned with the related policies and procedures in any organization.

In recognition of the fact that several financial worldwide establishments announced operational misfortunes, there has been a developing enthusiasm for Operational Risk Management. For instance, UBS (Swiss Multinational Investment Bank and Financial Services Company) confronted an operational misfortune/loss due to one of its dealer's deceitful conduct (Fraud), and also, Operational Losses were reported in 119 banks in the SIGOR (the Standards Implementation Group) totaling approximately €59.6 billion in 2008. In either case, the events of operational loss are complicated and vary in classifications between the internal and external categories to business intrusions caused by system breakdowns (See in [1]).

Furthermore, risks of every type related to roles of business require techniques to manage and control its utilization and to mitigate its negative effects in order to increase partner satisfaction. As a result, the concept of IT Governance was born in order to incorporate reception of control structures and best practices to encourage, monitor, and enhance critical IT activities to expand business esteem and reduce business risk according to business strategy.

In 1996, ISACA issued the primary adaptation of "The Control Objectives for Information and related Technology" (COBIT) which concentrated on Audit, Control, and Management Concepts in the Enterprise. ISACA attempted to create COBIT until reaching COBIT 4.1 and then releasing the last form in COBIT 5 during early 2012, which concentrated mainly on merging the IT Management and the IT Governance concepts (See in [2]).

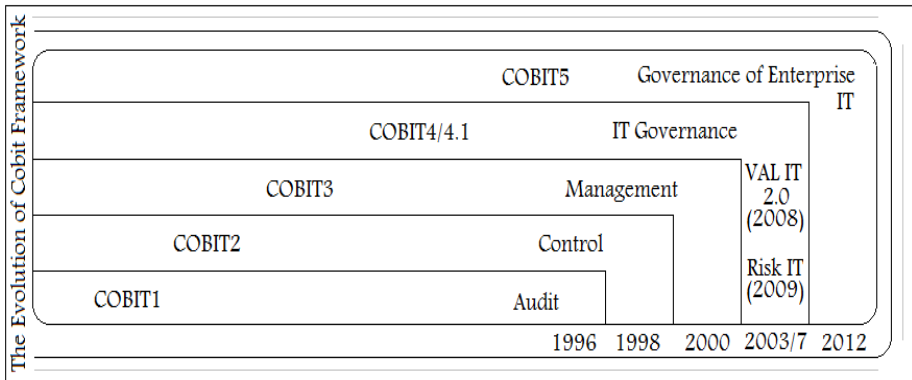


Figure 1: Evolution of COBIT Framework

Source: prepared by the author

COBIT 5 is a complete, globally accepted framework for governing and managing Enterprise Information and Technology (IT) that supports enterprise executives and management in their definition and achievement of business goals and related IT goals. COBIT 5 describes five principles and seven enablers that support enterprises in the development, implementation, and continuous monitoring and improvement of good IT-related Governance and Management practices (See in [3]).

2. The objective of the dissertation

This dissertation designed in order to illuminate the absolute theory related to the IT governance concept, encompassing all of its aspects, according to the latest international standards, policies, and procedures adopted recently by most of the financial sectors in the local Jordanian and international markets. Additionally, it sheds light on the importance of cloud computing methodology, covering its general growth and expansion directed to simplify the execution practices and management methods related to Information Technology environment. Moreover, this dissertation is clarifying one of the essential concepts of (IT Operational Risk), that is considered as a crucial role in any risk division at any organization by concentrating only on three main event types based on Basel II international business standard clarifying its impact on the daily operational practices and role of work in any institution.

After all, the most recent important framework related to IT governance (COBIT 5) was included, where I exposed the general effect of this framework on the entire financial sector in the region. Such a huge framework is used to maximize the work controls and maintain simplicity of the daily work processes for all of the related Departments especially the IT division in any institution according to the international standards and regulations stated by the authorities such as CBJ (Central Bank of Jordan), specifically in our case.

Several main questions derived from the main content of the whole research in order to shed light on the key major objectives obtained:

1. Does the MENA Region have sufficient contributions of publications in the fields of IT Governance, COBIT, IT Audit, and IT risk?
2. Does the amount of contributions reflect the current value of knowledge and awareness adopted recently in the MENA Region regarding the IT Governance concept?
3. How strong is the correlation between the main concept of IT Governance and the other suggested related topics (Cloud Computing, IT Operational Risk, and COBIT 5)?
4. What is the main concept of Cloud Computing and how would it generally affect the financial sector in any region?
5. What crucial points should the institutions take into consideration in case they are willing to apply Cloud-Computing Methodology and what security procedures should they adopt?
6. Are Germany, the UK, and Hungary considered as leading countries in the domain of Cloud Computing, and what legislative authorities are responsible for such legalizations and regulations in those countries?
7. Is the Jordanian banking sector fully aware of the volume of risks related to the IT sector, which surrounds its internal working policies and procedures?
8. Do the specialists in the Jordanian banks accurately estimate the allocation of capital (reserve) needed to afford the loss generated by event types related to IT Operational Risk?
9. What is the status of the Jordanian banking sector concerning COBIT 5?
10. How efficient and sufficient is the COBIT 5 framework concerning the improvement of the Performance of the Jordanian Banks?
11. Does the implementation of COBIT 5 framework affect the related departments in the entire institution equally?
12. How valuable are the results of COBIT 5 Framework compared to the amount of money invested on implementing such a framework in any institution?
13. Does the maturity level of deploying COBIT 5 framework directly affect the profitable variables (ROA, ROE) of the banks in the Jordanian financial sector?

3. Conceptual framework

The model in the figure below clarifies the dimensions of COBIT 5 framework affecting the financial performance in the banks sector.

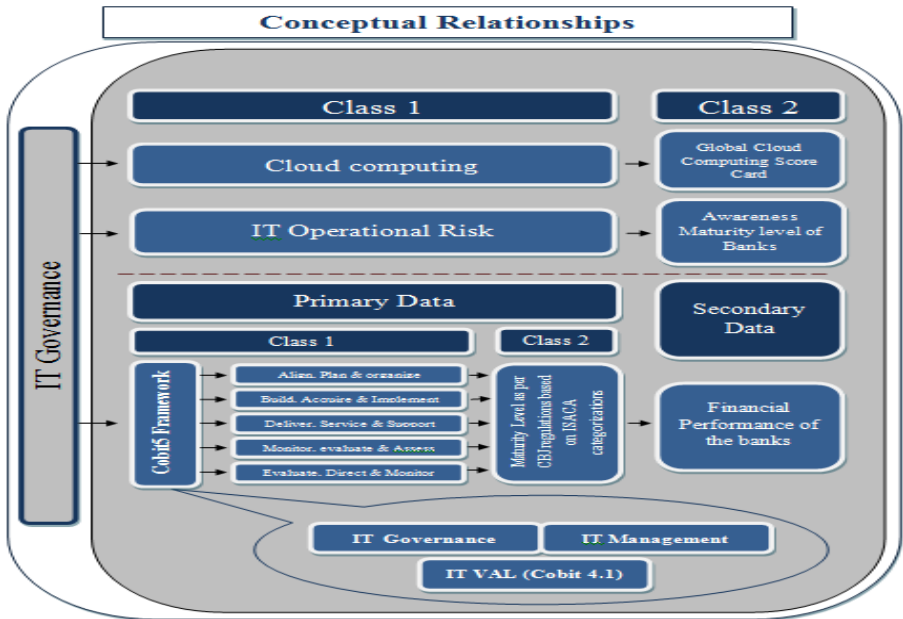


Figure 2: Thesis conceptual relationship.

Source: prepared by the author.

