


**تحديد مستوى حوكمة تقنية المعلومات المطبقة وفق إطار عمل (COBIT) في البنوك التجارية الليبية.**


**Determining The Level of Information Technology Governance Applied in Accordance with The Framework of (COBIT) in the Libyan Commercial Banks.**

**Assistant Prof. Dr. Tarek A. Elsharif<sup>1</sup>,**

**Associate Prof. Dr. Ali Altuğ Biçer<sup>2</sup>,**

**Associate Prof. Dr. Abdulaziz M. Elfessi<sup>3</sup>,**

<sup>1</sup>, Accounting Department, Libyan Academy – Benghazi,  
[dr.tarek.elsharif@lab.edu.ly](mailto:dr.tarek.elsharif@lab.edu.ly),  [orcid.org/0000-0002-2413-819X](https://orcid.org/0000-0002-2413-819X)  
(Corresponding author. Mobile: 00218-91 376 8150).

<sup>2</sup>, Business Administration Department, Istanbul Ticaret University – Istanbul,  
[abicer@ticaret.edu.tr](mailto:abicer@ticaret.edu.tr)  [orcid.org/0000-0002-5515-212X](https://orcid.org/0000-0002-5515-212X)

<sup>3</sup>, Statistics Department, University of Wisconsin-La Crosse – USA  
[aelfessi@uwlax.edu](mailto:aelfessi@uwlax.edu)  [orcid.org/0000-0002-0813-4148](https://orcid.org/0000-0002-0813-4148)



## المخلص:

هدفت الدراسة إلى تحديد مستوى حوكمة تقنية المعلومات المتوفرة في المصارف التجارية الليبية ، وفق نموذج (أهداف الرقابة للمعلومات والتكنولوجيا المرتبطة به (COBIT) والذي يغطي أربعة أبعاد متمثلة في: التخطيط والتنظيم ، الاستحواذ والتنفيذ ، والتسليم والدعم ، وأخيراً المتابعة والتقييم. حيث يعتمد COBIT نموذج أو طريقة المسح الإحصائي، لفهم مستوى تطبيق حوكمة تكنولوجيا المعلومات من خلال مسح آراء مديري المصارف التجارية الليبية العاملة في مدينة بنغازي - كعينة ممثلة لمجتمع البحث - بناءً على نموذج COBIT.

تم تطوير هذا النموذج من قبل معهد حوكمة تكنولوجيا المعلومات في عام 1992 في الولايات المتحدة الأمريكية، ويحدد هذا النموذج 34 هدفاً رفيع المستوى للتحكم في عمليات تكنولوجيا المعلومات. ويوفر هذا الإطار معايير مشتركة وقابلة للتطبيق ومقبولة لأمن تكنولوجيا المعلومات وممارسات التحكم الجيدة، وذلك من أجل دعم احتياجات الإدارة في تحديد المستوى المناسب لأمن تكنولوجيا المعلومات ومتابعتها، أيضاً يزود هذا الإطار المراجعين بمجموعة معترف بها من المقاييس والمؤشرات للحوكمة الرشيدة ، مما يساعدهم على التعبير عن آرائهم في المؤسسة.

تم توزيع 80 استبانة على عينة الدراسة التابعين للمصارف التجارية الليبية في بنغازي ، وتم استعادة 67 استبانة كلها كانت صالحة للتحليل الإحصائي، وبلغ معدل الاستجابة 84% ، وتوصلت الدراسة إلى أن المصارف التجارية محل الدراسة كانت عند المستوى المتوسط وفقاً لإطار COBIT، أوصت الدراسة بتطبيق نموذج قياس حوكمة تقنية المعلومات وفقاً لنموذج COBIT في المصارف التجارية الليبية ، واعتباره معيار لمستوى حوكمة تقنية المعلومات ، يصبح مساعداً للمصارف التجارية لفهم الوضع الراهن لها.

**الكلمات المفتاحية:** حوكمة تقنية المعلومات ، أبعاد حوكمة تقنية المعلومات ، COBIT.

## Abstract:

The research aims to determine the level of information technology governance available in the Libyan commercial banks in its four dimensions: planning and organization, acquisition and implementation, delivery, and support, monitoring and evaluation. Control Objectives for Information and Related Technology (COBIT) using the research model adopted the statistical survey method, through polling the opinions of administrators in the Libyan commercial banks operating in the city of Benghazi - as a sample representing the study community - to know the level of application of information technology governance based on the COBIT model, which is a tool used to control information technology.

This model was developed by the Institute of Information Technology Governance in the United States of America in 1992, this model sets 34 a high-level goal for the control of information technology operations, and this framework provides a general, applicable, and acceptable standard for good IT security, practices to monitor in order to support the management's needs in determining the appropriate level of information technology security



and follow-up, it also provides auditors with a set of measurements and acceptable indicators to obtain good governance that helps them express their opinion in the institution.

80 questionnaires were distributed to the employees related to the study in the Libyan commercial banks in the city of Benghazi, and 67 were retrieved a complete questionnaire and valid for statistical analysis, where the response rate reached 84%. The research found that the level of application of IT governance in the Libyan Commercial Banks according to the framework COBIT in the four dimensions is on the average level. The researchers recommended that it should be applied to measure model IT Governance Libyan commercial banks, according to model COBIT, to be the standard for the level of IT governance, and an assistant to the banks to find out the status quo.

**Keywords:** IT Governance, IT Governance Dimensions, COBIT.

## 1. INTRODUCTION

The globe witnessed a revolution in communications and information during the end of the twentieth century, particularly the Internet. One of the consequences of this transformation was the birth of the term "Information Technology" (IT). In the face of this tremendous tide of information technology, the demand for information technology by companies and institutions increased, and in an unconscious way, in the desire to simply acquire without control and in a way that achieves the maximum benefit to this company from this possession, which wastes a lot of economic opportunities on it, which leads to the creation of losses due to the high costs of acquisition and maintenance in exchange for modest returns (Hardy, 2006). Access to information technology is critical because it enables users, managers, and decision-makers to make suitable decisions by carefully identifying the organization's information technology strategy, planning and organizing it, obtaining it, and utilizing its resources and infrastructure. And implementing and conveying them to various administrative levels, as well as preserving them through supervision and control, is what is today known as Information Technology Governance (ITG) (Zayoud et al., 2014).

Information technology governance is defined as: "an integrated set of procedures, policies, responsibilities and organizational structures required, linked to information technology to support effective decision making" (Clayton & Powell, 2005).



