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Factors Affecting Usage of Computer-Assisted Auditing Tools and Techniques in Egypt from a Comprehensive Perspective

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Abstract:
One of the most important developments in the domain of auditing is the usage of computer-assisted auditing tools and techniques CAATTs. Even though it contributes to increasing the efficiency and effectiveness of the auditing profession, these tools and techniques haven’t been used as it is expected in developing countries. This research depends on a comprehensive perspective with three different dimensions, business environment, audit firm, and auditors which provides a more complete picture of using CAATTs and empirically tested with external auditors in Egypt. The analysis is based on survey data from 333 respondents and the survey was conducted on big and non-big audit firms in Egypt. The results show that the three levels and their factors have a positive significant effect on using CAATTs. The results also reveal that the clients and the auditors’ knowledge and skills have the strongest significant impact compared to the other factors of the business environment and the auditors. This study produces important contributions not only to accounting and auditing research but also to various stakeholders: regulators, professional bodies, audit firms, and auditors.

Keywords: Audit profession – Computer-assisted auditing tools and techniques CAATTs – External auditors.
1. Introduction:
The audit profession has been considerably impacted by the recent rapid advancement of technology (Tarek, Mohamed, Hussain, and Basuony, 2017; Pedrosa, Costa, and Aparicio, 2020), particularly in carrying out the audit function (La Torre et al., 2018; Kozlowski, 2018). As a result, audit firms are forced to integrate technology (Allbabidi, 2021). Using CAATTs, in particular, is crucial for improving the auditing process (Daoud, Marei, Al-Jabaly, and Aldaas, 2021).

1.1 Research gap:
According to Nasrah et al., 2023, regarding computer-assisted auditing tools and techniques (CAATTs), very little information is still available. The most of research in auditing related to using computer-assisted auditing tools and techniques (CAATTs) has focused on the acceptance of information technology or using these tools and techniques and has always concentrated on one level, the individual level, (Davis, 1985; Davis 1989; Davis et al., 1989). Others have focused on factors of two levels such as the organization, and environment factors that include technology in both levels (Tornatzky and Fletscher, 1990; Rosli et al., 2016; Widuri, R., O’Connell, B., & Yapa, P. W. 2016; Doğanay, 2019; Handoko and Thomas, 2021).

Handoko, Sabrina, & Ayuanda, 2019 have explored the social, individual, and organizational factors and have used the perceived usefulness and perceived ease of use as intervening variables.

On the other hand, research on the effect of the business environment, especially professional bodies, has been barely done and little research has been undertaken (Pedrosa, Costa, & Aparicio, 2020). In addition, in developing countries, the evaluation and examination of an auditee's information technology are not conducted sufficiently and adequately by auditors (Ismail & Abidin, 2009; Mansour, 2016; Allbabidi, 2021). Furthermore, the previous research has referred that, in developing
countries, audit firms still give low priority to the adaptation of computer-assisted audit tools and techniques CAATTs despite the benefits of using CAATTs, in particular increasing productivity levels and decreasing costs (Siew, Rosli, & Yeow, 2020; Lutfi, & Alqudah, 2023).

In addition, the previous research has not considered classifying the factors into the three dimensions, business environment, audit firm, and auditors that constitute the auditing profession, except for the study of Eissa, 2023 which has produced this classification and has provided a conceptual framework using a holistic approach based on the technology acceptance model, the technology organization environment model, and the unified theory of acceptance and use of technology. This conceptual framework is merely a theoretical construct, and it is important to be tested in real-world settings.

1.2 Objective of the study
So, it is still required for more research on the factors of using CAATTs (Janvrin et al. 2008; Byrnes et al. 2015; Lins et al. 2016; Mansour 2016; Pedrosa, Costa, & Aparicio, 2020) with a more thorough standpoint, especially in developing countries. The current study draws on prior research to explore the main factors that lead auditors to use the CAATTs in performing audits from a comprehensive perspective and to validate its assumptions and hypotheses by testing them in Egypt.