4. Methodology

4.1 IT Governance

4.1.1 Design and Methods

A comparison study has been conducted in order to understand the current and previous studies targeting the Public, Private and governmental sectors in MENA region countries through a desk-based research method performed to analyze related articles focusing on IT Governance / Audit and COBIT frameworks and technologies used to mitigate operational, management and all other different types of risks.

MENA is an English acronym referring to the “Middle East and North Africa” region. The term MENA covers a wide region; it extends from Morocco to Iran and includes all Middle Eastern countries (Mashriq and Maghreb countries). This geographical acronym is roughly the same definition of the “greater Middle East”.

4.1.2 Research Population and Sample

While sampling hundreds of published articles, books, and conferences aiming to find related articles aligned with the goal of the study, the result showed 38 out of 150 related articles were found in the final total and are listed

4.1.3 Data Collection

Through my work, data has been collected targeting more than 150 different articles published in various academic and professional journals, periodicals, and conference papers including master's and PhD theses as well. Limited to the information provided through many online platforms, data has been filtered according to its scientific values, the relation to the targeted concept and the age of the publication, concentrating on the papers related to IT governance concept published in valuable magazines between 2006 through 2017.

4.1.4 Data Analysis

As per the interests of researchers focused on some sectors rather than others, as well as their contribution studies on IT Governance, COBIT framework and other related topics, sections have been divided according to sectors in the MENA region including but not limited to some general sectors; Banking, Governmental, Telecom, Health, and Industrial.

4.2 Cloud Computing

4.2.1 Design and Methods

This comparison study used meta-analysis design to elucidate the main concepts of cloud computing theory utilizing the most well-known regulations issued through a number of legislative authorities in three European countries (Germany, Hungary, and the UK) such as:

- 1- Financial conduct Authority (FCA), Prudential Regulation Authority (PRA), Data Act Protection (DAP), UK Government regulations, Bank of England.
- 2- Hungarian National Bank (MNB), Hungarian Financial Supervisory Authority (HFSA), National Authority for Data Protection & Freedom of Information in Hungary.
- 3- Federal Office for Information Security (BSI), German Federal Data Protection (BDSG)

Additionally, an assessment has been made based on the BSA Global Cloud Computing Scorecard 2016 (of which Germany and UK were a part of), excluding the data procured when specialists in the MNB authority (Hungary) were surveyed to gain relevant responses based on some main sections in the Global BSA survey,

4.2.2 Research Population and Sample

Out of the available BSA (Global Cloud Computing Scorecard) of 24 different countries, I have sampled three European countries (Germany, Hungary, and the UK) according to their legislative authorities. This comparison study was conducted concentrating on the most six essential points that must be taken into consideration should one opt to apply Cloud computing services in any given sector. Additionally, through my work, 27 questions were derived based on the previously mentioned BSA

Scorecard in order to measure the maturity level of readiness between the countries in question.

4.2.3 Data Collection

A large amount of data was collected and analyzed through my work according to the following six most important sections that have been considered in the comparison study due to their essential influence on cloud computing services implementation:

- Regulatory Considerations & International Standards
- Risk Management
- Data Security and Data protection
- Effective Access to Data & Business Premises
- Change Management and Continuity Plan
- Exit plan

On the other hand, based on the aforementioned fractional assessment (questionnaire) that was derived from the BSA 2016 Global Cloud Computing scorecard, some major questions were proposed in order to investigate the extent of aptitude, disposition, and inclination of those three EU pre mentioned countries in implementing and hosting Cloud computing services. Those questions were then divided into seven main fields as follows:

- Data privacy (8 questions)
- Security (3 questions)
- Cybercrimes (3 questions)
- Intellectual property rights (5 questions)
- Support for industry – led standards & international harmonization's of rules (4 questions)
- Promoting free trade (3 questions)
- IT readiness broadband deployment (1 question)

4.2.4 Data Analysis

As my work shows, three main legislative authorities have been targeted in three European countries and with regulations prioritized, the six most important sections were focused on. A comparison study according to those regulations in said three European countries has been prepared based on those authorities resulting with the six sections mentioned above. Appropriate solutions in several categories have been proposed in case cloud computing would be required.

Additionally, through my work, 27 questions were derived based on the previously mentioned BSA Scorecard in order to measure the maturity level of readiness between the countries in question. Those proposed questions were divided into seven sections then weighted based on their importance and impact on cloud services.

As noticed earlier, each field of the seven listed previously contains several questions equaling different weights and subtotaled to equal 100% per section, calculated based on the following equations:

$$1^{\text{st}} \text{ Equation: } Qw = \frac{Im1 * Im2}{Tn}$$

Assuming that Qw stands for the Question's weight, Im1 stands for the value of Importance, Im2 stands for the value Impact and finally Tn stands for Total number of questions.

$$2^{\text{nd}} \text{ Equation: } R = \frac{Qw * L}{100}$$

Assuming that R stands for the Ratio, L stands for the Likert scale value based on three levels (Yes = "100", Partial = "50", No = "0").

As a pre-final step, each field has been weighted according to its importance and based on the BSA report with a combined sum of 100 % as follows:

- Data Privacy "10%",
- Security "10%",
- Cybercrime "10%",
- Intellectual Property Rights "20%",
- Support for industry-led standards "10%",
- Promoting Free Trade "10%",
- IT Readiness "30%"

As the final step, the sum of the above detailed values related to each country was calculated to identify the readiness, capability, and maturity level for each specific country in that regard.

4.3 IT Operational Risk

4.3.1 Design and Methods

Cooper and Schindler define research design as the blueprint for the collection, measurement, and analysis of data. Some studies adopted the cross-sectional descriptive research design. Cross-sectional studies are carried out once, which represent a snapshot at one point in time (See in [4]). Most of the survey designs provide an in-depth account of events, relationships, experiences/processes accruing in that particular instance (See in [5]).

This design was preferably adopted through my study because it offered the opportunity to collect data covering the IT operational risks in several private banks in the Jordanian financial sector at one point in time. It was also adopted as it allowed me to describe the phenomenon as it was, in its environment without any manipulation. It also allowed greater flexibility in terms of time and money, as well as the tendency to produce a high response rate. These reasons justified the use of this design in my study.

Based on the directions of both of the Central Bank of Jordan (CBJ) & the Association of Banks in Jordan (ABJ), a qualitative survey study was distributed in order to measure the current maturity of the local financial sector regarding the level of awareness related to these three main points as follows:

- Impact and criticality of risks caused by incidents related to Information Technology.
- Losses classified based on the three main particular event types related to IT Operational Risk according to Basel II accord.
- Annual allocation of a reasonable cash amount (reserves) based on the accurate estimation of losses caused by IT Operational risks and incidents.

4.3.2 Research Population and Sample

The sample is the portion or the subset of the research population, is selected to participate in a study, which represents the research population (See in [6]). My survey targeted all banks in the Jordanian financial sector asking several questions regarding three main event types related to the IT Operational risk role of work according to the Basel II accord and other international standards.

4.3.3 Data Collection

Conclusively, for the main questionnaire results, the primary data was collected directly from the banks' administrators, IT systems' administrators, managers, and auditors. The data was collected by use of a closed-ended questionnaire with separate sections covering each of the objectives and event types. The initial three sections collected the general information related to the correspondents. The fourth section collected data on objective one (IT Operational risk / event type 1/ External Fraud). The fifth section collected data on objective two (IT Operational risk / event type 2/ Damage to Physical Assets). The last section collected data on objective two (IT Operational risk / event type 3/ Business Disruption and Systems Failures).