The Information Technology Governance Institute (ITIL) has developed an IT governance concept, focusing attention on the function of internal auditing by managers and auditors, especially following the successive scandals of large companies, such as "Enron" and "Quest," which led to the enactment of the Sarbanes Oxley Act (SOX) in the United States, which contains texts of interest to organizations concerned with the control of information technology, It emphasizes the importance of having control tools to govern and monitor the work of information systems and technology in businesses. This resulted in the adoption of control frameworks that govern information technology in businesses, and these frameworks (The Committee of Sponsoring Organizations (COSO)), which was formed in 1985 to sponsor the National Commission on Fraudulent Financial Reporting, an independent private-sector initiative that investigated the factors that can lead to fraudulent financial reporting. It also developed recommendations for public companies and their independent auditors, for the SEC and other regulators, and for educational institutions. The first chairman of the National Commission was James C. Treadway, Jr., Executive Vice President and General Counsel, Paine Webber Incorporated and a former Commissioner of the U.S. Securities and Exchange Commission. Hence, the popular name "Treadway Commission." Currently, the COSO Chairman is Paul J. Sobel. COSO's goal is to provide thought leadership dealing with three interrelated subjects: enterprise risk management (ERM), internal control, and fraud deterrence.

COSO published Enterprise Risk Management — Integrated Framework in 2004. This paradigm was updated in 2017 with the publication of "Enterprise Risk Management-Integrating with Strategy and Performance," which emphasizes the necessity of risk consideration in both the strategy-setting and performance-driving processes. COSO has also produced several thought papers on ERM since 2009. These thought papers are available for free download (COSO, 2022).

In terms of internal control, COSO built a framework in 1992 that includes effective and influential operations on information technology, provides credibility to financial reporting, and is also deemed harmonious with the company's internal regulations and organization. (Clayton and Powell 2005; Nguen 2021). In May 2013, this framework was changed and reprinted. The 1992 framework was superseded and is no longer available as of December 15, 2014. COSO published Internal Control Issues in Derivatives Usage in 1996. Internal Control Over Financial Reporting — Guidance for Smaller Public Companies was released by COSO in 2006, followed by Guidance on



Monitoring Internal Control Systems in 2009. The 2006 smaller public company guidance is also superseded and no longer available as of December 15, 2014 (COSO, 2022).

Among these frameworks also: Control Objectives of the Information and Related Technology, (COBIT), which was established to be a monitoring tool on information technology through 34 high-level control targets, which fall under four dimensions: planning and organization, acquisition and implementation, delivery, and support, monitoring and evaluation (Lainhart, 1997; COBIT, 2019). Each COBIT dimension contains different controls; businesses can use the entire COBIT framework or select specific controls that meet their needs. Because COBIT controls primarily address business objectives governance, businesses typically map standards such as ISO 27000 to integrate them alongside COBIT and maximize security controls. Furthermore, COBIT contains a process reference model that describes and explains many governance and management processes (Amorim, et al., 2021). It further strengthens the security of organizational applications with strict policies and rules (Wolden et al., 2015).

The COBIT framework includes seven information standards: effectiveness, efficiency, privacy, inclusiveness, availability, responsiveness, and reliability. These standards interact inside the framework via IT resources such as people, applications, technology, facilities, and data (Al-Midani, 1999).

Based on the foregoing, the researchers use the COBIT model to determine the level of information technology governance in Libyan commercial banks, because it is critical to highlight the level of information technology in these banks and measure the level of governance (high, medium, low) in order to direct them toward achieving their goals and conserving their resources.

## **2. THE CONCEPT OF COBIT**

The concept of COBIT is based on the following pillars:

### **2.1. INFORMATION TECHNOLOGY OPERATIONS:**

The COBIT Framework defines 34 processes information technology-related are divided into four dimensions: Planning and Organization, Acquisition and Implementation, Delivery and Support, Monitoring and Evaluation. The following is an illustration of these dimensions:



- **Planning and Organizing:** This concept includes the optimal use of technology in companies, so that these companies assist in the implementation of their public and private goals, and in addition to the above, this concept sheds light on the form of infrastructure, and the organization of information technology in companies, to reach satisfactory results and benefits, and many use information technologies. It deals with strategy and tactics related to the contribution of information technology in companies and emphasizes that business goals must converge with what is planned, and that information activities must be planned, connected and managed efficiently, and the lack of planning and organization is conducive to the company's failure to identify and confront threats from internal and external sources (Lainhart, 2000).
- **Acquisition and Implementation:** It means defining technology requirements, obtaining them, and then implementing them through the ongoing operations inside the company, and by developing the plan related to preserving information and the company's assets, which helps to extend the life of the company's information technology and its components, in order to keep these activities working continuously, and processes are designed within the field of acquisition and implementation to define, develop and acquire information technology solutions, and to implement and integrate them in addressing the business of the institution. Maintenance and system changes are included in this field to ensure the continuity of the life cycle of the systems (ASCA, 2001; De Haes et al., 2013).
- **Delivery and Support:** It means the connection to information technology within the facility's systems, the implementation of its applications as well as support operations to be able and effective in the implementation of information technology systems, and this dimension considers the services required to be connected which extend from the traditional operations to training. To deliver services, support for them must be done effectively (Cater-Steel, 2009). Failure to achieve control objectives in this dimension can lead to incorrectly recorded transactions, which in turn leads to wrong decisions, because they are based on incorrect information, and can lead to damage to equipment or loss that can lead to obstruction business or cause additional costs, and moreover, unauthorized use can lead to fraud, embezzlement and loss incurred.



- **Monitoring and Evaluation:** This concept aims to ensure the extent to which the current information technology systems are consistent with what is designed and planned in order to achieve the business's goals, and it also aims to reach an independent and unbiased evaluation of the effectiveness and efficiency of information technology systems, and the extent of its ability to achieve goals and controls on business through internal and external auditors, this means that all information technology operations and their resources need to be regularly measured in order to obtain quality, adhere to the requirements of oversight, and achieve administrative oversight of the kinship operations in the business, and provide them with independent assurances from through internal and external auditor (Zayoud et al., 2014).

