The Impact of Digital Transformation on Audit Quality: Exploratory Findings from a Delphi Study

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Abstract

The study is designed to explore the effect of digitalization on audit quality. To achieve this objective, A Delphi study with 20 projections about the quality of auditing related to digitalization was developed and evaluated by a panel of Egyptian auditors on two rounds. Some of the results of this investigation showed that the respondents expect some major changes in the determinants of audit quality in the future as a result of digitalization especially when it comes to the qualifications of auditors, some audit procedures performed, and the timeliness of audit report. Other findings demonstrate that experts do not see a dramatic impact of technological progress on the determinants of audit quality mainly in the areas related to the audits becoming less informative or obsolete thus making audit users lose trust in them, increasing the auditing expectation gab, or increasing the regulatory gap between auditing standards and the new business reality. Among the issues that emerge from these findings are that advanced technologies such as big data analytics, artificial intelligence, blockchain technology, and Robotic process automation have the potential to decrease human involvement in the auditing process. Thus it cannot be expected that the auditing profession will stay the same under the prevalence of digitalization.

Key words

Exploratory study , Delphi study, Audit quality, Digital transformation, Digitalization

المستخلص

تهدف الدراسة إلى استكشاف أثر التحول الرقمي على جودة المراجعة. ولتحقيق هذا الهدف، تم توظيف منهجية دلفي Delphi عن طريق تطوير عشرون تنبؤ بأثر التحول الرقمي على محددات جودة المراجعة وهي مدخلات عملية المراجعة، إجراءات عملية المراجعة، مخرجات عملية المراجعة، التفاعل بين أصحاب المصلحة في عملية المراجعة، وبيئة عملية المراجعة. ثم تم تقييم هذه التنبؤات من خلال جولتين عن طريق مجموعة من مراجعي الحسابات المصريين . وقد أسفرت نتائج هذه الدراسة عن أن مراجعي الحسابات المصريين يتوقعون بعض التغيرات المهمة في محددات جودة المراجعة كنتيجة لإنتشار التحول الرقمي خصوصاً فيما يتعلق بمؤهلات المراجعين، بعض إجراءات المراجعة المطبقة، وتوقيت إصدار تقرير المراجعة. وعلى الجانب الآخر، اتفق مراجعي الحسابات على أن التحول الرقمي لن يؤثر بصورة كبيرة على محددات جودة المراجعة المتعلقة بفقدان عملية المراجعة لثقة المستخدمين، اتساع فجوة التوقعات، أو اتساع الفجوة التنظيمية بين معايير المراجعة والواقع العملي للمهنة. ويترتب على هذه النتائج أن التطور التكنولوجي المتسارع والمتمثل في تقنيات التحول الرقمي مثل البيانات الضخمة، الذكاء الإصطناعي، تكنولوجيا سلاسل الكتل، والتشغيل الآلي للعمليات بواسطة الإنسان الآلي سيكون لها دوراً كبيراً في تقليل التدخل البشري في عملية مراجعة الحسابات، ولهذا لا يمكن التوقع أن تظل عملية المراجعة على ما هي عليه في ظل شيوع أدوات التحول الرقمي.

الكلمات الدالة

التحول الرقمي ، جودة المراجعة ، منهجية دلفي ، دراسة استكشافية

10

1.Introduction

Auditing is perceived as a governance mechanism that is intended to avoid potential conflict between shareholders and managers, and to guarantee that reliable accounting information is disclosed (Carcello,et.al,2011). Accordingly, it is important to ensure its quality because audit quality is the main concern of stakeholders (Beisland et.al,2015; Hope et.al,2008); As a result, the audit profession must evolve to ensure the fulfilment of the stakeholders' needs. This can be attributed to three main reasons; first, audit is mainly considered by shareholders as a service which provides them with reasonable assurance of a faithful presentation of the firm's position. Second, the audit report which is prepared after the fiscal year ends by several months is based on historical data and does not provide any forward-looking information. Finally, the standardized nature of the audit report prevents it from satisfying the specific needs of its users (Manita et.al,2020).Thus, managers perceive audit as a cost rather than an added value because it does not provide them with recommendations that help future decision making (Dengler & Matthes, 2018).

According to Gartner (2016), digitalization can be defined as:

"The use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business"

The accelerated digitalization on all levels has significantly challenged existing business models (Loebbecke& Picot, 2015).Obviously; auditors are potentially affected by the progress of information technology, especially in big data analytics, artificial intelligence, Blockchain technology, and robotic process automation (Tiberius & Hirth, 2019).Since these developments will affect the entire auditing industry, they are relevant to both auditors and their stakeholders groups.