The key research question that motivates this work is:

What are the factors that have a significant influence on auditors to use computer-assisted auditing tools and techniques CAATTs in Egypt?

1.3 Significance of the study
The results of this study are anticipated to have an impact on the accounting industry, particularly the discipline of auditing. This is because it offers a wealth of insightful information about the factors influencing the use of technology in the auditing profession, which can assist regulators in taking this issue into account when creating or
updating regulations, as well as professional bodies for maintaining standards. In addition, it encourages audit firms to take action in leveraging technology as a tool to improve the performance of the auditors. This study is anticipated to be a useful reference for audit firms as they improve their policies and procedures.

The rest of this research is structured as follows. The research model and hypotheses are developed in the second section, which also discusses the theoretical background for the study. Section three explains the research methodology. Section four describes the way the empirical study was conducted and provides the results of the study. The final section concludes the research, reports on the findings, and offers limitations and future research.

2- Literature Review:

2.1 Theoretical Background

Computer-assisted auditing tools and techniques CAATTs are the tools and techniques of information technology that are used in auditing missions and audit engagements (IAASB, Vol. I 2018; Handoko, Sabrina, & Ayuanda, 2019) which includes automated working papers and traditional word processing applications (Braun and Davis, 2003), as well as specific programs that are designed especially for auditing tasks (Pedrosa, Costa, & Aparicio, 2020) that support auditors for the effectiveness and efficiency of audit work (Rosli, Yeow, & Siew, 2012). Computer-assisted auditing tools and techniques CAATTs can be used not only for the audit work process (Bierstaker, Janvrin, and Lowe 2014; Handoko, Sabrina, & Ayuanda, 2019) but also in testing the client’s information system (Jakšić, 2009; Handoko, Ariyanto, & Warganegara, 2018).

The client's information system may be tested either explicitly or implicitly through computer-assisted auditing tools and techniques CAATTs (Jakšić, 2009; Handoko, Ariyanto, & Warganegara, 2018), as
well as the auditing procedures (Bierstaker, Janvrin, and Lowe 2014; Handoko, Sabrina, & Ayuanda, 2019).

Good examples of CAATTs include professional software and spreadsheet programs. The auditor can use CAATTs for a variety of work duties, such as creating and reviewing audit work papers using spreadsheet applications (Handoko, Sabrina, & Ayuanda, 2019). The software can be used for analytical procedures as well as data summarization and anomaly detection (Boritz and No, 2011; Handoko, Sabrina, & Ayuanda, 2019). In addition to assessing audit evidence, auditors can use CAATTs to identify audit evidence, particularly trace back electronic evidence (Boritz and No, 2011).

The benefit of using computer-assisted auditing tools and techniques is that more transactions and controls may be covered but using these tools and techniques occasionally necessitates consulting with experts, which might take time, particularly in the first year of use (IAASB, Vol. III 2018).

2.2 Research Hypotheses Development:
The model will be described in more detail below, and it is likely to lead to a deeper knowledge of the elements that influence the use of computer-assisted auditing tools and techniques CAATTs. The conversation will then be broken down into three levels: environmental level, audit firm level, and individual level.
A. Business Environment Level

The business environment of the audit profession can be defined as the domain in which the audit profession can be conducted (Widuri O’Connell, & Yapa, 2016). The business environment includes three factors: the client, competitors, and professional bodies, that influence implicitly or explicitly, the philosophy and values of the audit firm as well as the auditors’ beliefs and mentality, hence, these factors have a significant effect on using computer-assisted auditing tools and techniques CAATTs (Eissa, 2023).

