

**The Effect of Assuring the Cloud User-Related Cybersecurity Risk Management Voluntary Disclosure on the Nonprofessional Investors' Judgments and Decisions: The Mediating Role of Perceived Management Assertions Reliability-An Experimental Study in Egypt**

**Safaa Ahmed Mahmoud Saleh**

---

(\*) **Safaa Ahmed Mahmoud Saleh**: Lecturer of Accounting, Faculty of Business, Alexandria University. Interested in research areas including auditing and assurance services, corporate governance, and financial reporting quality.

E-mail: **Safaa\_ahmed@alexu.edu.eg**

---

## Abstract

Given the increasing importance of cyber security risks, this research aims to study and test if the perceived reliability of cybersecurity risk-related management assertions can mediate the relationship between cybersecurity risk management (CSRM) assurance and nonprofessional investors' judgments and decisions. This research provided evidence demonstrating the significance of CSRM assurance in enhancing nonprofessional Egyptian investors' investment judgments and decisions by conducting an experiment of a 2x2x2 factorial mixed design using a sample of 143 M.B.A. and postgraduate studies students as a proxy. More specifically, it is found that the CSRM assurance report positively impacts nonprofessional Egyptian investors' judgments about investment attractiveness and decisions about the investment amount, and this effect is fully mediated by the effect of the CSRM assurance on the perceived reliability of published management assertions. In addition, the direct effect of the CSRM assurance on the decision of the investment amount is stronger for male investors, while participants' educational qualifications play a significant role in interacting with the CSRM assurance in affecting both investment attractiveness and amount. However, gender does not significantly affect the relationship between the CSRM assurance report and investment attractiveness. Generally, findings, which are supported by further analyses, emphasize the benefit of the voluntary auditor assurance on the CSRM report which has several implications for stakeholders, management, auditors, and policymakers.

**Keywords:** Cybersecurity Voluntary Assurance; Cybersecurity Risk; Cloud Computing; Industry 4.0; Nonprofessional Investors; Investors' Characteristics.

أثر توكيد مراقب الحسابات على الإفصاح الاختياري عن إدارة مخاطر الأمن السيبراني السحابي على قرارات وأحكام المستثمرين غير المحترفين: الدور الوسيط لمدى مصادقية تأكيدات الإدارة - دراسة تجريبية في مصر

## ملخص البحث

نظرا للأهمية المتزايدة لمخاطر الأمن السيبراني، يهدف هذا البحث إلى دراسة واختبار ما إذا كانت درجة ثقة المستثمرين غير المحترفين في تأكيدات الإدارة المتعلقة بإجراءات الرقابة الداخلية عن إدارة مخاطر الأمن السيبراني يمكن أن تتوسط العلاقة بين التوكيد المهني عن إدارة مخاطر الأمن السيبراني وأحكام وقرارات المستثمرين غير المحترفين. ولتحقيق ذلك، تم إجراء دراسة تجريبية بتصميم 2x2x2 بين وداخل المتغيرات باستخدام عينة من ١٤٣ من طلاب ماجستير إدارة الأعمال والدراسات العليا للقيام بدور المستثمرين المصريين غير المحترفين. وقد قدم هذا البحث أدلة تدعم أهمية التوكيد المهني المستقل لمراقب الحسابات عن إدارة مخاطر الأمن السيبراني في تعزيز أحكامهم وقراراتهم الاستثمارية. وعلى وجه التحديد، تبين أن تقرير التوكيد المهني المستقل عن إدارة مخاطر الأمن السيبراني يؤثر بشكل إيجابي على أحكام المستثمرين المصريين غير المحترفين بشأن مدى جاذبية الاستثمار في الشركة محل الدراسة والتي تستخدم خدمات الحوسبة السحابية، وكذلك القرار بشأن المبلغ المراد استثماره، ويتوسط هذا التأثير بشكل كامل درجة الموثوقية المدركة لتأكيدات الإدارة المنشورة. بالإضافة إلى ذلك، فإن التأثير المباشر للتوكيد المهني المستقل لمراقب الحسابات عن إدارة مخاطر الأمن السيبراني على قرار مبلغ الاستثمار أقوى بالنسبة للمستثمرين الذكور، في حين تلعب المؤهلات التعليمية للمشاركين دورا مهما في التفاعل مع التوكيد المهني المستقل لمراقب الحسابات عن إدارة مخاطر الأمن السيبراني في التأثير على كل من جاذبية الاستثمار وحجمه. ومع ذلك، لا يؤثر متغير الجنس بشكل كبير على العلاقة بين تقرير التوكيد ومدى جاذبية الاستثمار. بشكل عام، تؤكد النتائج، والتي تم تدعيمها بإجراء اختبارات إضافية أخرى، على أهمية التوكيد المهني المستقل الاختياري عن إدارة مخاطر الأمن السيبراني والتي لها تأثيرات عديدة على مختلف أصحاب المصالح والإدارة ومراقبي الحسابات وصانعي السياسات.

**الكلمات المفتاحية:** التوكيد المهني عن الإفصاح الاختياري، مخاطر الأمن السيبراني، الحوسبة السحابية، أدوات الثورة الصناعية الرابعة، المستثمرون غير المحترفين، خصائص المستثمرين.

---

## 1. Introduction

The process of investing entails putting money toward items that are expected to generate earnings over the course of time. However, based on their level of financial understanding and intentions, investors choose different investment opportunities. Nonprofessional investors are becoming more prevalent in financial markets worldwide. However, they may lack sufficient knowledge and experience to make sound decisions. Therefore, numerous governments have introduced regulations to improve the level and nature of disclosure provided by listed firms to protect those investors (Coram, 2010; Patel & Modi, 2017).

Generally, to make their investment judgments and decisions, investors depend on publicly disclosed information, and they are affected by several factors that can be categorized in terms of **investee-related** and **investor-related factors**. The **investee-related factors** include (a) the information format in terms of financial statement recognition and disclosure, the historical and expected performance, and the dividend policy, and (b) the disclosure credibility which is affected by management incentives, the degree of external assurance, the strength of the corporate governance mechanisms. Whereas, **investor-related factors include indicators** such as the investor's experience, educational qualifications, ability to use analytical tools, age, gender, and psychological factors including their personal preferences, self-confidence, uncertainty and risk avoidance (Chang & Wei, 2011; Obamuyi, 2013; Farooq et al., 2015; Martin, 2019).<sup>1</sup>

In addition, investors must take into account a firm's level of risk including the cyber risk. During the COVID-19 pandemic, many firms find themselves in a need to transform part, or all, of their information technology infrastructure to the cloud to enable employees to do their work remotely by accessing the system through using the internet. Since cloud computing is one of the emerging tools that help firms achieve their business objectives in the digital era, cloud computing-related cybersecurity risks should be incorporated within firms' risk management policies and procedures according to frameworks such as the COSO Enterprise Risk Management Framework, or the Cybersecurity Management Framework

---

<sup>1</sup> It should be noted that the current research focuses on the nonprofessional individual investors. However, the importance of variables at the national level, such as changing exchange rates, lowering interest rates, and adopting IFRS, cannot be denied.

recently issued by the Financial Regulatory Authority (FRA) in Egypt (Galligan et al., 2019; FRA, 2023). Moreover, nonprofessional investors depend in their investing decisions on their academic qualifications, and the degree of risk acceptance which can be affected by their gender besides confidence in the voluntary disclosure provided by the management of the investee (Chang & Wei, 2011).

Given the increased cybersecurity events that have negative economic consequences for firms and their stakeholders, investors are expecting more information about a firm's cybersecurity exposures. Due to the information asymmetry between firms and stakeholders, investors generally have to rely on the firms' public reports on cybersecurity risks. However, there is only a limited disclosure available about firms' cybersecurity issues since there is no explicit legal requirement for such disclosure (Cheong et al., 2021; Shaker et al., 2023). Nevertheless, all costs firms may incur before, during, or/and after a cyber-attack may negatively affect the firm's market value, and hence, the investor's decision to invest in such risky firms (Meisner, 2017; Zhang & Smith, 2023). Therefore, disclosing the management efforts in mitigating cybersecurity risks and whether those efforts are assured by an external party are of growing importance to investors. That is, most sensitive information related to customers and suppliers is stored on the cloud (Eaton et al., 2019; Zhang & Smith, 2023).

Indeed, fostering the confidence in, and credibility of corporate disclosures is used to guarantee that relevant information is provided to support stakeholders' judgments and decisions. The agency problem and the resulting skepticism on managers' incentives for increased disclosures make assurance even more necessary to strengthen the credibility of such disclosures. Therefore, users' confidence in voluntary reporting can be strengthened through external assurance, increasing the likelihood that the information given will be used for decision-making by investors and other stakeholders (Emeka-Nwokeji et al., 2017; Shaker et al., 2023).

In this regard, the Securities and Exchange Commission (SEC) issued disclosure guidance concerning material cybersecurity risks to assist listed firms in preparing disclosures about cybersecurity risks and incidents. Moreover, the American Institute of Certified Public Accountants (AICPA) has developed a cybersecurity risk management (CSRM) reporting framework to help firms communicate useful and relevant information about the effectiveness of their CSRM controls (AICPA, 2017; SEC, 2018). As a

result, prior studies (e.g., Smith et al., 2019; Li et al., 2020; Calderon & Gao, 2021) have focused on the consequences of cyber-attack disclosure in terms of the possible increase in audit fees.

However, currently, the provision of assurance on items that are proactively reported is not yet required in the Egyptian reporting environment. Nevertheless, users' confidence in voluntarily disclosed CSRM information may rise with the help of external assurance, increasing the likelihood that nonprofessional investors may use the published information in their investment decision-making process. Regarding corporate reporting in the Egyptian context, despite the Egyptian efforts to protect Egyptian governmental agencies from cyber-attacks, Egyptian professional and regulatory bodies have not issued any reporting guidance on cybersecurity risks. The current corporate governance code, which was issued in 2016 by the Egyptian Financial Supervisory Authority (EFSA), includes guidelines for disclosing sustainability information, such as risks, crises, and information protection (EFSA, 2016). However, this guidance does not address any of the cybersecurity risk indicators that firms should disclose. As a result, there is an imperative need for disclosure guidance regarding cloud-related cybersecurity risks, and assurance on cybersecurity risk management assertions in Egypt, particularly given the lack of professional legislation to provide a comprehensive framework for cybersecurity risk disclosure and the value of assuring such disclosure for listed firms. Accordingly, the **research problem** can be summarized by answering, theoretically and experimentally in the Egyptian context, the following research questions:

- Would nonprofessional investors' judgments and decisions be affected by the presence of the independent assurance report on the effectiveness of cloud users' cybersecurity risk management controls?
- Does the nonprofessional investors' perceived reliability of the management assertions about its cybersecurity risk management report mediate the relationship between their judgments and decisions and the presence of the independent cybersecurity risk management assurance report?
- Would the direct relationship between the independent assurance report on the cloud user's cybersecurity risk management report and the nonprofessional investors' judgments and decisions differ

---

according to the investor's gender and the level of educational qualifications?

Hence, the main **objective** of this research is to study and investigate the potential effect of assuring the voluntarily disclosed cybersecurity risk management reporting on nonprofessional investors' judgments and decisions, and whether the perceived reliability of the management assertions mediates this relationship. Also, the research aims to examine whether an investor's gender and the level of educational qualifications affect the strength and/or the direction of the relationship between the independent assurance report on the cloud user's CSRM report and the nonprofessional investors' judgments and decisions.

To achieve those objectives, the researcher conducted a 2×2×2 mixed factorial design, using a sample of 143 students of postgraduate studies and M.B.A, in which variables of interest are manipulated as follows (i) CSRM assurance report published by the cloud user is manipulated at two levels, as a **within-subject independent variable**, (ii) the investor's gender, and (iii) investor's qualifications, as **between-subject moderating variables**, each is manipulated at two levels. Because archival data are currently unavailable, the experimental technique offers a possibility to gain earlier insights into this crucial area. By conducting the current experimental study in the Egyptian reporting environment, this research would fill, to some extent, the academic gap concerning the effect of external assurance, as one of the corporate governance mechanisms, on nonprofessional investors' decisions. That is, the existence of an assurance report is expected to reduce the information asymmetry level, increase investors' confidence in risky firms that use cloud computing services, and hence reduce the riskiness of the firm, in turn, increase a firm's investment attractiveness for nonprofessional investors.

Hence, the current research comes to keeping up with the recent international concern about improving the disclosure of firms' practices to protect against the increased cyber-attacks as one of the main sources of information that investors rely on. Then, the importance of the current research is derived from its numerous contributions to the field of study and to practice. That is, studying the impact of voluntary assurance on CSRM reporting is crucial in today's digital age. With the increasing number of cyber threats and attacks, firms need to ensure that their cybersecurity measures are effective and efficient. Therefore, examining the impact of

---

voluntary assurance on CSRM reporting is essential for firms looking for improving their cybersecurity to protect themselves from potential threats and ensure the security of sensitive information.

More specifically, this research adds to two streams of academic studies. The first stream is the research examining the cybersecurity disclosure consequences, the current research contributes to this stream by being applied to the nonprofessional investors in the Egyptian reporting environment and by focusing on their decisions based on the perceived reliability of the cybersecurity disclosure. Besides, this research contributes to the second stream of studies that have been concerned with the role of external assurance in improving the quality of financial reporting by examining the interaction effect of the investor's characteristics and the presence of the assurance report on aiding the nonprofessional investors in their investment decision-making process.

The research's remaining sections are organized as follows. The cloud computing and cybersecurity from an accounting and professional view is presented in **Section 2**. The theoretical foundation for the development of research hypotheses is established in **Section 3**. The research design is explained in **Section 4**. Statistical results are presented and discussed in **Section 5**. Lastly, the research concludes in **Section 6**.

## **2. Cloud Computing and Cybersecurity: An Accounting and Professional View**

Recently, in conjunction with the spread of the Coronavirus (COVID-19) pandemic, most firms moved toward using the Fourth Industrial Revolution's "Industry 4.0" technological tools such as the internet of things, blockchain, and cloud computing, with cloud computing serving as the backbone of the entire process. Moving to the cloud looks like outsourcing important sensitive data storage to another party in a remote virtual location outside the control of the firm. For instance, Enterprise Resource Planning (ERP) systems can give users immediate access to the data they need to perform their daily managerial activities allowing them to accomplish work faster and with reduced costs when being outsourced to a cloud service provider (Singerová, 2018). This, in turn, motivated the need for a new level of control over the whole value chain. The National Institute of Standards and Technology (NIST) defines cloud computing as a model for on-demand network access to shared computing resources like networks,



servers, storage, and applications that can be quickly provisioned and released with little management work or service provider interaction (Mell & Grance, 2011).

