

## LEVEL OF USE OF INFORMATION TECHNOLOGY IN INTERNAL AUDITS AND THE DIFFERENCES USE IN JORDANIAN BANKS

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### Abstract

The study aims at identifying to which extent the internal auditors use the information technology in audit processes (planning, implementing control tests as well as the basic tests in addition to implementing the analytic procedures and the detailed tests and preparing audit report. Furthermore, the study is to examine the impact of the organizational characteristics including the level of the information technology in the bank, the difference of audit method, data operation method and a presence of the internal auditors specialized in the technology, on the level of the use of information technology tools in audit processes. The study has found that the level of the use of information technology in the internal audit processes, performed by the internal audit department of Jordanian banks in various fields of planning, implementing control tests as well as basic tests, and preparing audit reports, is moderate. But, the level of the use information technology in implementing the analytic procedures and the detailed tests through Excel program and electrical worksheets is high. Furthermore, the study has concluded that the level of the use of information technology tools in audit processes varies depending on the difference of the level of information technology in the bank; the difference has been in favor of the banks practicing the accounting transactions through smart phone applications. And the level of the use of information technology tools in audit processes varies depending on the difference of audit methods used in information technology environment. In addition, it has found that the level of the use of information technology tools in audit processes varies depending on the knowledge and professionalism of the internal auditors employing in internal audit department. And it has reached that the level of the use of information technology tools in audit processes is not different depending on the difference of the organizational characteristics related to data operation method used in Jordanian banks; however, it does not affect the use of information technology. Finally, the study has recommended that training courses of field of information technology, especially the field of information security and integrity and data protection against penetration attacks, internal control procedures appropriate for information technology environment and modern banking transactions, shall be continuously held for the internal auditors.

**Key words:** Audit Processes, Internal Auditors, Audit Report, Smart Phone Applications, Information Technology Tools in Audit

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### INTRODUCTION

Today, the world is witnessing a remarkable development of the role which modern technologies play in all fields of economic and social life of the countries. And the principle of focusing on information and technology as a one of fundamental factors of progress and development has become a postulated matter; technology and information are basic and effective tools which public and private companies need in order to perform quickly and accurately their activities. Internal auditor is an independent and objective activity; assurances and consultation services shall, therefore, be provided in order to add a value to the institution and improve its operations; this activity helps the institutions achieve its goals through adopting

a systematic approach which improves and assesses the effectiveness of processes of governance and risk and control management. According to the definition of Institute of Internal Auditors (IIA), using information technology in this field has become an urgent need and one of the fundamentals of the success of internal audit management of performing quickly and accurately its tasks. Auditor's work is mainly based on data progressing, particularly accounting data; this progressing can be performed by manual method which is supported by electronic methods; any internal auditor, shall, therefore, master the use of available media programs and electronic progressing systems in order to be able to perform professionally audit process; the auditor shall be able to use these programs and systems in all various steps and stages of audit plan and test implementation required for controlling and collecting the evidence and preparing audit report.

Using the technology is one of the important fields of accounting and auditing information system researches; technology has gained an increasing importance in all fields in the recent times, (Rajhans & Rajesh 2014). Accordingly, the researches in this field have evolved over the time through developing the concepts of studying new factors which can provide a better explanation for a phenomenon of technology adoption and use. Various studies have indicated that a motive of using information technology is a desire to keep pace with the development. Thus, one of the axes which the study have touched upon is the factors affecting the use of information technology in audit processes; in addition, the study has identified the theories examining the relationships which affect the behaviour of audit technology adoption. It has been noted that various theories can be individual and organized; and they can be both organizational and explanatory. These theories are as follows: the unified theory of acceptance and use of technology (UTAUT), two proposed models for successful adoption of computer assisted audit techniques (CAATs), the proposed model for identifying a level of the use of computer assisted audit techniques (CAATs) and the modified unified theory of acceptance and use of technology (UTAUT2) in addition to Individual -Technology, Organization and Environment (I-TOE) Framework as well as the unified technology readiness and cultural, technological, organizational and environmental model (UTR-CTOE Model).

Banking sector, one of the most important economic sectors in Jordan, witnesses a significant growth of information technology use and applications, particularly financial technology. Consequently, the use of information technology shall be accompanied by the development of internal control and audit procedures. Accordingly, this study is to identify the extent of the use and application of information technology tools in internal audit processes as well as the differences of the levels of organizational characteristics: - the degree of information technology automation, audit methods, data operation method, a presence of internal auditors specialized in information technology.

### **Purposes of Study**

The study aims at assessing to which extent the audit technology tools are used by the internal audit departments in Jordanian banks. In addition, it is to examine the differences of use levels of audit technology according to the organizational characteristics.

### **Importance of Study**

The study assesses to which extent the audit technology tools are used by the internal audit departments in Jordanian banks. In addition, it examines the differences of use levels of audit technology according to the organizational characteristics - the degree of information technology automation, audit methods, data operation method, a presence of internal auditors specialized in information technology.

### **Problem of Study**

The problem of study is determined by the two following questions:

- To which extent do the internal auditors use information technology in internal audit processes performed in Jordanian banks?
- Is the level of the use of information technology in internal audit processes in Jordanian banks affected according to the organizational characteristics- the degree of information technology automation, audit methods, data operation method, a presence of internal auditors specialized in information technology?