It is important to notice that digitalization essentially creates new business model attributes and has an inevitable effect that cannot be ignored by the audit profession. Although the audit profession is already forced to evolve in response to information technology in order to generate trust in the financial reports as well as in the profession itself (Caster& Verardo, 2007),

it must adjust even more due to the impact of digital transformation (Nearon, 2005; Bierstaker, et al.,2001).

Currently, the audit profession is in a paradigm shift towards a more digital organization and changes in the profession are becoming unavoidable (Lombardi et al., 2015; Byrnes et al., 2018). Due to this paradigm shift, digitalization should be used by auditors as a tool to obtain and handle information in such a way that guarantees a satisfactory level of audit quality. Clearly, digitalization involves both opportunities and challenges for the audit profession and since it is an on-going change, its effects are expected to be continuous.

In spite of the above, technological foresight for the audit profession is still inadequate. Until now, the specific effects of digitalization on the audit quality are still ambiguous. Against this background, this paper is set with the aim to explore the expected consequences of digitalization on the audit quality and on the stakeholders of auditing (clients, regulators, stockholders, financial analysts, lenders…etc.) in the Egyptian context. The rest of this paper is organized as follows: section 2 discusses the background of the study variables; digitalization tools and audit quality, section3 presents the research methodology, section 4 presents the main results of the study which are discussed in section 5, Finally, section 6 presents the conclusion.

2.Background

Digitalization is increasingly recognised as a serious, worldwide influencing factor on how businesses are run and the degree of their success, it has a profound effect on both people and every single aspect of their lifes because the acquisition of digital skills has become a prerequisite for individuals, industries, and governments (Muro,2017). There are many technologies that are associated with digitalization; they include –but not limited to- big data analytics, artificial intelligence, blockchain technology, and robotic process automation. Because these technologies play or are expected to play a major role in the evolution of the audit profession, they are going to be further examined in the following sections, then a brief background about audit quality and its measurements is going to be presented.

12

2-1 Big Data Analytics

Big data is primarily characterised by the four Vs; volume, velocity, variety, and value (Gantz & Reinsel, 2011). As a result of dropping down the costs of data storage, the volume of data has grown exponentially in the last few years (Breur, 2016), the speed of data generation has also dramatically increased over last years, data in this era is characterized by being generated from various sources, with no consistent form, therefore, they are stored in an unstructured way. Laney (2001) argued that the first three Vs ensure that conventional software cannot handle big data, however, the forth V shows that big data can add more value, especially if customer needs are understood and products and services are optimized (Chen et al.,2014; Ram et al.,2016). Accordingly, big data represents a new important tool to organize enormous, fast, and chaotic data and put them in the form of valuable knowledge (Snijders et al., 2012; De Mauro et al., 2016). Despite the economic growth that big data is expected to provide, it also brings up some risks such as privacy violations and discrimination (Cuquet & Fensel, 2018).

As for auditing, auditors can possibly employ big data to eliminate the expenses of their audits and improve its quality because big data can be used to make full audits –as opposed to sample audits- more economic (Yoon et al., 2015). Additionally, among the potential usages of big data analytics by auditors, is the improvement of insights about business transactions by integrating traditional data with external, non-accounting information, derived from big data (Yoon et al., 2015). For example, social media discussions about an important deal could be used for asset valuation purpose, or pictures taken by satellite could show the progress in construction work when a project is mentioned in the financial report (Tiberius & Hirth, 2019)

However, big data imposes some challenges on the auditors as many auditors do not possess much experience about unfamiliar data sources and may find it difficult to estimate their appropriateness, reliability, and relevance (Appelbaum, 2017). In addition, auditors may still not have a clear view of how to incorporate unstructured, non-accounting data with structured accounting data in a meaningful way (Yoon et al., 2015).

2-2 Blockchain Technology

Blockchain technology is considered a type of distributed ledger technology (DLT) which is relatively in its early stage of application but has great potential to alter how organizations conduct their business, and consequently how they are going to be audited (Schmitz & Leoni, 2019). Blockchain can be described as a decentralized digital ledger which records transactions between two parties in a peer-to-peer (P2P) network (Narayanan et al., 2016). In a distributed ledger, all participants have access to common records, which is the opposite of the typical current situation where different parties have access to different databases that updated and edited separately (Vaidyanathan,2017). Accordingly, blockchain technology is mainly considered fraud-proof (Cai & Zhu, 2016). An additional advantage is that distributed ledgers act as a universal bookkeeping service which makes it easy to track an audit trail by eliminating the need to cross-check various documents through different databases (Dai & Vasarhelyi, 2017).