Cloud computing includes three main service models; namely, Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service (IaaS). First, SaaS, such as Google Mail, Google Docs, Enterprise Resource Planning Systems (ERP), and Microsoft online services, provides fully functional computer programs that users can access in their place via the internet. However, the cloud user does not exercise any control over the design of the application, servers, and storage infrastructure. Therefore, the cloud service provider bears the most risk (Mell & Grance, 2011; Rabai et al., 2013; Ramachandra et al., 2017; Alouffi et al., 2021).

Second, in the PaaS like Google App Engine, users can use the operating system, as well as a set of programming languages and software development tools, to create their applications. Here, users have control over the application design, but not over the physical infrastructure. Accordingly, the cloud service provider bears a greater risk than the user. Finally, the IaaS providers, like IBM Blue Cloud and Google cloud storage, offer users complete access to processing, storage, and other resources such as virtual machines and web servers letting them modify those resources and operate computer systems as needed, therefore, it is also referred to as Hardware-as-a-Service (HaaS). Hence, the risk is borne by both the cloud service provider and the user (Mell & Grance, 2011; Rabai et al., 2013; Ramachandra et al., 2017; Alouffi et al., 2021).

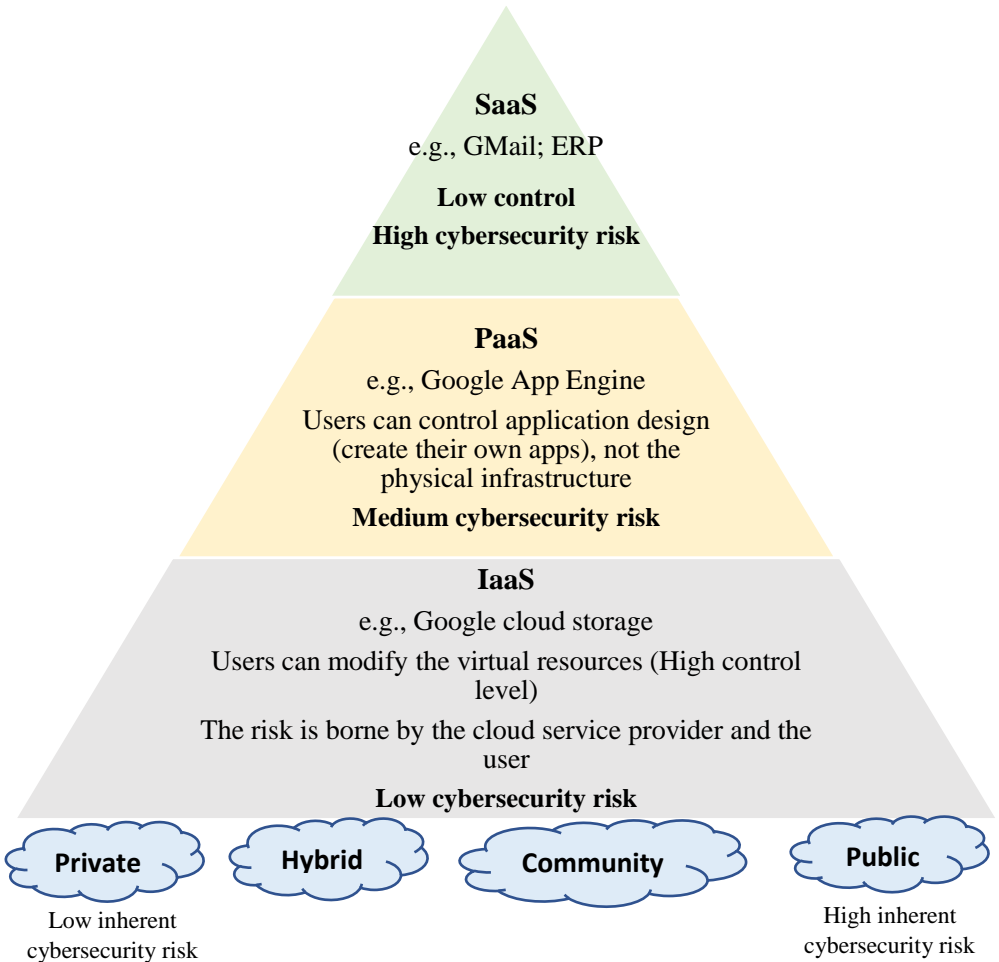
Each of those services can be utilized as a (i) private cloud exclusively used, accessed, managed, and operated by a single firm where payment is usually based on a subscription basis; (ii) public cloud in which resources are publicly available for a large number of users through the web and the payment is based on a consumption basis, (iii) community cloud that may be accessed, managed, and operated by one or more of firms in the community sharing similar interests, or (iv) hybrid cloud which is a combination of two or more cloud infrastructures (private, community, or public) enabling users to outsource their sensitive or critical data to the private cloud, and the less important data to the public cloud (Mell & Grance, 2011; Rabai et al., 2013; Ramachandra et al., 2017; Alouffi et al., 2021). Simply, the researcher can conclude that cloud computing means using information technology and

---

computer services as shared resources, via the internet as needed, in exchange for fees paid depending on the service utilized.

Despite the advantages of cost savings and flexibility related to using cloud services, all firms using those services either have been hacked or will be hacked in the future. Therefore, there are shortcomings associated with the cloud services' nature of being shared resources which increases the likelihood of being victims to cybercrimes like network, data, and storage attacks. This is due to the lack of control and governance since information technology-related risks such as security, integrity, and availability are pervasive for cloud-based services. That is, cloud users do not know the locations of data storage which are virtual storage, nor the provider's procedures for allocating computer resources, and control procedures used to safeguard the cloud computing infrastructure (Islam et al., 2016; Ramachandra et al., 2017).

In terms of security, an IaaS utilized privately has the least inherent risk level and is subject to the user's control to a great extent. In contrast, a SaaS utilized publicly does not under the control of the user and has a high level of inherent risk. In other words, the private cloud is more secure since only the user has access to and control over service delivery settings in contrast to the public cloud which is more vulnerable to security attacks. Therefore, there is an urgent need for professional assurance of data confidentiality, security, availability, and integrity to enhance users' confidence in cloud services (Islam et al., 2016; Ramachandra et al., 2017). **Figure 1** illustrates the inherent risk, and degree of control associated with each cloud service type since the public cloud has the greatest risk whereas the IaaS grant cloud users a high level of control.



**Figure 1:** The inherent risk and degree of control associated with each cloud service type

**Source:** Developed by the researcher

Accordingly, depending on the cloud service utilized, the management of the cloud user should assess the acceptable risk levels to determine the needed control processes and procedures known as cybersecurity. It is worth mentioning that cybersecurity can be defined as the set of processes, technological tools, and control procedures designed to safeguard technological resources such as networks, programs, systems, and data from intentional or unintentional attacks. As a result, cybersecurity refers to the protection of data that is analyzed and communicated across a network

---

connection. However, cybersecurity risks are those that arise from threats and exposures related to the linking to and usage of the Internet (Haapamäki & Sihvonen, 2019; Héroux & Fortin, 2020).

As mentioned above, websites, data, and information on server-based devices could be exposed to cyber-attacks committed by third parties or insiders. The danger of such attacks lies in the resulting negative consequences for listed firms and their stakeholders in terms of disrupting operations, theft of intellectual property, financial assets, or misappropriation of assets or sensitive information of firms and their customers. That is, cyber-attacks can negatively affect firms' financial statements (SEC, 2018; Héroux & Fortin, 2020). Therefore, it would be recommended to use the external auditor's services such as providing reasonable assurance on controls at a service firm by adopting the International Standard on Assurance Engagements (ISAE) 3402, besides assuring the user's CSRM report by adopting the ISAE 3000, or CSRM reporting framework (IAASB, 2009, 2013; AICPA, 2017). Accordingly, nonprofessional investors would benefit from the general-purpose assurance reports on controls at a service organization to ensure the effectiveness of security-related controls adopted by the cloud service provider, and the CSRM controls assurance report to ensure the effectiveness of security-related controls adopted by the cloud service user in which they would like to invest-in while it outsources some of its processes to the cloud service provider.

As a result, when deciding to invest, investors should carefully evaluate a firm's risk exposures. They, however, are unable to instantly follow a firm's efforts to lessen cyber-related dangers because there is no published data on how firms handle information security. To put it another way, investors have a lot of questions regarding the nature, extent, and efficacy of cybersecurity efforts. Therefore, firms may be able to reduce uncertainty and raise the likelihood that investors will choose to invest in the firm by increasing the level of risk management disclosures. Therefore, firms should publicly disclose all relevant cybersecurity risks, as well as any actual occurrences, such as those with implications for the financial or legal aspects in order for investors and other interested stakeholders to be informed (SEC, 2018; Eaton et al., 2019; Cao et al., 2022).

In this context, the SEC issued in 2011 a disclosure guidance regarding material cybersecurity risks, which is updated in 2018, to assist listed firms

in preparing disclosures about cybersecurity risks and incidents. The SEC requires listed firms to report, in a qualitative manner, risk factors that could threaten achieving their objectives (SEC, 2018). Recently in 2022, in response to requirements of Congress's Cybersecurity Disclosure Act of 2019, the SEC has issued proposed rules for obligating listed firms to periodically disclose both the CSRM controls and any actual cyber-attacks in terms of their nature and time of discovering within four business days from discovering the security incident (SEC, 2022). As a result, cybersecurity risk disclosure can send a positive signal to the market by notifying investors about the firm's implemented control procedures to mitigate cybersecurity risks which would be reflected in its market value (Cheong et al., 2021).

In the same context, the US Information Systems Audit and Control Association (ISACA) issued the third edition of the Information Technology Assurance Framework (ITAF) in 2014 which provides obligatory standards and non-obligatory guidelines to assist auditors engaged in assuring any subject matter related to the information technology. According to the ITAF, assurance engagement is "an objective evaluation of evidence for the goal of providing an assessment on risk management, control, or governance procedures for the firm, including cybersecurity engagements" (ISACA, 2014, p. 13).

Moreover, the AICPA, in collaboration with the Auditing Standards Board, has developed a CSRM framework that could be applied by all firms voluntarily. This would help firms communicate useful and relevant information about the effectiveness of their CSRM controls. Also, it assists auditors when engaged in reporting on the CSRM controls effectiveness since management can voluntarily engage an auditor to assure whether the CSRM controls were effective during the reporting period. Here, the auditor plays an important role in adding value to the management's disclosure of its CSRM program by expressing an opinion on the effectiveness of controls as a voluntary assurance report (AICPA, 2017).

A management narrative reporting about a firm's CSRM controls and assertions is part of the AICPA's framework. This framework defines the CSRM controls as a collection of policies, processes, and guidelines intended to (i) protect systems and information from security incidents that could jeopardize the firm's cybersecurity objectives and (ii) detect, manage,

---

and recover from security incidents that cannot be immediately prevented (AICPA, 2017).

Regarding cybersecurity reporting, listed firms should address cybersecurity risks and cyber incidents in their Management's Discussion and Analysis (MD&A)<sup>2</sup> if the costs associated with those incidents are likely to have a material effect on the firm's results of operations, liquidity, or financial position (SEC, 2018). According to recent research by Ernst & Young, many firms now disclose cybersecurity risks more effectively, and investors have also been interested in how quickly firms identify and mitigate the consequences of cybersecurity incidents and whether they have hired a third party to evaluate their cybersecurity control procedures (Appalraju, 2020).

Therefore, voluntary CSR disclosure in the annual report would inform investors that the firm is actively involved in preventing, detecting, and responding to security breaches. These signals would improve a firm's market value, reduce the likelihood of litigation, and mitigate the adverse implications of a prior cyber-attack. Hence, the existence of an assurance report would enhance the nonprofessional investors' perceived information quality of the risk management report (Gordon et al., 2010; Frank et al., 2021).

Keeping up with this international concern, the Egyptian regulatory authorities are working continuously to protect the Egyptian governmental agencies from cyber-attacks. For example, the Prime Minister's Office formed the Supreme Council for Cybersecurity, under the leadership of the Egyptian Minister of Communications and Information Technology, which aims to protect information and data in the Egyptian administrative authorities by designing a strategy to address and manage all cyber threats and attacks, as well as ensuring that it is effectively executed and regularly updated.<sup>3</sup> In addition, the National Telecom Regulatory Authority (NTRA) has formed the Egyptian Computer Emergency Readiness Team (EG-CERT) to be responsible for responding to information security events, as well as providing support, and protection against cyber-attacks, as well as giving early warnings about the spread of malware and large-scale cyber-

---

<sup>2</sup> Internationally, firms can report on cybersecurity-related issues in the Management Commentary. Whereas, the Board of Directors' report is the appropriate counterpart in Egypt.

<sup>3</sup> Available at the Egyptian Supreme Cybersecurity Council (ESCC): [https://www.escc.gov.eg/page1\\_1\\_en.html](https://www.escc.gov.eg/page1_1_en.html)

attacks on the Egyptian communications infrastructure.<sup>4</sup> Furthermore, the Central Bank of Egypt (CBE) established the Risk Management and Information Security Department which aims to manage information security, and protect its information assets besides managing the credit, market, and operational risks.<sup>5</sup>

Moreover, it is to the Egyptian government credit the responding to rapid developments in information technology and associated risks, after the Egyptian citizens' privacy has witnessed difficult times due to the lack of a legal framework that protects them from several types of cybercrime. The Egyptian House of Representatives issued an act to deal with cybersecurity crimes (The Anti-Information Technology Crimes Law, 2018). Followed by the issuance of the Personal Data Protection Law (2020), which aims to the protection of electronically processed personal data. This law outlines the obligations of people and organizations that may possess the personal data of users, restricts the use of personally identifiable information without the explicit permission of the data subject, and requires the reporting of any data breaches (The Personal Data Protection Law, 2020).