4.3.4 Data Analysis Design

Twenty-two responses from most of the targeted banks working in Jordan were received successfully and analyzed. Several methods are known to calculate the reserve needed for operational risk in the literature as well as in the regulations (see e.g. Basel II). I used the so-called Loss Distribution Approach, which is among the Advanced Measurement Approach in the Basel terminology. This method, among the most developed ones, gives a reserve highly depending on the actual risk the institution has taken (since the Value at Risk is calculated for the total claim distribution). In the LDA, the total loss (or claim) distribution is modeled by a compound distribution, usually compound Poisson distribution, where the individual losses (claims), say. X_i for loss i , are independent and identically distributed, usually with positive loss distribution. Furthermore, the number of losses, also known as simply 'frequency', is a nonnegative

integer valued random variable, say, N , and it is together with the individual losses is assumed to form an independent set of random variables. Thus, the total claim is clearly $S = X_1 + X_2 + \dots + X_N$.

In this case, S is said to follow a compound distribution. If N has id Poisson distribution, then S has a compound Poisson distribution.

The most common choice for the individual loss distribution is the lognormal distribution. In operational risk, we often face the problem of small sample size from the last years. Hence, it is difficult to use sophisticated statistical methods for selection of distributions. The errors of the parameter estimations might also be rather large. Thus, as it is usual in the literature and in the practice, for such cases one can choose the compound Poisson model with lognormal individual loss distributions. Our calculations are also based on this choice for the same reasons.

Hence, based on the descriptive statistics of the survey we calculated the parameter estimates of the 3 parameters of the model. Clearly, the Poisson parameter is estimated by the average number of losses per a certain period. For the lognormal parameters (in what follows, they are referred as μ and σ) we used 2 statistics from the survey: the average size of the individual losses and the ‘maximum’ loss they can imagine. The latter one - as usually done in practice - is identified by the 95% quintile of the lognormal distribution. Based on these two estimations we simply calculated the estimation for the two parameters. This was derived from the following equations:

$$\begin{aligned} \text{➤ } \sigma_{1,2} &= Z_{1-\alpha} \pm \sqrt{Z_{1-\alpha}^2 - 2 \ln \frac{q}{m}} \\ \text{➤ } \mu_{1,2} &= \ln q - \sigma * Z_{1-\alpha} \\ \text{➤ } \text{Mean} &= \exp\left(\mu + \frac{\sigma^2}{2}\right) \end{aligned}$$

Note that one could of course directly ask for the average individual loss and the variance or the standard deviation of the losses in the survey. That would be ideal from mathematical point of view since we could directly obtain the estimations of the first two moments of the individual loss distribution and then –as in the method of moments—just calculate the corresponding parameter estimates. However, it is not realistic that even experts are able to estimate the second moment based on their experience. It is much more realistic that they could estimate a kind of maximum loss.

Finally, as per the above and based on the fitted compound distribution, I calculated the Value of Risk (VaR) that will show the reserve needed at a certain confidence level. Since there is no formula for the quantile of the total loss, I apply Monte Carlo estimation to estimate the VaR.

4.4 COBIT 5

4.4.1 Design and Methods

My study uses the quantitative approach to an evaluation of the COBIT 5 framework. Burns and Grove underline that designing a qualitative study helps researchers to plan and implement said study in a way that will help them obtain the intended results, thus increasing the chances of acquiring the information that could be associated with the real situation (See in [7]). The use of my questionnaire was designed after some guidance and directions from professionals in ABJ (Association of Banks in Jordan) and reviewed by experts in CBJ (Central Bank of Jordan) based on some past-related studies that are adapted in order to partially meet the focus of this study. Said data is then collected directly from the respondents of the online questionnaire.

4.4.2 Research Population and Sample

A survey study was distributed on the 26 local and foreign banks in Jordan. The idea of this survey was supported by the Central Bank of Jordan (CBJ) as well as the Association of Banks in Jordan (ABJ). Such results are important to measure the current commitment value of the Jordanian banks regarding the CBJ regulations related to COBIT 5 Framework. Moreover, indicators highlight the maturity level in the Jordanian banks' sector regarding such international framework, particularly after passing more than 2 years since the first issuance and announcement of the CBJ regulations.

4.4.3 Data Collection

My questionnaire was designed to gather information from the respondents of general managers, department managers, and audit managers etc. in banks operating in the Jordanian market using a questionnaire adapted from prior literature. Johnson and Turner clarify that data collection is “a method of gathering information from respondents about attitudes, knowledge, and beliefs” (See in [8]). Through my questionnaire, a Likert scale is used to obtain the answers to the questions. Likert is a measurement of the metrics used to measure trends in the respondents' opinions. It implies a Likert scale of a five-degree answer to each interviewed question (ranging from not reached, slightly reached, partially reached, largely reached, and fully reached) which is represented numerically (1 to 5). To verify the veracity of the study tool, I presented the questionnaire to five experts, making the tool more accurate and objective as a measurement. The main determination of the questionnaire was to verify the following:

- The bank's awareness based on the international standards related to the IT Governance frameworks.
- The bank's compilation and maturity level regarding the CBJ regulations related to COBIT 5 framework.

The indicators of financial performance in the Jordanian financial sector compared to the investments allocated for COBIT 5 Framework

4.4.4 Data Analysis

The data collected was analyzed using different statistical techniques, which were determined by the research objectives and goals. The data analyses of this study were defined into two phases. The first phase is the pilot study with just 4 respondents to test the reliability and content validity of the instrument designed using Statistical Package for Social Sciences (SPSS) software.

In the main analysis, for data analysis and hypothesis testing, SPSS was the software used, including the following analyses: descriptive statistics used to summarize and describe the key features of the sample data such as frequencies, percentages, means, standard deviations, and ranges. Descriptive analysis was carried out to present the raw data into a form that made it easily understood and interpreted. To present the response on the major variables under investigation, a descriptive statistic (mean value and standard deviation) for all variables of interest were obtained.

5 Results and Findings

5.1 IT Governance

Most of the created tables in the thesis concentrated on all of the used material in the research focusing on many points especially the year of publishing, subject of the material, publishing country and domains that were mainly targeted in our study, keeping into consideration that all of the detailed results and findings are clarified and explained in the Appendix.

According to the results above, following are sample of the findings below that were gathered into sections according to the annual dates of publications:

(2006-2008)

- From early 2006, Saudi Arabian researchers had begun publishing articles concentrating on the IT Governance theory revealing required facts in order to measure the awareness level in that regard.
- In 2007, two main studies have been carried out in Saudi Arabian and Kuwaiti institutions regarding ICT and IT Governance of which both studies concentrated on the readiness for deploying an electronic future. Abu Musa clarified that the IT Strategy should be aligned with the organizational strategy by the help of the IT resources in a responsible matter to achieve better governance (See in [9]).

(2009-2011)

- In comparison between the Saudi Arabian, Iranian, and Jordanian published studies in the years 2009- 2011, Jordan lead in the first level of understanding and implementing IT Governance in several areas, especially in the banking sector. Ghazanfari clarified that governmental banks in Iran lost their desire for hosting E-commerce due to the lack of competition in adopting mandatory rules and regulations of ITG in different sectors (See in [10]).

- Yarifard clarified that after applying COBIT framework in many banks of the region, the revelation showed that most of them did not exceed the third maturity level based on the processes' definition in the CMMI (See in [11]).

(2012-2013)

- Afterwards, in 2012 and 2013 many studies were conducted targeting different sectors in several MENA countries such as Jordan, Oman, Iraq, UAE, Saudi Arabia, Algeria, and even Palestine. They focused on IT Governance and COBIT framework going through ICT Governance, IS, and IS governance (See in [12]).

- Salim and Othman focused on the health sector in Mosul, Iraq and explored some critical points that influence the role of effective implementation of IS Governance in that country due to the lack of DR plans and BC plans, written information security policy, and risk assessment procedures (See in [13]).

(2014-2015)

-A large group of researchers in the MENA region focused their studies on IT Governance and COBIT framework during 2014 to 2015 with belief of its importance in causing the success of any institution, especially after the expansion of using such frameworks, particularly after the release of last version of COBIT in 2012 (also known as COBIT 5).