1- The client

Recently, in the business world, companies always invested in information technology to enhance organizational performance and the quality of financial reporting (Wicaksono & Lusianah, 2016), especially businesses today that are moving toward e-business (Daoud, 2023). Therefore the accounting information systems, at these companies, have been changed from paper-pencil-based functions to computer-internet and software-based functions (Ashok, & MS, 2019). Consequently, the audit profession, particularly financial auditing, has faced a lot of challenges because of the large volume and diversity of data that increased from day to day, as well as the complexity of the auditee’s accounting information system (Pedrosa, Costa, & Aparicio, 2020). According to AAISB vol. III (2018), the nature, timing, and extent of audit evidence gathered will depend on the nature and caliber of auditees’ information systems. So, the top management of an audit firm should consider the characteristics of auditees’ accounting information systems when they specify audit strategies to be aligned with these systems (Allbabidi, 2021; Mansour, 2016) leads to adopting computer-assisted auditing tools and technique CAATTs (Eissa, 2023).
2- The competitors:
Technology's impact on the business environment will change the competitive landscape (Zhu et al., 2006), as it sets new rules for competitiveness that encourage businesses to work hard to outperform their rivals (Chan et al., 2012). Therefore, the adoption of IT by several businesses will inspire others, particularly rivals, to do the same (Zhu et al., 2003; Enaizan et al., 2020; Daoud, Marei, Al-Jabaly, and Aldaas, 2021). Consequently, using CAATTs is strongly encouraged by competitive pressure for audit firms (Rosli, Yeow, & Eu-Gene, 2013). To prevent missing a customer (Handoko, Sabrina, & Ayuanda, 2019) and to get a competitive advantage over rival audit firms technology assistance is therefore necessary for audit firms (Daoud, Marei, Al-Jabaly, and Aldaas, 2021).

3- The professional bodies:
An auditor’s performance depends fundamentally on the applicable auditing standards (Amin, & Mohamed, 2016) which is the main responsibility of professional bodies. Recently, because of the fourth industrial revolution, these professional bodies have started to be interested in the effect of advanced information technology on auditing (Allbabidi, 2021).

Therefore, the hypotheses are stated in the following sentences:

H1: Business environment has a positive effect on using computer-assisted auditing tools and techniques CAATTs

H1a: The clients have a positive effect on using computer-assisted auditing tools and techniques CAATTs

H1b: The competitors positively affect the use of computer-assisted auditing tools and techniques CAATTs

H1c: The professional bodies have a positive effect on using computer-assisted auditing tools and techniques CAATTs
B. Audit Firm Level:

Despite the usage of computer-assisted audit tools and techniques CAATTs, not only decrease costs but also increase productivity, using computer-aided audit tools and techniques is still not given high importance by audit firms in developing countries (Siew, Rosli Yeow, 2020).

Although Handoko, Sabrina, & Ayuanda, 2019 have found that audit firm’s factors do not affect the use of computer-assisted auditing tools and techniques CAATTs, other studies have concluded that these factors have a significant influence on the adaptation of computer-assisted auditing tools and techniques CAATTs & Pedrosa, Costa, Aparicio, 2020).

According to the study of Eissa, 2023 the audit firm’s factors are the size of the audit firm and the perceptions of the audit firm’s management.

1- Audit firm size:

The decision of an audit firm to use computer-assisted auditing tools and techniques CAATTs depends on the cost and benefit analysis (Daoud Marei, Al-Jabaly, & Aldaas, 2021) and according to Eissa, 2023 it is related to the size of the audit firm because the auditees of big audit firms typically have large business and complicated IT that may encourage using computer-assisted auditing tools and techniques CAATTs (Mansour, 2016) besides the bigger the size of the audit firm, the more financial resources that is necessary for acquiring computer-assisted auditing tools and techniques CAATTs Handoko, & Thomas, 2021).

2- Perceptions of audit firm’s management:

The top management of the audit firm plays an important role in encouraging auditors to use CAATTs in two ways. The first one establishing a policy to follow the auditing standards related to how to perform audit tasks in the technological advances and to recognize the
effects of technological development on their responsibility (Tarek Mohamed, Hussain, & Basuony, 2017). The second one involves raising awareness of the benefits of CAATTs usage in improving their performance (Mansour, 2016; Handoko, Ariyanto, & Warganegara, 2018).

Therefore, the hypotheses are stated in the following sentences:

**H2: Audit firm level has a positive effect on using computer-assisted auditing tools and techniques CAATTs**

- **H2a:** Audit firm size has a positive effect on using computer-assisted auditing tools and techniques CAATTs.
- **H2b:** Perceptions of audit firm’s management have a positive effect on using computer-assisted auditing tools and techniques CAATTs.

