

Hype or Hope: Digital Technologies in Auditing Process

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ABSTRACT

Manuscript type: Research paper

Research aims: This study aims to examine how technological, organisational and environmental (TOE) factors affect digital technologies' utilisation and its impact on auditors' performance.

Design/Methodology/Approach: A survey was conducted on 4 large and non-large companies in Jordan, and data were retrieved from 168 external auditors. The partial least squares (PLS-3) structural equations modeling was used to analyse data and to test the proposed model.

Research findings: Results show that the TOE factors have a significant and positive effect on digital technologies utilisation. It also appears to enhance auditors' performance.

Theoretical contribution/Originality: This study fills a gap in the literature of accounting by empirically assessing how digital technologies utilisation impacts the performance of auditors in Jordan. It also expands on previous literature by determining how the TOE factors affect such technology usage in the auditing process. This study also has a methodological contribution in the form of measuring the client's complexity of IT system from a different perspective, which is from the external auditor's perspective.

Practitioner/Policy implications: This study is expected to help regulators and audit companies to update their policies and regulations so that auditors are trained in using advanced technologies, and in protecting the security of accounting information. In this regard, efficient

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auditors will be able to protect investors, thereby creating an attractive environment for investment which can boost economic growth.

Research limitation/Implications: This study is based on the Jordanian context. There was no comparison made with developing or developed countries, hence no distinctions can be detected. Future studies should focus on looking at other countries so as to provide new insights into the auditing profession, and specifically, auditors' performance. Finally, this study is a practical guide for external and internal auditors who have not considered digital technologies, in the context of Jordan. Future studies may thus consider internal auditors and their relationship with external auditors in digital technologies utilisation.

Keywords: Technological, Organisational and Environmental Factors, Auditors' Performance, Digital Technologies

JEL Classification: M42

1. Introduction

To date, the use of digital technologies has become increasingly important as it paves the way for investors to make effective and efficient business decisions, (Handoko et al., 2018). Companies invest in digital technologies so as to improve their operational performance and their financial reporting quality (Wicaksono & Lusianah, 2016). Further to this, Bierstaker et al. (2014) also mentioned that digital technology is a very useful tool for external auditors who can use it to perform their audit duties more efficiently, especially in a big data environment. In a more recent study, Cristea (2020) and Lee and Tajudeen (2020) observed that artificial intelligence to automate the traditional data analysis process, which includes collecting and preparing audit data, copying and transposing information between the database/software (e.g., SAP) and tools (e.g., Microsoft Excel), organising the information based on several selection criteria, integrating manual notes, and running basic tests. All of these processes have enhanced the auditing process very much, and this implies that technology advancement can facilitate auditors' performance. It helps to make the auditors' tasks more effective and efficient, for instance, in ensuring the internal control of the auditees, in accessing documents and records, and in producing information, when compared to their manual auditing approach. Although many businesses have moved towards using sophisticated IT-based environments, auditor readiness and progress in this regard has been slow (Bierstaker et al.,

2014). At the same time, IT audits in developing countries is still at the minimum level (Mansour, 2016; Ismail & Abidin, 2009). This implies that some companies may be experiencing some disadvantages. Several researchers such as Al-Ansi (2015) and Gibran (2010), argued that external auditors should bear part of the responsibilities for companies' bankruptcy and their business failures. This is because stakeholders expect auditors to provide credible and quality information. One of the ways to meet these increasing demands is by using audit technologies which can assist auditors in detecting false penetrations and frauds more efficiently (Bierstaker et al., 2014; International Federation of Accountants, 2019), thereby improving auditors' performance (International Accounting Education Standards Board, 2014).

In the context of Jordan, computerised accounting information systems used by companies and banks had helped to expose instances of electronic penetration and hacking (Mansour, 2016). Cases of credit cards issued by Jordanian banks being hacked had also occurred, involving at least 500 Visa credit cards which had led to a loss of 5 million JD (Central Bank of Jordan, 2018). This crisis raised some ambiguities about the performance of Jordanian external auditors. There is thus, an urgent need to develop a deliberate study which can address this issue. Endorsements have been made by Marie (2015), and Al-Hanini (2009), who had proposed that external auditors need to keep up to date with the changes that have occurred in Jordanian IT, which is currently being utilised as a tool in the field of accounting. The scholars maintained that external auditors need to include IT into their system so as to improve their performance.

The effects of technological factors (Handoko et al., 2018; Al-Ansi, 2015), and organisational factors (Bierstaker et al., 2014; Wicaksono & Lusianah, 2016; Curtis & Payne, 2014) on digital technologies' utilisation have been examined previously. Although these studies provided some insights into the adoption and usage of technology in auditing, there were some limitations in terms of environmental factors. Thus several scholars (Marie, 2015; Mansour, 2016; Lim-u-sanno & Ussahawanitchakit, 2009) highlighted the need for studies to integrate the environmental factors into their investigations. It was argued that the influence of professional bodies, as an environmental factor, cannot be neglected within the auditing context (Mansour, 2016; Lim-u-sanno & Ussahawanitchakit, 2009).