Another impact that blockchain technology may have on auditing is related to the fact that blockchain can be used as an alternative to any transaction system currently used by a central intermediary, such as a bank or a land registry. If the correctness of financial reports is certified by those intermediaries, the need for audits may decrease (Tiberius& Hirth, 2019). If a public blockchain system is used to handle all the transactions of a company, they can be trusted by financial information users because all transactions are decentrally validated in real time, an additional central audit could be perceived as unnecessary. On the other hand, if a private blockchain system is used by companies which possess full accessibility and authority over transactions, auditors would still be needed for correctness of transactions assertion (Albrecht et al., 2018). Overall, the expected accompanying advantages and risks of blockchain technology for auditing have not been explored yet (Dai & Vasarhelyi, 2017).

2-3 Artificial Intelligence

Artificial intelligence (AI) is increasingly recognized as one of the most promising yet intimidating human inventions. Till now, a clear definition of AI does not exist (Richins et al., 2017). Artificial intelligence, sometimes referred to as machine intelligence, is considered as intelligence exhibited

14

by machines compared to the inherited intelligence of humans and animals (Turner, 2018). AI is perceived as an umbrella term for technologies that can be used either by themselves or in the combination of each other in order to imitate cognitive behaviours that are shared among humans, such as learning and problem solving (Issa et al., 2016). Generally, AI is supposed to engage in various activities which are based on human information processing, such as pattern recognition, learning, and planning. Most AI is applied in language recognition, visual pattern recognition, or logical problem solving (Gershman et al., 2015).

For auditing purposes, AI can contribute in finding irregularities in accounting data. Recently, machine learning which is considered the most important sub-concept of AI (Jordan & Mitchell, 2015), is being used by the "Big Four" auditing companies for data collection and validation (Brennan et al., 2017), machine learning can also be used in auditing in ratio analysis and classification of journal entries (Zhaokai & Moffitt,2019). Additionally, Natural Language Processing is applied in order to extract useful information in a much higher degree of speed as it can look through hundreds of thousands of documents at speed incomparable to humans (Jordan & Mitchell, 2015). Another form which could have an impact on auditing practices is Deep Learning which can be applied on social media and news articles to notify auditors of possible liabilities, market, or internal control threats (Sun & Vasarhelyi, 2018).

Several other uses of artificial intelligence are imaginable for the future. For example, AI could make inventory processes less subject to human error (Appelbaum & Nehmer, 2017). It also can be used in improving industry-wide auditing processes and standards. It is also expected that strong AI could replace human auditors (Kokina & Davenport, 2017). Relevantly, it is optimistically expected that 30 percent of corporate audits are going to be performed by artificial intelligence by the year 2025 (Dutta et al., 2015).

2-4 Robotic Process Automation

Robotic process automation (RPA) can be defined as a preconfigured software that uses business rules and predefined sequence of steps and movements to complete the automatic execution of a combination of tasks, processes, activities and transactions to deliver a result or service" (IEEE, 2017). Robotic process automation is a simple programing tool that do not

15

require a lot of computer knowledge and that can be easily used to automate time-consuming, manual, rules-based tasks faster and cheaper than other automation technologies (PwC, 2017)

For auditing purposes, multiple tasks could be automated by RPA such as sending emails, requesting follow-ups when deadlines pass, monitoring development towards the annual audit plan, tracking key risk indicators, automating reporting and dashboarding activities, including populating audit committee and management report templates or internal audit's balanced scorecard, and automation of data quality evaluation by verifying if all fields are filled in or to check for duplicate entries or not valid ones (PwC, 2017). If performed by humans, such tasks would be considered tedious, dull, time-consuming, and susceptible to mistakes (McGhee & Grant, 2019). Among the various perceived advantages of RPA robots over human beings is that robots can work 24/7, are quicker, more robust, and can be easily modified. However, because RPA can easily handle great amounts of transactions, it is extremely essential that they are set up and configured in an accurate way, as any inaccurate set up may damage a massive number of transactions in such a short time (Jansen et al., 2019).

2-5 Audit Quality

Traditionally, one of the most commonly cited definitions of audit quality arises from (DeAngelo, 1981) who argued that audit quality can be reflected as a probability of both detecting and reporting material misstatements that may exist in the client's accounting system. Until now, there is no universal definition of audit quality so its perception relies on whose eyes one looks through (users, auditors, regulators, and other stakeholders in the financial reporting process) that can have various views about audit quality ; users of financial reports may recognize that high quality audit means the absence of material misstatement, auditors consider audit quality as satisfactorily completing all tasks required by the firm's audit methodology, The audit firm can evaluate high audit quality as one for which the work can be defended against challenge in inspection or court of law, regulators may believe that high audit quality is related to compliance with professional standards, and finally society can view high quality audit to be a mean to avoid economic problems for a firm or the market (Knechel et al.,2013).

16

Several attempts have been made to assess audit quality including among others; Audit Quality Framework released by International Auditing & Assurance standards Board (IAASB, 2014), Audit Quality Framework released by Public Company Accounting Oversight Board (PCAOB, 2015), and Audit Quality Framework released by Centre of Audit quality (CAQ, 2016). Each of these frameworks attempted to provide a set of indicators that can be used as a proxy for audit quality. The framework that is going to be employed in this study is that of IAASB which is considered the most comprehensive one.