**C. Individual level:**

Despite the research of Pedrosa, Costa, & Aparicio, 2020 has concluded that auditors are interested in using the technological tools and techniques for auditing tasks, the findings of other studies have revealed that auditors haven’t used the computer-assisted auditing tools and techniques CAATTs as they are expected, especially in the light of sophisticated IT-based environments (Bierstaker et al., 2014; Allbabidi, 2021; Daoud, Marei, Al-Jabaly & Aldaas, 2021). The research of Eissa, 2023 has found that the auditor’s willingness to learn and use technology depends on the auditor’s knowledge and skills, as well as the auditors’ peers.

1. **Auditors’ knowledge and skills:**

IT is no longer a specialized field reserved for information technology specialists due to information technology's rapid development (Allbabidi, 2021) so, it’s required to pay more attention to the usefulness of information technology, as well as the technical skills of auditors.
On the other hand, users are more likely to accept tools that are easy to use (Hoque, Saif, AlBar, and Bao, 2016). This means that the ease of use of the technology is primarily determined by the technological abilities of each auditor, which differ from one auditor to another (Handoko, Sabrina, & Ayuanda, 2019). The study of Tarek, Mohamed, Hussain, & Basuony, 2017 has concluded that the auditors’ IT knowledge and skills play a vital role in the auditors’ perceptions of its importance and their realization of the client’s IT complexity as well as their ability to use new audit applications. Furthermore, Handoko, Sabrina, & Ayuanda, 2019 have found that auditors' perception of the usefulness and ease of use of CAATTs positively affects their adoption and performance.

Finally, the usefulness and ease of use are related to the knowledge and skills of auditors, then, the auditors need to have a suitable level of competence that gives them the capacity to assess the usefulness and utility of these tools and techniques (Eissa, 2023).

2-Auditors’ peers

Peers influence referees to the individual's expectation that others who work in the same field believe that it is necessary to use the new tools and techniques (Pedrosa, & Costa, 2014). Auditors' peers are those who work in the same professional field and extend to include others outside the firm. Peers and social influence have a favorable effect on the acceptability of computer-assisted audit tools and methodologies, according to Pedrosa and Costa's 2014 research. Furthermore, according to Pedrosa, Costa, and Aparicio 2020, peer influence has a beneficial impact on social influence, but social influence has no impact on the intention of CAATS usage.

When using technology for fieldwork, auditors frequently teach their peers how to utilize technology in the field (Handoko, Sabrina Ayuanda, 2019), which is anticipated to influence the auditors' beliefs and motivate them to use technology, particularly CAATTs.
Therefore, the hypotheses are stated in the following sentences:

**H3:** Individual-level factors have a positive effect on using computer-assisted auditing tools and techniques (CAATTs)

**H3a:** Auditors’ knowledge and skills affect positively the usage of computer-assisted auditing tools and techniques (CAATTs).

**H3b:** Auditors’ peers have a positive effect on the usage of computer-assisted auditing tools and techniques (CAATTs).

3- Research Methodology:

3.1 Variables:

Usage of computer-assisted auditing tools and techniques is the dependent variable, which is affected by independent variables in three levels. The first level is the business environment, which consists of three independent variables, the client, the competitors, and the professional bodies. The audit firm level is the second one that includes two variables, audit firm size and perceptions of the audit firm’s management. Finally, the third level is related to the auditor, which is the end user of computer-assisted auditing tools and techniques. The individual level includes two independent variables: auditors’ knowledge and skills and auditors’ peers.
3.2 Population and Sample:
Respondents for this research are auditors (333) who work in audit firms in Egypt. The most important observations regarding the demographic characteristics of the study sample are:

- There were 229 Males (68.7%) and 103 Females (31.3%) in the sample.
- Most respondents 137 (41.1%) were aged between 51:60 Year.
- The majority at educational level were Bachelor Degree 245 (%73.5),while the minority were doctoral degree 24 (%7.2).
- For professional certifications, there were nothing 162 (48.6%), While the minority were both American Accounting Association and bachelor’s (degree 14 by 4.2%).
- For years of experience the majority of the sample were more than 29 years by (48%), While the minority are between 10: 19 Year of 36 respondents by (% 10,8).