Statutory guidelines derived from auditors' association of professional bodies have stated that digital technology is important. However,

even though these professional bodies may serve as the legal body to raise auditing standards, its importance as an environmental factor has not been much examined. Further to this, past studies have also overlooked the impact of digital technologies on auditors' performance. Given the limitations of previous studies, there is thus a need to conduct a study, particularly within the context of Jordan as a developing country, to examine how these two factors are interrelated. To date, the audit profession in Jordan is also facing many difficulties which could be enhanced by more research focusing on information technology auditing (Mansour, 2016; Al-Hanini, 2009). Past studies have mainly focused on western countries which are typically characterised by their individualistic culture, hence the current study aims to examine the context of an Arabic community that possesses a collectivistic culture where its social life is more dominating than its private life (Marie, 2015). In this regard, Jordan serves as an interesting setting.

This study addresses the gap identified in existing accounting literature by empirically assessing the impact of TOE factors on digital technologies' utilisation and its impact on auditors' performance, in the context of Jordan. This study also makes a methodological contribution by measuring the companies' complexity of IT system, from the perspective of the external auditors. The findings of this study are expected to enable regulators and audit firms to update their policies and regulations so that auditors can be mandatorily trained in the use of advanced technologies which can then enhance their performance. The auditors' efficiency would then be able to offer protection to investors, thereby creating an attractive environment for boosting the overall economic growth.

This paper is organised in the following manner: Section 2 discusses the literature review and hypotheses development. Section 3 explains the methodology. Section 4 reports on the findings, Section 5 focusses on the discussions and Section 6 concentrates on the implications and limitations of the study.

2. Literature Review

2.1 Auditor Performance

Auditor performance is defined as the total expected values offered, and the behaviours conducted by auditors. Recent financial crises have highlighted old and new questions concerning auditors' performance,

which point to the credibility of financial statements prepared by auditors. Traditionalists contend that external audits contribute to the credibility of financial statements because auditors are trained to be insightful; they also possess the knowledge that can be used to curtail poor management as well as to facilitate the production of accurate information (Handoko et al., 2018; Sikka, 2009). In relation to this, Curtis and Payne (2014) emphasised that improving audit performance is of particular importance in today's audit environment that is characterised by increased responsibilities and workloads, especially fraud detections. This task is especially mandated by SAS No. 99, which states that suboptimal performance, particularly in situations where task complexity exceeds individual skills and experience, can be improved.

Technological advancement, to some extent, has disrupted the audit profession as auditing firms strive to keep abreast with the technologies. The adoption of new and smart technologies can lead to improvements in many aspects of the professions' quality, hence it is vital to implement the technology. Since mid-2000, there has been a marked increase in the introduction of technologies. This has impacted auditors' role and profession (La Torre et al., 2018; Kozlowski, 2018). Techniques such as continuous auditing and computer assisted audit techniques (CAATs) require that auditors adopt advanced electronic environments (Lamboglia & D'Onza, 2014; Curtis & Payne, 2014; Braun & Davis, 2003). Despite the relevant effects and widespread diffusion of technology in auditing, these issues seem to be under-researched. While literature on digital technologies is vast, ranging from engineering to a wide set of applications in many areas of research, research examining their applications in the audit profession is far in between (Issa et al., 2016).

2.2 Theory of Technology-Organisation-Environment (TOE)

In examining the technological, organisation, and environment factors that may influence the performance of the Jordanian external auditors, this study employs the theory of technology-organisation-environment (TOE) as a framework. Developed by Tornatzky and Fleisher (1990) for the purpose of analysing information technology adoption by companies, the TOE is a technology acceptance model. Using this framework, Tornatzky and Fleisher (1990) was able to identify the factors that influenced technology adoption among companies. The first of these, the technological context describes both the external and internal technologies relevant to a company. This includes current firm

practices (Lin & Lin, 2008) as well as the available external technologies (Pan & Jang, 2008). The second, organisational context, refers to the organisation's scope, managerial structure and size (Oliveira & Martins, 2008), and finally, the environmental context refers to how the organisation conducts its businesses which comprise the nature of the industry, government dealings and its competitors (Tornatzky & Fleischer, 1990).

The TOE framework serves as a useful analytical structure for examining the adoption and assimilation of different information technology innovations. The TOE framework has a consistent empirical support, a solid theoretical basis, and various potential applications in information system innovations (Awa et al., 2015). However, some specific factors may vary across different studies. Based on the TOE theory, this study incorporates three factors, namely the technological factors, organisational factors and environmental factors, which are deemed to influence digital technologies' utilisation among companies.

2.2.1 *Technological Factors*

The technological factors are evaluated based on three dimensions - IT knowledge, IT cognitive style and IT self-efficacy. IT knowledge refers to the individual's ability to describe the conceptual or theoretical aspect of the technology (International Federation of Accountants, 2019). It is deduced that auditors' computer knowledge would enhance their positive perceptions on digital technologies (Mansour, 2016). It appears that users who have IT knowledge tend to develop positive experiences when using the system. Thus, they are more likely to utilise the system in the future. They also tend to have the confidence that using digital technologies could facilitate their performance in their auditing tasks, thereby leading to higher utilisation (Wicaksono & Lusianah, 2016; Al-Ansi, 2015). Based on these arguments, the following hypothesis was formulated:

H_{1a}: IT knowledge has a positive effect on digital technologies' utilisation.