The main objective of this framework is to provide awareness about various elements of audit quality that can be considered as 'key drivers' which maximize the likelihood that quality audits are consistently performed at different levels: engagement level, firm level, national level. This framework encompasses five elements that are used as indicators of audit quality; 1-Inputs which consist of values, ethics, and attitudes of auditors (such as; objectivity, integrity، independence, and professional skepticism), as well as, their knowledge, skills, and experience (such as; judgments, understanding of the business & industry, and training of audit staff, 2-processes that focus on quality of control procedures (such as; performance of audit test work, use of information technology, compliance with auditing standards، and documentation, 3-Outputs which consist of audit opinion, audited financial statements, auditor reports to management, and firm transparency report. 4-Interaction which relates to any relationships between stakeholders in the audit process such as auditors, management, regulators, and users, 5-context which concentrate on laws and regulations, business practices, information systems، governance, and litigation environment.

3.Methodology

Since academic literature is relatively little compared to the vast experience accumulated by practitioners in dealing with innovative digitalization tools, the researcher decided that it would be reasonable to develop an initial theory by exploring the opinions of experts from the auditing field. For this type of exploratory, theory-building studies, a Delphi study is a suitable research method.

3-1 The Delphi Method

The Delphi method has been developed further since it first appeared in the 1950s (Dalkey and Helmer, 1963). It is suitable for forecasting man-made future situations compared to causal-deterministic natural development processes, such as the weather, social interactions, and coincidence (Tiberius, 2011). According to this method, forecasts can be derived from a group of experts who express their subjective knowledge and experience-based opinions. The Delphi method has been applied in many fields of business administration and management, such as banking, human resources, information systems, manufacturing, marketing, new product development, project management, and supply-chain management (Tiberius & Hirth, 2019). For accounting and auditing research, it has also been used to explore future events and trends (Brancheau et al., 1996; Worrell et al., 2013).

Linestone and Turoff (2002) define the Delphi study as a method for structuring a process of group communication so that the process allows a group of individuals، as a whole, to deal with a complex problem. To accomplish this structured communication, the following is provided: feedback of individual contributions of information and knowledge, assessment of the group judgement or view, opportunity for individuals to revise their views, and some degree of anonymity for the individual responses. The Delphi method develops the most probable scenario, generated by merging multiple expert statements. Firstly, a pretest is carried out to minimize the risk of misinterpretation of statements by experts. After the first survey round, interim results are revealed to the respondents during the next round. A Delphi study's main goal is the assemblage of expressed opinions and the narrowing of the statistical spread in order to formulate a clear consensus. The conclusions of a resulting scenario can be drawn from both consensus and disagreement (Tiberius & Hirth, 2019).

3-2 Formulation of Projections

Because audit quality is a broad topic, a full investigation covering every aspect of audit quality in detail cannot be generated. And because prior studies about the impact of digitalization on audit quality do not exist particularly in Egypt, a broad exploratory rather than a deep scenario is chosen. A broadly designed Delphi approach covers many aspects of audit

18

quality,but omits details. Future Delphi studies can select narrower scopes or partial scenarios and ask more detailed questions. The scenario of this study is subdivided into five thematic sections that are derived from the Audit Quality Framework released by International Auditing & Assurance standards Board (IAASB,2014): inputs to the audit, audit processes, outputs of the audit, interaction between stakeholders of the audit process, and context in which these elements interact.

After selecting the sections of the study, specific future-oriented statements (projections) are formulated. Because future-oriented research is scarce in auditing, statements cannot be generated solely based on literature review. Rather, they must be generated based on reasonable conclusions that consider current developments such as the technological trends discussed earlier. However, even improbable or rather extreme projections can be included in a Delphi study, because the same general tendency can be derived from either the rejection of an improbable projection or the inclusion of a probable one. Accordingly, 20 projections were formulated for the five selected sections.

3-2-1 Impact of Digitalization on Inputs to the Audit

According to (IAASB, 2014), inputs to the audit are related to auditor values, ethics, and attitudes; they are considered as key attributes of audit quality and performing the audit engagement. These attributes are integrity and objectivity of the audit team, conducting an audit in the interest of all stakeholders‹ independence, and professional skepticism of the audit engagement team‹ auditor knowledge, expertise and adequate time assigned to audit engagement.

Accordingly, the following projections were formulated:

P1-1: As a result of the prevalence of digitalization of business operations, IT knowledge and expertise will be a prerequisite for auditors

P1-2: As a result of the prevalence of digitalization of business operations, the auditing profession will become less attractive for young professionals because of the necessity of more IT education and training.