3.3 Method of Data Collection:
The researcher prepared a questionnaire on factors affecting the usage of computer- assisted auditing tools and techniques in Egypt that consists of two parts (Appendix). The first part consists of the demographic characteristics, which include (Gender, Age, professional certifications, Years of Experience, Current job and audit firm size. The second part consists of the items used in measuring the variables used to test the hypotheses of the study. The respondents marked their opinion on a five-point Likert scale, ranging from 1 “strongly agree” to 5 “strongly disagree”.
4.1 Validity and Reliability:

Table (1): Reliability and Validity Analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>Dimensions</th>
<th>Const.</th>
<th>Loadings</th>
<th>Cronbach's Alpha</th>
<th>Composite Reliability</th>
<th>Average Variance Extracted (AVE)</th>
</tr>
</thead>
<tbody>
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<td>The clients</td>
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<td>Business Environment Level</td>
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<td>Source: Based on calculations using Smart PLS</td>
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<tr>
<td>The competitiors</td>
<td>CI</td>
<td>0.856</td>
<td>0.876</td>
<td>0.914</td>
<td>0.758</td>
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<td></td>
<td>CI</td>
<td>0.874</td>
<td>0.901</td>
<td>0.914</td>
<td>0.788</td>
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<tr>
<td></td>
<td>CI</td>
<td>0.820</td>
<td>0.970</td>
<td>0.914</td>
<td>0.761</td>
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<tr>
<td>The professional bodies</td>
<td>CP1</td>
<td>0.947</td>
<td>0.932</td>
<td>0.963</td>
<td>0.952</td>
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<tr>
<td></td>
<td>CP1</td>
<td>0.982</td>
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<tr>
<td>The audit firm size</td>
<td>TP1</td>
<td>0.521</td>
<td>0.901</td>
<td>0.950</td>
<td>0.826</td>
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<td></td>
<td>TP2</td>
<td>0.655</td>
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<td></td>
<td>TP3</td>
<td>0.800</td>
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<td></td>
<td>TP4</td>
<td>0.876</td>
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<td>Audit firm level</td>
<td>FS1</td>
<td>1.000</td>
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<tr>
<td>Perceptions</td>
<td>PR2</td>
<td>0.832</td>
<td>0.924</td>
<td>0.963</td>
<td>0.928</td>
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<tr>
<td>Individual level</td>
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<tr>
<td>Auditors’ peers</td>
<td>AP2</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
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<tr>
<td>Auditors’ knowledge and skills</td>
<td>ARS1</td>
<td>0.878</td>
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<td>0.790</td>
<td>0.869</td>
<td>0.768</td>
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<td>Using CAATs</td>
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<td>CAATs1</td>
<td>0.687</td>
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<td>CAATs2</td>
<td>0.963</td>
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<td>CAATs3</td>
<td>0.823</td>
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<td>CAATs4</td>
<td>0.875</td>
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<td>CAATs5</td>
<td>0.965</td>
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<td>CAATs6</td>
<td>0.962</td>
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<td>CAATs7</td>
<td>0.831</td>
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<td>CAATs8</td>
<td>0.963</td>
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<td>CAATs9</td>
<td>0.726</td>
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<td>CAATs10</td>
<td>0.894</td>
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<td>CAATs11</td>
<td>0.898</td>
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<td>CAATs12</td>
<td>0.946</td>
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<td>CAATs13</td>
<td>0.719</td>
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<td>CAATs14</td>
<td>0.808</td>
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<td>CAATs15</td>
<td>0.885</td>
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<td>CAATs16</td>
<td>0.106</td>
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<td>CAATs17</td>
<td>0.317</td>
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<td>CAATs18</td>
<td>0.256</td>
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<tr>
<td>CAATs19</td>
<td>0.445</td>
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<tr>
<td>Source: Based on calculations using Smart PLS</td>
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</table>
The Variance inflation factor (VIF) needed to be determined for the investigation. This is because evidence of the Common Method Bias (CMB) is being detected using a comprehensive collinearity technique. Kock, 2017 found that the VIFs were less than five, ruling out the possibility of CMB. The validity and trustworthiness of numerous factors can be monitored with Confirmatory Factor Analysis (CFA). Cronbach's alpha was used to calculate how reliable the results were. The Cronbach alpha for each of the variables was greater than 0.7. According to the findings of the study, each of the statements provides a sufficient summary of the factors that went into it (Vellone et al., 2013). Both the composite reliability and the average variance extracted were calculated to gain a better idea of how well the statements conveyed the elements. Both the Average variance extracted (AVE) and Composite reliability (CR) for each component were more than 0.7 and 0.5 respectively. This is an example of how the claims can be used to account for the relevant factors (Shrestha, 2021).