In addition to provisions of decree No. 139 of 2023 issued by the FRA that apply to those engaged in non-banking financial activities using financial technology. According to this decree, these firms are obligated to provide information security systems for all assets, use data encryption features, and conduct periodic maintenance of systems and devices. The FRA must also be notified when information security breaches occur. This is in addition to the frameworks that firms can use in the field of information technology governance including the Information Technology Governance Framework, Technology Risk Management Framework, and Cybersecurity Management Framework, where firms should develop risk management strategies, including information technology risks, and cybersecurity risks as one of the types of information technology risks that may hinder firms from achieving their goals. In light of these governance frameworks, the firms' board of directors can form committees for IT governance, technology risk management, and cybersecurity management, provided that they report to the firm's board of directors and are responsible for supervising the

---

<sup>4</sup> Available at the Egyptian Computer Emergency Readiness Team (EG-CERT): <https://www.egcert.eg/>

<sup>5</sup> Available at the Central Bank of Egypt (CBE): <https://www.cbe.org.eg/en/AboutCBE/Risk/Pages/RiskManagementandInformationSecurity.aspx>

---

implementation of these frameworks and ensuring compliance with the procedures required to be followed (FRA, 2023).

However, till now, the Egyptian reporting environment does not mandate the providing of assurance on issues that are proactively reported. Yet, users' confidence in voluntarily released CSR information may increase with the aid of external assurance, increasing the possibility that nonprofessional investors can employ the published information in their investing decision-making process. As a result, the current research adopts an experimental research design to examine the impact of voluntary CSR reporting being assured on nonprofessional investors in Egypt as will be indicated later.

### **3. Literature Review and Research Hypotheses Formulation**

This section analyzes previous research that has studied the possible mediated association between the CSR assurance report and nonprofessional investors' judgments and decisions. This is followed by research that has addressed the moderating role of the investor's gender and qualifications on this association in the context of related theories that can interpret these relationships which, in turn, build the theoretical basis for the formulation of research hypotheses.

#### **3.1 The CSR report assurance and the nonprofessional investors' judgments and decisions: The mediating role of perceived management assertions' reliability**

One of the most critical reporting areas for stakeholders is risk disclosure which provides information about the current risks that firms face and potential risks that may face in the future (Ibrahim et al., 2022; Demek & Kaplan, 2023). Despite being important for making judgments and decisions, risk disclosure, as nonfinancial information reporting, is uneven and unorganized, making it difficult for users to employ nonfinancial information in their investment decisions (Dong & Wong-On-Wing, 2021). Accordingly, firms may be able to reduce risk and enhance the attractiveness of investing in the firm by making more risk management disclosures. However, considering the idea that data is the new oil, increasing the level of voluntary disclosure without being assured provides data that lack users' confidence. That is, the characteristics of risk disclosures have an impact on investors' judgments and decisions (Cao et al., 2022; Demek & Kaplan, 2023).



In this regard, there is some evidence concerning the impact of cybersecurity risk disclosure on firms' market values. Specifically, the disclosure about the firm's exposure, or the probability to be exposed to such types of risks, will increase the investor's awareness about the nature and the size of such risks. In addition, the firm's disclosure of its investment in cybersecurity will give the investor an impression of the firm's ability to manage this type of risk. However, the relationship between the assurance of CSRM disclosure and investors' judgments and decisions may not proceed directly. That is, the assurance would enhance the reliability of management disclosure, and, in turn, investors' judgments and decisions would be improved based on the enhanced perceived reliability of the CSRM (Emeka-Nwokeji et al., 2017).

Furthermore, various stakeholders especially nonprofessional investors are requesting independent assurance to raise the quality of reporting about nonfinancial information in a primarily voluntary setting (Cohen et al., 2011; Moroney et al., 2012). In this context, the **stakeholders' theory** supports the nonprofessional investors' request for assuring on the disclosed CSRM report by an independent party such as an auditor, since firms must disclose the relevant nonfinancial information that satisfies the needs of different stakeholders and increase its credibility. In addition, in the light of the **agency and signaling theories**, voluntary disclosing nonfinancial information related to the CSRM would reduce the information asymmetry level and allow investors to better assess the future cash flows which would be positively reflected in their investment decisions and the higher share prices. However, this positive impact of voluntary disclosure depends on the perceived credibility which is enhanced in case of being accompanied by an independent assurance report (Emeka-Nwokeji et al., 2017; Michael & Dixon, 2019; Cordazzo et al., 2020).

From another perspective, the positive impact of the assurance on the investors' perceived disclosure credibility may depend on the disclosure signal. According to the **attribution theory**, investors would assume the management incentive to disclose positive information is to achieve self-interest, hence they would be less confident in this disclosure unlike the case of disclosing negative unfavorable information (Coram et al., 2009; Michael & Dixon, 2019). Experimentally, Arnold et al. (2011) found that voluntarily disclosing favorable nonfinancial information affects professional investors' pricing of shares in case of being assured. In addition, Gerwanski et al.

(2022) found that students as non-professional investors perceived the integrated reporting under the presence of positive assurance as being credible reflected in their increased investment amount. This is, also, supported by the findings of Emeka-Nwokeji et al. (2017) that assuring the voluntarily disclosed information enhances its credibility from the financial reporting users' viewpoint.

Whereas, Wu and Tuttle (2014), found that nonprofessional investors consider the management's voluntary disclosure about its controls as reliable since this may reflect the management's awareness of the risks associated with its business and the active attempting to mitigate them, however, assuring that disclosure increases the perceived reliability of the management disclosure. Similarly, Frank et al. (2019) found that nonprofessional investors perceive management disclosure about its CSRM controls as reliable without being accompanied by an assurance report in case the firm has not been subject to a cyber-attack. In contrast, if the firm has been attacked, then the existence of an assurance report increases investors' confidence in the management report. However, empirically, Cordazzo et al. (2020) found no relationship between the unassured environmental nonfinancial information and share prices.

**Accordingly**, the management's disclosure voluntarily regarding the implementation of effective controls to manage the potential cybersecurity risk associated with cloud computing, through its published assertions, would indicate how keen management is to handle any potential risks associated with employing cloud computing services. However, if the management voluntarily engaged an independent auditor to provide reasonable assurance on its disclosed assertions about the cloud computing-related CSRM controls, this would increase the nonprofessional investors' perceived reliability of the management disclosure, since those investors lack sufficient investing experience. That is, the degree to which cybersecurity risk disclosure affects the attractiveness of investment relies on whether investors believe the published information is reliable. In this context, the first research hypothesis is derived, in its alternative form, as follows:

**H1:** The auditor's assurance on the CSRM report significantly affects the nonprofessional Egyptian investors' perceived reliability of the published related management assertions.

Concerning the relationship between CSRSM report assurance and investment-related decisions, prior research provided mixed evidence. In general, just issuing the assurance report, regardless of being subject to cyber-attack, increases the investment attractiveness of a firm that discloses CSRSM reports (Frank et al., 2019; Cheng et al., 2022). Nevertheless, prior studies regarding the relationship between CSRSM disclosure and investors' decisions provided mixed evidence. That is, some studies (e.g., Gordon et al., 2010; Berkman et al., 2018; Navarro & Sutton, 2021) found that the increase in the level of disclosure of material cybersecurity risks in a voluntary way reduces the information asymmetry level which is reflected in the higher market values of disclosing firms.

However, some research found a positive relationship between investment attractiveness and cybersecurity risk disclosure that depends on whether the firm has been subject to cybersecurity events (e.g., Frank et al., 2019), the management responsibility for risk management (e.g., Tan & Yu, 2018; Frank et al., 2021), and the disclosure content and timeliness (e.g., Cheng & Walton 2019; Kelton & Pennington, 2020). While other studies (e.g., Perols & Murthy, 2021; Cheng et al., 2022) provided evidence that the presence of the assurance report has not affected investors' motivation to invest in hacked firms disclosing the risk management report alongside an independent assurance report.

**Therefore**, results are inconclusive regarding the relationship between the assurance on the CSRSM report disclosure and investment-related decisions. However, the researcher can conclude that the presence of an independent assurance report alongside the published CSRSM report assertions represents a positive indication of the management effectiveness in managing cyber risks associated with doing business on the cloud which is consistent with the agency theory and current empirical findings of some studies. This is, in turn, supposed to be reflected in nonprofessional investors' judgments related to the degree of the vulnerable firm's attractiveness to be invested in, and deciding on how much to invest of their available money in such firm. Therefore, the researcher can anticipate that nonprofessional investors will increase their investments in case of the existence of a positive assurance, which can be formulated in the following research hypotheses in the alternative forms:

**H2:** The auditor's assurance on the CSRSM report significantly affects the nonprofessional Egyptian investors' judgments and decisions.

---

**H2a:** The auditor's assurance on the CSRSM report significantly affects the nonprofessional Egyptian investors' judgments about the cloud user's investment attractiveness.

**H2b:** The auditor's assurance on the CSRSM report significantly affects the nonprofessional Egyptian investors' decision about the amount to be invested in the cloud user firm.

It is believed that when management looks for independent verification of nonfinancial disclosures, then it is behaving ethically. As a result, assurance strengthens the voluntary reporting of cybersecurity risk control procedures by assisting in the impact reduction of unfavorable events (Stuart et al., 2021). In this context, some studies (e.g., Chang & Wei, 2011; Rennekamp, 2012; Elliott et al., 2020) have provided evidence that the nonprofessional investors' perceived reliability of the published information, in general, whether the financial information or the accompanying notes, affects their investment-related judgments and decisions. The same conclusions were reached regarding the disclosure of cybersecurity risks. That is, as nonprofessional investors' awareness about the importance of controls to protect against cybersecurity risks increases, their confidence in a firm's financial reporting system increases, and their perceived usefulness of disclosing and assuring on the cybersecurity risks management also increases which, in turn, reflected in their intention to invest positively (Yang et al., 2020).

**Accordingly**, the relationship between the assurance on the CSRSM report and investment-related judgments and decisions can be interpreted in terms of the effect of increased reliability of the disclosed information. That is, nonprofessional investors' perceptions of nonfinancial disclosure reliability motivate their investments. Hence, perceived reliability can act as a mediating variable when talking about the relationship between the assurance on the CSRSM report and nonprofessional investors' investment-related judgments and decisions. Based on these conclusions, the third research hypothesis can be formulated in its alternative form as follows:

**H3:** The nonprofessional Egyptian investors' perceived reliability of the management assertions about its CSRSM significantly affects their judgments and decisions.

Then, this research hypothesis can be subdivided into the following sub-research hypotheses:

**H3a:** The nonprofessional Egyptian investors' perceived reliability of the management assertions about its CSRSM significantly affects their judgments about the cloud user's investment attractiveness.

**H3b:** The nonprofessional Egyptian investors' perceived reliability of the management assertions about its CSRSM significantly affects their decision about the amount to be invested in the cloud user firm.

### **3.2 The CSRSM assurance report and the nonprofessional investors' judgments and decisions: The moderating role of the investor's gender and qualifications**

Nonprofessional investors' investment-related judgments and decisions can be influenced by other factors such as the investor's gender and level of educational qualifications (Chang & Wei, 2011; Martin, 2019). Gender serves as an important element among other demographic characteristics owing to the significance of behavioral factors. When making financial decisions, female investors are more risk averse than male investors, since men and women have different perspectives on risk. Generally speaking, male investors are more risk-takers, more financially literate, and wealthier than their female counterparts (Patel & Modi, 2017; Mohammadi & Shafi, 2018; Hsu et al., 2021). However, gender, may in other cases, has less or no influence on risk tolerance while making investment decisions (Patel & Modi, 2017). Therefore, in light of both theoretical predictions and empirical findings, the fourth research hypothesis can be developed as follows in its alternative form:

**H4:** The significant relationship between the assurance report on the CSRSM report and the nonprofessional Egyptian investors' judgments and decisions will differ according to the investor's gender.

Then, this research hypothesis can be subdivided into the following sub-research hypotheses:

**H4a:** The significant relationship between the assurance report on the CSRSM report and the nonprofessional Egyptian investors' judgments about the cloud user's investment attractiveness will differ according to the investor's gender.

---

**H4b:** The significant relationship between the assurance report on the CSRSM report and the nonprofessional Egyptian investors' decision about the amount to be invested in the cloud user firm will differ according to the investor's gender.

Another important demographic element is the formally acquired academic qualifications, which can lead to a higher financial risk tolerance. That is, having the basic financial knowledge and understanding of the fundamentals of finance could strengthen the impact of disclosing nonfinancial information on nonprofessional investors' decisions (Krische, 2019). A well-educated investor will be more knowledgeable, and take all relevant investment-related aspects into account, which will enable them to make better investment judgments (Fachrudin & Fachrudin, 2016; Kalyan & Gupta, 2021). Accordingly, the fifth research hypothesis can be developed as follows in the alternative form:

**H5:** The significant relationship between the assurance report on the CSRSM report and the nonprofessional Egyptian investors' judgments and decisions will differ according to the investor's educational qualifications.

Then, this research hypothesis can be subdivided into the following sub-research hypotheses:

**H5a:** The significant relationship between the assurance report on the CSRSM report and the nonprofessional Egyptian investors' judgments about the cloud user's investment attractiveness will differ according to the investor's educational qualifications.

**H5b:** The significant relationship between the assurance report on the CSRSM report and the nonprofessional Egyptian investors' decision about the amount to be invested in the cloud user firm will differ according to the investor's educational qualifications.

#### **4. Research Design**

To determine whether the independent assurance on the cloud user's CSRSM report affects nonprofessional investors' judgments and decisions and whether demographic variables, such as gender and qualifications, interact with the independent assurance in this regard, this section explains the experimental study conducted to test the research hypotheses. Moreover,

research models designed to test the research hypotheses, and the variables' measures are explained in the following subsections.

#### **4.1 The Research Methodology**

In a field experiment, participants are exposed to several treatments that are linked to the manipulated independent variable, which is a typical methodology in social science studies. In other words, experiments can be used to evaluate people's cognitive abilities, perspectives, and desires. Additionally, experiments are appropriate for estimating the relationships among variables and hypothesis-testing research that aims to investigate the hypothesized causation by altering the independent variable, and noting whether its change results in variation of the dependent variable in a controlled situation. This is because most relevant factors that are predicted to explain the dependent variable are kept constant whereas only trying to manipulate the independent variable of interest (Croson & Gächter, 2010; Charness et al., 2012).