P1-3: As a result of the prevalence of digitalization of business operations, the auditing profession will become repellent for current auditors due to pressures of altering conventional methods of performing audits.

19

P1-4: As a result of the prevalence of automated auditing procedures, reliance on machines will reduce the need for humans which will cause the loss of a massive number of auditing jobs.

3-2-2 Impact of Digitalization on Audit Processes

Audit processes involve applying effective audit processes and quality control procedures for the purpose of obtaining sufficient and reliable audit evidence. These processes have to comply with laws, regulations, and applicable standards related to audit firms such as risk assessment، analytical procedures, substantive procedures, and tests of controls carried out during the engagement (Knechel et al., 2013).

The following projections were formulated to explore the impact of digitalization on audit processes:

P2-1: Automation of auditing procedures will relieve auditors from routine tasks, giving them a greater chance to perform complex tasks such as professional judgement efficiently.

P2-2: As a result of the prevalence of automated auditing procedures, auditing profession will shift from traditional auditing to new services such as consulting and tax planning.

P2-3: With the prevalence of digitalization of business operations, continuous auditing will replace traditional annual auditing.

P2-4: With heavy investments required for the application of IT in auditing firms, most small and mid-size audit firms will go out of business.

P2-5: As a result of great possibilities that digitalization may offer to audit procedures; full audits will replace sample-based audits.

P2-6: As a result of the prevalence of digitalization of business operations and automated auditing procedures, audit risk will be eliminated completely.

3-2-3 Impact of Digitalization on Outputs of the Audit

Outputs of the audit process can be represented in not only audit report but also audited financial statements, auditor reports to management, and firm transparency reports. Stakeholders regard these reports as a part of audit quality, and they assess them based on timeliness of the reports and their value.Furthermore, the main purpose of the auditors is to express their opinions for increasing the reliability and credibility of audited financial statements (Knechel et al., 2013).

Accordingly, the following projections are formulated:

20

P3-1: Due to higher percentage of total assets devoted to intangible assets e.g., software and with greater valuation flexibility, audits will become less informative for audit users.

P3-2: With the spread of automated auditing procedures, users of audit will lose trust in manual auditing procedures.

P3-3: As a result of the prevalence of digitalization of business operations, technology will make auditors' personal judgements obsolete.

P3-4: As a result of the prevalence of digitalization of business operations and automated auditing procedures, audit reports are expected to be issued in a timelier basis.

3-2-4 Impact of Digitalization on the Interaction Among Stakeholders of the Audit

It is known that auditors do not work in isolation, They interact and build relationships with stakeholders in the audit process (such as management, regulators, audit committees, and financial information users) which are important and influential elements for achieving audit quality.Transmission and sharing of information among these stakeholders can facilitate effective communication and build confidence in the audit report (Francis, 2011).

 Accordingly, the following projections are formulated:

P4-1: With the spread of automated auditing procedures, the audit expectation gab will increase substantially, especially regarding future-oriented information in management's reports.

P4-2: With the spread of automated auditing procedures, clients will regard current audit price models as inappropriate leading to an erosion of audit fees.

P4-3: Because all blockchain transactions are already decentrally approved by multiple participants, Clients who use public blockchain technology will regard formal auditing as obsolete.

3-2-5 Impact of Digitalization on the Context of the Audit

Context is related to laws & regulation, business practices, information systems, governance، litigation environment which have become more developed because of complexity of developments and degree of a business growth. They also influence audit risk, audit evidence, audit quality (Knechel et al., 2013).

21

The following projections are formulated to explore the impact of digitalization on the context of the audit:

P5-1: Because of the expansion in digitalization in business processes, a substantial regulatory gap between auditing standards and the new business reality will exist.

P5-2: AI will be utilized in setting accounting and auditing standards.

P5-3: Because AI would immediately identify the relevant standard and apply it to the accounting issue correctly, auditing algorithms using AI will make traditional areas of auditor's discretion obsolete.

3-3 Selection of Experts

One essential characteristic of the Delphi method is that the group size must be at least 20 participants to avoid the risk that individual bias may contaminate aggregate responses (Linestone and Turoff, 2002). The key point in choosing the experts is to identify the kind of knowledge required for an expert entering the study (Okoli & Pawlowski, 2004). In this research project, the panel consisted of auditors working in big Egyptian Audit Firms.

3-4 Data Collection

In the first round, data was collected by sending a link to the questionnaire which contained the 20 above-mentioned study's projections to social media groups of auditors working in big Egyptian audit Firms. At this round, 128 responds were received. In the second round, the link was re-sent to the same 128 respondents accompanied with structured feedback from the first round and 75 responds were received.