Results from prior studies have shown that IT cognitive styles can affect the individual's decision-making and behaviour, significantly (Chakraborty et al., 2008; Handoko et al., 2018; Marie, 2015). Cognitive style is defined by Messick (1976, p. 4) as "stable attitudes, preferences or habitual strategies that determine individuals' modes of perceiving,

remembering, thinking and problem solving". It has been noted that cognitive style can significantly and positively impact on the individual's perception of IT importance (Chakraborty et al., 2008). Individuals who perceive that new technologies can be useful, and are easy to use, tend to increase IT utilisation, and past studies seemed to show consistency. For instance, Al-Ansi (2015) found that cognitive style positively influenced the individuals' perceived IT importance and utilisation. Based on the above, the following hypothesis was formulated:

H_{1b}: IT cognitive style has a positive effect on digital technologies' utilisation.

Self-efficacy refers to the person's belief in his/her own capability and ability to organise and execute a course of action so as to produce a desired outcome (Bandura, 1997). Within the context of technology, individuals with high self-efficacy tend to be more confident in using the tools; they enjoy the usage, and they experience less anxiety about using them (Chakraborty et al., 2008). This argument was also endorsed by Mansour (2016) who mentioned that self-efficacy can influence performance expectations. Likewise, Wicaksono and Lusianah, (2016) deduced that self-efficacy has a significant impact on IT utilisation. Based on the above arguments, the following hypothesis was thus formulated:

H_{1c}: IT self-efficacy has a positive effect on digital technologies' utilisation.

2.2.2 Organisational Factors

In this study, the organisational factors were evaluated based on three dimensions, which include management support, IT training and IT facilitating resources. Management support is defined as the perceived level of general support offered by senior executives and decision makers (Igbaria et al., 1997). The active involvement of management increases the strategic importance of the technology usage (Ahmi & Kent, 2013). Without the support of the management, technology development could not be manifested across organisations because it requires substantial financial resources. Within the context of auditing, Curtis and Payne (2014) found that management support leads to increased IT usage. Based on this, the following hypothesis was thus proposed:

H_{2a}: IT management support has a positive effect on digital technologies' utilisation.

With the development of information technology, devices are being introduced more rapidly into the market. This also leads to organisations investing in financial resources so as to acquire the latest available technology. Despite this, technologies are being under-utilised mainly because of the employees' incapability to use them. This phenomenon suggests the importance of IT training so as to optimise technology usage (Yi & Davis, 2001). IT training helps employees to update their skills, and to reduce their anxiety towards technology adoption, thereby leading to high utilisation. In the auditing context, studies done by Al-Ansi (2015), Mansour (2016), and Handoko et al. (2018) found a positive relationship between IT training and IT utilisation. Given these arguments, the following hypothesis was thus formulated:

H_{2b}: IT training has a positive effect on digital technologies' utilisation.

Curtis and Payne (2014), and Ahmi and Kent (2013) found that IT usage can be hindered by the limited access to hardware and software facilities. This means that the individual's perception of control over the use of technology is influenced by the available IT facilitating resources. Venkatesh et al. (2003, p. 453) defined IT facilitating resources as "the degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system". In the auditing context, auditors are more likely to use technologies like the CAAT, if they believe that the organisation provides them with the necessary IT support (Bierstaker et al., 2014). Based on these arguments, it is thus expected that IT facilitating resources would positively affect digital technologies utilisation; hence the following hypothesis was formulated:

H_{2c}: IT facilitating resources have a positive effect on digital technologies' utilisation.

2.2.3 Environmental Factors

In this study, the environmental factors were evaluated based on complexity of clients' IT system, their competitive pressure, and the regulations imposed by professional bodies. Control risk may influence computer-related audit procedures when examining clients with complex IT system (American Institute of Certified Public Accountants, 2012). For example, SAS No. 94 cautions auditors that determining control risks

at maximum level, and relying only on testing as a procedure, may not be sufficiently effective for clients with complex IT systems. Moreover, professional standards suggest that auditors should consider control risks during planning, when examining clients with complex IT systems (American Institute of Certified Public Accountants, 2011). Al-Ansi et al. (2013) also agreed with Al-Kharbi (2010) that if external auditors were not updated in terms of the IT usage, they would be unable to cope with other challenges being imposed by the technology-driven business environment. In support of that, Marie (2015) asserted that those interested in the audit profession are well aware of the gap existing between the actual practice of auditors, and the improvements noted in the IT-related auditing profession. Based on this, it is thus expected that the complexity of client's system has a positive influence on their IT utilisation. Hence, the following hypothesis was proposed:

H_{3a}: Perceived complexity of clients' IT system has a positive effect on digital technologies' utilisation.