4.2 Hypotheses Testing

Structural Equation Modelling

![Diagram of Structural Equation Model of the Phenomenon](image)

Structural Equation Model of the Phenomenon

The preceding diagram illustrates the structural equation model's method of constructing relationships. Structural equation modeling
(SEM) is employed to examine the interrelationships between variables. It explains the phenomenon in detail. Once CFA is applied, the assumptions of the SEM are met, allowing for accurate modeling of the data (Cepeda-Carrion et al., 2018). The path analysis is considered a subset of SEM that would help assess the effect of multiple independent variables through multiple pathways. While path analysis can estimate the strength of each path, SEM calculates the fitting and performance of the overall model (Zhang, 2022).

To determine if the hypotheses assertions presented before were supported or not, hypotheses testing was done.

**Table (2): Estimates of structural equation model**

<table>
<thead>
<tr>
<th>Path</th>
<th>Original Sample Standard Error</th>
<th>Original Sample Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Environment -&gt; CAATTs</td>
<td>0.156***</td>
<td>0.025</td>
</tr>
<tr>
<td>The clients -&gt; CAATTs</td>
<td>1.271***</td>
<td>-1.000</td>
</tr>
<tr>
<td>The competitors -&gt; CAATTs</td>
<td>0.389***</td>
<td>-0.337</td>
</tr>
<tr>
<td>The professional -&gt; CAATTs</td>
<td>0.833***</td>
<td>-0.747</td>
</tr>
<tr>
<td>Audit firm level -&gt; CAATTs</td>
<td>0.592***</td>
<td>0.030</td>
</tr>
<tr>
<td>Audit firm size -&gt; CAATTs</td>
<td>0.315***</td>
<td>-0.130</td>
</tr>
<tr>
<td>Perceptions -&gt; CAATTs</td>
<td>0.312***</td>
<td>0.159</td>
</tr>
<tr>
<td>Individual level -&gt; CAATTs</td>
<td>0.593***</td>
<td>0.049</td>
</tr>
<tr>
<td>Auditors’ peers -&gt; CAATTs</td>
<td>0.455***</td>
<td>0.460</td>
</tr>
<tr>
<td>Auditors’ knowledge and skills -&gt; CAATTs</td>
<td>0.559***</td>
<td>-0.544</td>
</tr>
</tbody>
</table>

***p-value<0.01, ** p-value<0.05, “” p-value>0.05

Source: Based on calculations using Smart PLS

The business environment, the audit firm level, and the individual level had a positive significant impact on CAATTs usage at a 99% confidence level. So, the main hypotheses, H1, H2, and H3, are accepted.

For the business environment, the clients, competitors, and professional bodies had a significant strong positive effect on using CAATTs at a confidence level rate of 99%. It is noticed that the clients (β=1.271) had the strongest significant impact on using CAATTs followed by
professional bodies (β=0.833) and lastly the competitors (β=0.589). Thus, the sub-hypotheses, H1a, H1b, and H1c, are accepted.