The data collection was conducted in October, November, and December 2020.The respondents were asked to express their opinions as either they agree or disagree with the statements included in the questionnaire, using a four-point Likert scale (strongly disagree, disagree, agree, and strongly agree).Because the objective of this study is explore the expert's opinions regarding the impact of digitalization on audit quality, it was preferred to encourage the experts to take one side of whether agreement or disagreement with the statements. Accordingly, a four-point scale was chosen because an even-numbered Likert scale has the advantage of

22

eliminating neutral responses and enabling the avoidance of tendency toward the centre (Tiberius& Hirth, 2019).

The structured questionnaire which was electronically sent to the participants maintained three essential prerequisites of the application of Delphi method. Firstly, the study was conducted anonymously since anonymity is a central feature of Delphi studies (Woudenberg, 1991). Secondly, structured feedback about the results from the previous rounds was received by participants in order to enhance the degree of respondents' consensus (Woudenberg, 1991; Skulmoski et al.,2007).Thirdly, the study comprised of two rounds because after the second round, the modification of opinions was minor indicating that a degree of saturation was reached. Two rounds could be considered the minimum acceptable number of rounds, but some researchers suggest that three to six rounds are necessary to reach reasonable findings (Linstone & Turoff, 2002).

4.Results

The results of a Delphi study are based on the aggregated responses of individuals. In order to calculate the statistical distribution, the responses were assigned the following numerical values: strongly disagree (1), disagree (2), agree (3), strongly agree (4).The median was employed as a measure of central tendency as it has been established as the preferred measure for Delphi studies because it enables to avoid statistical bias (Rowe & Wright, 1999). Table 1 presents a summary of the acceptances and rejections of the 20 study projections.

Table 1

Agreements and disagreements with study projections

Opinion	Projection
Strongly agree	1-1,2-1,2-2,2-3,2-5,3-4,4-3,5-1
Agree	4-2,5-2
Disagree	1-2,1-3,1-4,2-4,2-6,3-1,3-2,3-3,4-1,5-3

To interpret the aggregated responses, inter-quartile range (IQR) which is the difference between the upper quartile (.75) and the lower quartile (.25) was used to measure the scattering around the median. A small IQR indicates a high level of consensus, while a high IQR indicates a high level of disagreement. It is supposed that the scattering range of responses will

23

decrease after the first survey round as they approximate the median. Table 2 shows the results of descriptive analysis for the two rounds and the differences between them.

Table 2 shows that there was no complete consensus to any of the projections of the study in the first round. Nevertheless, some projections were agreed upon more than others as their IQR reached 1. As for the results of the second round, the scattering of opinions of the respondents about five projections decreased which is considered the main target of the Delphi method. For projections 1-4, 2-2, 2-5, 3-4, and 4-3, the IQR decreased by 1 indicating that the participants of the study reached a better degree of consensus about these projections.

According to the experts which participated in this study, digitalization will make IT knowledge and expertise an important prerequisite for auditors, but it will make the auditing profession less attractive for young professionals or make it repellent for current auditors. Additionally, they agreed that the technological progress will not decrease the need for humans or cause a loss of massive number of auditing jobs.

The surveyed experts strongly agreed that continuous auditing will replace traditional annual auditing and that full audits will replace sample-based audits as a consequence of digitalization. In addition to that, they agreed that digitalization will give auditors greater chance to perform complex tasks such as professional judgment efficiently and enable them to shift from traditional auditing to new services such as consulting and tax planning. On the other hand, the experts did not agree that digitalization will make small and mid-sized audit firms go out of business, or that it will eliminate audit risk completely.

Regarding the audit reports, the surveyed experts strongly agreed that digitalization will result in issuing them in a timelier basis. While they disagreed that digitalization will make audit reports less informative for users. The experts also disagreed that technology will make auditors' professional judgment obsolete, or lead to the loss of trust in manual auditing procedures by audit users.

Table 2
Descriptive statistics

	Round 1 (N=128)				Round 2 (N=75)				Difference			
	.25	.5	.75	IQR	.25	.5	.75	IQR	.25	.5	.75	IQR
Impact of digitalization on inputs to the audit												
P1-1	3	4	4	1	3	3	4	1	0	-1	0	0
P1-2	1	2	3	2	1	2	3	2	0	0	0	0
P1-3	1	2	3	2	1	2	3	2	0	0	0	0
P1-4	1	2	3	2	1	2	2	1	0	0	-1	-1
Impact of digitalization on audit processes												
P2-1	3	3	4	1	3	3	4	1	0	0	0	0
P2-2	3	3	4	1	3	3	3	0	0	0	-1	-1
P2-3	3	4	4	1	3	4	4	1	0	0	0	0
P2-4	2	2	3	1	2	2	3	1	0	0	0	0
P2-5	2	4	4	2	3	4	4	1	+1	0	0	-1
P2-6	1	2	2	1	1	2	2	1	0	0	0	0
Impact of digitalization on outputs of the audit												
P3-1	2	2	3	1	2	2	3	1	0	0	0	0
P3-2	2	2	3	1	2	2	3	1	0	0	0	0
P3-3	2	2	3	1	2	2	3	1	0	0	0	0
P3-4	3	4	4	1	4	4	4	0	+1	0	0	-1
Impact of digitalization on the interaction among stakeholders of the audit												
P4-1	2	2	3	1	2	2	3	1	0	0	0	0
P4-2	2	3	3	1	2	3	3	1	0	0	0	0
P4-3	2	3	4	2	3	3	4	1	+1	0	0	-1
Impact of digitalization on the context of the audit												
P5-1	2	3	4	2	2	2	4	2	0	-1	0	0
P5-2	2	3	3	1	2	3	3	1	0	0	0	0
P5-3	2	2	3	1	2	2	3	1	0	0	0	0
.25 :lower quartile .5 :median .75 :upper quartile IQR (Inter-quartile range): upper quartile-lower quartile												