-As Al Ramahi focused on COBIT 5, he clarified that executives must ensure that information technology works with the greatest possible efficiency to help achieve strategic goals and objectives in Jordanian organizations (See in [14]).

(2016-2017)

-Finally, during 2016-2017, several researchers in countries behind the online curve overwhelmingly felt responsible and continued to investigate IT Governance performance in their market (Lebanon, Bahrain, and Morocco). Then by conducting empirical studies on both public and private sectors arriving to the conclusion that IT directors and managers are more knowledgeable about COBIT, ITIL, ISO 17799, PAM Book, and Balanced Score Card approaches in comparison to employees in Lebanese organizations.

5.2 Cloud Computing

5.2.1 Discussions & Comparison Study

The most six important sections that have been considered in the comparison study due to their essential influence on cloud computing services implementation are as follows: (See in [15-18])

5.2.1.1 Regulatory Considerations & International Standards

Initially, the British point of view is that institutions should have a documented business case to support the decision of outsourcing considering any relevant regulatory obligations, as well as probable risks and remain certain that the outsourced agreement will not worsen the firm's operational risk. Vital for regulation determination while keeping in mind this jurisdictional key point, the contract also should guarantee the auditors and regulators' effective access to data and business premises in case the service provider is located out of the U.K. On the other hand, adherence of the provider to the international standards is demanded, taking into account the importance of external assurance since it might be more relevant regarding the well-understood standards and stabilized assessed services in data centers.

5.2.1.2 Risk Management

Comparatively, other parties in Hungary strengthen the concept of the IT risk analysis to meet the requirements in cloud service security principles and phases of service's lifecycle. This would be achieved by operating controls either by the institution or by the service provider, as what was agreed upon by the signed contract, whereas the institution shall manage risks causing regulatory noncompliance with risk mitigation actions. This defines the level of required assurance according to the risk level of the areas involved.

5.2.1.3 Data Security and Data protection

On the other hand, German experts reassure that the security of cloud services is an ongoing task so data of the cloud customer should only be processed; stored, and backed up outside the contractually agreed locations, only with the prior express written consent of the cloud customer. The cloud provider must use secure network protocols for the import and export of information as well as for the management of the service in order to ensure the integrity, confidentiality, and availability of the transported data. Moreover, the requirements for the protection of personal data according to BDSG (German Federal Data Protection Act) or the EU Data Protection Directive boil down to the following: Legal permission/consent, Direct collection, Data minimization, Purpose limitation, Transparency, etc.

5.2.1.4 Effective Access to Data & Business Premises

Regulated firms should require effective access for the auditors, regulators, and relevant competent authorities to data related to its outsourced activities offered by service providers as UK expert parties advise. As such, regulated firms detect these notification requirements on accessing data and should be reasonable without restrictions on auditors and regulator's access, since they must treat any information

disclosed in accordance with the confidentiality obligation set out in (FSMA)¹. Simultaneously, contracts should enable them to contact the service provider directly in case a firm cannot disclose data for any reason. In addition, in some cases, contracts must allow business premises' access relevant for the exercise of effective oversight, apart from that it is preferable to provide reasonable prior written notice before the time of this visit. This is valid except when there is an emergency or crisis situation at times when the scope of visit could be limited only to the services that are used by the firm's group.

5.2.1.5 Change Management and Continuity Plan

However, Hungarian authorities advise institutions to obtain regular assurance of the cloud service provider's compliance with the data security and protection requirements, which should be obtained at least annually or after any significant changes in the relevant business process, service, configuration or legal environment. Knowing that, some institutions might rely on independent third parties' audits or certifications for obtaining such kind of assurance.

5.2.1.6 Exit plan

Finally, German experts advise that to maintain business continuity, the institutions should simply carry out the following several steps that should be defined in the action plan and exit strategy during the exit process:

- Installation of migration tools;
- Testing the downloading of the data in a test environment;
- Downloading the data in the production environment, and taking back the service based on the scripts;
- Validating based on the acceptance criteria; verifying the correctness of the data taken back; and closing the migration;
- Follow-up for fixing errors after migration;
- After the successful exit from the cloud, deleting the data at the service provider, including both live, backup, and archiving environments according to the contractual conditions.

However, the service provider shall provide assurance (declaration) of deleting the data; Terminating the unnecessary IT and communication connections with the service provider.

¹The Financial Services and Markets Act is an Act to make provision about the regulation of financial services and markets; to provide for the transfer of certain statutory functions relating to building societies, friendly societies, industrial and provident societies and certain other mutual societies; and for connected purposes.

5.2.2 Analysis Results:

The content of the basic questionnaire above was derived from the BSA 2016 Annual Global Cloud Computing Scorecard of which some major questions were collected to investigate the extent of aptitude, disposition, and inclination of those three EU countries for implementing and hosting Cloud computing services.

Questions have been weighted due to their importance and impact on cloud services. They have been divided into seven main fields, each of which containing several questions possessing different weights with a summation of 100% per section. Each field has its own different weight with a total of 100% based on COBIT 5 framework as the following: Data Privacy “17%”, Security “21%”, Cybercrime “22%”, Intellectual Property Rights “9%”, Support for industry led standards “9%”, Promoting Free Trade “8%”, and IT Readiness “14%”. See figures below.