For the second level, the audit firm level, audit firm size and perceptions of the audit firm’s management had a significant strong positive effect on usage of CAATTs at a confidence level rate of 99%. Both the audit firm size (β=0.315) and perceptions of the audit firm’s management (β=0.312) had almost an equal impact on the usage of CAATTs. Then, the sub-hypotheses, H2a and H2b, are accepted.

For the third one, the individual level, auditors’ knowledge & skills and Auditors’ peers had a significant positive effect on CAATTs at a confidence level rate of 99%. The auditors’ knowledge and skills (β=0.559) constituted a stronger impact on CAATTs than the auditors’ peers (β=0.455). Thus, the sub-hypotheses, H3a and H3b, are accepted.

4.3 Model Evaluation:

Table (3): Model Evaluation.

<table>
<thead>
<tr>
<th></th>
<th>SS0</th>
<th>SSE</th>
<th>Q²</th>
<th>R Square</th>
<th>R Square Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAATTs</td>
<td>4980.000</td>
<td>3337.038</td>
<td>0.330</td>
<td>0.683</td>
<td>0.678</td>
</tr>
</tbody>
</table>

SRMR=0.134, d_ULS=8.330, d_G=20.211, Chi-Square=2901.448, NFI=0.665

With an R2 of 0.678, we may deduce that CAATTs account for 67.8% of the variation in CAATTs occurred because of the business environment level, the audit firm level, and the individual level. The model is evaluated using Q2, the cross-validated redundancy metric. The model was shown to have predictive value because Q2 was greater than zero. Root mean square of residuals (SRMR) is a statistical fit metric. As it approaches zero, the model is deemed to be a good fit for
the data. According to Ximenez et al. 2022 an SRMR of 0.134 is an acceptable value.

**Conclusion:**
Recent research has shown that the fourth industrial revolution has forced audit firms to focus on the effect of technology (Allbabidi, 2021), and to adopt the computer-assisted audit tools and techniques CAATTs specially, using CAATTs leads to increased productivity levels as well as decreasing costs (Siew, Rosli, & Yeow, 2020). Despite the usage of CAATTs has become no longer optional, the adaptation and implementation of computer-assisted auditing tools and techniques CAATTs still have been given low priority in developing countries (Lutfi, & Alqudah, 2023). So, It is still required for more research on the factors of using CAATTs (Janvrin et al. 2008; Byrnes et al. 2015; Lins et al. 2016; Mansour 2016; Pedrosa, Costa, & Aparicio,2020) with a more thorough standpoint, especially in developing countries.

This research aims to study the effect of different factors of three levels, the business environment, the audit firm level, and the individual level, on using CAATTs in big four and non-big four audit firms in Egypt. The data analysis illustrates some important results.

For the first level, the business environment has a positive significant impact on using CAATTs, as well as, its factors, the clients, competitors, and professional bodies, have a significant strong positive effect on using CAATTs, and the clients have the strongest significant impact.

For the second one, the audit firm level has a positive significant impact on using CAATTs. audit firm size and perceptions of audit firm’s management have a significant strong positive effect on using CAATTs and both of them have the same impact on using CAATTs.

For the individual level, it has a positive significant impact on CAATTs usage and auditors’ knowledge & skills and auditors’ peers
have a significant positive effect on using CAATTs, but the auditors’ knowledge and skills have a greater influence than the auditors’ peers.

**Limitation and future research:**
This study has limitations, that is using a sample from the external auditors in Egypt. There is an opportunity for future research to explore the same issue in other countries and further research can use other types of auditors, such as internal auditors.

As the use of computer-assisted auditing tools and techniques CAATTs becomes increasingly prevalent in the field of auditing, it is important to investigate their impact on various aspects of the profession. Future research could explore several key questions related to CAATTs, such as the effect of their use on the code of ethics for professional accountants. Additionally, studies could examine the role of CAATTs in enhancing the risk assessment process in auditing. Another important area of investigation is the knowledge and skills necessary for auditors to effectively use CAATTs in their work. Furthermore, future studies could employ a variety of methods, such as case studies.