## 2.2. INFORMATION STANDARDS:

The degree of interest that returns to the decision-maker depends on the amount added to his knowledge of what affects the decision-making behavior. To be useful, COBIT has used seven information standards to reach the ultimate benefit of quality, control, and information security, these standards are (Kieso et al., 2016):

- **Relevance:** In the sense that the information fits with the purpose for which it was prepared, and it can be judged on the relevance or not of how this information affects the behavior of its users so that it leads them to make a less wrong and more beneficial decision at the same time, and in line with the laws, regulations, and contractual agreements.
- **Faithful representation:** Asserts that the information is real, free from errors, and visualizes the reality to be reported.
- **Comparability:** Information that is measured and reported in a similar manner for different companies is considered comparable.
- **Verifiability:** Verifiability occurs when independent measurers, using the same methods, obtain similar results.
- **Timeliness:** The sense of providing information in a timely manner, so that it is ready and available upon request, and the need for it without delay from its date, until the desired benefit is achieved from it.



- **Understandability:** In the sense that the information is understandable to its users, and there is no ambiguity that leads it out of its intended meaning, and at the same time it is easy and clear.

### 2.3. IT RESOURCES:

It refers to the constituents of information technology, which guarantee the effective functioning, as they are divided into five sections (Salle & Di-Vitantonio, 2006; Elsharif, 2019):

- **Database:** It is the container that contains the basic data stored on different storage methods, which must be available in order for the operation to be carried out.
- **Programs:** They are the procedural parts of an information system based on the use of electronic devices. There are two types of programs: the first is called system programs, and the second is called application software.
- **Technology:** It includes devices and systems such as operating systems, hardware, networks, different media, databases, etc.
- **Facilities:** They are infrastructure, and resources such as electricity, buildings, water ... etc.
- **Human Resources:** It is the most important component of information technology, as it links the various elements of information technology, and works to operate it, and its examples: analysts, planners, programmers .... etc.

### 3. LITERATURE REVIEW

The COBIT framework provides a generally applicable standard that is acceptable for effective information technology security and control procedures to assist the administration in evaluating and adhering to the required level of information technology security. It also offers auditors with a set of metrics and appropriate indicators for achieving good governance, allowing them to voice their concerns within the business. The first COBIT bulletin was produced in 1996, followed by the second bulletin in 1998, the third bulletin in 2000, and the fourth bulletin in 2005 (Zayoud et al., 2014; De Haes et al., 2013).

Also, (COBIT) develops a framework for managing IT risks, assists managers, auditors, and users in understanding their companies' IT systems, aids in the





development of the governance model and guides the selection of the level of security and control required to protect companies' assets efficiently and effectively (Pauwels, 2006).

The following is a list of a range of relevant studies obtained by the researchers:

According to an article by Pultorak and Kerrigan (2005) that used the inductive approach, the use of information technology governance helps boards of directors' work at their full potential to achieve organizational integration and alignment in working with stakeholders, thus achieving good financial performance. The article also discussed performance by assuring the efficiency and effectiveness of information technology, as well as the COBIT and the Information Technology Infrastructure Library (ITIL) frameworks as a framework for measuring the extent of corporate IT governance. Finally, the article concluded that in order to successfully build good IT governance, management must engage in a three-way merger and integration process that includes stakeholder alignment, job integration, and financial performance.

Hardy (2006) examined the importance of controlling information technology and its security in light of the dangers associated with the information in his study, which led to the creation of information technology governance legislation to alleviate the concerns of organizations, investors, users, customers, and sellers about the security and confidentiality of their organizations' information. The study also looked at the lack of effective management of the risks associated with information technology, despite scientific advances. According to the study, ITIL in America is undertaking a study on information hazards, surveying 200 IT professionals and experts from 14 nations. The study indicated that less than 25% of the firms examined assigned reasons to external hazards represented by the norms and foundations upon which the organization was founded, indicating a good opportunity for the widespread use of external resources for information technology. The study concluded with a recommendation that top management and boards of directors assure the security and protection of information in their enterprises, and that this matter be discussed, prioritized, and maintained on the agenda.

Krehnke (2007) researched (ING), a global financial services corporation in the Netherlands that operates in 60 countries and serves millions of consumers globally. The study sought to determine the impact of information technology governance in groups (ING) on achieving a higher return on asset investment and creating value for this group. This group's executive management effectively adopted IT governance in its firm in 2005 using a COBIT



framework, considering the cost and benefit of this procedure. The Group achieved a profit in 2005 that was 19.4% greater than in 2004 since IT governance was not implemented in 2004, and the return on share improved from 3.32% in 2004 to 22.7% in 2005. The assets' operating efficiency improved, and profitable growth climbed across all business lines, including insurance life, which grew by 22.9%, indicating the excellent investment quality in information technology and the degree of effective governance on this technology. This demonstrates the significance and effectiveness of IT governance in institutions and businesses.

The Zayoud et al., (2014) research aims to determine the level of governance of information technology available in the Commercial Bank of Syria Latakia using a form (COBIT) by its four dimensions. The research on the survey methodology, and through the survey of administrators in the Commercial Bank of Syria, the research found that the level of application of IT governance in the Commercial Bank of Syria Lattakia according to the framework (COBIT) of the average level. The researcher recommended that it should be applied to measure model IT Governance in Syrian commercial banks, according to the model (COBIT), to be the yardstick for the level of IT governance, and an assistant to the banks to find out the status quo.

Al-Azmi (2014) study aimed to assess the effectiveness of internal control systems in Kuwaiti banks using the (COBIT) risk management model. Where the study used the statistical methods of arithmetic means and standard deviations, Cronbach's alpha test to measure the stability of the fields of the study tool, in addition to the one-sample T-test to test the study's hypotheses. The study reached several results, the most important of which is the high level of evaluating the effectiveness of internal control systems in Kuwaiti banks using the COBIT model with its four dimensions. The study recommended the need to apply this risk management model by Kuwaiti banks due to its high positive impact on the internal control system of banks.

Nassour's study (2015) aimed to assess the level of application of information technology governance through its four main areas in the Syrian banking sector through a (COBIT) framework. A questionnaire was designed and distributed to employees in banks from the administrative levels (managers, internal auditor, head of the department) for employees in public banks and private banks in the capital, Damascus, and using appropriate statistical methods to analyze the data, the study concluded that the level of application of information technology governance was Average according to the (COBIT)



framework in its four areas, and the study recommended the need to apply a model for controlling information technology in Syrian banks according to the (COBIT) framework to be a control tool for information technology used in preparing financial reports.

Steuperaert, (2019) states the new framework for governance and management of enterprise information & technology COBIT 2019 has been released. The updated framework provides a timely refresh of its structure and contents and adds exciting new features like design factors that allow tailoring governance systems, and many more.