Moreover, the experts agreed that digitalization will make clients who use public blockchain technology regard formal auditing as obsolete and will lead to an erosion of audit fees. On the other hand, they did not agree that the audit expectation gab will increase regarding future-oriented information in management's reports.

Finally, they agreed that over the coming years, AI will be utilized in setting accounting and auditing standards, but they did not agree that a regulatory gab between auditing standards and the new business reality will exist, or that AI will make traditional areas of auditor's discretion obsolete.

5.Discussion

5-1 Impact of Digitalization on Inputs to the Audit

In the first section, one out of four projections were agreed upon; 68.8% of participants agreed that because of the prevalence of digitalization of business operations, IT knowledge and expertise will be a prerequisite for auditors. In the first round, most experts completely agreed with this projection, this complete agreement moved to mere agreement in the second round. The three remaining projections in this section were disagreed upon by the participants; 35.9% of them did not agree that because of the prevalence of digitalization of business operations, the auditing profession will become less attractive for young professionals because of the necessity of more IT education and training. 40.6% of them did not agree that because of the prevalence of digitalization of business operations, the auditing profession will become repellent for current auditors due to pressures of altering conventional methods of performing audits.34.4% of them did not agree that because of the prevalence of automated auditing procedures, reliance on machines will reduce the need for humans which will cause the loss of a massive number of auditing jobs. These opinions might be because some participants might have answered what they hope to happen not what they expect to happen. This can be observed primarily for projections that are realized to be future threats to the auditing profession. For the fourth projection, the second round resulted in less dispersion among the opinions of experts as they reached a higher degree of consensus that digitalization will not cause the loss of a massive number of auditing jobs in the future, this goes in line with the notion that whatever the degree to which

26

technological progress reaches, it cannot threaten the role of human beings in the auditing process.

5-2 Impact of Digitalization on Audit Processes

In the second section, two projections were completely agreed upon by the participants. 65.6% of experts completely agreed that the prevalence of digitalization of business operations will require that continuous auditing replace traditional annual auditing. Considering the availability of modern technology and the capital market's need for timelier and more reliable financial reporting, companies which engage in continuous or even real-time auditing might be preferred by investors. 56.3% of participants agreed that the great possibilities that digitalization may offer to audit procedures will cause full audits to replace sample-based audits, it is expected that full audits will be completely automated and do not cause the auditor to incur any additional work or expense and guarantees greater trustworthiness among audit users.

Participants agreed that automation of auditing procedures will relieve auditors from routine tasks, giving them a greater chance to perform complex tasks such as professional judgement efficiently and that auditing profession will shift from traditional auditing to new services such as consulting and tax planning. On the other hand they disagreed that heavy investments required for the application of IT in auditing firms will cause most small and mid-size audit firms to go out of business and that the prevalence of digitalization of business operations and automated auditing procedures will result in eliminating audit risk completely.

After conducting the second round, the dispersion of the answers to projections 2-2 and 2-5 decreased leading to a greater degree of consensus among participants that digitalization will give auditors better chances to shift from traditional auditing to new services such as consulting and tax planning, the experts expect digitalization to affect auditor's everyday work in appositive way. In addition they reached a greater level of agreement with the notion that the great possibilities that digitalization may offer to audit procedures will enable auditors to conduct full audits instead of sample-based audits. Despite of that, they did not agree that this will eliminate audit risk completely. This result might be due to the fact that despite the technological advancements that are expected to take place in the future,

27

experts expect human auditors to still play a crucial role in the auditing process, making the elimination of human errors impossible.