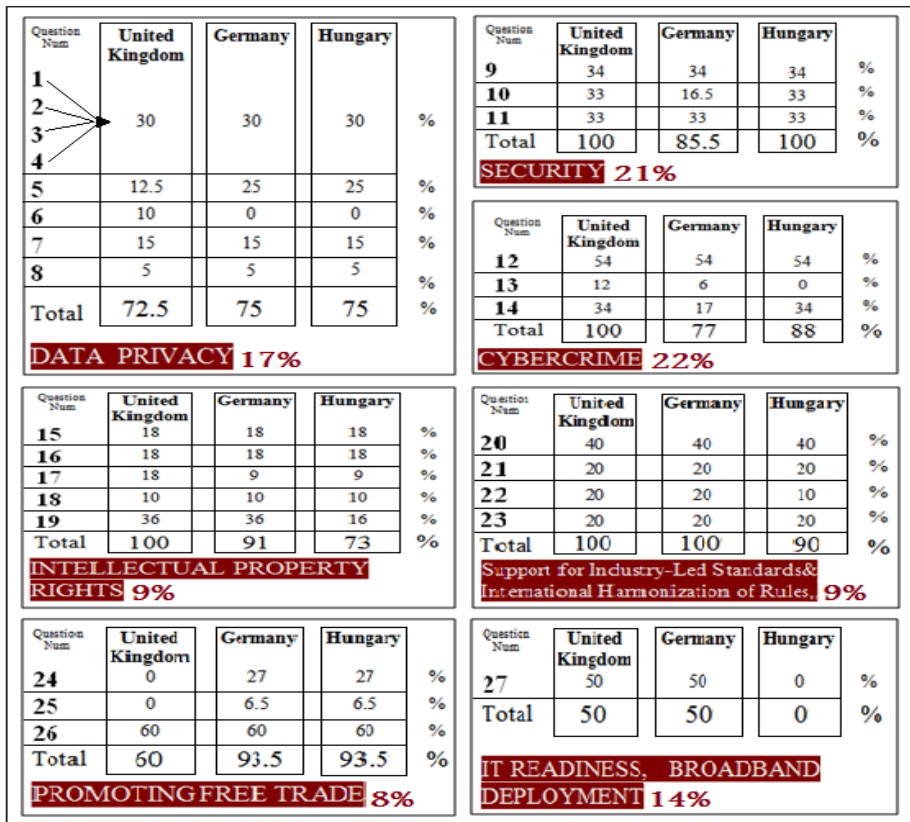


Figure 3: Cloud Computing - Survey Results - 7 main fields

Source: prepared by the author

	United Kingdom				Germany				Hungary			
	weight	*	Importance	= Value	weight	*	Importance	= Value	weight	*	Importance	= Value
1. Data Privacy	72.5	*	17%	= 12.325	75	*	17%	= 12.750	75	*	17%	= 12.750
2. Security	100	*	21%	= 21	85.5	*	21%	= 17.955	100	*	21%	= 21
3. Cybercrime	100	*	22%	= 22	77	*	22%	= 16.940	88	*	22%	= 19.360
4. Intellectual Property Rights	100	*	9%	= 9	91	*	9%	= 8.190	73	*	9%	= 6.570
5. Support for Standards & international Rules	100	*	9%	= 9	100	*	9%	= 9	90	*	9%	= 8.10
6. Promoting Free Trade	60	*	8%	= 4.80	93.5	*	8%	= 7.480	93.5	*	8%	= 7.480
7. IT Readiness, BroadBand Deployment	50	*	14%	= 7	50	*	14%	= 7	0	*	14%	= 0
	Total Percentage % = 85.125				Total Percentage % = 79.315				Total Percentage % = 75.260			

Figure 4: Percentage of calculations- Cloud Computing

Source: prepared by the author

As a result, we can calculate the individual average for each section separately for each country aside, as follows:

- Germany total ratio = (79.315%)
- Hungary total Ratio = (75.260%)
- United Kingdom total ratio = (85.125%)

The above values show that United Kingdom is still considered as one of the leading countries concerning readiness and showing ability of implementing such cloud services. Nevertheless, Germany highly competes with the others in some major fields such as “Data Privacy” and “Promoting Free Trade”, where the country rises above the UK. Furthermore, it is also worth mentioning that “Data Privacy” is considered as one of the most important requirements for a healthy implementation process of Cloud solutions. Finally, due to the previous values, Hungary notably supersedes the other two competing countries in that regard, defeating Germany in two other fields (“Security” and “Cybercrime”).

5.3 IT Operational risk

Discussions & Comparison study

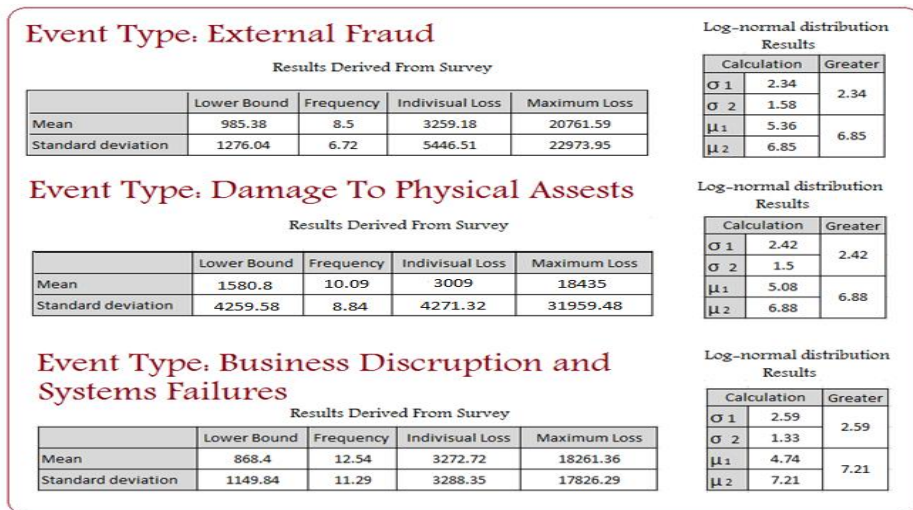


Figure 5: Results derived from survey - Log-normal distribution (IT Operational Risk)

Source: prepared by the author

As observed from Figure 5, some main results have been concluded as the following:

- For the first event type “External Fraud”, the figure highlights that the (Average) mean value of the lower bound is derived by a calculation completed by all of the banks equaling 985.38 JODs. This clarifies that the Jordanian banks do not acknowledge a loss incident less than the average of 985.38 JODs. Given that, the standard deviation value comes to 1276.04 JODs indicating an estimation showing large differences in loss values as the banks have different regulations.
- Regarding the “Frequency” column, it is defined as the number of occurrences repeated in a specific event type where it shows that the Mean value (as per the estimation by the specialist overlooking the “External Fraud” event type) equals 8.5 with a standard deviation value of 6.7, which represents the normal case in most of the Jordanian banks.
- Regarding the “Individual Loss” column, it is defined as the average expected amount of individual losses related to a certain event type. Specifically, in our case, we can conclude that the mean value (as per the estimation of specialists

regarding this specific event type) equals 3259.18 JODs, while the standard deviation value equals 5446.51 JODs which clearly shows a large value of standard deviation; proving a large difference in the estimated values related to this section remain.

- Regarding the “Maximum Loss” column, it is defined as the expected amount of the worst / largest loss. In our case, 20761.59 JODs is equal to the largest loss related to the “External Fraud” event type.
- As shown above in Figure 6, the average amount of Capital (Reserve) linked to the “Business Disruption and Systems Failures” event type in all of the Jordanian banks has been estimated by specialists totaling the amount of “2,033,095” JODs.
- In order to keep confidentiality for the Jordanian banks, it was prevented by the security protocols to expose the specific values of reserves related to each bank individually. Therefore, it was allowed only to show the total of the estimated values related to all of the Jordanian banks.

larger Result		Lower Estimation		Higher Estimation	
External Fraud					
Montcarlo		Montcarlo		Montcarlo	
lam	8.5	lam	7	lam	15
mu	5.36	mu	5.36	mu	5.36
sigma	2.34	sigma	2.34	sigma	2.34
M	1000000	M	1000000	M	1000000
Quantile	99.90%	Quantile	99.90%	Quantile	99.90%
Reserve	1226619	Reserve	1056908	Reserve	1638737
Damage To Physical Assests					
Montcarlo		Montcarlo		Montcarlo	
lam	10.09	lam	8.99	lam	17
mu	5.08	mu	5.08	mu	5.08
sigma	2.42	sigma	2.42	sigma	2.42
M	1000000	M	1000000	M	1000000
Quantile	99.90%	Quantile	99.90%	Quantile	99.90%
Reserve	1331915	Reserve	1252993	Reserve	1807299
Business Disruption and Systems Failures					
Montcarlo		Montcarlo		Montcarlo	
lam	12.54	lam	10	lam	20
mu	4.74	mu	4.74	mu	4.74
sigma	2.59	sigma	2.59	sigma	2.59
M	1000000	M	1000000	M	1000000
Quantile	99.90%	Quantile	99.90%	Quantile	99.90%
Reserve	2033095	Reserve	1774688	Reserve	2773473

Figure 6: Main events types results (IT Operational Risk)

Source: prepared by the author

For retaining more acute results, I assumed that the specialists have underestimated the values of losses related to the previously mentioned event types and based on that, similar calculations were completed using the same variables but changing the LAM

(Frequency) value with a lower estimation on one side and a higher estimation on the other, resulting with the following:

- By estimating the LAM (frequency) segment with a lower value, the reserves slightly change with low effect on the essential calculation; but in contrast, the high estimation of the LAM (frequency) segment will significantly be affected with a higher value of needed reserves.
- Consequently, there is a definite risk when underestimating the volume of loss caused by such event types since such an act would result in a massively negative effect on the business role inside any institution, while noting that a high level of awareness is highly needed in that topic.

5.4 COBIT 5 Framework

Table 2 below shows the results of the previously conducted survey indicating the deployment’s maturity level of the COBIT 5 framework in the Jordanian banks’ sector. It clarifies the mean values (Maturity levels) for the 37 processes divided into 5 main sections (APO, BAI, DSS, MEA, and EDM).