Recent audit-market pressures have led to radical changes in the audit methodologies of some audit companies (Mansour, 2016). To increase both the audit effectiveness and its value to clients, audit firms are persuaded to adopt new technologies (Berberich, 2005). More than a few regulators and researchers have raised concerns about the ability of small audit companies in competing with larger companies in the IT environment (Handoko et al., 2018). This shows that competition drives the auditing firms to consider technology investment so as to maintain their competitiveness. Companies' adoption of advanced technologies may enable these auditing firms to leverage on newer and more efficient ways of auditing, hence the ability to outperform their rivals. The utilisation of the state-of-the-art technologies would help such auditing firms to position themselves as a leading-edge auditing firm. Based on this, it is expected that competitive pressure has a positive influence on digital technologies' utilisation. Thus, the following hypothesis was formulated:

H_{3b}: Competitive pressure has a positive effect on digital technologies' utilisation.

Professional bodies are sources for helping members to remain well-informed, and to sustain their relevance. They also ensure that members conform to international professional standards and practices (American Institute of Certified Public Accountants, 2012).

Undoubtedly, regulations and laws related to IT increase the awareness of IT importance among auditors (International Accounting Education Standards Board, 2014; International Federation of Accountants, 2019). Prior literature (Curtis & Payne, 2014; Al-Ansi, 2015; Wicaksono & Lusianah, 2016) has highlighted the relationship between professional associations and technology adoption. It is deemed that auditors' acceptance of IT would increase if they are encouraged by their professional associations to adopt these audit technologies. Based on this, it is therefore deduced that regulations done by professional bodies have a positive influence on auditors' digital technologies utilisation. Based on the above, the following hypothesis was formulated:

H_{3c}: Regulations of professional bodies have a positive effect on digital technologies' utilisation.

2.2.4 *Digital Technologies' Utilisation and Auditors' Performance*

The effective use of IT generates innovations; it can also help firms to redesign their business processes, which, together with positive dynamics, can subsequently lead to enhanced performance (Handoko et al., 2018). IT utilisation can influence business performance in several ways such as: 1) by altering richness perceptions of IT importance; and 2) by affecting performance, that is, to improve the efficiency and effectiveness of businesses (Wicaksono & Lusianah, 2016). Auditing standards proposed by associations have also stated that IT utilisation may improve audit performance (Bierstaker et al., 2014). Interestingly, auditors had previously indicated that IT utilisation is important for several applications (audit planning, risk assessment, internal control evaluation, client acceptance, client relationship management, and fraud review) (Mansour, 2016). IT utilisation is equally important because audit technologies make it possible for auditors to improve their performance (Al-Ansi, 2015). Therefore, it is believed that IT utilisation would have a positive influence on auditors' performance. Based on this, the following hypothesis was formulated:

H₄: Digital technologies' utilisation has a significant and positive effect on auditors' performance.

Based on the literature review, and the formulated hypotheses, a research framework was thus developed for this study. Figure 1 illustrates.

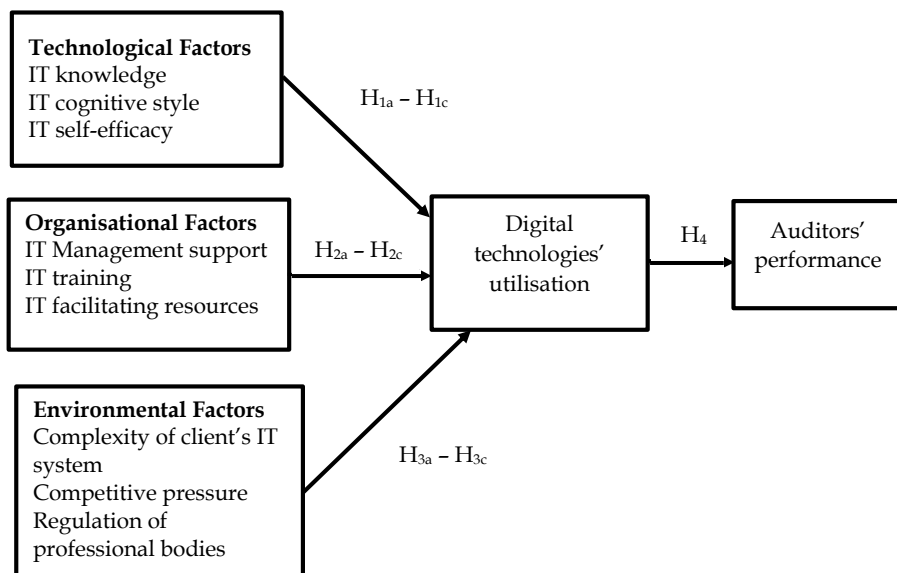


Figure 1: Research Framework

3. Methodology

This study employs a quantitative approach based on a survey questionnaire which was used to test the research hypotheses. The research population for this study comprised Jordanian auditors of various ranks, including audit partners, audit senior managers, audit managers, senior auditors, junior auditors, audit trainees, or other equivalent positions. The questionnaire was pilot tested with 40 respondents from 4 large and non-large companies. Based on the 32 responses received, the inconsistencies of wording, and unclear or ambiguous items listed in the questionnaire were refined. According to the Jordanian Association of Certified Public Accountants (2019), the total population of Jordanian external auditors are, of date, 360. Using the rand () function noted in MS Excel, random numbers were then generated. These were first sorted, and then selected, from the 186 external auditors who represented 4 large and non-large companies. Prior to the questionnaire distribution, formal approval was acquired from the auditors who participated in the survey and their top management. This is pertinent because the Jordanian government has a stringent regulation that prohibits Jordanian auditors from participating in any study without the consent of their companies'

top management. Once the permission was granted, the questionnaires were personally distributed to external auditors who were randomly selected from different areas in Jordan. Of the 186 questionnaires administered, a total of 168 were retrieved, resulting in a 90.32 per cent response rate, hereby considered high. This was possible because the questionnaires were personally distributed, which was the most preferred approach, instead of online distribution or by the telephone. In this study, each construct or variable was measured through the use of multi-items adapted from previous studies. These were measured based on the 5-point Likert-scale. Appendix 1 further illustrates.