Following a review of previous studies, we notice that the current study differs from these studies in its approach to determining the level of application of information technology governance, but it follows the same approach that used by Zayoud et al., (2014), Al-Azmi (2014) and Nassour (2015) who have taken the COBIT framework in determining the level of application of information technology governance, Considering the additional features offered by COBIT 2019.

#### **4. STATEMENT OF THE PROBLEM**

The research problem is represented by two basic points: The first point is the seeking of the commercial banks to acquire information technology systems, and what appears in the field of technology of modern software and tools. The second point is the lack of knowledge by these banks of the level of governance available to them from this gained technology, as well as their lack of knowledge of the measurement tools for this governance, which may lead to failure to achieve the desired goals and the loss of many customers.

So, it can be said that most of the studies that were conducted in Libya dealt with the issue of corporate governance, and there is even no one study so far (according to the researchers' knowledge), that dealt with the subject of information technology governance in Libya. Based on, the study problem can be summarized in the following main question:

Does the level of information technology governance currently applied in Libyan commercial banks differ from the level of information technology governance based on the COBIT model?

To answer the main question of the study, the following sub-questions were formulated:



1. Does the level of information technology governance in the field of **planning and organization** currently applied in Libyan commercial banks differ from the level of information technology governance based on the **COBIT** model?
2. Does the level of information technology governance in the field of **acquisition and implementation** currently applied in Libyan commercial banks differ from the level of information technology governance based on the **COBIT** model?
3. Does the level of information technology governance in the field of **delivery and support** currently applied in Libyan commercial banks differ from the level of information technology governance based on the **COBIT** model?
4. Does the level of information technology governance in the field of **monitoring and evaluation** currently applied in Libyan commercial banks differ from the level of information technology governance based on the **COBIT** model?

## 5. OBJECTIVES OF STUDY

Control over information technology governance and providing protection and security for it is extremely important to reach the goals of the banks that apply it, by designing and devising several tools and frameworks to be indicators, processes, standards, and measures to measure the level of information technology,

Among these tools is a framework COBIT that was designed to achieve control and control of information technology, and direct it to serve the parties that implement it, hence the importance of research in the following:

1. Helping to implement a new measurement mechanism for the level of information technology governance in the commercial banks under study through a four-dimensional COBIT framework.
2. Assist the commercial banks under study in determining how they should use information technology (governance), to contribute to achieving their strategic goals efficiently and effectively.



## 6. THE IMPORTANCE OF STUDY

By reading the problem of this study, and focusing on the role that IT governance plays through the COBIT framework, the significance of this study can be summarized as follows:

1. That is the first study dealing with Libya's information technology governance.
2. This study measures the level of information technology governance in the Libyan commercial banks based on COBIT with its four dimensions.
3. This study presents a set of recommendations that can assist Libyan commercial banks to determine how information technology governance should be used.

## 7. METHODOLOGY OF THE STUDY

This part of the study shows the study population, tools, model, and hypotheses, in addition to the statistical methods that were used. Where the study relied on the statistical survey method, through a survey of the views of accountants, and administrators who related to the research topic in the Libyan commercial banks operating in the city of Benghazi to determine the level of available information technology governance and compare it with the COBIT model.

### 7.1. THE STUDY MODEL

The study model consists of four main variables were (Planning and Organization, Acquisition and Implementation, Delivery and Support, and Monitoring and Evaluation) as variables that measure the level of available information technology governance by the COBIT model in the commercial banks in Benghazi city as shown in Figure 1.

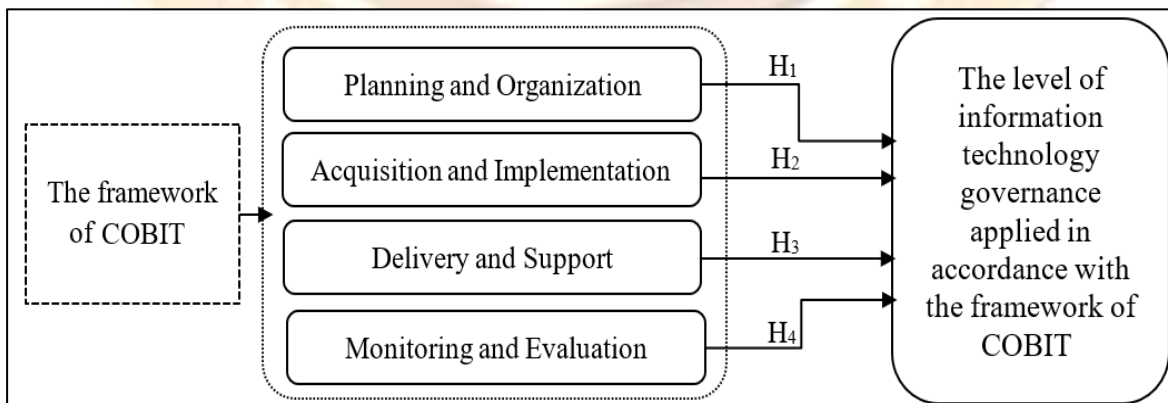


Figure 1. The Study Model



## 7.2. THE STUDY HYPOTHESES

Based on the theoretical framework of the study, based on the study's questions and objectives, and reviewing the literature, the main hypotheses of the study can be formulated as follows:

**H<sub>1</sub>:** There is statistically significant difference (at the level of  $\alpha = 0.05$ ) between the level of IT governance currently applied in Libyan commercial banks, and the level of IT governance according to the COBIT framework.

$H_0: \mu \leq 3$  (the mean of the COBIT framework application)

$H_1: \mu > 3$

This main hypothesis leads us to the following four sub-hypotheses:

**H<sub>1a</sub>:** There is statistically significant difference (at the level of  $\alpha = 0.05$ ) between the level of IT governance in the field of Planning and Organization currently applied in Libyan commercial banks, and the level of IT governance according to the COBIT framework.

**H<sub>1b</sub>:** There is statistically significant difference (at the level of  $\alpha = 0.05$ ) between the level of IT governance in the field of Acquisition and Implementation currently applied in Libyan commercial banks, and the level of IT governance according to the COBIT framework.

**H<sub>1c</sub>:** There is statistically significant difference (at the level of  $\alpha = 0.05$ ) between the level of IT governance in the field of Delivery and Support currently applied in Libyan commercial banks, and the level of IT governance according to the COBIT framework.