Process Name	APO01	APO02	APO03	APO04	APO05	APO06	APO07	APO08	APO09	APO10	APO11	APO12	APO13	APO
														Total
AVG	2.8	3.2	2.8	2.9	2.9	3.0	3.1	3.1	3.1	3.0	2.9	2.8	2.9	3.0
Median	2.5	3.0	2.8	3.0	2.8	3.0	3.0	3.0	3.0	3.0	3.0	2.8	2.7	2.9
SD	0.539	0.557	0.454	0.428	0.460	0.439	0.608	0.410	0.411	0.501	0.518	0.591	0.435	0.5
Process Name	BAI01	BAI02	BAI03	BAI04	BAI05	BAI06	BAI07	BAI08	BAI09	BAI10	BAI			
											Total			
AVG	3.0	3.1	2.9	2.9	3.0	2.7	3.0	3.0	2.9	2.7	2.9			
Median	3.2	3.0	2.8	2.7	3.0	2.8	3.0	3.0	3.0	3.0	2.9			
SD	0.529	0.423	0.548	0.489	0.501	0.655	0.402	0.357	0.443	0.448	0.5			
Process Name	DSS01	DSS02	DSS03	DSS04	DSS05	DSS06	DSS							
							Total							
AVG	2.9	2.9	2.7	3.0	3.0	2.9	2.9							
Median	3.0	3.0	3.0	3.0	3.0	2.7	2.9							
SD	0.432	0.413	0.558	0.396	0.388	0.356	0.4							
Process Name	MEA01	MEA02	MEA03	MEA										
				Total										
AVG	2.7	2.7	3.1	2.8										
Median	2.8	2.8	3.0	2.9										
SD	0.670	0.664	0.397	0.6										
Process Name	EDM01	EDM02	EDM03	EDM04	EDM05	EDM								
						Total								
AVG	2.8	3.0	3.1	2.8	2.9	2.9								
Median	3.0	3.0	3.0	2.7	3.0	2.9								
SD	0.548	0.355	0.392	0.409	0.477	0.4								

Table 1: COBIT 5 Processes (AVG, Mean, and SD) Table - Jordanian Banks’ Sector.

Source: prepared by the author.

The right section of the above table clarifies the 5 main values of maturity levels seperated into the main sections of the COBIT 5 framework according to the 23 banks

responses, as previously mentioned. The table clearly shows that the higher value belongs to the APO main process, while the lowest value belongs to the MEA main process. Conclusively, in the initial stage of the project the majority of the Jordanian banks are concentrating on deploying the APO (practical) part of the COBIT 5 framework (Align, Plan, and Orgnize) rather than the MEA (control) part of the framework process (Monitor, Evaluate, and Assess).

Paired Samples Correlations (ROE, ROA, Net Profit)

Correlations

		Admin	Audit	Compliance	Finance	High Mang.	HR	IS	IT	PMO
ROA_2017	Pearson Correlation	,197	-,165	,391	,155	,074	-,019	,170	,150	-,003
	Sig. (2-tailed)	,368	,452	,065	,479	,738	,931	,438	,496	,990
	N	23	23	23	23	23	23	23	23	23
ROA_2016	Pearson Correlation	-,010	-,031	,055	,118	,063	-,154	,052	,124	,098
	Sig. (2-tailed)	,964	,889	,802	,593	,776	,483	,814	,573	,656
	N	23	23	23	23	23	23	23	23	23
DIF_ROA	Pearson Correlation	,293	-,194	,484*	,067	,023	,174	,174	,051	-,132
	Sig. (2-tailed)	,174	,375	,019	,761	,916	,428	,426	,817	,549
	N	23	23	23	23	23	23	23	23	23
ROE_2017 ROE_2017	Pearson Correlation	,196	-,073	,304	,266	,236	-,067	,130	,110	,106
	Sig. (2-tailed)	,370	,741	,158	,219	,278	,762	,554	,618	,630
	N	23	23	23	23	23	23	23	23	23
ROE_2016	Pearson Correlation	,094	,089	,067	,320	,280	-,072	,118	,177	,253
	Sig. (2-tailed)	,669	,685	,763	,137	,195	,745	,592	,420	,245
	N	23	23	23	23	23	23	23	23	23
DIF_ROE	Pearson Correlation	,157	-,273	,382	-,118	-,098	,015	,008	-,126	-,263
	Sig. (2-tailed)	,474	,207	,072	,592	,655	,946	,969	,568	,225
	N	23	23	23	23	23	23	23	23	23
Net_Profit_2017	Pearson Correlation	,171	,190	,020	,228	,264	,104	,136	,204	,223
	Sig. (2-tailed)	,435	,386	,929	,295	,223	,636	,537	,351	,306
	N	23	23	23	23	23	23	23	23	23
Net_Profit_2016	Pearson Correlation	,132	,219	-,069	,246	,275	,092	,122	,201	,247
	Sig. (2-tailed)	,550	,315	,756	,258	,203	,675	,579	,359	,257
	N	23	23	23	23	23	23	23	23	23
DIF_Profit	Pearson Correlation	,284	-,021	,417*	,055	,107	,116	,144	,138	,025
	Sig. (2-tailed)	,190	,926	,048	,802	,628	,597	,512	,531	,909
	N	23	23	23	23	23	23	23	23	23

Table 2: Paired Samples Correlations (ROE, ROA, Net Profit)

Source: prepared by the author

The Paired Samples Correlation table highlight the information that departments score as significantly positive correlated pointing out that the highest correlation found was between the IT Department and Risk Department showing a value of (r = .904).

Based on several created tables in the main text including table 3 above, which were mainly derived from the essential results of the survey that targeted all of the banks in the Jordanian market. some interesting results were exposed as the following:

- The lowest mean value belongs to the MEA Group of Processes showing that most of the banks did not give the needed attention for this kind of process or that they might have faced serious difficulties in implementing such a process, knowing that the group of processes are mainly owned by the control departments additional to the PMO division, even though the SD gives an indicator that there are major differences between the banks' responses dissimilar to each other in this regard.
- The highest number between all of the average/means calculations belongs to the APO group of processes equaling the value of 3, clarifying that the majority of banks in Jordan highly comply with these types of processes implementation in all aspects of APO (Align, Plan, and Organize) found in the COBIT 5 framework, knowing that the largest part of this group of processes are mainly owned by the IT Department while the rest are related to the PMO, HR, Finance, IS and Administration Departments.
- High Standard Deviation values clarify large dissimilarities according to the specialists' responses based on the maturity level of the banks, as they have different assumptions regarding the recent achieved levels of processes' implementation. Nevertheless, the above figure clarifies that the MEA (Monitor, Evaluate and Assess) group of processes calculated the highest value of SD equaling 0.6 degrees, clarifying that most of the banks differ in their responses indicating that they slightly differentiate in their maturity level of implementing and complying with COBIT 5 regulations related to the MEA practices in all aspects.
- The APO02 process (Manage Strategy), owned by the IT department, retains the highest value of 3.2 degrees average, which might clarify that the most mature department during the implementation process of COBIT 5 framework would be the IT division in most of the banks based on being familiar with such standards since their role of work usually should depend on a well managed IT strategy aligned with the general strategy of the institution.
- The APO03 process (Manage Enterprise Architecture), owned by the project management department in some financial institutions, would be considered as the lower value of the average. This would be convenient in most of the cases since this process is usually built based on the general strategic plan of the institution, and implementing such a process would be complicated most of the time, which would be the reason why most of the banks are facing difficulties to deploy such a process.
- The APO04 process (that manages innovation) has received the lowest value of SD indicating that most of the banks' responses are highly similar in that regard,

making it the smoothest and most comprehensive process concerning an implementation phase.