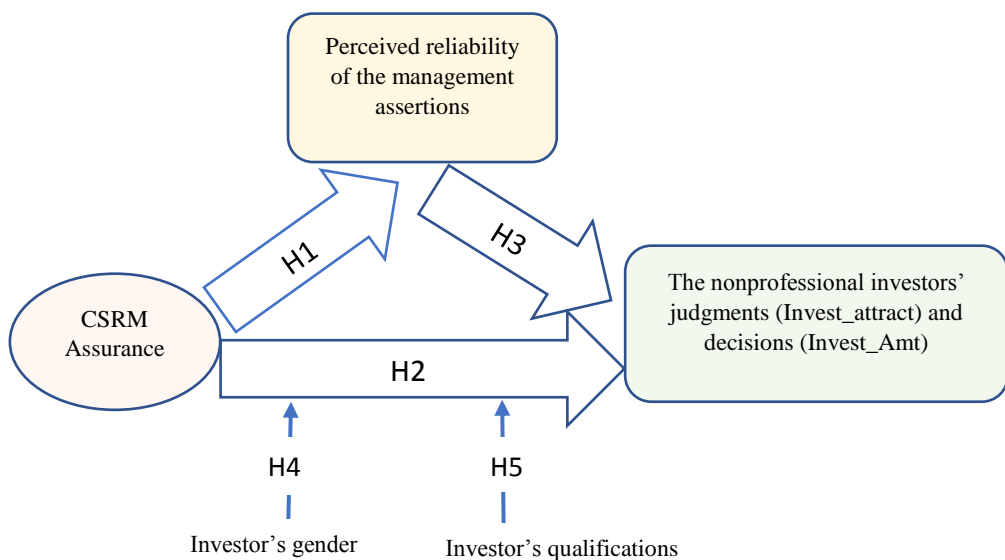
**Accordingly**, the current experimental study aims to test the research hypotheses to conclude whether the Egyptian nonprofessional investors' judgments and decisions would be affected by the voluntary assurance of the CSRSM report and whether this effect is influenced by the perceived reliability. Moreover, the current experiment seeks to determine whether the cloud user's published assurance report interacts with the gender and qualifications of nonprofessional investors to influence their perceptions and preferences reflected in their judgments and decisions.

As a stakeholder group, nonprofessional investors make up a sizeable portion of the stock market, and they might be lacking crucial information when evaluating a firm as an investment opportunity if it has been subject to a cyber-attack, as opposed to professional investors, who are more likely to be knowledgeable in cybersecurity risks and the financial potential consequences of a breach. Therefore, nonprofessional investors can see cybersecurity risk disclosure differently (Frank et al., 2019; Cheng & Walton, 2019). That's why the current research focuses on Egyptian nonprofessional investors.

#### **4.2 The Research Variables and Model**

Based upon the above-formulated research hypotheses, the voluntary assurance on the CSRSM is the primary independent variable, which is

expected to indirectly affect the nonprofessional investors-related judgments and decisions, as dependent variables, through influencing the perceived reliability of the management assertions about its CSRM controls, as a mediating variable. Additionally, some of the demographic characteristics, represented by gender and qualifications of targeted investors, that resulted in the experimental moderation model are displayed in **Figure 2**. This figure illustrates the generally expected relationships among the research variables in which the perceived reliability is expected to mediate the direct influential relationship between the CSRM assurance and the nonprofessional investors' judgments about the investment attractiveness, and the decisions of the investment amount. In addition, the existence of the moderating variables is anticipated to moderate the direct influential relationship in terms of the interaction effect on both investment attractiveness and amount.



**Figure 2:** The main research model  
**Source:** Developed by the researcher

As reflected in research hypotheses and depicted in Figure 2, the main **independent variable** in the current research is the voluntary assurance on controls related to the cloud user cybersecurity risk management “hereafter **CSRM\_Ass**” which is manipulated at two levels, within-subjects, to observe the effect on the nonprofessional investors’ judgments and decisions as



conveyed by the differences in participants' responses under the case of the existence of CSR<sub>M</sub>\_Ass versus its absence (e.g., Frank et al., 2019; Cheng et al., 2022).

The nonprofessional investors' judgments and decisions, as **dependent variables**, are measured via a set of questions related to the investment attractiveness, as a judgment, and determining the amount to be invested, as a decision, following some prior studies (e.g., Elliott et al., 2017; Frank et al., 2019; Cheng & Walton, 2019; Kelton & Pennington, 2020). The investment attractiveness of a firm is measured using an 11-point scale, ranging from not at all attractive taking the value "0" to very attractive taking the value "10". Also, participants are asked to determine the amount to be invested in the hypothetical firm by deciding any amount ranging from zero "nothing at all" to EGP10,000 "the entire amount".

The **mediating** or intervening variable is the variable through which the independent variable affects the dependent variable (MacKinnon, 2011; Namazi & Namazi, 2016). In the current research, there is one mediating variable; namely, the perceived reliability of the management assertions. The nonprofessional investors' judgments about their perceived reliability of the management assertions, as a judgment, following some prior studies (e.g., Elliott et al., 2017; Frank et al., 2019), is measured using an 11-point scale ranging from strongly disagree to trust in the management's report about its CSR<sub>M</sub> controls taking the value "0" to strongly agree taking the value "10". That is, the CSR<sub>M</sub>\_Ass is expected to affect nonprofessional investors' decisions indirectly by influencing their perceptions of the reliability of the management assertions about its CSR<sub>M</sub>.

The **moderating variable** aims to measure whether the strength and/or direction of the causal relationship is modified in the case of the existence of a moderating variable. It aims to answer the questions of when and for whom the causal relation is established and it looks like another independent variable (MacKinnon, 2011; Namazi & Namazi, 2016). In the current research, two moderating variables are expected to strengthen the effect of the CSR<sub>M</sub> assurance report on nonprofessional investors' judgments and decisions associated with their potential investment in a firm that uses cloud services. One variable is gender which is manipulated at two levels. It takes the value of "1" for male investors and the value of "0" for females. The other moderating variable is the qualifications of the investor which is manipulated at two levels. It takes the value of "1" if the sampled investors

are highly qualified, and the value of “0” otherwise. The researcher adopted an approach that is frequently used to evaluate participants' academic qualification levels. In the current research, the participants' academic qualification levels were initially rated on a scale of five-levels to determine whether they have completed a professional certificate, diploma of graduate studies, M.B.A, Master/Ph.D. of finance or accounting degrees and whether they have invested before. Then, participants are classified as highly qualified or less qualified; namely, they are considered to be highly qualified investors if they fell into three or more of the five-levels, otherwise, they are considered less qualified investors (Shen et al., 2017).

Accordingly, there is an expected mediation effect since the effect of the CSRSM assurance report, as an independent variable, is expected to affect nonprofessional investors' judgments and decisions through influencing their perceptions of the reliability of the management assertions about its CSRSM as a mediator variable. In addition, there is an expected moderation effect since the direct effect of the CSRSM assurance on participants' judgments and decisions is expected to be moderated by their qualifications and gender which may reflect their risk preferences. **Table 1** lists the primary research variables used in the main research model and their corresponding measurement techniques.

### 4.3 The Experimental Procedures

To achieve the objectives of the experimental study, the researcher determined the research experimental design, tool, and sample as explained in the following subsections.

#### 4.3.1 Experimental Design

Some studies (e.g., Frank et al., 2019; Cheng & Walton, 2019; Kelton & Pennington, 2020) conducted in the area of voluntary disclosure of the CSRSM report adopted the between-subjects experimental design. However, the choice of the experimental design depends on the purpose of the research and the applicability of the research design. Therefore, the mixed factorial design, which combines the advantages of both designs, the within- and between- subjects, is used in the current research. This mixed design, known as repeated measures factorial design, is used in case of the existence of at least one within-subjects variable, and one between-subjects variable (Charness et al., 2012; Vuorre & Bolger, 2018).

**Table 1: The primary research variables and their corresponding measurements\***

Variable	Type	Measures
<b>CSRM_Ass</b>	Independent	The voluntary assurance on controls related to the cloud user cybersecurity risk management is manipulated, as a within-subject variable, at two levels to observe the effect on the nonprofessional investors' judgments and decisions with the existence of CSRM_Ass versus its absence (Cheng et al., 2022).
<b>Invest_attract</b>	Dependent	The investment attractiveness of a firm, as an investment <b>judgment</b> , is measured using an 11-point scale, ranging from not at all attractive taking the value "0" to very attractive taking the value "10" (Cheng & Walton, 2019).
<b>Invest_Amt</b>	Dependent	Participants are requested to determine the amount to be invested in the hypothetical firm that uses cloud services by deciding any amount ranging from zero "nothing at all" to EGP10,000 "the entire amount", as an investment <b>decision</b> (Cheng & Walton, 2019).
<b>Per_reliab</b>	Mediator	The nonprofessional investors' judgments about their perceived reliability of the management assertions, as judgment, is measured using an 11-point scale ranging from strongly disagree to trust in the management's report about its CSRM controls taking the value "0" to strongly agree taking the value "10" (Elliott et al., 2017; Frank et al., 2019).
<b>Gender</b>	Moderator	It takes the value of "1" for male investors and the value of "0" for females (Shen et al., 2017).
<b>Qualifications</b>	Moderator	It takes the value of "1" if the sampled participants are highly qualified, and the value of "0" otherwise (Shen et al., 2017).

\*Source: Developed by the researcher.

Accordingly, a  $2 \times 2 \times 2$  mixed factorial design is chosen to accomplish the objectives of the current research in which the three variables of interest are manipulated as follows, as shown in **Table 2**, (i) CSRM assurance report published by the cloud user, as the independent variable, is manipulated within-subjects at two levels, (ii) the investor's gender, as a between-subject variable, is manipulated at two levels, as a moderating variable, and (iii) investor's qualifications, as a between-subject variable, is manipulated at two levels as another moderating variable. That is, the effect of the existence of the cybersecurity assurance report by the cloud user on nonprofessional investors' perceptions and decisions are compared under the presence versus absence of the CSRM assurance report, and whether being affected by the qualifications and gender of the

investor making the investment-related judgments and decisions. Hence, the current research differs from prior studies by applying a mixed design to obtain the benefits of both designs and maximize as possible the confidence in, and the generalization of, research results.

**Table 2: The Experimental Design: 2×2×2 repeated measures factorial design\***

		The CSRМ assurance report published by the cloud service user	
		Without CSRМ_Ass (T1)	With CSRМ_Ass (T2)
Investor's gender	Male Group (A)	A1 Investment attractiveness; the amount to be invested	A2 Investment attractiveness; the amount to be invested
	Female Group (B)	B1 Investment attractiveness; the amount to be invested	B2 Investment attractiveness; the amount to be invested
Investor's qualifications	Highly qualified Group (C)	C1 Investment attractiveness; the amount to be invested	C2 Investment attractiveness; the amount to be invested
	Less qualified Group (D)	D1 Investment attractiveness; the amount to be invested	D2 Investment attractiveness; the amount to be invested

\*Source: Developed by the researcher.

### 4.3.2 The Research Tool

The research tool used to collect data is the questionnaire.<sup>6</sup> It is designed understandably with clearly stated relevant statements and consists of three sections; demographic data, the experimental package and tasks, and the post-experiment questions. The **first section** aims to collect information about the demographic characteristics of the sample participants such as age, gender, and academic educational level.

However, the **second section** involves a specific scenario in which all participants were told to assume that they have EGP10,000 to invest in the Egyptian Exchange (EGX), and that there is a hypothetical telecommunication firm “ABC Inc.” representing an investment opportunity

<sup>6</sup> Available upon request.

due to its relatively high vulnerability to cybersecurity attacks given the private and secret customer data it handles to achieve the objectives of the experimental study of the current research. Each participant in the experiment has received an experimental package that includes descriptive information about ABC Inc., an unqualified audit report, as an indicator of financial statements' freedom from material misstatements, and information that the firm has never obtained a qualified audit opinion, nor has restated its financial statements. In addition, a set of summary financial statements for two fiscal periods including a balance sheet, income and cash flow statements, and some accompanying notes are provided. The structure of the experimental package was extracted from the financial reports of a real firm, but it was reasonably adjusted to prevent participants from recognizing the real firm. Only this information was provided to participants in the experiment, excluding any other information that is likely to affect their decision such as ownership structure, size of audit firm, and industry average.

Next, participants were asked to rate the investment attractiveness of ABC Inc. and to make judgments regarding the reliability of the management's report on its CSRM controls. In addition, participants were asked to determine how much they would invest in ABC Inc. deciding any amount ranging from 0 "nothing at all" to 10,000 "the entire amount" (Elliott et al., 2017). The **last section** of the questionnaire aims to determine participants' perceptions of some issues related to investing in this firm using the cloud services including additional variables' metrics to test whether the findings of the main research model would be more validated.

Furthermore, there are four separate groups of participants for the between-subjects moderating variables, since there are two separate groups (A and B) for the investor's gender. Each group received the same case information in which participants were asked to make their judgments under the nonexistence of a CSRM assurance report published by the cloud user as the investee (A1), followed by the case of the presence of the cloud service user's CSRM assurance report (A2). To alleviate or counterbalance the order effect, participants within the other group (B) were exposed to an alternative ordering of treatments (i.e., B2 then B1) (Charness et al., 2012).

By comparing the responses of participants across the different treatments of the within-subjects CSRM\_Ass independent variable (**T1** as a pre-test without assurance case; **T2** as a post-test with the assurance case),

---

the researcher can determine whether the existence of the CSR assurance report by the cloud service user makes a difference in nonprofessional investors' judgments and decisions, regardless of the effect of the investor's gender. However, to test for the effect of the investor's gender, responses of the two independent experimental groups (A and B) are compared to reach a conclusion on whether gender interacts with the presence of a CSR assurance report in enhancing the perceived reliability of the disclosed management assertions about its CSR.

In addition, the other two separate groups (C and D) pertain to the investor's educational qualifications. Within Group (C), participants who are considered highly qualified were asked to make their judgments under the nonexistence of a CSR assurance report published by the cloud user as the investee (C1), followed by the case of the presence of the cloud service user's CSR assurance report (C2). However, participants within the other group (D) who are less qualified were exposed to an alternative ordering of treatments (i.e., D2, D1).