4. Analysis and Findings

The partial least squares (PLS-3) structural equation modeling was employed to test the conceptual model and the developed hypotheses. Majority of the respondents were males (69.6 per cent), aged between 20 to 29 years old (54.8 per cent). More than half (59.5 per cent) of the respondents possessed a bachelor's degree and had been working for more than 10 years (27.4 per cent). A total of 91.7 per cent of the respondents had professional qualifications, with majority of them possessing the JACPA, and most being Junior Auditors. Table 1 summarises the demographic profiles.

4.1 Measurement Model Analysis

The measurement model analysis was performed so as to examine the model's reliability and validity. This was assessed through convergent validity and discriminant validity tests. As shown in Table 2, the factor loadings for all items were between 0.548 and 0.956, which were above the threshold value of 0.5 (Hair et al., 2017). Both the composite reliability (CR), and average variance extracted (AVE) scales were above the accepted values of 0.5. These figures implied that the items satisfied the convergent validity test.

Besides convergent validity, the current study also uses discriminant validity to strengthen the findings. As per past studies, the discriminant validity is only deemed to exist if the value of the average variance extracted for a particular construct is higher than its correlation with other constructs (Hair et al., 2017). As noted in Table 3, all constructs had AVE values which were substantially higher than their correlation with other constructs, indicating that there was discriminant validity.

Table 1: Demographic Summary of Survey Respondents

Demographic Variables	Category	Frequency	Percentage (%)
Gender	Male	117	69.6
	Female	51	30.4
Age	20 – 29 years	92	54.8
	30 – 39 years	28	16.7
	40 – 49 years	20	11.9
	50 – 59 years	22	13.1
	60 years and above	6	3.6
Educational Level	Diploma	13	7.7
	Bachelor	100	59.5
	Master	42	25.0
	Doctorate	13	7.7
Experience	Never	14	8.3
	Less than 1 year	23	13.7
	2 – 5 years	44	26.2
	6 – 10 years	41	24.4
	Above 10 years	46	27.4
Professional qualification	Yes	154	91.7
	No	14	8.3
Type of professional qualification	CPA	51	30.4
	ACCA	11	6.5
	CMA	12	7.1
	JACPA	80	47.6
	No qualification	14	8.3
Current position	Audit Partner	31	18.5
	Audit Senior Manager	24	14.3
	Audit Manager	22	13.1
	Senior Auditor	33	19.6
	Junior Auditor	44	26.2
	Audit Trainee	14	8.3

Table 2: Convergent Validity of Measurement Model

Constructs	Items	Factor Loadings	Average Variance Extracted (AVE)	Cronbach's Alpha	Composite Reliability (CR)
IT Knowledge	ITK1	0.816	0.573	0.839	0.869
	ITK2	0.763			
	ITK3	0.811			
	ITK4	0.625			
	ITK5	0.754			
IT Cognitive Style	ITCS1	0.759	0.6	0.834	0.882
	ITCS2	0.744			
	ITCS3	0.784			
	ITCS4	0.797			
	ITCS5	0.787			
IT Self-Efficacy	ITSE1	0.589	0.545	0.719	0.825
	ITSE2	0.755			
	ITSE3	0.863			
	ITSE4	0.720			
IT Management Support	ITMS1	0.838	0.728	0.875	0.914
	ITMS2	0.928			
	ITMS3	0.842			
	ITMS4	0.800			
IT Training	ITT1	0.887	0.667	0.834	0.888
	ITT2	0.887			
	ITT3	0.707			
	ITT4	0.772			
IT Facilitating Resources	ITFR1	0.889	0.688	0.886	0.917
	ITFR2	0.870			
	ITFR3	0.851			
	ITFR4	0.756			
	ITFR5	0.773			
Complexity of Clients' IT System	CCS1	0.861	0.843	0.917	0.941
	CCS2	0.956			
	CCS3	0.934			
Competitive Pressure	CP1	0.873	0.510	0.703	0.801
	CP2	0.612			
	CP3	0.776			
	CP4	0.548			
Regulations of Professional	RPBJ1	0.907	0.572	0.842	0.868
	RPBJ2	0.793			