- Finally, it is evident the MEA01 process (Monitor, Evaluate and Assess Performance and Conformance) has received the higher value of SD which indicates that majority of the banks had different viewpoint concerning this process since it measures the performance and conformance in the institution which would slightly vary by the bank's standard methods.

6 CONCLUSIONS AND RECOMMENDATIONS

Through this thesis, some theoretical frameworks were adopted to explore the importance of the IT Governance concept such as the Cloud Computing method, IT Operational Risk Conception and COBIT 5 Framework. In order to clarify the conclusion, results were gathered in sections as the following:

6.1 IT Governance - Conclusion

After conducting an empirical comparison study in order to analyze the scientific content of the previous and current scientific researches targeting the public, private, and governmental sectors in the MENA region, I concluded the following:

- The theoretical studies contribution in the MENA region targeting the IT Governance sector was concluded by 11 theoretical studies against 27 empirical studies in that regard.
- Since early 2006, several studies precisely targeted the IT Governance topic, but many researchers in the MENA region also paid early attention towards similar topics of this framework. The majority of those studies have been conducted empirically focusing on several types of sectors such as the banking sector with a percentage of 19% of all the targeted studies, additional to 8% representing the percentage of participation related to the governmental and telecom sectors.
- Jordan ranked first due to concentrating on the value of maturity interconnected with their awareness level, as well as their aim in deploying the IT Governance concept in several areas especially in the banking sector with 21% of all participant studies. Saudi Arabia ranked second with 18.4% in all types of research, and Bahrain placed third with 10.5% of the total participant studies.
- Several MENA region researchers concentrated on the IT Governance topic and concluded with participant studies equaling 57.8%, with 26.3% of the participants focused on COBIT articles, while the rest were counted with other related topics.
- A massive absence of participation by several countries such as Tunis, Yemen, and Libya occurred due to their economic instability and political situation.
- As a result of insufficient awareness and knowledge in the research field, it is extremely important to spread the cultural awareness in the MENA region regarding the importance/impact of the role that research plays, especially in the

field of IT Governance due to its huge effect on the development process in any institution.

- Extra effort should be placed in publishing scientific articles related to IT Governance and COBIT Frameworks targeting the Industrial and Health sectors in the MENA region.
- The COBIT 5 Framework is strongly linked to the IT Governance framework by reason of concentrating on the value of integrating the management and governance utilities in order to reach the extreme values of adopting IT techniques, policies, and procedures aligned with the general strategic plan of any institution.
- The remaining two subjects (Cloud Computing and IT Operational Risk) are partially connected to the IT Governance concepts, confirming their importance and sequential necessity for providing awareness of multiple types of threats/risks that might surround the IT division giving a chance for preparing a suitable IT environment and focusing on needed methods that mitigate risk and strengthen controls.

6.2 Cloud computing - Conclusion

By preparing and reviewing many publications and scientific articles, several points had been focused on in order to clarify the importance and accuracy of using the Cloud Computing method, since it is considered as an essential and valuable trend in recent years, yet most of the users underestimate its risk. The following are the main results:

- Cloud Computing is divided into several well-known types, such as Public Cloud, Private Cloud, and Hybrid Cloud.
- Public cloud is possibly represented by the “Software as a Service” model (SaaS) in which the service provider controls all of the elements in the cloud model.
- Hybrid cloud is possibly represented by the “Infrastructure as a Service” model (IaaS) and “Platform as a Service” model (PaaS) in which the institution and service provider share the responsibility of controlling the cloud elements
- Private cloud is considered as the most secured cloud option since it is completely managed by the institution itself.
- Community cloud is one of the most important and recent competing trends in the market, ensuring effectiveness and added security yet has not currently achieved one of the key goals of assuring reduction of expenses while using cloud services.

Regarding the Cloud Computing conducted research, I discovered that there are some key points that most legislative authorities in several countries agreed on in order to help institutions ensure constant and secure work procedures for the use of cloud computing services, specifically the outsourced ones, concluding in the following sections:

A. Regulatory Considerations and International Standards of cloud computing require these common objectives to be met:

- Relevant Regulatory obligations peculiar to Cloud computing services, focusing on Jurisdiction as where the service provider is located should be considered.
- An assurance of the effective access to Data and Premises by the authorized people/controllers, specifically on data related to the outsourced activities offered by service providers, should be guaranteed.
- Contracts should guarantee the rights of direct communication with the service provider in case beneficiary firms cannot disclose data for any reason and ensure access allowance to business premises that are relevant to the practice of “Effective Oversight” if needed.

B. Risk Management in cloud computing requires these common objectives to be met:

- Risk Assumption, Risk Avoidance, Risk Retention, Risk Transfer, and any other related strategy or related combination of strategies should be used and managed properly in similar institutions considering the Business recovery tactic in case of outsource provider failure, without neglecting any notification of breaches in the possible event of any unwelcome intruders.
- The roles of Risk Assessment and Risk Control are two of the most critical phases considered to be as an on-going task, which should be applied at least once annually due to its high effect on the success of the cloud service lifecycle regardless of which type of cloud service is used.

C. Data Security and Data Protection methods in cloud computing requires these common objectives to be met:

- Security Assessment and a Data Residency policy with the provider should be carried out by a firm, however, in case of using public clouding, data segregation and data sensitivity should be considered.
- The identification and appliance of security classification to data that is planned to be outsourced to the cloud service provider should be prepared accurately by the institution in line with the legal regulations with its own data protection rules.

D. Effective Access to Data and Business Premises in cloud computing requires these common objectives to be met:

- The institution is required to obtain an assurance that the cloud service provider adheres to the relevant data protection rules and legal regulations that are set by the legislative authorities in various countries in order to make new provisions for the regulation of processing of information related to individuals, including the obtaining, holding, usage, or disclosure of such information.

E. Change Management policy and Continuity Plan in Cloud Computing requires these common objectives to be met:

- A regular assurance of the cloud service provider's full compliance of the data security and protection requirements is required at least annually or after any significant changes are made to the relevant business process, service, configuration, or legal environment.
- In order to maintain well-functioning and healthy related work procedures, the Continuity Plan should be reviewed and adopted by higher level management in case of any disturbance in workflow, unexpected trouble, or failure of the service provider.
- It is essential for firms to have a comprehensive Change Management Policy establishing what provisions must be made for making future changes to technology service and methods of testing changes tasked to be carried out.

F. Exit plan in cloud computing

- It is essential to have a documented and fully tested Exit Plan to ensure the capability of exiting outsourcing plans without unexpected disruption to the firm's provision of services or unexpected compliance with regulatory regime in case of termination or transition to an alternative service provider.
- Focus should place on the importance of the obligations in the termination agreement that ensure the outsourcing provider cooperate with the firm for a smooth transition.

Additionally, based on the conducted survey derived from the BSA global list, the following was concluded on my behalf:

- The UK is still considered one of the leading countries concerning readiness and ability of implementing such cloud services.
- Germany highly competes with the other countries in some major fields such as "Data Privacy" and "Promoting Free Trade", where Germany rises above the UK in these regards.
- The "Data Privacy" section is still considered one of the most important requirements for a healthy implementation process of Cloud computing solutions, and notably, Hungary defeats the competing countries in that regard, also superseding Germany in two other fields (Security and Cybercrime).
- I discovered that Germany ranked third place on the BSA global list, while the UK ranked in ninth place, considered as leaders due to their infrastructure, flexibility, and readiness for adopting such a concept in most of the sectors. Unfortunately, Hungary did not place on this list, compared to the first 24 mentioned leading countries worldwide in cloud computing domain.
- On the other hand, I discovered that Hungary also competes on the level of regulations, assuring that most of the essential regulations related to Cloud Computing usage and methods are available and approved by the responsible authorities in Hungary.
- Public Cloud users should be aware that their information could be stored in a shared infrastructure. For this purpose, I propose that cloud service providers should

contractually agree to bear a financial burden in case of fraud occurrence according to their oversight or non-adherence to the regulations agreed upon, as well as a security assessment and data residency policy with the provider always carried out by the firm.