Accordingly, the treatments included in the resulting 2×2×2 experimental design are as follows: (a) male nonprofessional investors without the existence of the CSR assurance report (A1), followed by the case of the existence of the CSR assurance report (A2); (b) female nonprofessional investors with the existence of the CSR assurance report (B2), followed by the case of without the existence of the CSR assurance report (B1); (c) highly qualified nonprofessional investors without the existence of the CSR assurance report (C1), followed by the case of the existence of the CSR assurance report (C2); (d) less qualified nonprofessional investors with the existence of the CSR assurance report (D2), followed by the case of without the existence of the CSR assurance report (D1).

In light of this experimental design, **to test the mediation research hypotheses H1 through H3**, responses of participants across the different treatments (T1, T2), **regardless of their gender and qualifications**, the researcher can determine whether the existence of the CSR assurance report by the cloud service user's auditor makes a difference in nonprofessional investors' judgments and decisions. Concerning the **moderation research hypotheses**, to test for the investor's gender moderation effect (H4a and H4b), responses of the two independent experimental groups (A and B) are compared to reach a conclusion on

whether the investor's gender interacts with the presence of a CSR assurance report in affecting nonprofessional investors' judgments and decisions. However, to test for the investor's qualifications moderation effect (**H5a and H5b**), responses of the two independent experimental groups (**C and D**) are compared to conclude whether the investor's qualifications interact with the presence of a CSR assurance report in affecting nonprofessional investors' judgments and decisions.

As **further analyses**, the riskiness of the investment is measured using an 11-point scale, ranging from very low risk taking the value "0" to very high risk "10" (Elliott et al., 2015). In addition, participants were requested to rate how the unauthorized access would affect the financial performance of the firm using a seven-point Likert scale ranging from 1 "most severely impacted", 4 "no impact", and 7 "least impacted" (Cheng & Walton, 2019; Demek & Kaplan, 2023). Noting that this section is not part of the 2×2×2 mixed factorial design, it is considered as another analysis to further support the current research findings.

It is important to keep in mind that experimental research is frequently vulnerable to internal and external invalidity sources. On one hand, it is referred to as internally valid when a causal relationship can be inferred from experimental findings with a degree of certainty (Babbie, 2007). To enhance the internal validity, the researcher formulated a standardized questionnaire using the same statements to handle the instrumentation effect, controlling for other possible factors affecting the dependent variable and reversing the order of treatments within each group to counterbalance the order effect. In addition, participants were asked to respond to some manipulation questions to ensure that they correctly understood the given material. Finally, the researcher conducted additional tests to ensure findings from the main research model. External validity, on the other hand, relates to the extent to which the results of the experiment could be applied to the real world (Babbie, 2007). To enhance the external validity, the researcher conducted a field experiment in a more natural investing setting using a sample of post graduate students to assume the role of nonprofessional investors following some prior studies (e.g., Elliott et al., 2017; Shen et al., 2017; Gerwanski et al., 2022).

---

### 4.3.3 Sample Selection

The researcher selected a judgmental sample of accounting and finance postgraduate students, and undergraduate Master of Business Administration (M.B.A.) students since they can comprehend the experimental requirements and execute the investment activities because they have appropriate knowledge of finance and accounting. There are various advantages to using M.B.A. and postgraduate students to act as nonprofessional investors. First, university graduates generally did not act professionally when making investment decisions. Second, it is possible to gather a substantial number of participants. Third, university post-graduates often reflect different geographical areas with different cultural and individual backgrounds which would make the responses more realistic when testing hypotheses, and increase the generalizability of the results. Finally, researchers can create a more carefully regulated environment for their experimental design (Elliott et al., 2017; Shen et al., 2017; Gerwanski et al., 2022).

The original sample included 185 postgraduate students who were enrolled in a diploma of graduate studies, Master/Ph.D. of finance or accounting degrees, or M.B.A. program at Alexandria university in Egypt to proxy for the Egyptian nonprofessional investors, considering that it was optional to take part in the experimental study. After discarding 6 responses that incorrectly answered the manipulation questions, the researcher eventually collected 143 useable responses (77.3% valid responses). This sample size is considered appropriate compared to the sample sizes of other studies conducted using post-graduates as nonprofessional investors. For example, Gerwanski et al. (2022) used a sample of 117 students of the master's degree program, and Shen et al. (2017) applied using 194 master's students; Kelton and Pennington (2012) utilized 84 M.B.A students, and the study of Pinsker and Wheeler (2009) used 64 M.B.A students, however, Perols and Murthy (2021) applied using 106 M.B.A. students; while Köhler et al. (2020) applied their experiment using 69 undergraduate students as non-professional investors, also Aprayuda et al. (2021) used 65 undergraduate students. Noting that all of those studies distributed their participants among groups since they conducted between-subjects experiments. However, the current research utilized the within-subjects design to benefit from the increased sample size.

The researcher conducted some preliminary checks to ensure the participants' understanding of the current experiment. Generally, the three manipulation checks indicated that the research sample understood to a great extent the information presented to them. More specifically, participants



indicated their general understanding of the given experimental information since they acknowledged the availability of information about the firm's CSRM controls. In addition, all participants correctly recognized the unavailability of an independent auditor report on the cloud computing-related CSRM in the case of its actual absence. Moreover, all participants correctly acknowledged that the firm does not publish an independent service auditor report on security controls at the cloud service provider.

**Table 3** summarizes the main descriptive statistics of the full sample. Among 143 participants, about half (52.4%) of the participants were male. The average age of the full sample was 31.4 years old, which might explain the fact that 54% stated that they already previously invested. Also, 57% are considered highly qualified investors, and nearly 94% of the participants stated that they intend to invest in the next five years.

**Table 3: Main descriptive statistics of the full sample\***

N=143	Gender	Qualifications	Age	Past_invest	Future_invest
Mean	0.52	0.57	31.43	0.54	0.94
Median	1	1	30	1	1
Std. Deviation	0.501	0.497	5.552	0.5	0.231

\*Source: Developed by the researcher.

To achieve the objectives of the experimental study, participants were assigned randomly among the experimental groups. To ensure the random distribution of participants, the Mann-Whitney test is performed in order to compare participants' characteristics. Given that, the Kolmogorov-Smirnov test for normality revealed that sample data are not normally distributed, since a P-value of (0.000) is less than 0.05 for all the variables under study. This means rejecting the null hypothesis (which states that the population from which the study sample was drawn follows the normal distribution) and accepting the alternative hypothesis (which states that the population from which the study sample was drawn does not follow the normal distribution). Accordingly, non-parametric tests, that suit data that are measured on ordinal scales, were relied upon to analyze the collected data to test the current research hypotheses (Corder & Foreman, 2009).

Results indicated that there is no significant difference between the two independent gender groups in terms of qualifications, since p-values are

greater than 0.05, and hence the null hypothesis cannot be rejected as shown in **Table 4**. Similarly, there is no significant difference between the two independent qualification groups in terms of gender. These results implied the random distribution of participants between the two experimental groups. Therefore, the randomization condition of the between-subjects design has been achieved.

**Table 4: Participants' distribution according to moderating variables**

Experimental groups	Gender (Male=1; Female = 0)				Qualifications (highly qualified =1; less qualified = 0)			
	Male		Female		Highly Qualified		Less Qualified	
	Group A		Group B		Group C		Group D	
	N	%	N	%	N	%	N	%
	75	52.4	68	47.6	81	56.6	62	43.4
<b>Hypotheses*</b>	H <sub>0</sub> : M <sub>a</sub> =M <sub>b</sub>				H <sub>0</sub> : M <sub>c</sub> =M <sub>d</sub>			
<b>P-value**</b>	0.236				0.232			

\* M<sub>a</sub>: Median of participants' characteristics in terms of qualifications in group A (male);

M<sub>b</sub>: Median of participants' qualifications in group B (female).

M<sub>c</sub>: Median of participants' characteristics in terms of gender in group C (highly qualified);

M<sub>d</sub>: Median of participants' gender in group D (less qualified).

\*\*The researcher performed tests using a significance level of 0.05. If the p-value is 0.05 or less, then it indicates the acceptance of the alternative hypothesis.

Source: Developed by the researcher.

## 5. Statistical Results

This section presents the results of statistical tests for Hypotheses testing. In addition to demonstrating some further analyses to ensure the validity of research results, and conclude this section with a summary of the hypothesis testing results.

### 5.1 Hypotheses Testing

Referring to the experimental design indicated in Table 2 above, to test the mediation research hypotheses (H1 to H3), T1 (the case without CSRM\_Ass) must be compared against T2 (the case with CSRM\_Ass) regardless of gender and qualification; i.e., comparing (A1+B1+C1+D1) versus (A2+B2+C2+D2), using the 143 participants (full sample). In order to do this, the researcher run the Wilcoxon Signed Ranks test as a non-

parametric test for repeated measures used when comparing medians of responses of two related samples.

**To test H1** regarding the positive effect of the CSRSM auditor's assurance on the perceived reliability, the Wilcoxon Signed Ranks test has been run using the full sample. Results indicated in **Table 5** show a significant difference between the nonprofessional Egyptian investors' perceived reliability of the published CSRSM management assertions ( $p$ -value  $< 0.05$ ) on behalf of the case of the existence of the CSRSM assurance report. This is consistent with the mean (4.74) and median (5) of responses under the case without the existence of the CSRSM assurance report compared to (mean 6.92 and median 7) under the case with its existence. **Therefore, H1 is supported.**

**Table 5: Wilcoxon Signed Ranks test results on the perceived reliability (H1)\* (n = 143)**

Variable	Cases	Min	Max	Mean	Media n	SD	H <sub>0</sub>	P-value (Z stat.)
Per_reliab	without assurance	2	7	4.74	5	1.34	$M_{\text{Per\_reliab\_without}} =$ $M_{\text{Per\_reliab\_with}}$	<b>0.000</b> (-10.428)
	with assurance	3	9	6.92	7	1.53		

\*Using an 11-point Likert scale, with zero representing "Strongly disagree to trust" to 10 representing "Strongly trust", participants are requested to rate the perceived reliability of the management report regarding the cybersecurity risk management controls of the hypothetical firm.

$M_{\text{Per\_reliab\_without}}$ : Median of participants' perceived reliability level under the case of the absence of the CSRSM assurance report.

$M_{\text{Per\_reliab\_with}}$ : Median of participants' perceived reliability level under the case of the existence of the CSRSM assurance report.

Source: Developed by the researcher.

**To test H2** regarding the effect of the CSRSM auditor's assurance on the nonprofessional Egyptian investors' judgments (**H2a**) and decisions (**H2b**), the researcher run the Wilcoxon Signed Ranks test using the full sample. **Regarding H2a**, results of the Wilcoxon Signed Ranks test indicate that there is a significant difference between the participants' judgment regarding the investment attractiveness in case of the existence of the CSRSM assurance report versus its absence, which is supported by the higher mean and median in case of the assurance report 6.23 and 6, respectively compared to 4.71 and 5, in case of without the existence of the assurance

report as shown in **Table 6**, Panel A. **Regarding H2b**, results of the Wilcoxon Signed Ranks test indicate that there is a significant difference between the participants' decision about the investment amount in case of the existence of the CSRSM assurance report versus its absence as shown in Panel B of **Table 6**, which is supported by the higher mean and median in case of the assurance report, EGP 3783 and 3000, respectively compared to EGP 2731 and 2500, respectively in case of without the existence of the assurance report. **Accordingly**, the second research hypothesis (**H2**) is **supported**.

The third research hypothesis **H3** concerns the effect of the nonprofessional Egyptian investors' perceived reliability of the management assertions about its CSRSM on their judgments (**H3a**) and decisions (**H3b**). Using the full sample, as indicated in **Table 7**, there is a positive strong relationship between the perceived reliability and the investment attractiveness whether under the case of the absence of the CSRSM assurance report (0.869) or its existence (0.973). Moreover, by regressing the investment attractiveness on the perceived reliability by conducting the ordinal regression, results supported the positive effect of the perceived reliability on the investment attractiveness under the case of the absence of the CSRSM assurance report (p-value < 0.05 with coefficient 2.119 interpreting 74.6% of changes in the investment attractiveness). Similarly, results supported the positive effect of the perceived reliability on the investment attractiveness (p-value < 0.05) under the case of the existence of the CSRSM assurance report with a higher coefficient of 5.620 interpreting 89.3% of changes in the investment attractiveness. **Accordingly**, **H3a** is **supported**.

**Regarding H3b**, using the full sample, as indicated in **Table 7**, there is a positive strong relationship between the perceived reliability and the investment amount whether under the case of the absence of the CSRSM assurance report (0.710) or its existence (0.852). Moreover, by conducting the ordinal regression, results supported the positive effect of the perceived reliability on the investment amount in the case of the absence of the CSRSM assurance report (p-value < 0.05 with coefficient 0.864 interpreting 21.4% of changes in the investment amount). Similarly, results supported the positive effect of the perceived reliability on the investment amount (p-value < 0.05) under the case of the existence of the CSRSM assurance report with a higher coefficient of 1.068 interpreting 22.7% of changes in the investment

---

amount. Accordingly, **H3b is supported**. Therefore, the third research hypothesis (**H3**) **is supported**.

**In light of these findings**, the researcher concludes that results of research hypotheses testing for H1 through H3 provided evidence that is consistent with findings of other studies (e.g., Wu & Tuttle, 2014; Frank et al., 2019; Yang et al., 2020; Navarro & Sutton, 2021) that nonprofessional investors perceive disclosure about CSR controls as reliable without being accompanied by an assurance report, supporting signaling and agency theories that providing more nonfinancial information has positive implications for investors. Results also agree with others (e.g., Emeka-Nwokeji et al., 2017; Elliott et al., 2020; Shaker et al., 2023) that external assurance enhances nonprofessional investors' perceived reliability reflected in their investment judgments and decisions. In addition, results are consistent with the findings of some studies (e.g., Frank et al., 2019; Yang et al., 2020; Cheng et al., 2022) that the investment attractiveness of a firm that discloses CSR reports accompanied by an assurance report, regardless of being subject to cyber-attack, increases the perceived reliability of the disclosure.

**Table 6: Results of Wilcoxon Signed Ranks test for H2 (n = 143)**

**Panel A: Wilcoxon Signed Ranks test results on the investment attractiveness (H2a)\***

Variable	Cases	Min	Max	Mean	Median	SD	H <sub>0</sub>	P-value (Z stat.)
Invest_attract	without assurance	2	7	4.71	5	1.36	$M_{\text{attract\_without}} = M_{\text{attract\_with}}$	<b>0.000</b> (-9.702)
	with assurance	2	9	6.23	6	1.64		

\*Using an 11-point Likert scale, with zero representing “Not at all attractive” to 10 representing “Most attractive”, participants are requested to rate the investment attractiveness of the hypothetical firm that uses cloud services.