**H<sub>1d</sub>:** There is statistically significant difference (at the level of  $\alpha = 0.05$ ) between the level of IT governance in the field of Monitoring and Evaluation currently applied in Libyan commercial banks, and the level of IT governance according to the COBIT framework.

As demonstrated in part 8.3.2, these hypotheses will be tested using the (One-Sample T-test) analysis.

## 7.3. POPULATION AND SAMPLE

Given the size of the research community and the fact that the banking system in Libya is a central system that depends on the Libyan central bank (the Libyan Central Bank, 2016), where banks follow the same procedures and regulations,



the study population includes all the financial people working in the branches of the Libyan commercial banks (Accountants, Internal Auditors, heads of the departments, Directors of Departments, branches managers), and As a result, the study sample was collected from banks that are active in the Libyan city of Benghazi using the random sampling approach.

Based on that, the study instrument was distributed randomly to 80 banks and branches, all of them were retrieved with a response rate of 100% and 13 questionnaires were excluded by 16% because they were not valid for analysis, hence the questionnaires analyzed were 67 questionnaires by 84%, as shown in Table 1.

**Table 1. Distribution of Questionnaires.**

Questionnaires	Num.	%
Distributed	80	100%
Retrieved	80	100%
Excluded	13	16%
<b>Analyzed</b>	<b>67</b>	<b>84%</b>

The number of respondents who responded to the researchers' questions and agreed with their conclusion in each of the banks is represented in the following table:

**Table 2. Research Sample.**

Banks	Frequency	%
Wahda Bank	33	49.3%
National Commercial Bank	13	19.4%
Bank of Commerce & Development	8	11.9%
North Africa Bank	8	11.9%
Sahara Bank	5	7.5%
<b>Total</b>	<b>67</b>	<b>100.0%</b>

#### 7.4. THE STUDY INSTRUMENT

The questionnaire employed in the studies (Zayoud et al., 2014; Al-Azmi, 2014; Nassour, 2015) was slightly modified to fit the Libyan environment and the needs of the study in order to collect data based on relevant articles. The study tool is divided into two sections: the first is for demographic and general information, and the second is for questions designed to evaluate the four study hypotheses listed in Table 3.



**Table 3. The number of questions related to dimensions.**

Section	Variables	Dimensions	Questions
1	General Questions	Demographic Questions	1 - 6
2	The framework of COBIT	Planning and Organization	7 - 24
		Acquisition and Implementation	25 - 38
		Delivery and Support	39 - 64
		Monitoring and Evaluation	65 - 72

The answers to section 2 were according to a five-point Likert scale.

Also, the range of the questionnaire scale is shown in Table 4.

**Table 4. The Questionnaire Scale Range.**

The Answer	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Degree	1	2	3	4	5
Range	< 1.80	1.81 – 2.60	2.61 – 3.40	3.41 – 4.20	> 4.21

#### 7.4.1. Normality Distribution Test

This test is used to determine if the data of given variables follows natural distribution or not, and testing is necessary in the case of hypotheses testing since most parametric tests require that the data be distributed naturally or that the sample size is sufficiently large (Hair et al., 2010).

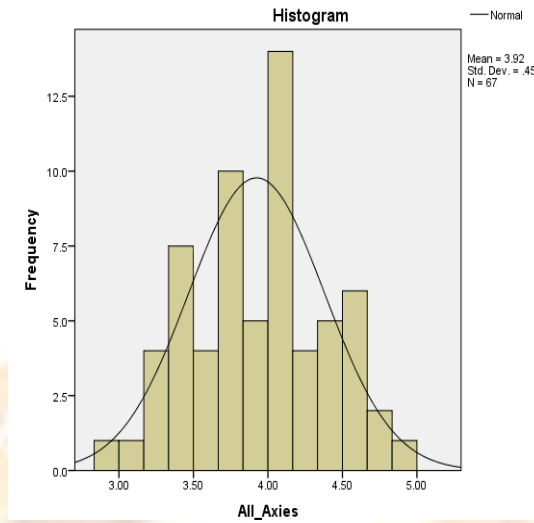
The Shapiro-Wilk test was used to test whether the data follows the normal distribution or not. The results of the test of normality distribution are presented in Table 5.

**Table 5. Normality distribution test.**

Variables	Shapiro-Wilk		
	Statistic	df	Sig.
Planning and Organization	0.985	67	.621
Acquisition and Implementation	0.982	67	.433
Delivery and Support	0.989	67	.825
Monitoring and Evaluation	0.967	67	.071







**Figure 2. Normality distribution test**

The results in Table 5 reveal that the probability value (Sig.) for all research variables was higher than the = 0.05 level. This means that the data is distributed normally. Figure 2 acknowledges this. As a result, parametric tests were used.

#### 7.4.2. The Questionnaire Stability

Cronbach's coefficient alpha was determined for reliability analysis to see if there was consistency in how the participants responded to the questions for each factor. It is a measurement to determine whether the scale's variables are favorably related to one another or not. The results of this study confirm the items' internal consistency because most researchers agree that instruments should have a reliability of 0.60 or above (Carmines and Zeller, 1979; Sekaran & Bourgie, 2016). The stability of the research tool was confirmed. Each set of questionnaire items had their -Cronbach coefficient calculated, and all of the study's measurements displayed high levels of reliability, ranging from 0.895 to 0.905. The survey is regarded as credible because all scales were higher than 0.60, as indicated in Table 6.

**Table 6. The stability of the questionnaire (Cronbach's  $\alpha$ ).**

Variables	Dimensions	Cronbach's $\alpha$
The framework of (COBIT)	Planning and Organization	0.895
	Acquisition and Implementation	0.898
	Delivery and Support	0.946
	Monitoring and Evaluation	0.905



## 8. RESULTS

### 8.1. CHARACTERISTICS OF PARTICIPANTS

In this section, descriptive analysis was utilized to examine the demographic information and identify the participant characteristics. The results are summarized in Table 7. which includes demographic data on gender, age, education, specialization, years of experience, and job position of participants' demographic data.

According to the findings, 82% of participants were males, 18% were females, and 66% were between the ages of 30 and 50. Approximately 84% of respondents were university graduates, with nearly 66% holding bachelor's degrees.