Table 2: Continued

Constructs	Items	Factor Loadings	Average Variance Extracted (AVE)	Cronbach's Alpha	Composite Reliability (CR)
Bodies in Jordan	RPBJ3	0.719	0.637	0.885	0.913
	RPBJ4	0.687			
	RPBJ6	0.647			
Auditors' Performance	AP1	0.805	0.637	0.885	0.913
	AP2	0.848			
	AP3	0.735			
	AP4	0.725			
	AP5	0.867			
	AP6	0.796			
Digital Technologies' Utilisation	DTU1	0.889	0.738	0.875	0.924
	DTU2	0.715			
	DTU3	0.805			
	DTU4	0.773			
	DTU5	0.857			

Table 3: Discriminant Validity Analysis

Constructs	CCS	CP	ITCS	ITFR	ITK	ITMS	ITSE	ITT	AP	RPBJ	DTU
CCS	0.918										
CP	0.218	0.714									
ITCS	0.244	0.337	0.774								
ITFR	0.308	0.593	0.499	0.829							
ITK	0.126	0.327	0.323	0.490	0.757						
ITMS	0.256	0.541	0.412	0.508	0.250	0.853					
ITSE	0.361	0.463	0.490	0.526	0.322	0.613	0.738				
ITT	0.182	0.620	0.217	0.551	0.486	0.637	0.485	0.817			
AP	0.165	0.578	0.508	0.710	0.423	0.720	0.532	0.651	0.798		
RPBJ	0.371	0.007	0.204	0.057	0.316	0.108	0.108	0.039	0.292	0.756	
DTU	0.201	0.312	0.220	0.525	0.426	0.270	0.641	0.523	0.350	0.567	0.770

Notes: The numbers in bold in the diagonal row are square roots of the AVE, SD = Standard Deviation, M = Mean, CCS = Complexity of Clients' Systems, CP = Competitive Pressure, ITCS = IT Cognitive Style, ITFR = IT Facilitating Resources, ITK = IT Knowledge, ITMS = IT Management Support, ITSE = IT Self-Efficacy, ITT = IT Training, AP = Auditors' Performance, RPBJ = Regulations of Professional Bodies in Jordan, DTU = Digital Technology Utilisation.

4.2 Structural Model Analysis

Assuming that the measurement model satisfied the convergent and discriminant validity, a structural model was thus developed and then tested. The R square value for the auditors' performance and their digital technologies' utilisation were recorded at 0.754, and 0.683, respectively. This indicates that a substantially adequate model has been developed. Table 4 presents the hypotheses testing results. The results revealed that IT knowledge ($\beta=0.527$, $t=3.253$, $p<0.001$), IT cognitive style ($\beta=0.321$, $t=1.368$, $p<0.05$), IT self-efficacy ($\beta=0.374$, $t=4.521$, $p<0.001$), IT management support ($\beta=0.111$, $t=2.150$, $p<0.05$), IT training ($\beta=0.224$, $t=3.298$, $p<0.01$), IT facilitating resources ($\beta=0.303$, $t=5.265$, $p<0.001$), perceived complexity of clients' IT system ($\beta=0.126$, $t=2.541$, $p<0.05$), competitive pressure ($\beta=0.155$, $t=3.187$, $p<0.05$), and regulations of professional bodies ($\beta=0.192$, $t=5.225$, $p<0.001$), all had positive impact on digital technologies' utilisation. These results further supported H_{1a} , H_{1b} , H_{1c} , H_{2a} , H_{2b} , H_{2c} , H_{3a} , H_{3b} and H_{3c} . This showed the evidence which indicates that digital technologies' utilisation had a significant influence on auditors' performance ($\beta=0.160$, $t=5.225$, $p<0.001$). Hence, H_4 was supported.

5. Discussion

This study aims to investigate the impact of technological, organisational and environmental factors on digital technologies' utilisation. It also attempts to investigate the relationship between digital technologies' utilisation and auditors' performance. Consistent with previous studies (Curtis & Payne, 2014; Chakraborty et al., 2008; Schwarzer, 2014), this study lends credence to the importance of technological, organisational and environmental factors, as noted through the findings. The move to industrial revolution 4.0 has brought about many emerging software/applications/hardware to the auditors' working environment (Lois, et al., 2020; Dbouk & Zaarour, 2017). Such a situation may cause a "change" in the auditing process, and as a result, some aspects of judgments had become digitised. The robotic process automation has replaced the traditional revenue and payroll testing process, hence in the new auditing method, different machine learning techniques are being applied. This helps to create a predictive model which can impact the auditing process. While the emergence of these technologies may be a tool that could improve the auditing process, the changes these technologies imposed on organisations may be perceived differently by