- I propose that different moderated rules should exist in place in order to regulate these cloud trends and in my opinion, a partnership be made among all European countries to act as an official unified party, which would be responsible for the creation of the regulations and standards that would suit the EU region. Such regulations would serve a better facilitation of cloud computing services due to the EU's unity, geographical proximity, and possible need to exchange such services among the EU countries.
- A classification and ranking for past/present cloud service providers should be completed based on their sufficient compliance to related regulations and standards in order to facilitate a process for the beneficiary organizations to choose the best match of cloud service providers for contracting matters. Also, it is worth mentioning that the risk of Jurisdiction location of the service provider is an essential matter in this case focusing on the sensitivity of data used by the governmental sector rather than the private sector while applying cloud computing.
- Extreme caution should be taken in the event that data belonging to the governmental sector might be used, transmitted, or stored, since such data is crucially sensitive and would affect the general safety standard in a country.
- A classification of the data that will be used in cloud services should be applied before the implementation phase regardless of what kind of cloud model that will be used.
- Finally, I suggest using a community cloud-computing model that groups institutions who share the same classification, business model, infrastructure, and community with common concerns, whether managed internally or by a third party, and either hosted internally or externally.

6.3 IT Operational Risk - Conclusion

The following shows results related to the IT Operational Risk topic:

- The majority of the Jordanian banks have gained sufficient awareness specifically related to the three important event types with a high maturity level in the related work procedures.
- I concluded that the "Business Disruption and Systems Failures" event type requires a capital (reserve) with an estimated total of 2.03 million JODs. This event type is considered vital, as it would affect the main role of businesses directly, possibly causing a detrimental collapse/termination of the daily work processes in case of high probabilities of occurrence.
- The estimation of Capital (Reserve) related to the two event types (External Fraud and Damage to Physical Assets) calculate lower than the third event type (Business Disruption and Systems Failures). This possibly portrayed a history of less harmful

outcomes while the estimation of occurrence of the first and second event types (Frequency) resulted in a lower average than the third event type, in all of the Jordanian banks.

- The estimated net profit during 2017 for the 22 banks targeted in my survey totaled approximately 514 million JODs, as per the recent declaration of the Association of Banks in Jordan (ABJ). Therefore, when comparing the results of their Allocation (Reserves), it is apparent that the specialists in the financial sector are too optimistic regarding the financial risks, especially during the years when the economical market was on the rise.
- The volume of needed Allocation (Reserve) related to the three specific event types previously mentioned are grossly being underestimated by the banks' specialists.
- My study reveals that there is a high probability of achieving similar results in adjacent countries. Therefore, it is my proposition that such a survey should be completed by similar banks in the MENA region to ascertain the necessary data that can yield actions required in the financial sectors in order to avoid massive losses related to such event types.
- The Jordanian banking sector pays careful attention to event types of IT Operational Risk as per the Basel II classification, keeping in consideration the differences between such event types. The following order of these event types is in accordance to their importance based on the concluded results:
 - 1st Business Disruption and Systems Failures
 - 2nd Damage to Physical Assets
 - 3rd External Fraud

In my opinion, it should be necessary for the Jordanian banks to give additional attention towards the expected IT Risk event types, especially the "Damage to Physical Assets" and "External Fraud" event types due to their critical impact on the business role in any institution.

6.4 COBIT 5 – Conclusion

The following shows results related to the COBIT 5 topic

- COBIT 5 Framework is considered as a comprehensive practice that includes 37 processes affecting more than 60 policies and 140 work procedures in any institution. Most of the related policies and procedures are linked to the IT services and activities, guaranteeing that nine departments are commonly related to the COBIT 5 Framework summarized by the IT, IS, RISK, HR, Administration, Compliance, Organizational, Finance, and Audit departments, additional to the higher-level management.
- This framework retains several major roles and responsibilities that should be clearly defined using the RACI model. Such a deployment requires continual practical improvements with small steps toward stabilization and effectiveness,

assuring maximum focus on changing and improving the people's behavior by scheduling professional training sessions, such as ITIL in order to increase the knowledge base of the related stakeholders and increasing their awareness regarding COBIT 5 processes, practices, and activities.

- Tasking such a project for applying the COBIT 5 framework in any institution requires commitment and effort from all of the related stakeholders/departments. This is dependent on a very detailed plan and specified milestones to measure achievements periodically in order to assess current situations and immediately correct the direction if necessary, since losing the road map of such a project might lead to some irreparable problems and even more conflicts.

While conducting my research within the period of 2 years after the CBJ (Central Bank of Jordan) regulations were declared related to the COBIT 5 Framework, my research concluded the following:

- Many significant indicators showed an acceptable level of awareness within the Jordanian banks regarding the importance of deploying such a framework and standards for the projected longevity of their current infrastructure and the health of their institutions.
- The majority of the Jordanian banks had faced several difficulties in the initial stages of the COBIT 5 implementation project. I have derived that the relationship between the COBIT 5 processes and financial performances of the Jordanian banks portrayed an insignificant relationship. This result is not in line with (Alramahi Nidal, Barakat Abdallah, Hossam Haddad (2014))
- It was through my research that a discovery of the total value of the COBIT 5 maturity level related to all of the Jordanian banks reached a level of 2.9 out of 5. This indicates that the majority of these banks are complying with their best efforts in the deployment process of the COBIT 5 Framework striving to achieve the required maturity level according to the CBJ regulations.
- The possibility of a positive correlation between the COBIT 5 Framework and the financial performance indicators related to the Jordanian banks is remarkably promising, given sufficient time for the results of implementing the related enhanced policies and procedures to come to fruition.
- My research reveals that the financial performance and profitability ratios of the majority of related Jordanian banks still demonstrate some bad indicators of "ROA", "ROE", and "Net Profits after tax" when being compared between the years of 2016 and 2017.
- Through my research, I have discovered that the most affected department while adopting the COBIT 5 Framework was the IT group concluding that approximately 40.5% of the practices were directly related to this division.
- Notably, my results of this analysis showed strong correlations between the IT and the other involved departments, which indicated that most of the affected

departments are related to each other sharing several concerns and responsibilities during the implementation process of the COBIT 5 Framework.

It is my proposition that this survey should be replicated/conducted annually targeting the whole sample of Jordanian banks or in any interested comparable countries in the region, in order to assure the increased awareness of the maturity level in the importance of deploying and understanding such a framework.

Finally, I strongly propose that the researchers in this field should continue studying and examining the COBIT 5 Framework further in several sectors in order to increase the value and volume of the academic contribution in that regard, clarifying the advantages of merging the concepts of management and governance within the IT sector.

Optimistically, it is my belief that such indicators of awareness regarding the IT Governance topic will increase dramatically, especially with the recent release of the new COBIT 2019 regulations.

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8 LIST OF FIGURES

Figure 1: Evolution of COBIT Framework.....	5
Figure 2: Thesis conceptual relationship.....	7
Figure 3: Cloud Computing - Survey Results - 7 main fields.....	18
Figure 4: Percentage of calculations- Cloud Computing.....	19
Figure 5: Results derived from survey - Log-normal distribution	20
Figure 6: Main events types results	21

9 LIST OF TABLES

Table 1: COBIT 5 Processes (AVG, Mean, and SD) Table -Jordanian Banks’ Sector.....	30
Table 2 : Paired Samples Correlations (ROE, ROA, Net Profit)	31

10 LIST OF PUBLICATIONS

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