5-3 Impact of Digitalization on Outputs of the Audit

In the third section, one projection was completely agreed upon by the participants; 64.1% of them completely agreed that audit reports are expected to be issued in a timelier basis as a result of the prevalence of digitalization of business operations and automated auditing procedures. For this projection, the second round resulted in complete consensus as there was no degree of dispersion in the responds of the participants about this projection. However, the participants disagreed that audits will become less informative for audit users due to larger percent of total assets devoted to intangible assets e.g. software and with greater valuation flexibility ,this projection may have been disagreed with because new accounting standards concerning software valuation and depreciation are expected to be issued. The participants also disagreed that users of audit will lose trust in manual auditing procedures with the spread of automated auditing procedures and that technology will make auditors' personal judgements obsolete.

5-4 Impact of Digitalization on the Interaction Among Stakeholders of the Audit

In the fourth section, the participants disagreed to one projection that stated that the audit expectation gab will increase substantially, especially regarding future-oriented information in management's reports with the spread of automated auditing procedures. On the other hand, they agreed that clients will regard current audit price models as inappropriate leading to an erosion of audit fees, and that because all blockchain transactions are already decentrally approved by multiple participants, Clients who use public blockchain technology will regard formal auditing as obsolete. For this particular projection, the second round resulted in a greater degree of agreement among participants; this is an important result as this projection represents a threat to the whole auditing profession. But this result can be responded to by the fact that blockchain technology only depicts transactions related to the profit and loss statements. Other items such as provisions and goodwill still require auditor's individual judgment.

28

5-5 Impact of Digitalization on the Context of the Audit

In the last section of the survey, the participants disagreed that the expansion in digitalization in business processes will result in a substantial regulatory gap between auditing standards and the new business reality. Interestingly, their opinions moved from agreement to disagreement with this projection moving from the first round to the second round of the study. This might be because the experts do not expect regulators to set particular standards for areas of discretion which would prevent the expectation gap to rise. The participants also disagreed that auditing algorithms using artificial intelligence will make traditional areas of auditor's discretion obsolete. This disagreement could be a result of participants might be answering what they hope not what they expect. One projection in this section was agreed upon by the participants; the projection which stated that artificial intelligence technology will be utilized in setting accounting and auditing standards.

6.Conclusion

The present study was designed to explore the effect of digitalization on audit quality. To achieve this objective, a Delphi study with 20 projections about the quality of auditing related to digitalization was developed and evaluated by a panel of Egyptian auditors. Some of the results of this investigation showed that the respondents expect some major changes in the determinants of audit quality in the future as a result of digitalization especially when it comes to the qualifications of auditors, the audit procedures performed, and the timeliness of audit report. Other findings demonstrate that experts do not see a dramatic impact of technological progress on the determinants of audit quality mainly in the areas related to the audits becoming less informative or obsolete thus making audit users lose trust in them, increasing the auditing expectation gab, or increasing the regulatory gap between auditing standards and the new business reality.

The findings of this study contradict with the prediction of (Frey & Osborne, 2017) which expected an extinction of the accounting profession, having a similar effect on the auditing profession as the majority of the experts surveyed disagreed that digitalization will make the auditing profession less attractive for young professionals, or repellent for current auditors. They also disagreed that reliance on machines will reduce the need for humans causing a loss of a massive number of auditing jobs. On the

other hand, the findings of this study are consistent with those of (Tiberius & Hirth, 2019) which reported no major threats on the auditing profession by digitalization, and expected that technological progress will support rather than threaten the auditing profession.

One of the issues that emerge from these findings is that it cannot be expected that everything will stay the same under the prevalence of digitalization. Advanced technologies such as big data analytics, AI , blockchain technology, and Robotic process automation have the potential to decrease human involvement in the auditing process. For instance, big data could play an important role in complementing original accounting data and enhancing reporting quality, AI could perform many of the same audit procedures and judgments as a human being in the future, blockchain technology could make the audit report redundant because every transaction is decentrally verified by various blockchain members, and finally, robotic process automation could relief auditors from performing tedious, dull, time-consuming, and susceptible to mistakes tasks such as sending emails, requesting follow-ups when deadlines pass, monitoring development towards the annual audit plan or tracking key risk indicators.

Finally, a number of important limitations of the current study need to be considered. Firstly, there is a considerable chance that a professional bias in the expert panel existed; the experts could have expressed what they wished for not what they expected or they might tend to be optimistic about the future developments of their field. Consequently, adding experts from other backgrounds such as IT professionals, university professors of auditing or regulators may have led to a set of results that contains more dramatic consequences on the auditing profession imposed by digitalization. Secondly, only two rounds were conducted in this Delphi study because of the limitations of time and response rate, adding more rounds could have resulted in a greater degree of consensus among the panel of experts. Thirdly, the examined technologies were limited to big data analytics, AI, blockchain technology, and robotic process automation. This was primarily done to shorten the length of the survey to avoid a lower response rate. The impact of other technologies such as cloud computing or internet of things may have yielded different results. These limitations are recommended to be considered in conducting future studies.

30

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32

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36