### **LITERATURE REVIEW AND RESEARCH HYPOTHESIS DEVELOPMENT**

Researchers in information system field have interested in studying the impact of information technology on the internal audit profession; and various studies have touched upon different aspects of the impact of information technology on internal audit profession. Some studies have assessed the level of auditors' knowledge of information technology and to which extent they are aware of the importance of this technology; other studies have examined the impact of information technology on the quality of internal audit tasks; in addition, several studies have focused on the assessment of the level of the use of the information technology in the internal audit departments and the identification of the most commonly used audit techniques; moreover, some studies have examined the determinants of the use of audit technology.

In the field of this study, some previous studies have examined the impact of information technology on internal audit profession; and they have explored the impact of emergence of information technology on the role and responsibilities of internal audit profession as well as the requirements which must be provided in internal audit departments and the strategies which can be followed in order to achieve further advancement in the field of information technology use (Ahmed, 2007; Abu-Musa, 2008; Salehi & Husini, 2010; Moorthy et al. 2011; Honselaar, 2012). Furthermore, some studies have assessed the level of the use of computer-assisted audit techniques by the internal auditors in performing their tasks; they also have identified the audit techniques used in audit process ( Debreceeny et al., 2005; Janvrin, 2008; Ismail & Abidin, 2009; Adeyemi et al., 2014; Lotto, 2014; Smidt et al., 2014; Pedrosa, 2015; Abou-El-Sood et al., 2015; Omonuk & Oni, 2015; Wu et al., .2016; Cangemi, 2016).

Other studies have illustrated the impact of information technology on the responsibilities and tasks of internal audit processes which have changed due to the impact of emergence of information technology as well as the transformation of information systems from paper

documents into electronic transactions ( Abu- Ahmed; 2007, Musa, 2008; Salehi & Husini, 2010; Moorthy et al., 2011; Honselaar, 2012). Most results of previous studies have indicated that the level of the use of the computer –assisted audit techniques is still in the early stages; and these techniques are mostly limited and simple. In addition, the results have showed that the electronic techniques, mostly used by the internal auditors, are electronic worksheets, progressing programs and electronic spreadsheets (Janvrin, 2008; Ismail & Abidin, 2009; Adeyemi et al., 2014; Lotto, 2014; Smidt et al., 2014; Pedrosa, 2015; Abou-El-Sood et al., 2015; Omonuk & Oni, 2015; Wu et al., 2016; Cangemi, 2016). On the other hand, the results of some studies have indicated that the internal auditors use efficiently the advanced computer-assisted audit techniques; and they have illustrated that information technology auditors play a role in achieving the efficiency of the use of information technology (Debreceeny et al., 2005; Salehi & Husini, 2010; Honselaar, 2012).

Accordingly, the internal auditors need to improve the level of their knowledge and skills of information technology since the use of audit techniques is not easy; Information system (IS ) Auditing Guideline (G3) has indicated that computer skills and knowledge shall be available in addition to information technology auditor’s experience when determining the possibility of the use of this technology. Other researchers have indicated that the role of information technology audit consultant has increased in order to achieve the efficiency of the use of the technology in audit process within the organization. Thus. The auditors specialized in information technology play an important role in achieving the efficiency of the use of information technology (Salehi & Husini, 2010; Moorthy et al., 2011; Honselaar, 2012). In addition, the level of the use of audit technology is varied among the different economic sectors; and there is a variation of using the audit technology within the same economic sector.

For example, in Jordanian banking sector, the field of study, different levels of using audit technology are existent within the same sector; some banks expand the use and application of information technology and financial technology; other banks are still in a nascent stage of this technology; other banks are reluctant to expand the use of financial technology (Adeyemi; 2005., al et Debreceeny .et al., 2014; Smidt et al., 2014) due to the difficulty of dealing with data volume. Some researchers have believed that automating audit process is an urgent need because it is difficult to deal with big data volume using traditional audit methods, especially after electronic operation of data has increased within business organizations’ processes; and electronic and digital business has grown.

Other researchers have indicated that auditing around the computer method has mostly been terminated due to the circumstances in which this method is not available in a majority of accounting systems operating electronically the data (Davis, 1968, Ahmed, 2007; Abu-Musa, 2008; Salehi & Husini, 2010; Moorthy et al., 2011; Honselaar, 2012) .

The hypotheses of study can be formulated according to the previous studies mentioned above; the researcher has presented two main hypotheses and sub-hypotheses, which are as follows:

**Main First Hypothesis (H1):** The internal auditors use information technology techniques in planning the internal audit processes performed in Jordanian banks.

First main hypothesis branches into more specific sub-hypotheses as follows:

- **First sub-hypothesis (H1-1):** The internal auditor use information technology techniques in planning audit process performed in Jordanian banks;
- **Second sub-hypothesis (H1-2):** The internal auditors use information technology techniques in order to implement control tests as well as basic tests of audit process performed in Jordanian banks;
- **Third sub-hypothesis Test (H1-3):** The internal auditors use information technology techniques in order to implement analytical procedures and detailed tests of audit balances in Jordanian banks; and
- **Fourth sub-hypothesis(H1-4):** Internal audit department uses information technology techniques in preparing internal audit report and documenting audit process.

**Second Main Hypothesis (H2):** The level of the use of information technology tools in audit processes varies according to the difference of organizational characteristics (the level of information technology in the bank, the difference of audit methods, data operation methods and a presence of internal auditors specialized in the technology).