**References**


study of small and medium enterprises in Bangladesh. *Information Development*, 32(4), 986-1000.


# Appendix

## QUESTIONNAIRE

**Personal information**

- Gender
  - Male
  - Female

- Age
  0 21 - 30 years
  0 31 - 40 years
  0 41 - 50 years
  0 51 - 60 years
  0 61 years and above

- Educational Level:
  - Bachelor
  - Master
  - Doctorate
  - Others

- Type of professional qualification:
  - CPA
  - ACCA
  - CMA
  - CIA
  - Egyptian Society of Accountants and Auditors
  - Others
  - No qualification

- Years of experience in auditing:
  0 0 - 5 years
  0 6 - 10 years
  0 11 - 15 years
  0 16 - 20 years
  0 21 - 25 years
  0 26+ 30
  0 31 years and above

- Current position:
  - Audit Partner
  - Audit Senior Manager
  - Audit Manager
  - Senior Auditor
  - Junior Auditor
  - Audit Trainee
  - Others

- Audit firm size:
  - Big 4
  - Big 10
  - Non Big 4 but it has a significant share in the market and a relatively large number of clients
  - Small
### Variables and Questionnaire Items

<table>
<thead>
<tr>
<th>Variables</th>
<th>Questionnaire Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>The client</td>
<td>Majority of our clients have large accounting transaction volumes. Most of our clients have highly computerized financial reporting systems. It is necessary for some clients to use CAFTIs in audit tools.</td>
</tr>
<tr>
<td>Competitors</td>
<td>Our audit firm’s decision to implement CAFTIs is affected by competitors in audit industry. Our audit firm’s adoption of CAFTIs is helpful in allowing our audit firm to remain competitive.</td>
</tr>
<tr>
<td>Professionals</td>
<td>Professional bodies work to promote the profession of audit to cope with it. National professional bodies support CAFTIs usage. International professional bodies support CAFTIs usage. Professional bodies such as ISAA provide the essential framework of the audit procedures in the computational environment.</td>
</tr>
<tr>
<td>Perceptions of audit firm’s management</td>
<td>Top management of our audit firm is interested in usage of computer assisted auditing tools and techniques (CAFTIs). Top management in our audit firm is aware of the benefits that can be achieved by using computer assisted auditing tools and techniques (CAFTIs). Top management in my audit firm gives strong support for CAFTIs usage in firm’s operation. Firms can manage in our audit firm have been helpful in the use of CAFTIs.</td>
</tr>
<tr>
<td>Auditors’ competence</td>
<td>I have the sufficient knowledge necessary to use CAFTIs. I have the sufficient skills necessary to use CAFTIs.</td>
</tr>
<tr>
<td>Auditors’ peers</td>
<td>My peers, in my audit firm, believe that CAFTIs influences positively my CAFTIs usage. My peers, in other audit firms, believe that CAFTIs influences positively my CAFTIs usage. As a response to the competition, I use CAFTIs to perform my audit job.</td>
</tr>
<tr>
<td>Using CAFTIs</td>
<td>To identify and assess the risks of material misstatement due to fraud. To identify unusual or unexpected relationships or transactions. To determine the materiality level. To prepare working papers (planning procedures). To obtain evidence about control effectiveness. Performing substantive analytical procedures to identify unusual or expected revenue relationships or transactions. To select sample transactions from electronic files which match predetermined parameters or criteria. To use large populations to electronically test a repetitive calculation or other process. To execute analytical substantive procedures. To obtain sufficient appropriate audit evidence regarding the appropriateness of management’s use of the going concern assumption in the preparation of the financial statements. To extract specific records such as payments more than a specified amount or transactions before a given date. To extract top or bottom records in a database. To identify missing and duplicate records. To identify possible fraud. To sort transactions with specific characteristics. To test an entire population instead of a sample. To totalize (add up) the total/montary amount of records in affiliated inventory and check extensions such as pricing. To verify, summarize, and age information. To match data across files.</td>
</tr>
</tbody>
</table>