Table 4: Hypotheses Testing Results

Construct	Hypotheses	Path Coefficient	Sample Mean (M)	Standard Deviation (STDEV)	T-Statistics (O/STDEV)	P-Values (One-tail)
IT Knowledge Utilisation	→ Digital Technologies'	H _{1a}	0.530	0.052	3.253	0.000
IT Cognitive Technologies' Utilisation	Style → Digital Technologies' Utilisation	H _{1b}	0.320	0.062	1.368	0.001
IT Self-Efficacy Technologies' Utilisation	→ Digital Technologies' Utilisation	H _{1c}	0.369	0.068	4.251	0.000
IT Management Support Technologies' Utilisation	→ Digital Technologies' Utilisation	H _{2a}	0.101	0.050	2.150	0.016
IT Training Utilisation	→ Digital Technologies'	H _{2b}	0.215	0.055	3.298	0.000
IT Facilitating Resources Technologies' Utilisation	→ Digital Technologies' Utilisation	H _{2c}	0.295	0.070	5.265	0.000
Perceived Complexity of Clients' IT System Utilisation	→ Digital Technologies' Utilisation	H _{3a}	0.118	0.060	2.541	0.006
Competitive Pressure Technologies' Utilisation	→ Digital Technologies' Utilisation	H _{3b}	0.140	0.051	3.187	0.001
Regulation of Professional Bodies in Jordan Utilisation	→ Digital Technologies' Utilisation	H _{3c}	0.188	0.075	2.699	0.004
Digital Technologies' Utilisation Auditors' Performance	→	H ₄	0.151	0.057	5.225	0.000

different auditors, depending on their level of self-efficacy and comfort in using the technologies (Wicaksono & Lusianah, 2016). Consequently, some auditors may hesitate in utilising these digital technologies. They may refrain from adapting to the changes, and from learning new things due to their low confidence, and their lack of technology “savviness”. It is probable that their lack of adequate IT skills and knowledge may cause them to perform their job less effectively. In some extent, their lack of skills and knowledge may cause them anxiety, which then lowers their optimisation in digital technologies’ utilisation (Mansour, 2016; Handoko et al., 2018). The continuous upgrading of technologies may also unsettle their confidence, thereby leading to the need for them to be retrained several times. A process of this nature may lead to substantial training costs for the organisations. Based on this, it is not surprising, that without the support of the management, digital technologies and their benefits may not materialise.

The rapid advancement of digital technologies and the benefits they bring to the auditing process have enabled many large accounting firms to introduce the use of technology, such as artificial intelligence, in making audit judgments (Serpeninova, et al., 2020). This advancement may pressurise the auditors into changing their conventional auditing process to something more current, so as to stay ahead of current changes. As auditing firms are regulated by professional accounting bodies, there is no doubt that the auditing standards issued by the professional bodies would help to increase their awareness on current and new technologies that would enhance their management of accounting issues (Curtis & Payne, 2014). As members of the professional bodies, these auditors would be influenced to utilise these digital technologies, as noted by the current study. This outcome may be due to the fact that many of the respondents in the current study were from large enterprises with large accounting transaction volumes, which may be overwhelming and less manageable to be audited manually. In that regard, it explains why these large auditing firms would require a complex accounting information system (Pratoomsuwan, 2017). Thus, there is a need for the auditors concerned to use digital technologies, which are more advanced, in order to perform their auditing tasks more efficiently.

6. Implications and Conclusion

In conclusion, this paper presents the extent of digital technologies’ utilisation in the auditing context by focussing on the technological,

organisational and environmental (TOE) framework. Theoretically, it contributes to existing literature by incorporating the environmental factors into the framework; it also measures the complexity of clients' IT system from the perspective of external auditors. This study also expands on previous literature by investigating the impact of digital technologies' utilisation on auditors' performance.

With the emergence of industrial revolution 4.0, audit firms, professional bodies, and regulators are beginning to direct their focus to the impact of technology. The result of this study showed that technology has clear benefits on the operational efficiency of the auditing process. Alongside these benefits, firms, however, need to overcome some of the challenges, some of which are not fully understood. There is no doubt that the disruptive technologies are having a profound impact on the skills required of auditors, and this has implications for educators and recruitment policies. The findings derived from the current study suggest that it is imperative for firms and educators to develop digital talents. It appears that IT and coding should be embedded into the educational syllabus because IT is no longer a niche subject area. Digital skills are the engine of the future's growth, hence there is a need for educational institutions to expose future graduates to such knowledge as it would help prepare them to practise auditing with more efficiency since digital technologies' utilisation offers many huge benefits. Auditing firms must not only focus on accounting technical skills when delivering or sending auditors for training. Instead, they need to blend the technical skills with digital skills so as to enhance the auditors' performance. Training institutions need to plan and design special training programmes which can increase the IT cognitive styles of auditors. Doing so would help to improve their attitude and their habitual strategies for recognising, remembering, thinking and problem-solving in their performance. With sufficient training and support from the top management, the auditors' competency could be improved, and digital technologies' utilisation could increase.

In response to the speed of technological and digital advances noted in the auditing context, it is imperative for audit firms and auditors to invest in these technologies, and to know how to use them. The parties involved may need to consider artificial intelligence, block chain, and other developments in data capabilities as a measure to ensure their competitiveness. It is important for audit firms to adopt digital technologies so that their audit strategies can be aligned with the clients' sophisticated accounting systems. The findings of this study also suggest

that professional accounting bodies need to tighten the requirements in using digital technologies, and to provide support so as to encourage audit firms to use the tools.