## METHODOLOGY

### Methodology of Study (Study Design)

Inductive approach has been used in order to collect and analyse the data related to the elements of the study based on the literatures related to the fields of the use of information technology in internal audit processes as well as deduct the factors affecting the level of the use of information technology in internal audit processes.

### Population and Sample of Study

A population and sample of study consist of (commercial and Islamic) banks in Jordan; a sample of study is composed of 16 Jordanian commercial and Islamic banks; foreign commercial and Islamic banks have been excluded; in order to test the hypotheses of study, questionnaires have been distributed to internal audit departments; 4 questionnaires have been distributed to each bank; 64 questionnaires have been retrieved.

### Statistical Standard

Five-Likert scale has been used in order to answer questionnaire's questions. Each of the five responses has a numerical value as follows: 5- strongly agree, 4- agree, 3- neutral, 2 – disagree and 1 – strongly disagree.

In order to analyses the data, ranges have been used as follows: 1-2.33 indicates that it is low; 2.34 – 3.67 indicates that it is moderate; 3.68 - 5 indicates that it is high.

The scale has been calculated by using the following equation:

$$\begin{aligned} & \text{Upper limit of scale (5) – lower limit of scale (1)/ number of required categories (3)} \\ & = (5 - 1)/3 = 1.33 \end{aligned}$$

Then, the answer (1.33) has been added to the end of each category.

### Reliability of Study Tool

For ensuring the reliability of study tool, internal consistency (Cronbach's alpha) coefficient has been calculated by using a group outside the sample of study composed of 20 ---; table 1 illustrates the internal consistency coefficient according to Cronbach's Alpha equation of the fields and total score; and these values have been considered appropriate for the purposes of this study.

**Table 1: Internal Consistency (Cronbach's alpha) Coefficients of the axes and total score**

Field	Internal Consistency
The use of technology in planning processes	0.71
The use of technology in implementing control tests as well as basic tests	0.80
The use of technology in implementing the analytical procedures and the detailed tests	0.79
The use of technology in preparing internal audit report and documenting audit process	0.77
The factors affecting the use of information technology in internal audit processes performed in Jordanian banks	0.78
Total Score	0.82

### Sample of Study

Table 4 outlines the organizational characteristics of the level of the use of information technology in banking transactions in Jordanian banks as well as in internal audit departments.

**Table 2**

	Category	Frequency	Percentage
The level of information technology in the bank	Banks implement the banking transactions through the branches only	14	21.9
	The banks implement accounting processes through the branches and websites	38	59.4
	The banks implement the accounting transactions through smart phone applications.	12	18.8
A difference of audit methods	Audit department uses audit around computer method	12	18.8
	Audit department uses information technology audit method	20	37.3
	Audit department uses audit with computer method	32	44.0
Data operation method	Centralized	40	62.5
	Decentralized	24	37.5

A presence of internal auditors specialized in the technology	A specialized team includes experts of electronic transactions and cyber security	40	62.5
	There are internal auditors who are trained to audit the electronic transactions.	24	37.5
Total		64	100.0

Table 4 shows:

- Jordanian banks tend greatly to practice the banking work through the branches and websites; Corona pandemic has been one of the most important factors encouraging the banks to use the websites. In addition, it is noted that the level of the use of electronic applications which provide the banking services is still limited in the Jordanian banking sector; according to the previous relevant studies, an advanced level of the use of information technology requires technical methods of internal audit as well as knowledge and skills which are compatible with the modern environment of electronic services;
- A large number of Jordanian banks use information technology by about 44%, followed by auditing the electronic transactions;
- Regarding data operation method, Jordanian banks tend to electronic operation of data; it is a positive trend but it requires a continuous and specialized control in order to protect the data and ensure business continuity in peak times; and
- Jordanian banks have highly specialized teams and experts of information security and electronic transactions; this indicates that banks' administrations are aware of information technology risks; they are also aware of the need for a qualified human resources in order to keep pace with the developments of the banking transactions.

## HYPOTHESES TEST

### Test Main First Hypothesis (H1):

**First sub-hypothesis (H1-1)** is the internal auditors use information technology in planning the internal audit processes performed in Jordanian banks.

For ensuring hypothesis validity, arithmetic means and standard deviations of the use of information technology in planning the internal audit processes performed by the internal auditor in Jordanian banks have been extracted; table 3 illustrates them.

**Table 3**

Rank	Number	Paragraph	Arithmetic Mean	Standard Deviation	Level
Internal audit department uses the information technology techniques in:					
1	1	Developing the internal audit plans for managing audit process	4.13	.436	High
2	3	Supervising the implementation of audit plans	3.96	.730	High
3	7	Identifying audit risks and fields	3.83	.733	High
4	9	Designing and documenting audit process	3.80	.752	High
5	5	Identifying the levels of materiality	3.72	.761	High
6	11	Assessing the level of information technology in the department or the branches and audit requirements	3.66	.863	Moderate
7	10	Preparing a time budget appropriate for audit process	3.49	.669	Moderate
8	6	Identifying the size of samples	3.46	.599	Moderate
9	8	Carrying out the analytical procedures at a planning stage	3.44	.614	Moderate
10	2	Developing audit plan for audit teams	3.40	.454	Moderate
11	4	Identifying the sources of audit evidence and audit goals	3.36	.604	Moderate
12	12	Distributing well audit tasks among the audit team members	3.29	.426	Moderate
		Planning	3.63	.450	moderate

Table 5 shows that arithmetic means have ranged between 3.29 – 4.13; paragraph (1): ‘Developing the internal audit plans for managing audit process’ has occupied the first rank; and the arithmetic mean has reached 4.13. ; paragraph (12): ‘Distributing well audit tasks among the audit team members ’ has occupied the last rank; and the arithmetic mean has reached 3.29; And total arithmetic mean of the use of information technology in planning audit process performed by the internal auditor in Jordanian banks has reached 3.63.