**Table 7. All Characteristics of Responders.**

No.	Characteristics	Elements of Characteristics	Frequency	Percent
1	Gender	Male	55	%82.0
		Female	12	%18.0
		Total	67	%100.0
2	Age	< 30 years	15	%22.4
		From 30 to < 40 years	19	%28.4
		From 40 to < 50 years	25	%37.3
		From 50 years and over	8	%11.9
		Total	67	%100.0
3	Qualification	Higher Diploma	11	%16.4
		Bachelor	44	%65.7
		Master	10	%14.9
		Doctorate	2	%3.0
		Total	67	%100.0
4	Specialization	Accounting	42	%62.7
		Financing and banking	9	%13.4
		Business Management	14	%20.9
		Economy	2	%3.0
		Total	67	%100.0
5	Experience Years	< 5 years	9	%13.4
		From 5 to < 10 years	17	%25.4
		From 10 to < 15 years	11	%16.4
		From 15 to < 20 years	15	%22.4
		From 20 years and over	15	%22.4
		Total	67	%100.0



No.	Characteristics	Elements of Characteristics	Frequency	Percent
6	Job position	Accountant	29	%43.3
		Internal Auditor	9	%13.4
		Head of Department	18	%26.9
		Director of the Department	8	%11.9
		Branch Manager	3	%4.5
		Total	67	%100.0

Table 7 also shows that the specialization of the participants in this study was distributed as 63% accounting, 21% business management, and 13% financing and banking, with 87% having more than 5 years of experience.

Table 7's demographic results show that the sample members have good experience and are better qualified to understand the subject of study and express valid opinions when answering the questionnaire.

## 8.2. DESCRIPTIVE STATISTICS

This section would show the participants' attitudes toward the study's questions, and whether they supported or opposed them. The mean and standard deviation results for each question ranked descending based on the mean of each paragraph, are shown below.

### 8.2.1. IT Governance in The Field of Planning and Organization

Table 8 displays the mean, percentage, and standard deviation for each of the first-dimension questions.

**Table 8. IT Governance in The Planning and Organization Field.**

Question	Mean	%	SD	Rank
7) A long-term strategic plan for information systems is clearly and accurately developed.	3.9552	79%	0.78688	9
8) The structure of the required information is defined and described in terms of the chosen pattern and corporate data to serve the bank's strategy.	4.0448	81%	0.68386	2
9) The type of information required, the rules of information structure, its classifications, and the level of its security are determined to fit the strategic plan.	4.0597	81%	0.91917	1
10) The technology infrastructure is being planned to monitor future activities and trends.	3.8806	78%	0.78860	14
11) Plans for the procurement of technological equipment and software are developed, as are the technical standards to be used.	3.9104	78%	0.79260	11



Question	Mean	%	SD	Rank
12) The Information Systems Planning and Management Committee is appointed.	3.9552	79%	0.72682	8
13) Organizational relationships, responsibilities, ownership, and information custody are defined.	3.9701	79%	0.69566	7
14) The annual budget for information systems operations is established, and the proposed costs and benefits of operational operations are stated.	4.0000	80%	0.67420	4
15) The Technology Information Systems Unit is allocated a specific department to oversee operational expenditures.	4.0149	80%	0.76856	3
16) Internal policies, property rights, and growing awareness of information system security are established as standards and processes.	3.9701	79%	0.79716	6
17) Internal policies, property rights, and growing awareness of information system security are established as standards and procedures.	3.8955	78%	0.85519	13
18) It defines the required qualifications for human resources, responsibilities, roles, and how to change or abolish jobs.	3.8507	77%	0.78342	15
19) A specialized department is appointed to deal with the needs of external parties and the practices and procedures to be implemented to achieve this.	3.8060	76%	0.82092	17
20) Mapping the flow of information and intellectual property, ensuring confidentiality, dealing with e-commerce, and complying with insurance contracts.	3.9403	79%	0.88558	10
21) A qualified unit is devoted to assessing and estimating the risks surrounding the information systems used and how they are documented, identified, and measured.	3.9104	78%	0.86570	12
22) A plan is developed to cope with the dangers, and methods to avoid them are chosen.	4.0000	80%	0.81650	5
23) A framework is designed to manage the numerous information systems projects in terms of initiative involvement and work team membership and duties.	3.7463	75%	0.76561	18
24) A plan for system quality assurance and formal project risk management, as well as plans for examination, training, and post-implementation review are developed.	3.8358	77%	0.77062	16
<b>The Overall Average</b>	<b>3.9303</b>	<b>79%</b>	<b>0.47480</b>	



Also, Table 8 shows that the overall average for (IT Governance in The Field of Planning and Organization) dimension was 3.9303 by 79%. The average standard deviation was 0.4748. Likewise, the average of the mean of the above questions was close to the side of the agreement. Therefore, there were positive attitudes toward these questions because their mean was higher than the mean of scale 3.

### 8.2.2. IT Governance in The Field of Acquisition and Implementation

Table 9 presents the mean, percentage, and standard deviation for each question of the second-dimension questions.

**Table 9. IT Governance in The Acquisition and Implementation Field.**

Question	Mean	%	SD	Rank
25) The required information needs and actions for automated solutions and information-collecting techniques are identified.	3.9701	79%	0.65064	9
26) The system software to be acquired is determined, and the necessary control systems are installed and maintained.	3.9254	79%	0.84052	10
27) Required software is defined in terms of flexibility, existing and future needs, and data collection methods.	3.8657	77%	0.79574	12
28) The required outputs are defined, documented, and appropriate remedial mechanisms identified and controllable.	4.0149	80%	0.63943	4
29) New electronic equipment and software are being improved, and preventative maintenance for the equipment is being planned.	4.1343	83%	0.71553	1
30) Security, installation, maintenance, control, and how the system's benefits are used and controlled are all given as system software parts.	4.0896	82%	0.73302	2
31) Operational requirements are provided, and service levels are determined.	3.9851	80%	0.72806	7
32) An operational operations handbook is developed and resources for training prepared.	3.8955	78%	0.74130	11
33) The following system installation and operation elements are defined: training, application software performance scale, implementation plans, system transformation and data, and analysis of change plans and strategies.	4.0000	80%	0.73855	5



Question	Mean	%	SD	Rank
34) System experimental aspects such as test criteria, performance, final acceptance test, security check, documentation, operational processes, product promotion, and customer needs assessment are created.	4.0597	81%	0.75640	3
35) An administrative unit is established to oversee and control changes connected to change initiatives, assess influences, and manage emergency situations.	3.6567	73%	0.86256	14
36) The policy for software release and distribution, documentation methods, and responsibilities for maintenance shall be stated therein.	3.8507	77%	0.87479	13
37) Software is installed and approved for technological solutions that the bank has accessed.	3.9851	80%	0.70695	6
38) Special software is installed and approved to face and address changes in the workplace.	3.9701	79%	0.75819	8
<b>The Overall Average</b>	<b>3.9574</b>	<b>79%</b>	<b>0.49535</b>	

Also, this table shows that the overall average for the (IT Governance in the Field of Acquisition and Implementation) dimension was 3.9574 by 79%. The average standard deviation was 0.49535. Furthermore, the average of the means of the preceding questions came close to the agreement. As a result, these questions elicited positive responses because their mean greater than the mean of scale 3.