While this study provides contributions to both academia and practice, it is also restricted by some limitations. First, the study only focused on external auditors, and not internal auditors in Jordan. Future studies may consider the internal auditors and their relationship with external auditors, whether in Jordan or other countries, so as to provide new insights into the audit profession. Second, this study had not considered the responses of stakeholders on the importance of IT and its relationship with external auditors. Future studies could focus on this area so as to uncover the IT gap between stakeholders and external auditors. It may also be useful for future research to identify stakeholders' satisfaction with external auditors' tasks. Finally, this study had only focused on the context of Jordan without considering other developing or developed countries. Future studies could therefore focus on other countries so as to provide new insights which could be compared professionally and specifically with regards to auditors' performance.

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Appendix 1

Measurement of Variables

Variables	Items	Questions	Sources
IT knowledge	ITK1	I have good knowledge of general office automation.	Ismail & Abidin (2009)
	ITK2	I have good knowledge of accounting firm office automation.	
	ITK3	I have good knowledge of audit automation.	
	ITK4	I have good knowledge of e-commerce technologies.	
	ITK5	I have good knowledge of system design and implementation.	
IT Cognitive Style	ITCS1	I usually have original ideas.	Chakraborty et al. (2008)
	ITCS2	I like to proliferate (increase) ideas.	
	ITCS3	I am self-motivated person.	
	ITCS4	I usually think critical to show my work problems.	
	ITCS5	I like to cope with several new ideas at the same time.	
IT Self-Efficacy	ITSE1	I am capable to achieve the goals I have set for myself.	Iskandar et al. (2012)
	ITSE2	I have the IT skills that help me to accomplish my tasks.	

Appendix 1 (continued)

Measurement of Variables

Variables	Items	Questions	Sources
	ITSE3	In general, I think that I can utilise the IT to obtain outcomes that are important to me.	
	ITSE4	I be able to successfully use IT to overcome many challenges.	
	ITSE5	I am confident that I have IT knowledge to help me to role effectively on many different tasks.	
	ITSE6	I have IT skills that enable me to do most tasks very well.	
Management Support	ITMS1	Top management is interested in IT function.	Ragu-Nathan et al. (2004)
	ITMS2	Top management in my firm is aware of the benefits that can be achieved by using audit technology.	
	ITMS3	Top management always supports and encourages the use of audit technology.	
	ITMS4	Top management keeps the pressure on auditors to use IT.	
IT Training	ITT1	Continuous IT training provided by firm helps me to do my auditing job more efficiently.	Takeuchi et al. (2007)
	ITT2	Comprehensive IT training programs provided by firm are important in enhancing my auditing job.	
	ITT3	Training programs provided by firm developed my IT skills and knowledge.	
	ITT4	IT Training programs provided by firm enhanced my auditing job experiences.	
IT Facilitating Resources	ITFR1	I have the resources necessary to use the information techniques used in this organisation.	Curtis & Payne (2014)

Appendix 1 (continued)

Measurement of Variables

Variables	Items	Questions	Sources
	ITFR2	Information techniques used in this organisation are compatible with other audit software I use.	
	ITFR3	Assistance is available for system difficulties when I use the information techniques used in this organisation.	
	ITFR4	Specialised instructions concerning the information techniques are available to me.	
	ITFR5	Information techniques used in this organisation fits well with the firm's audit approach.	
Complexity of Clients' IT System	CCS1	Auditing in a highly automated system is complex.	Gerrard & Cunningham (2003)
	CCS2	Auditing clients use complex IT systems involving complex procedures.	
	CCS3	Computer-related audit procedures are difficult to understand.	
Competitive Pressure	CP1	As a response to the competition, I use IT to perform my audit job.	Chwelos et al. (2001)
	CP2	In the audit firms, the adoption of IT is helpful in allowing an organisation to remain competitive.	
	CP3	There is pressure to adopt IT placed on my audit firm by our competitors.	
	CP4	It is important to apply the latest technology to stay competitive.	
Regulation of Professional Bodies in Jordan	RPBJ1	Regulation of Professional Bodies takes into consideration the continuous development of IT.	Al-Kharbi (2010)
	RPBJ2	Regulation of Professional Bodies takes into consideration the audit procedures in IT.	

Appendix 1 (continued)

Measurement of Variables

Variables	Items	Questions	Sources
	RPBJ3	Professional bodies such as JACPA provide the essential framework of the audit procedures in the computerised environment.	
	RPBJ4	Professional bodies such as JACPA work to promote the profession of audit to cope with IT.	
	RPBJ5	Professional bodies have ability to change the auditing competitive environment.	
	RPBJ6	There is a relationship between the professional bodies such as JACPA and the international professional organisations to develop the audit.	
Auditors' Performance	AP1	I found the information techniques used in this organisation useful in my electronic audit job.	Curtis & Payne (2014)
	AP2	I found using the information techniques used in this organisation enabled me to accomplish tasks more quickly.	
	AP3	I found using the information techniques used in this organisation increased my overall productivity.	
	AP4	I found using the information techniques used in this organisation increased my chances of getting a raise.	
Digital Technologies' Utilisation	DTU1	Utilisation of General Office Automation.	Ismail & Abidin (2009)
	DTU2	Utilisation of Accounting Firm Office Automation.	
	DTU3	Utilisation of Audit Automation.	
	DTU4	Utilisation of E-Commerce Technologies.	
	DTU5	Utilisation of System Design and Implementation.	