**Second sub-hypothesis (H1-2) Test:**

**Second sub-hypothesis (H1-2)** is the internal auditor uses information technology techniques in order to implement control tests as well as basic tests of audit process performed in Jordanian banks.

For ensuring hypothesis validity, arithmetic means and standard deviations of the use of information technology in implementing control tests as well as basic tests of audit process performed by the internal auditor in Jordanian banks have been extracted; table 6 illustrates them.



**Table 4**

Rank	Number	Paragraph	Arithmetic Mean	Standard Deviation	Level
Internal audit department uses the information technology techniques in implementing control tests as well as basic tests of audit process performed in Jordanian banks; this use includes the following:					
1	15	Ensuring the efficiency of the procedures of internal control operation	3.77	.607	High
2	14	Examining and assessing the internal control system	3.66	.654	Moderate
3	20	Classifying, posting and summarizing all the transactions	3.61	.771	Moderate
4	13	Analysing and understanding the internal control environment	3.60	.701	Moderate
5	17	Assessing the efficiency of internal control system	3.55	.747	Moderate
6	19	Ensuring the accuracy while processing the financial transactions	3.54	.672	Moderate
7	16	Ensuring a compliance with the internal control procedures	3.52	.753	Moderate
8	18	Ensuring the implementation of the transactions in the branches and departments	3.47	.750	Moderate
		Implementing the control tests as well as the basic tests	3.59	.482	Moderate

Table 6 shows that arithmetic means have ranged between 3.47 – 3.77; paragraph (15): ‘Ensuring the efficiency of the procedures of internal control operation’ has occupied the first rank; and the arithmetic mean has reached 3.77. ; paragraph (18): ‘Ensuring the implementation of the transactions in the branches and departments ’ has occupied the last rank; and the arithmetic mean has reached 3.47; And total arithmetic mean of the use of information technology in implementing control tests as well as basic tests of audit process performed by the internal auditor in Jordanian banks has reached 3.59.

### Third sub-hypothesis Test

**Third sub-hypothesis (H1-3)** is the internal auditors use information technology techniques in order to implement analytical procedures and detailed tests of audit balances in Jordanian banks.

For ensuring hypothesis validity, arithmetic means and standard deviations of the use of information technology in implementing the analytical procedures and detailed tests of audit balances of audit process performed by the internal auditor in Jordanian banks have been extracted; table 5 illustrates them.

**Table 5**

Rank	Number	Paragraph	Arithmetic Mean	Standard Deviation	Level
Internal audit department uses the information technology techniques in implementing the analytical procedures and detailed tests of audit balances; this use includes the following:					
1	26	Information technology is used for implementing the analytical procedures as well as analysing and connecting between the items of financial and non-financial statements for the same time period and comparing them with financial and non-financial data for other time periods.	4.01	.577	High
2	28	The use of computerized systems helps the internal auditor implement the analytical procedures in order to reduce the detailed tests of the transactions and balances of account items.	3.94	.588	High
3	32	The information technology is used for audit compliance	3.91	.590	High
4	30	The information technology is used in financial audit.	3.90	.666	High
4	31	The information technology is used in the operational audit.	3.90	.591	High
6	25	The auditor uses the information technology to make an accurate comparison between the actual financial ratios of facility and similar financial ratios.	3.88	.504	High
6	33	The use of the information technology helps the auditors verify the balances	3.88	.591	High
6	34	The use of the information technology contributes to the achievement of the accuracy of the balances.	3.88	.690	High
9	21	The information technology is used for carrying out the analytical procedures which identify the realistic and logical extent of financial balances and transactions of the bank.	3.83	.589	High
10	24	The applied programs are used in audit process to make a comparison between the actual results of bank's branches and the desired and planned results in order to identify the deviations and their reasons.	3.72	.718	High
10	29	The information technology is used in the analytical procedures in order to identify the extent of the reality and logic of the balances.	3.72	.648	High
12	22	The auditor relies on the information technology in order to implement the analytic procedures which identify to which extent the possible (expected) essential misstatements of the financial statements are existent.	3.71	.714	High
13	27	The electronic technology is used for auditing accurately the balances of different accounts.	3.68	.634	High

14	23	The electronic technology is used for implementing the analytical and financial procedures of the transactions of the branches.	3.55	.747	Mode rate
		The electronic technology is used for implementing the analytical procedures and the detailed tests.	3.82	.434	High

Table 7 shows that arithmetic means have ranged between 3.55 – 4.01; paragraph (26): ‘Information technology is used for implementing the analytical procedures as well as analysing and connecting between the items of financial and non-financial statements for the same time period and comparing them with financial and non-financial data for other time periods.’ has occupied the first rank; and the arithmetic mean has reached 4.01 ; paragraph (23): ‘The electronic technology is used for implementing the analytical and financial procedures of the transactions of the branches. ’ has occupied the last rank; and the arithmetic mean has reached 3.55; And total arithmetic mean of **the use of information technology in implementing** the analytical procedures and detailed tests of audit balances of audit process performed by the internal auditor in Jordanian banks has reached 3.82.