$M_{\text{attract\_without}}$ : Median of participants’ perceived investment attractiveness level under the case of the absence of the CSRSM assurance report.

$M_{\text{attract\_with}}$ : Median of participants’ perceived investment attractiveness level under the case of the existence of the CSRSM assurance report.

**Panel B: Wilcoxon Signed Ranks test results on the investment amount (H2b)\***

Variable	Cases	Min	Max	Mean	Median	SD	H <sub>0</sub>	P-value (Z stat.)
Invest_Amt	without assurance	0	6000	2731	2500	1651	$M_{\text{Amt\_without}} = M_{\text{Amt\_with}}$	<b>0.000</b> (-9.077)
	with assurance	0	8000	3783	3000	2251		

\*Participants are requested to provide a potential investment amount ranging from nothing at all to the entire available amount of ten thousand EGP.

$M_{\text{Amt\_without}}$ : Median of participants’ decided investment amount under the case of the absence of the CSRSM assurance report.

$M_{\text{Amt\_with}}$ : Median of participants’ decided investment amount under the case of the existence of the CSRSM assurance report.

Source: Developed by the researcher.

**Table 7: Correlation and ordinal regression for the perceived reliability, investment attractiveness, and investment amount**

Variable	Cases	Correlations	Model Sig. ( $X^2$ )	R <sup>2**</sup>	P-value (Coeff.)
Invest_attract	without assurance	0.869*	0.001 (183.35)	74.6	<b>0.000</b> (2.119)
	with assurance	0.973*	0.000 (319.98)	89.3	<b>0.000</b> (5.620)
Invest_Amt	without assurance	0.710*	0.003 (34.29)	21.4	<b>0.000</b> (0.864)
	with assurance	0.852*	0.000 (35.06)	22.7	<b>0.000</b> (1.068)

\*Spearman's correlation coefficients are significant at 0.05 significance level for the relationship between Per\_reliab and each of Invest\_attract and Invest\_Amt under the case of with CSRSM assurance versus without CSRSM assurance.

\*\*Represents the Nagelkerke Pseudo R<sup>2</sup>, the counterpart of the determination coefficient in the linear regression model, used to evaluate how effectively the model can interpret the Invest\_attract and Invest\_Amt dependent variables under each case.

Source: Developed by the researcher.

Regarding the **moderating role** of the nonprofessional Egyptian investors' **gender** on the relationship between the CSRSM assurance report and their judgments and decisions, results of the Wilcoxon Signed Ranks test compared by gender indicate that there is a significant difference between the participants' judgment about the investment attractiveness, also their decision about the investment amount in case of the existence of the CSRSM assurance report versus its absence within each of male and female groups as shown in **Table 8, Panel A**. However, the results of the Mann-Whitney test, as shown in **Table 8, Panel C**, indicated that there is an insignificant difference between the males and females regarding their perceptions of the degree of investment attractiveness whether under the existence of the CSRSM assurance (P-value > 0.05) or its absence (P-value > 0.05). Accordingly, **H4a is not supported**.

In contrast, regarding H4b, results of the Mann-Whitney test indicated that there is a significant difference between the males and females regarding their decisions about the amount to be invested whether under the existence of the CSRSM assurance (P-value = 0.000 < 0.05) or its absence (P-value = 0.000) for the behalf of males. That is the median investment amount was 2,000 EGP for females whether with or without the existence of the CSRSM assurance report; however, for males, the median investment amount increased from 4,000 to 6,000 under the existence of the CSRSM assurance report as shown in **Panel A of Table 8**. Accordingly, **H4b is supported**. Taken together, **H4 is partially supported**.

**For the moderating role** of the nonprofessional Egyptian investors' **qualifications**, results of the Wilcoxon Signed Ranks test compared by participants' qualifications, as shown in **Table 8, Panel B**, indicate that there is a significant difference between the participants' judgment about the investment attractiveness, also their decision about the investment amount in case of the existence of the CSRSM assurance report versus its absence within each separate group of the highly and less qualified groups. However, **regarding H5a**, results of the Mann-Whitney test indicated that there is a significant difference between the highly and less qualified participants regarding their perceptions of the degree of investment attractiveness whether under the existence of the CSRSM assurance (P-value = 0.000 < 0.05) or its absence (P-value = 0.000). Accordingly, **H5a is supported**. Regarding H5b, results of the Mann-Whitney test indicated that there is a significant difference between the highly and less qualified participants

---

regarding their decisions about the amount to be invested whether under the existence of the CSR assurance report (P-value < 0.05) or under its absence (P-value < 0.05). Accordingly, **H5b is supported**. Taken together, **H5 is supported Consequently**,

For the moderating role of the nonprofessional Egyptian investors' gender and qualifications, the researcher concludes that results of **H4** testing agree with prior studies (e.g., Chang & Wei, 2011; Mohammadi & Shafi, 2018; Hsu et al., 2021) indicating that male investors are more risk-takers and nonprofessional investors depend on their degree of risk acceptance which can be affected by their gender besides their perceived reliability of the voluntary disclosure provided by the management of the investee. Furthermore, results of **H5** testing agree with prior studies (e.g., Chang & Wei, 2011; Fachrudin & Fachrudin, 2016; Kalyan & Gupta, 2021) that highly qualified investors can make better investment judgments since they are more informed and consider all relevant investment-related issues.

## 5.2 Further analyses

As an additional analysis to explain the relationships studied in the fundamental analysis of the current research and to address any defect in the current research model if any, in addition to further assessing the robustness of the results, the researcher conducted the following analyses. Noting that results are untabulated since this section is not part of the current research design, but it is considered as additional analyses to further support the current research findings.

**To ensure the moderating role** of gender, the model is retested by conducting the mixed factorial ANOVA for the dependent variable Invest\_attract as a within-subject variable compared by the gender of participants. Results indicated that there is an insignificant interaction Invest\_attract\*Gender (p-value = 0.246) under the case of Invest\_attract without assurance, as a pre-test, as well as for the interaction Invest\_attract\*Gender (p-value = 0.06) with assurance. This supports findings from the Mann-Whitney test.



**Table 8: Results of statistical tests for moderating variables**

<b>Panel A: Wilcoxon Signed Ranks test results on the investment attractiveness and amount compared by gender</b>							
Group	Variable	Cases	Mean	Median	SD	H <sub>n</sub>	P-value (Z stat.)
Male (A) (n= 75)	Invest_attract	without assurance	4.59	4	1.29	M <sub>a_attract_without</sub> =	0.000 (-7.610)
		with assurance	6.48	7	1.52	M <sub>a_attract_with</sub>	
	Invest_Amt	without assurance	3813	4000	1651	M <sub>a_Amt_without</sub> =	0.000 (-7.048)
		with assurance	5407	6000	1762	M <sub>a_Amt_with</sub>	
Female (B) (n= 68)	Invest_attract	without assurance	4.85	5	1.43	M <sub>b_attract_without</sub> =	0.000 (-6.102)
		with assurance	5.96	6	1.72	M <sub>b_attract_with</sub>	
	Invest_Amt	without assurance	1537	2000	1008	M <sub>b_Amt_without</sub> =	0.000 (-6.021)
		with assurance	1993	2000	1049	M <sub>b_Amt_with</sub>	
<b>Panel B: Wilcoxon Signed Ranks test results on the investment attractiveness and amount compared by qualifications</b>							
Highly qualified (C) (n= 81)	Invest_attract	without assurance	5.40	6	1.06	M <sub>c_attract_without</sub> =	0.000 (-7.712)
		with assurance	7.00	7	1.10	M <sub>c_attract_with</sub>	
	Invest_Amt	without assurance	3451	4000	1450	M <sub>c_Amt_without</sub> =	0.000 (-7.273)
		with assurance	4605	5000	2054	M <sub>c_Amt_with</sub>	
Less qualified (D) (n= 62)	Invest_attract	without assurance	3.82	3	1.21	M <sub>d_attract_without</sub> =	0.000 (-5.920)
		with assurance	5.23	6	1.67	M <sub>d_attract_with</sub>	
	Invest_Amt	without assurance	1790	2000	1412	M <sub>d_Amt_without</sub> =	0.000 (-5.468)
		with assurance	2710	2500	2047	M <sub>d_Amt_with</sub>	

**Panel C: Results of Mann-Whitney test for moderating variables**

		Invest_attract without assurance	Invest_attract with assurance	Invest_Amt without assurance	Invest_Amt with assurance
Gender* (H4a,b)	P-value (Z stat.)	0.249 (-1.153)	0.09 (-1.698)	0.000 (-8.255)	0.000 (-8.984)
Qualifications** (H5a,b)	P-value (Z stat.)	0.000 (-6.814)	0.000 (-6.454)	0.000 (-6.070)	0.000 (-4.960)

\*Sample size for male (group A) n=75; and for female (group B) n= 68 to test differences in investment attractiveness and amount between males and females under the existence versus absence of the CSRM assurance report.

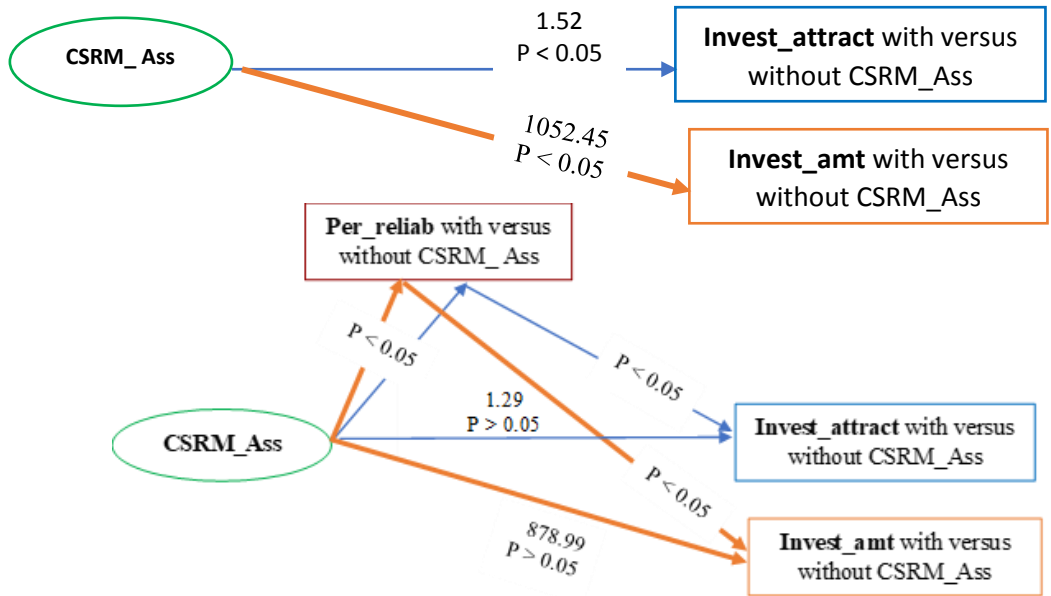
\*\*Sample size for highly qualified (group C) n=81; and for less qualified (group D) n= 62 to test differences in investment attractiveness and amount between highly and less qualified participants under the existence versus absence of the CSRM assurance report.

Source: Developed by the researcher.

However, results of the mixed factorial ANOVA, for the dependent variable Invest\_Amt as a within-subject variable compared by the gender of participants, indicated that there is a significant interaction Invest\_Amt\*Gender (p-value= 0.000, F= 85.929). More specifically, the pairwise comparison indicated that there is a significant difference between males and females in their invested amount whether under the case of with (p-value= 0.000, F= 193.061) or without assurance (p-value= 0.000, F= 128.993). Similarly, the model is retested, compared by the qualifications of participants, by conducting the mixed factorial ANOVA for repeated measures for the dependent variables Invest\_attract and Invest\_Amt as within-subject variables, results indicated that there are significant interactions Invest\_attract\*Qualifications and Invest\_Amt\*Qualifications.

**To ensure the mediating role** of the perceived reliability, the effect of the independent variable, CSRM\_Ass, is conveyed in the scales since the independent variable, CSRM\_Ass, does not have values in the data because the same participant gives his opinion on the two cases as a pre- and post-test. Therefore, the MEMORE V2.1 for testing mediation in designs with repeated measures within-subjects is used (Montoya & Hayes, 2017).

As shown in **Figure 3**, the total effect of CSRM\_Ass on Invest\_attract is 1.52, and significant p-value = 0.000; however, the indirect effect of CSRM\_Ass on Invest\_attract through Per\_reliab decreased to 1.29 and became insignificant with p-value = 0.2346 which is greater than 0.05. For the investment amount dependent variable, the total effect of CSRM\_Ass on Invest\_Amt is 1052.45, and significant p-value= 0.000; however, the indirect effect of CSRM\_Ass on Invest\_Amt through Per\_reliab decreased to 878.99 and became insignificant with p-value= 0.416. These results support the mediating effect of the perceived reliability on the relationship between the CSRM assurance on nonprofessional investors' judgment about the investment attractiveness and decision about the investment amount.



**Figure 3:** The mediation research model reflecting the total and indirect effects  
**Source:** Developed by the researcher

As an additional analysis, the riskiness of the investment is measured using an 11-point scale, ranging from very low risk taking the value “0” to very high risk “10” (Elliott et al., 2015). First, the Wilcoxon Signed Ranks test has been run using the full sample of 143 participants to test whether the CSR\_M assurance report affects the participants’ perceived risk. Results indicated a significant difference between the nonprofessional Egyptian investors’ perceived risk of investing in the hypothetical firm ( $p$ -value = 0.000;  $Z$  stat. = -5.862) on behalf of the case of the existence of the CSR\_M assurance report. This is consistent with the mean (7.2) and median (7) of responses under the case with the existence of the CSR\_M assurance report compared to (mean 8.7 and median 9) under the case without its existence. Therefore, the existence of the CSR\_M assurance report has possible implications in reducing the perceived risk associated with investing in firms using cloud services from the viewpoint of Egyptian nonprofessional investors.