### 8.2.3. IT Governance in The Field of Delivery and Support

Table 10 presents the mean, percentage, and standard deviation for each question of the third-dimension questions.

**Table 10. IT Governance in The Delivery and Support Field.**

Question	Mean	%	SD	Rank
39) The level of service supplied to customers is defined by the information systems.	4.0149	80%	0.70695	2
40) The administrative units required for the effective management of client service levels are defined.	3.8806	78%	0.72868	16
41) The shared points with customers, the nature of the relationship, and the degree of security in this relationship are established.	3.9254	79%	0.80366	10



Question	Mean	%	SD	Rank
42) Supply contracts are regulated to ensure the sustainability of the supply of resources from the external environment.	3.7164	74%	0.73456	24
43) A plan is prepared to implement and manage target performance requirements efficiently and effectively.	3.8806	78%	0.74919	15
44) The resources are scheduled to enable the operation and management of the available capacity.	3.9104	78%	0.77325	13
45) A framework is in place to respond to emergency conditions and to deplete resources at risk.	3.8507	77%	0.94153	18
46) A detailed contingency plan is in place to address risks and implement alternative support measures.	3.6567	73%	0.99319	26
47) There is a precise system for documenting, classifying, protecting and managing user accounts for data.	3.9552	79%	0.78688	6
48) Mechanisms and processes for managing encrypted information units are put in place.	3.9851	80%	0.72806	3
49) There is a system for determining the cost components in the management information systems used.	3.6866	74%	0.87402	25
50) The system contains cost-calculation, invoice-issuance, and price-setting functions.	3.7910	76%	0.78889	22
51) The bank develops a practical approach to determine the data demands of users from the information system.	3.8507	77%	0.85730	20
52) The plan includes an informed training system and information security principles.	3.9254	79%	0.80366	9
53) A mechanism for identifying, recording, and escalating consumer requests is given.	3.9104	78%	0.77325	11
54) The system allows for adjustments monitoring as well as analysis of the overall trend and reports.	3.8806	78%	0.89650	14
55) A specialized unit is supplied to administer, record, and control resource allocation.	3.9701	79%	0.69566	4
56) The techniques for storing in-use software and identifying unlicensed software are provided.	3.9104	78%	0.71205	12
57) An effective and efficient mechanism is available to address the issues faced the bank's processes.	3.8507	77%	0.82119	19
58) The system includes mechanisms to address, track and audit the escalation of problems.	3.9552	79%	0.76738	5



Question	Mean	%	SD	Rank
59) There is a system for data preparation, collection, retention, error handling, and the authority to use it.	3.9254	79%	0.78458	8
60) The system takes into account data accuracy, completeness, integrity, handling, importance, and storage management.	4.0746	81%	0.68121	1
61) Facilities and visitors are physically protected from environmental hazards and personal health and safety is ensured.	3.7313	75%	0.72993	23
62) A sustainable energy supply is provided to the technology information site.	3.8657	77%	0.79574	17
63) There is a system that contains operational procedure processing, an instruction manual, and a table of functions completed.	3.8060	76%	0.78313	21
64) The system provides documentation of start-ups, operation, continuity, records and standard work schedules.	3.9403	79%	0.77617	7
<b>The Overall Average</b>	<b>3.8789</b>	<b>78%</b>	<b>0.51611</b>	

Besides, this table shows that the overall average for (IT Governance in The Field of Delivery and Support) dimension was 3.8789 by 78%. The average standard deviation was 0.51611. Similarly, the average of the mean of the above questions was close to the side of the agreement. Therefore, there were positive attitudes toward these questions because their mean was higher than the mean of scale 3.

#### 8.2.4. IT Governance in The Field of Monitoring and Evaluation

Table 11 presents the mean, percentage, and standard deviation for each question of the third-dimension questions.

**Table 11. IT Governance in The Monitoring and Evaluation Field.**

Question	Mean	%	SD	Rank
65) The data necessary for the oversight is collected and the management reporting process is defined.	4.1194	82%	0.70759	1
66) A performance appraisal mechanism is established, and the extent of customer satisfaction is evaluated.	4.0448	81%	0.86046	3
67) A mechanism for controlling internal operations is defined and the level of reporting on this control is set.	4.1045	82%	0.67721	2





Question	Mean	%	SD	Rank
68) The operating time of the internal control and the level of safety and security required of it are determined.	3.9552	79%	0.78688	6
69) Information systems services are certified and approved while ensuring their security and evaluating their effectiveness independently internally and externally.	3.8955	78%	0.78111	7
70) Independent assurance is obtained of compliance with laws, regulatory needs and compliance with contracts.	4.0000	80%	0.73855	4
71) Regular operations are carried out to measure the available level of information systems in the bank.	3.9701	79%	0.69566	5
72) Appropriate information is provided about the level of IT governance in the Bank.	3.8806	78%	0.76915	8
<b>The Overall Average</b>	<b>3.9963</b>	<b>80%</b>	<b>0.58386</b>	

As well, this table shows that the overall average for (IT Governance in The Field of Monitoring and Evaluation) dimension was 3.9963 by 80%. The average standard deviation was 0.58386. Also, the average of the mean of the above questions was close to the side of the agreement. Therefore, there were positive attitudes toward these questions because their mean was higher than the mean of scale 3.

### 8.3. Data Analysis

#### 8.3.1. Correlation Analysis

Table 12 indicates the strength of the link between factors. Where Pearson's correlation analysis was performed, it is evident from the start that there is a substantial correlation between the research variables.

**Table 12. Pearson correlation test between study variables.**

Axis	Dimensions	All	one	two	three	four
All	All Axes	1				
one	Planning and Organization	0.881**	1			
two	Acquisition and Implementation	0.920**	0.843**	1		
three	Delivery and Support	0.936**	0.710**	0.780**	1	
four	Monitoring and Evaluation	0.774**	0.654**	0.655**	0.695**	1

\*\* . Correlation is significant at the 0.01 level (2-tailed), N=67.