#### Fourth sub-hypothesis (H1-4): Test

**Fourth sub-hypothesis (H1-4) is internal** audit department uses the information technology techniques in preparing internal audit report and documenting audit process.

For ensuring hypothesis validity, arithmetic means and standard deviations of fourth hypothesis stipulating that ‘internal audit department uses information technology techniques in preparing internal audit report and documenting audit process.’ Have been extracted; table 6 illustrates them.

**Table 6**

Rank	Number	Paragraph	Arithmetic Mean	Standard Deviation	Level
Internal audit department uses the information technology techniques in preparing internal audit report and documenting audit process.; this use includes the following:					
1	39	The information technology is used for documenting all audit processes.	3.80	.586	High
2	37	The computerized systems are used in audit process in order to summarize the results of audit and discuss them with auditor team or facility’s management.	3.77	.726	High
3	35	The use of information technology helps the auditor collect various evidences of audit.	3.74	.574	High
4	36	Electronic technology is used in audit process in order to prepare and provide observations, recommendations and reports which are submitted to the management.	3.54	.479	Moderate
4	38	Information technology is used for reaching objective results through documenting properly the audit process.	3.54	.479	Moderate

4	40	Information technology is used for preparing audit reports and reaching the recommendations.	3.54	.366	Moderate
		Information technology is used for preparing internal audit report and documenting audit process.	3.65	.352	Moderate

Table 8 shows that arithmetic means have ranged between 3.54 – 3.80; paragraph (39): ‘The information technology is used for documenting all audit processes.’ has occupied the first rank; and the arithmetic mean has reached 3.80; paragraph (26): ‘Electronic technology is used in audit process in order to prepare and provide observations, recommendations and reports which are submitted to the management.’, paragraph (38): ‘Information technology is used for reaching objective results through documenting properly the audit process.’, and paragraph (40): ‘Information technology is used for preparing audit reports and reaching the recommendations.’ have occupied the last rank; and the arithmetic mean has reached 3.54; And total arithmetic mean of the use of information technology in preparing internal audit report and documenting audit process performed by the internal audit department has reached 3.65.

### First Main Hypothesis Test

For ensuring main hypothesis and sub-hypotheses validity, arithmetic means and standard deviations of the use of information technology techniques in audit processes performed in Jordanian banks, have been extracted; and they have been compared with standard mark 3 - hypothesis acceptance standard- by using t-test as stated in table 7.

**Table 7**

	Arithmetic Mean	Standard Deviation	T-Value	Freedom degrees	Statistical Significance
Planning	3.63	.450	11.177	63	.000
Implementing the control tests as well as the basic tests	3.59	.482	9.813	63	.000
Implementing the analytic procedures and the detailed tests	3.82	.434	15.158	63	.000
Preparing the internal audit report and documenting the audit process	3.65	.352	14.858	63	.000
Total score	3.69	.393	14.131	63	.000

Table 7 indicates the following:

- There are statistical differences at  $(0.05 = \alpha)$  between the performance and the hypothetical mean of planning; T-value has been 11.177; statistical significance has been 0.000; and it has been within the statistically acceptable level. Thus, this hypothesis, stipulating that the internal auditors use information technology techniques

in planning the internal audit processes performed in Jordanian banks, has been accepted.

- There are statistical differences at  $(0.05 = \alpha)$  between the performance and the hypothetical mean of implementing the control tests as well as the basic tests; T-value has been 9.813; statistical significance has been 0.000; and it has been within the statistically acceptable level. Thus, this hypothesis, stipulating that internal auditor uses information technology techniques in order to implement control tests as well as basic tests of audit process performed in Jordanian banks, has been accepted.
- There are statistical differences at  $(0.05 = \alpha)$  between the performance and the hypothetical mean of implementing the analytic procedures and the detailed tests; T-value has been 15.158; statistical significance has been 0.000; and it has been within the statistically acceptable level. Thus, this hypothesis, stipulating that internal auditor uses information technology techniques in order to implement analytical procedures and detailed tests of audit balances in Jordanian banks, has been accepted;
- There are statistical differences at  $(0.05 = \alpha)$  between the performance and the hypothetical mean of preparing the internal audit report and documenting the audit process; T-value has been 14.858; statistical significance has been 0.000; and it has been within the statistically acceptable level. Thus, this hypothesis, stipulating that internal audit department uses information technology techniques in preparing internal audit report and documenting audit process, has been accepted.
- There are statistical differences at  $(0.05 = \alpha)$  between the performance and the hypothetical mean of the level of information technology techniques in audit processes performed by the internal auditor in the Jordanian banks as a whole; T-value has been 14.131; statistical significance has been 0.000; and it has been within the statistically acceptable level. Thus, the main hypothesis, stipulating that the internal auditors use information technology techniques in planning the internal audit processes performed in Jordanian banks, has been accepted.

### Second Main Hypothesis Test

**Second Main Hypothesis:** The level of the use of information technology tools in audit processes varies according to the difference of organizational characteristics (the level of information technology in the bank, the difference of audit methods, data operation methods and a presence of internal auditors specialized in the technology).