To ensure the mediating effect of the perceived risk, the MEMORE V2.1 is used. Results indicated that the total effect of CSR<sub>M</sub>\_Ass on Invest\_attract is significant p-value = 0.000; however, the indirect effect of CSR<sub>M</sub>\_Ass on Invest\_attract through Per\_risk decreased but still significant with p-value < 0.05. Similarly, for the investment amount dependent variable, the total effect of CSR<sub>M</sub>\_Ass on Invest\_Amt is significant at p-value= 0.000, and the indirect effect of CSR<sub>M</sub>\_Ass on Invest\_Amt through Per\_risk is still significant. These results support the fully mediating effect of the perceived reliability, but the partial mediation of the perceived risk, on the relationship between the CSR<sub>M</sub> assurance on nonprofessional investors' judgment about the investment attractiveness and decision about the investment amount. Considering the mediation of both the perceived risk and reliability, results indicated an insignificant effect of the perceived risk on the investment attractiveness (p-value= 0.55) and the investment amount (p-value= 0.83), while the perceived reliability still has a positive significant effect (p-value < 0.05). Similarly, by adding the perceived risk to the ordinal regression conducted under the case of the presence of the CSR<sub>M</sub> assurance report, results indicated an insignificant negative effect of the perceived risk on the investment attractiveness (p-value 0.336 > 0.05), while the perceived reliability still has a positive significant effect on the investment attractiveness (p-value < 0.05). Similar results were given in the case of the absence of the CSR<sub>M</sub> assurance report.

Next, the Chi-Square test indicated a significant association between gender and perceived risk (p-value= 0.000;  $X^2 = 43.241$ ). To further ensure whether gender affects the perceived risk, results of the ordinal regression conducted under the case of the absence of the CSR<sub>M</sub> assurance report with gender as an independent variable, indicated a significant effect of gender on the perceived risk (p-value 0.000 < 0.05). Similar results were given under the case of the presence of the CSR<sub>M</sub> assurance report under the case of the absence of the CSR<sub>M</sub> assurance report. Also, results of the Wilcoxon Signed Ranks test compared by gender indicate that there is a significant difference between the sampled nonprofessional Egyptian investors' perceived risk on behalf of males.

Finally, participants were requested to rate how the unauthorized access may affect the financial performance of the attacked firm using a seven-point Likert scale ranging from 1 "most severely impacted", 4 "no impact", and 7 "least impacted" (Cheng & Walton, 2019). Results of the

Wilcoxon Signed Ranks test indicated that there is a significant difference between the nonprofessional Egyptian investors' opinion regarding the effect on the financial performance of the attacked firm in case of its exposure to unauthorized access to its customers' data ( $p$ -value = 0.000;  $Z$  stat. = -10.138) on the behalf of the case of the existence of the CSR assurance report. Therefore, the existence of the CSR assurance report has possible implications in affecting the Egyptian nonprofessional investors' perception of the potential negative consequences of being attacked.

### 5.3 Summary of the Hypothesis Testing Results

To summarize the findings of the hypotheses testing, an overview is presented in **Table 9**. Overall, findings revealed that the CSR assurance report positively affects the nonprofessional Egyptian investors' perceived reliability of the published management assertions (H1). In turn, the perceived reliability positively affects the nonprofessional Egyptian investors' judgments about the investment attractiveness (H3a) and decisions about the amount to be invested (H3b). This is in addition to the direct effect the CSR assurance report has on the nonprofessional Egyptian investors' judgments about the investment attractiveness (H2a) and decisions about the amount to be invested (H2b). This positive impact of the CSR assurance report on investment amount is strengthened in the case of the investor being a male investor, using gender as a moderating variable (H4b). Whereas there is no significant interaction effect of gender on the relationship between the CSR assurance report and investment amount (H4a not supported). However, using the participants' educational qualifications as a moderating variable implied significant interaction with the CSR assurance in affecting both the investment attractiveness (H5a) and the amount (H5b).

Similarly, results of the mixed factorial ANOVA, as a supporting analysis, revealed the significant interaction of both qualifications and gender on the investment amount, but only the qualifications variable has an interaction effect with the CSR assurance in affecting the investment attractiveness. The additional analysis indicated that males have perceived risk as lower than females, especially under the existence of the CSR assurance report. This can interpret why they have decided to invest more than females, that's why gender affects the investment amount. However, both males and females have enough financial background to judge the investment attractiveness, since all are postgraduate studies students. **In**

**addition**, the supplemental analyses' results are broadly agreed with the results of the basic research model, thus, demonstrating the internal validity of the research findings.

**Table 9: Summary of Hypotheses Testing\***

	<b>Research Hypotheses (statistical test used)</b>	<b>Result</b>
<b>H1</b>	The CSRSM assurance report → the nonprofessional Egyptian investors' perceived reliability  (Wilcoxon Signed Ranks test for the full sample)	<b>Supported</b>
<b>H2</b>	The auditor's assurance on the CSRSM report significantly affects the nonprofessional Egyptian investors' judgments and decisions.	<b>Supported</b>
<b>H2a</b>	The CSRSM assurance report → judgments about the Invest_ attract	<b>Supported</b>
<b>H2b</b>	The CSRSM assurance report → decision about the Invest_Amt  (Wilcoxon Signed Ranks test for the full sample)	<b>Supported</b>
<b>H3</b>	The nonprofessional Egyptian investors' perceived reliability of the management assertions about its CSRSM significantly affects their judgments and decisions.	<b>Supported</b>
<b>H3a</b>	The perceived reliability → judgments about the Invest_ attract	<b>Supported</b>
<b>H3b</b>	The perceived reliability → decision about the Invest_Amt  (The ordinal regression test for the full sample; MEMORE for testing mediation in repeated measures designs)	<b>Supported</b>
<b>H4</b>	The significant relationship between the assurance report on the CSRSM report and the nonprofessional Egyptian investors' judgments and decisions will differ according to the investor's gender.	<b>Partially Supported</b>
<b>H4a</b>	The moderating role of the investor's gender on H2a	Not supported
<b>H4b</b>	The moderating role of the investor's gender on H2b  (For males versus females: Mann-Whitney test; mixed factorial ANOVA)	<b>Supported</b>
<b>H5</b>	The significant relationship between the assurance report on the CSRSM report and the nonprofessional Egyptian investors' judgments and decisions will differ according to the investor's educational qualifications	<b>Supported</b>
<b>H5a</b>	The moderating role of the investor's educational qualifications on H2a	<b>Supported</b>
<b>H5b</b>	The moderating role of the investor's educational qualifications on H2b  (For highly versus less qualified: Mann-Whitney test; mixed factorial ANOVA)	<b>Supported</b>

\*Source: Developed by the researcher.

---

## 6. Conclusion

Given the argument that data is the new oil, expanding the level of voluntary disclosure without independent assurance produces data that lack financial statements users' confidence. In this context, the current research investigates the potential effect of assuring the voluntarily disclosed CSRSM assertions on Egyptian nonprofessional investors' judgments and decisions and whether their perceived reliability of the management assertions mediates this relationship. The statistical results of hypotheses testing revealed that the CSRSM assurance positively affects the judgments of participants, as nonprofessional investors, about the degree of investment attractiveness of a firm that uses cloud computing services, and their decision about the amount to be invested. However, after considering the effect of the CSRSM assurance on participants' perception of the management assertions' reliability, results of the fundamental and additional analyses indicated that the perceived reliability fully mediates the effect the CSRSM assurance has on the Egyptian nonprofessional investors' judgments (attractiveness) and decisions (amount).

Moreover, the current research aims to examine whether investors' gender and the level of educational qualifications moderate the effect the CSRSM assurance has on the Egyptian nonprofessional investors' judgments and decisions. Regarding the gender moderating effect, results indicated that gender strengthens the relationship between the CSRSM assurance and the invested amount on behalf of males revealing their general attitude of the risk-taking. However, no significant differences are found between males and females regarding their rating of investment attractiveness. Concerning the qualifications moderating variable, results indicated that it strengthens the relationship between the CSRSM assurance and the Egyptian nonprofessional investors' judgments about investment attractiveness and decisions of the investment amount on behalf of the highly qualified participants.

As a supplemental analysis, results indicated that participants perceived lower risk levels of investing in the firm that uses cloud services under the existence of a published CSRSM assurance report versus its absence. This result holds for the full sample and males when compared to females since gender affects the perceived risk. Also, it is evidenced that the CSRSM assurance report can mitigate the potential negative consequences of being attacked on the Egyptian nonprofessional investors' perceptions. That

---

is, they perceived a lower effect on the financial performance of the firm if exposed to cyber-attack under the case of the CSRSM assurance.

**In conclusion**, the findings of the current research support agency, signaling, and stakeholders' theories. That is when the management of firms using cloud services voluntarily discloses nonfinancial information related to cybersecurity risk factors and assertions reflecting the management's responsibility and efforts in mitigating those risks, then it conveys positive signals to the nonprofessional investors. This would reduce the information asymmetry level between the management and Egyptian nonprofessional investors, increase their awareness, and satisfy their needs for relevant nonfinancial information about cloud computed-related cybersecurity risks. However, the voluntary publishing of an independent assurance report on the CSRSM-related assertions improved their perceived reliability which, in turn, reflected in their intention to invest and the amount to be invested.

It is worth noting that there are some **limitations** in the light of which findings of the current research must be evaluated. **First**, only the primary effect of the CSRSM assurance, as an investee-related factor, in enhancing nonprofessional investors' judgment about perceived reliability, investment attractiveness, and decision of the investment amount is tested. Thus, one limitation of this research is the omission of other variables that may affect investors' judgments and decisions such as the role of audit and risk committees, the reputation of the firm, the firm's status in the industry, the type of audit opinion, board of directors' characteristics, and the size of the audit firm. Also, only the investor's gender and qualifications are considered. Thus, this research omits other investor-related factors that may affect investors' judgments and decisions such as age and experience, and factors on the national level, as well, such as changes in exchange rate, interest rate, and the adoption of new accounting standards such as International Financial Reporting Standards (IFRS). **Second**, the current research sample has consisted of students of M.B.A and post-graduate studies as nonprofessional investors excluding professional, institutional investors, and other stakeholders such as financial analysts and credit officers. **Third**, the inherent character of experimental research may have an impact on the experiment's external validity. As a result, care should be taken when drawing conclusions from the results of the current research.

The findings of this research do, however, offer some **insights and recommendations** that can make a difference in the Egyptian financial



reporting environment. That is, conclusions offer some implications to help management, auditors, investors, and standards' setters better appreciate the value added in case of engaging an independent auditor to provide independent positive assurance on the management's assertions related to its effort in controlling the cybersecurity risks. **In this context**, there is an imperative need for disclosure guidance regarding cloud-related cybersecurity risks. According to the full disclosure principle of financial accounting, and in line with the role of corporate governance, the issuers of the Egyptian Accounting Standards should be interested in enhancing risk disclosure to include more detailed information reflecting the purpose of using the cloud service, the potential effect on the firm's financial performance and position, and whether being previously attacked. Hence, the corporate governance code can be updated to include detailed guidelines of the recommended items to disclose about cybersecurity risk to reduce the information asymmetry level and increase transparency, in turn, increase users' confidence in the financial reporting system.

**Moreover**, to increase users' trust in cloud services, there is an urgent need for professional assurance especially for data confidentiality and security. Due to the possible cognitive inabilities of some stakeholders, it would be better if the FRA and the EGX obligate at least the listed risky firms utilizing cloud services to provide an independent assurance report on CSRM to be publicly available. This is to increase the confidence in financial statements for a wide range of users. Frameworks such as Information Technology Assurance Framework, AICPA's CSRM framework, or the International Standard on Assurance Engagements (ISAE) 3000 (revised) or its revised Egyptian counterpart can guide auditors in this regard. This would, in turn, contribute to mitigating the audit expectation gap.

To conclude, to provide a more comprehensive understanding of the benefits of cybersecurity assurance, the researcher suggests conducting more **future research** applied to other contexts. **For example**, repeating the current research using a between-subject experimental design with testing other factors excluded in the current research that may affect investors' judgments and decisions. Another recommended research is examining the effect of disclosing being exposed to cyber-attacks on professional versus nonprofessional investors' decisions, and on the audit fees. Also, it is recommended to investigate the determinants of the cybersecurity risk

disclosure among listed firms on the EGX and how this would affect the audit risk model. Further investigation of the effectiveness of the audit and risk committees' role on the level of cybersecurity risk disclosure can be fruitful. Moreover, it would be valuable to study the inferences of the enhanced cybersecurity risk disclosure level and its alternative forms, in a separate report or the notes, in terms of the effect on the stock prices, and the cost of equity and debt. Lastly, it may be interesting to explore the value of cybersecurity risk assurance versus cybersecurity risk insurance from the viewpoint of the management of risky firms and potential users such as investors and creditors.

## References

- AICPA, American Institute of Certified Public Accountants. (2017). *Guide: Reporting on an Entity's Cybersecurity Risk Management Program and Controls*. New York, NY: AICPA.
- Alouffi, B., Hasnain, M., Alharbi, A., Alosaimi, W., Alyami, H., & Ayaz, M. (2021). A systematic literature review on cloud computing security: Threats and mitigation strategies. *IEEE Access*, 9, 57792-57807.
- Appalraju, Y. (2020). *Cybersecurity disclosure report*. Ernst & Young and Chartered Professional Accountants of Canada May 2020. Ernst & Young US Center for Board Matters initiatives.
- Aprayuda, R., Misra, F., & Kartika, R. (2021). Does the order of information affect investors' investment decisions? Experimental investigation. *Journal of Accounting and Investment*, 22(1), 150-172.
- Arnold, V., Bedard, J. C., Phillips, J. R., & Sutton, S. G. (2011). Do section 404 disclosures affect investors' perceptions of information systems reliability and stock price predictions?. *International Journal of Accounting Information Systems*, 12(4), 243-258.
- Babbie, E. (2007). *The Practice of Social Research*, Eleventh Edition. Thomson Learning, Inc., Publication: Boston, USA.
- Berkman, H., Jona, J., Lee, G., & Soderstrom, N. (2018). Cybersecurity awareness and market valuations. *Journal of Accounting and Public Policy*, 37(6), 508-526.
- Calderon, T. G., & Gao, L. (2021). Cybersecurity risks disclosure and implied audit risks: Evidence from audit fees. *International Journal of Auditing*, 25(1), 24-39.