At a level of significance of 0.05, all variables with their axes have a statistically positive correlation coefficient, and the level of significance for each paragraph was less than 0.05. The findings confirm that all factors have a strong association ( $r > 0.600$  level).

### 8.3.2. One-sample T-test Analysis

Following the validation of the search variables, hypotheses were tested using a one-sample T-test analysis. This analysis was used to validate the fundamental hypothesis and its sub-hypotheses. If the calculated t value is more than the tabular t value of 1.66 right-tailed (T-Value Calculator | Good Calculators, 2021) and the significance criterion is less than 0.05, the hypothesis is rejected. Table 13 shows the result of the testing hypotheses.

Table 13 summarizes the results of the research hypotheses test on the current level of IT governance in Libyan commercial banks. The mean of all axis paragraphs is 3.9238, with a relative weight of 78.5%, which is higher than the neutral relative weight of 60%. And, as shown in Figure 3, (t) computed is 16.594, which is greater than the T tabular of 1.668 with a significance level of 0.000.

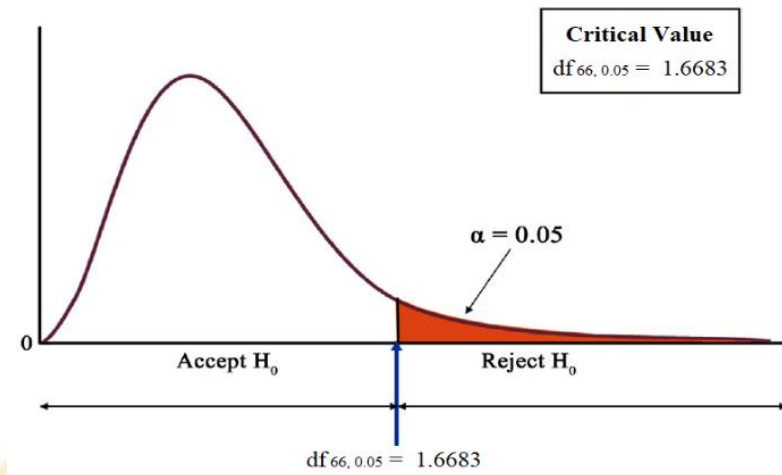
**Table 13. Results of Research Hypotheses Test.**

Test Value = 3							
Hypothesis	Axes	t	Sig.	Mean	S. D.	%	Decision
H <sub>0a</sub>	Axis 1	16.039	0.000	3.9303	0.47480	78.6%	Reject H <sub>0a</sub>
H <sub>0b</sub>	Axis 2	15.820	0.000	3.9574	0.49535	79.1%	Reject H <sub>0b</sub>
H <sub>0c</sub>	Axis 3	13.939	0.000	3.8789	0.51611	77.6%	Reject H <sub>0c</sub>
H <sub>0d</sub>	Axis 4	13.967	0.000	3.9963	0.58386	79.9%	Reject H <sub>0d</sub>
<b>H<sub>0</sub></b>	<b>All Axes</b>	<b>16.594</b>	<b>0.000</b>	<b>3.9238</b>	<b>0.45569</b>	<b>78.5%</b>	<b>Reject H<sub>0</sub></b>

T tabular at  $df_{(66, 0.05)} = 1.668$ .

Table 13 summarizes the results of the research hypotheses test on the current level of IT governance in Libyan commercial banks. The mean of all axis paragraphs is 3.9238, with a relative weight of 78.5%, which is higher than the neutral relative weight of 60%. And, as shown in Figure 3, (t) computed is 16.594, which is greater than the T tabular of 1.668 with a significance level of 0.000.





**Figure 3. One-sample T-test result.**

The results in Table 13, which are confirmed in Figure 3, mean that the fundamental hypothesis and all its sub-hypotheses are rejected. And acceptance of the alternative hypothesis and all alternative sub-hypotheses, i.e., there are statistically significant differences between the existing level of information technology governance in Libyan commercial banks and the COBIT framework level of information technology governance.

According to the COBIT framework and its four areas, the present level of information technology governance in Libyan commercial banks ranges between 77.6% and 79.9%, which is deemed moderate level. This is consistent with the result (moderate) reached by (Zayoud, 2014) and (Nassour, 2015) and differs from the result (high) reached by (Al-Azmi, 2014).

## 9. CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS

From the foregoing, the study derived various conclusions and recommendations the most notable of which are:

### 9.1. CONCLUSIONS

Based on the analysis of the questionnaire responses and the testing of the study's hypotheses, the following conclusions were obtained:

1. The current level of information technology governance in the field of planning and regulation in Libyan commercial banks differs from the level of information technology governance based on the COBIT model because the current level of information technology governance in the field of planning and regulation in Libyan commercial banks is an average level.



2. The current level of information technology governance in the field of acquisition and implementation differs from the level of information technology governance based on the COBIT model, as the current level of information technology governance in the field of planning and regulation in Libyan commercial banks is an average level.
3. The current level of information technology governance in the field of delivery and support differs from the level of information technology governance based on the COBIT model, as the current level of information technology governance in the field of planning and regulation in Libyan commercial banks is an average level.
4. The current level of information technology governance in the field of monitoring and evaluation differs from the level of information technology governance based on the COBIT model, as the current level of information technology governance in the field of planning and regulation in Libyan commercial banks is an average level.
5. According to the COBIT model's four dimensions, the level of implementation of information technology governance in Libyan commercial banks is average.

## 9.2. RECOMMENDATIONS

1. A model for assessing information technology governance for Libyan commercial banks should be implemented in accordance with the COBIT framework as a standard assessment of the level of information technology governance and an aid for these banks to know their current condition.
2. The IT departments in the Libyan commercial banks should plan, follow up, and evaluate the information technology needs over time.
3. The significance of the Central Bank holding COBIT framework training courses in order to assure the availability of trained employees capable of providing commercial banks with the knowledge and skills required to use this framework in a way that achieves compatibility and sustainability.

## 9.3. LIMITATIONS

This study investigates the level of information technology governance in Libyan commercial banks using the COBIT paradigm, within the following constraints:

1. Time limit: The study's time limit runs from 10/10/2022 to 20/05/2023.



2. The spatial boundary is exemplified in the commercial banks that operate in the Libyan city of Benghazi.
3. Human Limitation: The study is confined to administrative staff such as branch managers, department heads, and so on who have a direct connection to the study subject, implying that the study will not include all employees working in these banks.

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