For ensuring second main hypothesis validity, arithmetic means and standard deviations of the use of information technology tools in audit processes according to the following variables: the level of information technology in the bank, the difference of audit methods, data operation methods and a presence of internal auditors specialized in the technology, have been extracted; table 8 illustrates them.

**Table 8**

		Arithmetic Mean	Standard Deviation	Number
The level of information technology in the bank	Banks implement the banking transactions through the branches only	3.68	.267	14
	The banks implement accounting processes through the websites	3.60	.435	38
	The banks implement the accounting transactions through smart phone applications.	4.02	.118	12
A difference of audit methods	Audit department uses audit around computer method	4.06	.092	12
	Audit department uses information technology audit method	3.66	.371	20
	Audit department uses auditing with computer method	3.58	.403	32
Data operation method	Centralized	3.71	.365	40
	Decentralized	3.67	.443	24
A presence of internal auditors specialized in the technology	There are internal auditors who are trained to audit the electronic transactions.	3.66	.424	41
	A specialized team includes internal auditors and experts of electronic transactions and cyber security.	3.81	.250	22

Table indicates that there is an apparent variation of the arithmetic means and standard deviations of the use of information technology tools in audit processes due to the difference of the categories of the variables of the level of information technology in the bank as well as the difference of audit methods, and data operation methods in addition to a presence of the internal auditors specialized in the technology. Furthermore, Four- way analysis has been used in order to identify the significance of the statistical differences between the arithmetical means; table 9 illustrates the results.

**Table 9**

Variance Source	Sum of Squares	Degrees of Freedom	Mean Squares	F Value	Statistical Significance
the Level of Information Technology in the bank	.921	2	.460	4.581	.014
the difference of audit methods	1.166	2	.583	5.801	.005
data operation methods	.004	1	.004	.039	.844
a presence of the internal auditors specialized in the technology	.480	1	.480	4.773	.033
Error	5.627	56	.100		
Total	8.842	62			

Table 11 indicates the following results:

- There are statistically significant differences at  $(0.05 = \alpha)$  due to the impact of the level of the use of information technology in the bank; F -value and statistical

significance have reached 4.581 and 0.014, respectively. And the differences have been in favor of those banks practicing all accounting transactions through smart phone applications.

- There are statistically significant differences at  $(0.05 = \alpha)$  due to the impact of the difference of audit methods; F -value and statistical significance have reached 5.801 and 0.005, respectively. And the differences have been in favor of audit department practicing auditing around the computer method.
- There are no statistically significant differences at  $(0.05 = \alpha)$  due to the impact of data operation methods; F -value and statistical significance have reached 0.039 and 0.844, respectively.
- There are statistically significant differences at  $(0.05 = \alpha)$  due to the impact of a presence of the internal auditors specialized in the technology; F -value and statistical significance have reached 4.773 and 0.033, respectively. And the differences have been in favor of a specialized team of the internal auditors and experts of electronic transactions and cybersecurity.

Here, it can be said that the level of the use of information technology in audit processes varies according to the difference of the organizational characteristics: the level of information technology in the bank, the difference of audit methods and a presence of the internal auditors specialized in the technology.

In addition, the level of the use of information technology tools in audit processes is not different depending on the difference of the organizational characteristics related to data operation method used in Jordanian banks.

## RESULTS AND RECOMMENDATIONS

### Results

The study has reached the following results:

- The level of the use of information technology in the internal audit processes as a whole in Jordanian banks is moderate; this result is consistent with Debreceeny et. al.study (2005) ensuring that the internal auditors in Singapore use advanced audit techniques in audit processes. Furthermore, Salehi & Husini study (2010) has indicated that internal auditors use efficiently computer – assisted auditing techniques in Iran. Moreover, other studies has shown that the internal auditors use simple electronic programs such as word processing programs, electronic tables and electronic worksheets;
- The level of the use of information technology in the internal audit processes, performed by the internal audit department of Jordanian banks in various fields of planning, implementing control tests as well as basic tests, and preparing audit reports, is moderate. But, the level of use information technology in implementing the analytic

procedures and the detailed tests through Excel program and electrical worksheets is high;

- The level of the use of information technology tools in audit processes varies depending on the difference of the level of information technology in the bank; the difference has been in favor of the banks practicing the accounting transactions through smart phone applications. Accordingly, this new environment of the banking transactions contributes to the use of information technology tools in audit processes;
- The level of the use of information technology tools in audit processes varies depending on the difference of audit methods used in information technology environment; the difference has been in favor of audit department practicing auditing around the computer method in information technology environment;
- The level of the use of information technology tools in audit processes varies depending on the knowledge and professionalism of the internal auditors employing in internal audit department; the differences have been in favor of a specialized team of the internal auditors and experts of electronic transactions and cybersecurity. Thus, this new environment contributes to the use of information technology tools in audit processes; and
- The level of the use of information technology tools in audit processes is not different depending on the difference of the organizational characteristics related to data operation method used in Jordanian banks; however, it does not affect the use of information technology.

## Recommendations

The study has reached a set of recommendations as follows:

- Training courses of field of information technology, especially the field of information security and integrity and data protection against penetration attacks, internal control procedures appropriate for information technology environment and modern banking transactions, shall be continuously held for the internal auditors;
- The Central Bank shall follow up the control procedures regarding control procedures; in addition, a cooperation between the internal audit department and the Central Bank shall increase in regard with the control and audit processes performed in the digital transactions environment;
- A course related to the internal audit and the electronic methods which can be used in audit processes shall be added at Jrdanian universities; and
- Studies on the organizational characteristics such as professional standards and the legislations related to the banking control in the information technology environment shall be conducted.