- Cao, R., Kafae, N. O., Aziz, A., & Cavusoglu, H. (2022). *Market Value of Cybersecurity Strategies*. Pacific Asia Conference on Information Systems (PACIS) 2022 Proceedings.
- Chang, R. D., & Wei, J. T. (2011). Effects of governance on investment decisions and perceptions of reporting credibility: Investment experience of Taiwanese individual investors. *Asia Pacific Journal of Management*, 28(1), 139-155.
- Charness, G., U. Gneezy, and M. A. Kuhn. (2012). Experimental methods: Between-subject and within-subject design. *Journal of Economic Behavior & Organization* 81 (1):1-8.
- Cheng, X., & Walton, S. (2019). Do nonprofessional investors care about how and when data breaches are disclosed?. *Journal of Information Systems*, 33(3), 163-182.
- Cheng, X., Hsu, C., & Wang, T. D. (2022). Talk too much? The impact of cybersecurity disclosures on investment decisions. *Communications of the Association for Information Systems*, 50(1), 481 – 500.
- Cheong, A., Yoon, K., Cho, S., & No, W. G. (2021). Classifying the contents of cybersecurity risk disclosure through textual analysis and factor analysis. *Journal of Information Systems*, 35(2), 179-194.
- Cohen, J., Holder-Webb, L., Nath, L., & Wood, D. (2011). Retail investors' perceptions of the decision-usefulness of economic performance, governance, and corporate social responsibility disclosures. *Behavioral Research in Accounting*, 23(1), 109-129.
- Coram, P. J. (2010). The effect of investor sophistication on the influence of nonfinancial performance indicators on investors' judgments. *Accounting & Finance*, 50(2), 263-280.
- Coram, P. J., Monroe, G. S., & Woodliff, D. R. (2009). The value of assurance on voluntary nonfinancial disclosure: An experimental evaluation. *Auditing: A Journal of Practice & Theory*, 28(1), 137-151.
- Cordazzo, M., Bini, L., & Marzo, G. (2020). Does the EU Directive on non-financial information influence the value relevance of ESG disclosure? Italian evidence. *Business Strategy and the Environment*, 29(8), 3470-3483.

- 
- Corder, G., and D. Foreman. (2009). *Nonparametric Statistics for Non-Statisticians: A Step-by-Step Approach*. John Wiley and Sons, Inc., Publication: New Jersey, USA.
- Crosan, R., & Gächter, S. (2010). The science of experimental economics. *Journal of Economic Behavior & Organization*, 73(1), 122-131.
- Demek, K. C., & Kaplan, S. E. (2023). Cybersecurity breaches and investors' interest in the firm as an investment. *International Journal of Accounting Information Systems*, 49, 1-15.
- Dong, L., & Wong-On-Wing, B. (2021). Does causally linking nonfinancial measures influence investors' use of management's disclosures of nonfinancial information?. *Accounting & Finance*, 61, 2269-2299.
- Eaton, T. V., Grenier, J. H., & Layman, D. (2019). Accounting and cybersecurity risk management. *Current Issues in Auditing*, 13(2), C1-C9.
- EFSA, Egyptian Financial Supervisory Authority. (2016). *The Egyptian Corporate Governance Code*. Egyptian Institute of Directors (EIoD).
- Elliott, W. B., Fanning, K., & Peecher, M. E. (2020). Do investors value higher financial reporting quality, and can expanded audit reports unlock this value?. *The Accounting Review*, 95(2), 141-165.
- Elliott, W. B., Grant, S. M., & Rennekamp, K. M. (2017). How disclosure features of corporate social responsibility reports interact with investor numeracy to influence investor judgments. *Contemporary Accounting Research*, 34(3), 1596-1621.
- Elliott, W. B., Rennekamp, K. M., & White, B. J. (2015). Does concrete language in disclosures increase willingness to invest?. *Review of Accounting Studies*, 20, 839-865.
- Emeka-Nwokeji, N. A., Damian, O. C., & Okeke, P. C. (2017). Providing assurance services as a tool for improving the quality of voluntary disclosures: A survey of users' perception. *African Journal of Education, Science and Technology*, 3(3), 183-199.
- Fachrudin, K. R., & Fachrudin, K. A. (2016). The influence of education and experience toward investment decision with moderated by

- financial literacy. *Polish Journal of Management Studies*, 14(2), 51-60.
- Farooq, A., Afzal, M., Sohail, N., & Sajid, M. (2015). Factors affecting investment decision making: Evidence from equity fund managers and individual investors in Pakistan. *Journal of Basic and Applied Scientific Research*, 5(8), 62-69.
- FRA, Financial Regulatory Authority. (2023). *Decree of the Board of Directors of the Authority No. 139 of 2023 regarding technological infrastructure, information systems and means of protection and insurance necessary to use financial technology to conduct non-banking financial activities (in Arabic)*. Available online at: <https://fra.gov.eg/>
- Frank, M. L., Grenier, J. H., & Pyzoha, J. S. (2019). How disclosing a prior cyberattack influences the efficacy of cybersecurity risk management reporting and independent assurance. *Journal of Information Systems*, 33(3), 183-200.
- Frank, M. L., Grenier, J. H., & Pyzoha, J. S. (2021). Board liability for cyberattacks: The effects of a prior attack and implementing the AICPA's cybersecurity framework. *Journal of Accounting and Public Policy*, 40(5), 1-16.
- Galligan, M.E., Herrygers, S., & Rau, K. (2019). *Managing Cyber Risk in a Digital Age*. Deloitte and Committee of Sponsoring Organizations of the Treadway Commission (COSO).
- Gerwanski, J., Velte, P., & Mechtel, M. (2022). Do nonprofessional investors value the assurance of integrated reports? Exploratory evidence. *European Management Journal*, 40(1), 103-126.
- Gordon, L. A., Loeb, M. P., & Sohail, T. (2010). Market value of voluntary disclosures concerning information security. *MIS Quarterly*, 567-594.
- Haapamäki, E., & Sihvonen, J. (2019). Cybersecurity in accounting research. *Managerial Auditing Journal*, 34(7), 808-834.
- Héroux, S., & Fortin, A. (2020). Cybersecurity disclosure by the companies on the S&P/TSX 60 Index. *Accounting Perspectives*, 19(2), 73-100.
- Hsu, Y. L., Chen, H. L., Huang, P. K., & Lin, W. Y. (2021). Does financial literacy mitigate gender differences in investment behavioral bias?. *Finance Research Letters*, 41, 1-9.

- 
- IAASB, International Auditing and Assurance Standards Board. (2009). *Assurance Reports on Controls at a Service Organization: International Standard on Assurance Engagements (ISAE) 3402*. London, U.K.:IAASB.
- IAASB, International Auditing and Assurance Standards Board. (2013). *Assurance Engagements other than Audits or Reviews of Historical Financial Information: International Standard on Assurance Engagements (ISAE) 3000 (Revised)*. London, U.K.:IAASB.
- Ibrahim, A. E. A., Hussainey, K., Nawaz, T., Ntim, C., & Elamer, A. (2022). A systematic literature review on risk disclosure research: State-of-the-art and future research agenda. *International Review of Financial Analysis*, 82, 1-23.
- ISACA, Information Systems Audit and Control Association. (2014). *Information Technology Assurance Framework ITAF<sup>TM</sup>: A Professional Practices Framework for IS Audit/Assurance, 3rd Edition*. Illinois, USA.:ISACA.
- Islam, T., Manivannan, D., & Zeadally, S. (2016). A classification and characterization of security threats in cloud computing. *Int. J. Next-Gener. Comput*, 7(1), 268-285.
- Kalyan, A. P., & Gupta, B. (2021). Does level of education/experience affect investors decision making. *Phronimos: The KIAMS Journal*, 1(1), 19-35.
- Kelton, A. S., & Pennington, R. R. (2012). Internet financial reporting: The effects of information presentation format and content differences on investor decision making. *Computers in Human Behavior*, 28(4), 1178-1185.
- Kelton, A. S., & Pennington, R. R. (2020). Do voluntary disclosures mitigate the cybersecurity breach contagion effect?. *Journal of Information Systems*, 34(3), 133-157.
- Köhler, A., Ratzinger-Sakel, N., & Theis, J. (2020). The effects of key audit matters on the auditor's report's communicative value: Experimental evidence from investment professionals and non-professional investors. *Accounting in Europe*, 17(2), 105-128.

- Krische, S. D. (2019). Investment experience, financial literacy, and investment-related judgments. *Contemporary Accounting Research*, 36(3), 1634-1668.
- Li, H., No, W. G., & Boritz, J. E. (2020). Are external auditors concerned about cyber incidents? Evidence from audit fees. *Auditing: A Journal of Practice & Theory*, 39(1), 151-171.
- MacKinnon, D. P. (2011). Integrating mediators and moderators in research design. *Research on Social Work Practice* 21 (6):675-681.
- Martin, R. (2019). Examination and implications of experimental research on investor perceptions. *Journal of Accounting Literature*, 43, 145-169.
- Meisner, M. (2017). Financial consequences of cyber attacks leading to data breaches in healthcare sector. *Copernican Journal of Finance & Accounting*, 6(3), 63-73.
- Mell, P., & Grance, T. (2011). *The NIST definition of cloud computing*. National Institute of Standards and Technology Special Publication 800-145.
- Michael, A., & Dixon, R. (2019). Audit data analytics of unregulated voluntary disclosures and auditing expectations gap. *International Journal of Disclosure and Governance*, 16(4), 188-205.
- Mohammadi, A., & Shafi, K. (2018). Gender differences in the contribution patterns of equity-crowdfunding investors. *Small Business Economics*, 50, 275-287.
- Montoya, A. K., & Hayes, A. F. (2017). Two-condition within-participant statistical mediation analysis: A path-analytic framework. *Psychological Methods*, 22(1), 6-29.
- Moroney, R., Windsor, C., & Aw, Y. T. (2012). Evidence of assurance enhancing the quality of voluntary environmental disclosures: An empirical analysis. *Accounting & Finance*, 52(3), 903-939.
- Namazi, M., and N.-R. Namazi. (2016). Conceptual analysis of moderator and mediator variables in business research. *Procedia Economics and Finance* 36:540-554.
- Navarro, P., & Sutton, S. G. (2021). Investors' judgment and decisions after a cybersecurity breach: Understanding the value relevance of cybersecurity risk management assurance. *Available at SSRN 3817763*.

- Obamuyi, T. M. (2013). Factors influencing investment decisions in capital market: A study of individual investors in Nigeria. *Organizations and markets in emerging economies*, 4(7), 141-161.
- Patel, B., & Modi, V. (2017). Impact of demographic factors on investment decision: An empirical study from South Gujarat Region. *International Journal of Latest Engineering and Management Research*, 2(12), 31-38.
- Perols, R. R., & Murthy, U. S. (2021). The impact of cybersecurity risk management examinations and cybersecurity incidents on investor perceptions and decisions. *Auditing: A Journal of Practice & Theory*, 40(1), 73-89.
- Pinsker, R., & Wheeler, P. (2009). Nonprofessional investors' perceptions of the efficiency and effectiveness of XBRL-enabled financial statement analysis and of firms providing XBRL-formatted information. *International Journal of Disclosure and Governance*, 6, 241-261.
- Rabai, L. B. A., Jouini, M., Aissa, A. B., & Mili, A. (2013). A cybersecurity model in cloud computing environments. *Journal of King Saud University-Computer and Information Sciences*, 25(1), 63-75.
- Ramachandra, G., Iftikhar, M., & Khan, F. A. (2017). A comprehensive survey on security in cloud computing. *Procedia Computer Science*, 110, 465-472.
- Rennekamp, K. (2012). Processing fluency and investors' reactions to disclosure readability. *Journal of accounting research*, 50(5), 1319-1354.
- SEC, Securities and Exchange Commission. (2018). *Commission Statement and Guidance on Public Company Cybersecurity Disclosures Release Nos. 33-10459; 34-82746*. Available online at: <https://www.sec.gov/rules/interp/2018/33-10459.pdf>.
- SEC, Securities and Exchange Commission. (2022). *Cybersecurity Risk Management, Strategy, Governance, and Incident Disclosure Release Nos. 33-11038; 34-94382*. Available online at: <https://www.sec.gov/rules/proposed/2022/33-11038.pdf>.
- Shaker, A. S., Al Shiblawi, G. A. K., Union, A. H., & Hameedi, K. S. (2023). The role of information technology governance on enhancing



- cybersecurity and its reflection on investor confidence. *International Journal of Professional Business Review*, 8(6), 1-23.
- Shen, H., Wu, H., & Chand, P. (2017). The impact of corporate social responsibility assurance on investor decisions: Chinese evidence. *International Journal of Auditing*, 21(3), 271-287.
- Singerová, J. (2018). Accounting in cloud. *European Financial and Accounting Journal*, 13(1), 61-76.
- Smith, T. J., Higgs, J. L., & Pinsker, R. E. (2019). Do auditors price breach risk in their audit fees?. *Journal of Information Systems*, 33(2), 177-204.
- Stuart, A. C., Bedard, J. C., & Clark, C. E. (2021). Corporate social responsibility disclosures and investor judgments in difficult times: The role of ethical culture and assurance. *Journal of Business Ethics*, 171(3), 565-582.
- Tan, H. T., & Yu, Y. (2018). Management's responsibility acceptance, locus of breach, and investors' reactions to internal control reports. *The Accounting Review*, 93(6), 331-355.
- The Anti-Information Technology Crimes Law No. 175. (2018). *The Egyptian House of Representatives*.
- The Personal Data Protection Law No. 151. (2020). *The Egyptian House of Representatives*.
- Vuorre, M., & Bolger, N. (2018). Within-subject mediation analysis for experimental data in cognitive psychology and neuroscience. *Behavior Research Methods*, 50, 2125-2143.
- Wu, Y. J., & Tuttle, B. (2014). The interactive effects of internal control audits and manager legal liability on managers' internal controls decisions, investor confidence, and market prices. *Contemporary Accounting Research*, 31(2), 444-468.
- Yang, L., Lau, L., & Gan, H. (2020). Investors' perceptions of the cybersecurity risk management reporting framework. *International Journal of Accounting & Information Management*, 28(1), 167-183.
- Zhang, Y., & Smith, T. (2023). The impact of customer firm data breaches on the audit fees of their suppliers. *International Journal of Accounting Information Systems*, 50, 1-20.