### Data availability

Datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Reference

1. Al-Gahtani, Said; Hubona, Geoffrey; Wang, Jijie. (2007). Information Technology (IT) in Saudi Arabia: Culture and the Acceptance and Use of IT. *Science Direct*. Vol.44 (), 681-691
2. Ahmi, Aidi. (2012). Adoption of Generalised Audit Software (GAS) by External Auditors in the UK. A thesis submitted in partial fulfilment of the requirement for degree of Doctor of Philosophy. Department of Information Systems and Computing 'Brunel University: United Kingdom
3. Al-Qudah, Anas; Baniahmad, Ahmad; Al-Fawaerah, Nawwaf. (2013). The Impact of Information Technology on the Auditing Profession. *Management and Administrative Science Review*. Vol.2
4. Abou-El-Sood, Heba; Kotb, Amr; Allam, Amir (2015). Exploring Auditors' Perceptions of the Usage and Importance of Audit Information Technology. *International Journal of Auditing*. Vol.19266-252 ,(3)
5. Abu-Musa, Ahmad (2008). Information Technology and its Implications for Internal Auditing: An Empirical Study of Saudi Organizations. *Managerial Auditing Journal*. Vol.23 (5), 438-466.
6. Adeyemi, Semiu; Mohammed, Ajape; Ogundeji, Mathias; Tijani, Oladipupo (2014). Audit Technology Tools and Business Process Assurance: Assessment of Auditors' Perspective in Nigeria. *Universal Journal of Industrial and Business Management*. Vol.2 (4), 93-102.
7. Ahmed, Hany (2007). Information Systems Development and the Changing Role of Internal Audit .Retrieved on 14/04/2015 on link: <http://ssrn.com/abstract=1324159>
8. Braun, Robert; Davis, Harold. (2003). Computer-Assisted Audit Tools and Techniques: Analysis and Perspectives. *Managerial Auditing Journal*. Vol.18 (9), 725-731.
9. Cerullo, Michael; Cerullo, Michael. (2003). Impact of SAS NO.94 on Computer Audit Techniques . *Information Systems Control Journal*. Vol.1, available at: [www.isaca.org](http://www.isaca.org)
10. Costel, Munteanu. (2014). Arguments on Using Computer-Assisted Audit Techniques (CAATs) and Business Intelligence to Improve the Work of the Financial Auditor. *Management Strategies Journal*. Vol.26 (4), 212-220.
11. Reem okab al-kasswna (2012)Study and Evaluation of Government Electronic Accounting Information Systems - a Field Study in the Hashemite Kingdom of Jordan *Research Journal of Finance and Accounting* <https://www.iiste.org/Journals/index.php/RJFA/article/view/1808>.
12. Reem okab al-kasswna2023 Internal Control System on Using Digital Banking Applications and Services in Jordanian Banks During the Corona Virus Pandemic, *Digitalisation: Opportunities and Challenges for Business*
13. Reem Oqab Hussein Al- Khasawneh, Mohamed bshayreh Mohamed Ali Al-Oqool ,(2019) Impact of the Development of ICT Infrastructure and Security on the Effectiveness of Accounting Information in the Jordanian Banking Sector, *International Business Research Archives* Vol. 12, No. 12
14. Dahlberg, Karl. (2002, April). Statement of Auditing Standard NO.94 The Effect of Information Technology on the Auditor's Consideration of Internal Control in a Financial Statement Audit. The Fourth Continuous Reporting and Auditing Conference. United States of America: New Jersey.
15. Debreceny, Roger; Lee, Sook; Neo, Willy; Toh, Jocelyn. (2005). Employing Generalized Audit Software in the Financial Services Sector Challenges and Opportunities. *Managerial Auditing Journal*. Vol.20 (6), 605-618.

16. Honselaar, Wesley. (2012). The Internal Audit Function: A Study Examining the Impact of Emerging IT on the Development of the Function. Thesis Postgraduate IT Auditing. Department of IT Audit, Faculty of Economics and Business Administration, Vrije Universiteit Amsterdam :The Netherlands.Ismail, Noor;
17. Abidin, Azlan (2009). Perception Towards the Importance and Knowledge of Information Technology among Auditors in Malaysia. *Journal of Accounting and Taxation*. Vol.1.69-61 ,(4)
18. Jakšić, Dejan. (2009). Implementation of Computer Assisted Audit Techniques in Application Control Testing. *Management Information Systems*. Vol.4 (1), 9-12.
19. Janvrin, Diane; Bierstaker, James; Low, Jordan (2008). An Examination of Audit Information Technology Use and Perceived Importance. *Accounting Horizons*. Vol.22 (1), 1-21.
20. Lake, Laura. (2009). *Consumer Behavior for Dummies*. United States: Wiley Publishing, Inc.
21. Lanza, Richard. (2003). Using Excel as an Audit Software. Retrieved from <https://www.scribd.com/document/352136367/using-excel-as-an-audit-software-pdf>
22. Leite, Charlene; Rodrigues, Jose; Sousa, Tatiana; Hora, Henrique. (2014). IT Services Management and ISO 20000: A Case Study in an IT Remote Support Company. *Management*. Vol.4 (2), 38-49.
23. Li, Long. (2010). A Critical Review of Technology Acceptance Literature. Retrieved from: [https://scholar.google.com/scholar?hl=en&as\\_sdt=0%2C5&q=A+Critical+Review+of+Technology+Acceptance+Literature&btnG=](https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=A+Critical+Review+of+Technology+Acceptance+Literature&btnG=)
24. Louwers, Timothy; Ramsay, Robert; Sinason, David; Strawser, Jerry. (2007). *Auditing & Assurance Services*. United States of America: McGraw-Hill.
25. Lotto, Josephat (2014). Examining the Impact of Information Technology on Internal Auditing Effectiveness in Tanzanian Organizations. *Time Journals of Social Sciences*. Vol.2 (3), 13-23.
26. Mahzan, Nurmazilah; Lymer, Andrew. (2008 ‘April). Adoption of Computer Assisted Audit Tools and Techniques (CAATs) by Internal Auditors: Current Issues in the UK. BAA Annual Conference. England: Blackpool.
27. Moorthy, Mohan; Seetharaman, Ananth; Mohamed, Zulkifflee; Gopalan, Meyyappan; San, LeeHar. (2011). The Impact of Information Technology on Internal Auditing. *African Journal of Business Management*. Vol.5 (9), 3523-3539.
28. Oliveira, Tiago; Martins, Maria. (2011). Literature Review of Information Technology Adoption Models at Firm Level. *The Electronic Journal Information Systems*. Vol.14 (1), 110-121.
29. Omonuk, Joseph; Oni, Anthony (2015). Computer Assisted Audit Techniques and Audit Quality in Developing Countries: Evidence from Nigeria. *Journal of Internet Banking and Commerce*. Vol.2027-20 ,(3)
30. Pedrosa, Isabel. (2015). Computer-Assisted Audit Tools and Techniques Use: Determinants for Individual Acceptance. A thesis presented in partial fulfilment of the requirements for the degree of Doctor in Information Science and Technology. Department of Information Science and Technology ‘University Institute of Lisbon: Portugal.
31. Rosli, Khairina; Yeow, Paul; Siew, Eu-Gen. (2012, July). Computer-Assisted Auditing Tools Acceptance Using I-TOE: A New Paradigm. Pacific Asia Conference on Information Systems PACIS). Vietnam: Hochiminh City.
32. Ramen, Mootooganagen; Jugurnath, Bhavish; Ramhit, Prachitee. (2015). UTR-CTOE: A New Paradigm Explaining CAATs Adoption. *Journal of Modern Accounting and Auditing*. Vol. 11(12).631-615 ,(
33. Salehi, Mahdi; Husini, Reza (2010). A study of the Effect of Information Technology on Internal Auditing: Some Iranian Evidence. *African Journal of Business Management*. Vol.5 (15), 6169 .6179-

34. Smidt, Louis; Nest, Van; Lubbe, Dave (2014 June). The Use of Sampling and CAATs within Internal Audit Functions in the South African Banking Industry. the Iberian Conference on Information Systems and Technologies (CISTI). Spain: Barcelona.
35. Shamsuddin, Amanuddin; Rajasharen, Logenthiran; Maran, Dhinesh; Ameer, Mohamed; Muthu, Punnir. (2015, April). Factors Influencing Usage Level of Computer Assisted Audit Techniques (CAATs) by Internal Auditors in Malaysia. Economics and Law Conference. Kuala Lumpur: Hotel Putra.
36. Sharma, Rajesh; Mishra, Rajhans. (2014). A Review of Evolution of Theories and Models of Technology Adoption. IMJ. Vol.6(2),17-29.
37. Straub, Detmar; Rose, Gregory. (1998). Predicting General IT Use: Applying TAM to the Arabic World. Journal of Global Information Management. Vol.6 (3), 39-46.
38. Sayana, Anantha. (2003). Using CAATs to Support IS Audit. Information Systems Control Journal. Vol.1, available at: [www.isaca.org](http://www.isaca.org)
39. Singleton, Tommie. (2006). Generalized Audit Software: Effective and Efficient Tool for Today's IT Audits. Journal Online. available at: [www.isaca.org](http://www.isaca.org)
40. The Institute of Internal Auditors. (2003). Development and Practice Aids. (First Printing .)United States of America: The Institute of Internal Auditors.-The Institute of Internal Auditors. (2004). Development and Practice Aids. (First Printing .)United States of America: The Institute of Internal Auditors.
41. Tsai, Wen; Chen, Hui; Chang, Jui; Lee, Hsiu. (2017, January). The Internal Audit Performance :The Effectiveness of ERM and IT Environments. 50th Hawaii International Conference on System Science. Hilton Waikoloa Village Resort: Hawaii .
42. Venkatesh, Viswanath; Zhang, Xiaojun. (2010). Unified Theory of Acceptance and Use of Technology: U.S. vs. China. Journal of Global Information Technology Management. Vol.13.27-5,(1)
43. Venkatesh, Viswanath; Thong, James; Xu, Xin. (2012). Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology . Forthcoming in MIS Quarterly. Vol.36 (1), 157-178.
44. Wu, Tung-Hsien; Huang, Shi-Ming; Huang, Shaio; Yen, David (2016). The Effect of Competencies, Team Problem-Solving Ability, and Computer Audit Activity on Internal Audit Performance. Information Systems Frontiers