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# Influence of artificial intelligence technology on green electronic auditing: Moderating effect of organizational culture

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**Abstract**

This study investigated the impact of the use of advanced technologies, namely expert systems, intelligent agents, and genetic algorithms, on green electronic auditing in accounting firms in Jordan. Research data were gathered from 480 study respondents through a questionnaire, and data were analyzed with Smart PLS. Results show that auditing practices were substantially improved by the use of these technologies, through the achievement of sustainability, and that these technologies became more effective with a supportive organizational culture. Results also show a strong relationship between the technologies, namely, expert systems, intelligent agents, and genetic algorithms. and green electronic auditing. This study demonstrated that organizational culture serves as a moderator that enhances green electronic auditing through its interaction with expert systems; however, not with intelligent agents or genetic algorithms. The study limitations include the use of just one region and likely biases in self-reported data. The use of technologies in other settings and other factors that affect green auditing practices can be examined in future studies. In general, the significance of using innovative technologies to increase auditing sustainability in accounting firms was elucidated in this study.



*Keywords*: Green electronic auditing, Expert systems, Intelligent agents, Genetic algorithms, Auditing firms, Organization culture

## 1. Introduction

Artificial intelligence, or AI, is an increasingly useful application in the lives of people and firms today, owing to the advantages of its usage in various sectors. The capabilities of AI allow the completion of tasks and activities that previously only humans could perform, because AI is a technology that emulates the human mind [1-3]. AI is actually not a new technology, and its usage in the accounting domain is regarded as a major development, as this domain, just like other domains, is compelled to keep abreast with the modern

developments today, which have affected both the financial and business environment [4, 5]. The use of AI indeed affects the efficiency of accounting systems [6], and through AI usage, accountants and auditors could develop and improve their professional performance more effectively [7]. Furthermore, AI usage is linked to the accounting and auditing strategy and techniques [5], and so, in this day and age, firms cannot avoid the use of AI to survive and remain competitive [8, 9]. Hence, accountants need to master and maximize the use of modern technologies.

The potential of AI in improving audit quality and in providing services to audit clients has been reported by [10]. It should be noted that technology has been employed by accountants to improve their work and work outcomes, but owing to the lack of knowledge and skills of many in AI, the implementation of AI may cause a reduction in job opportunities for many [11]. Alrabei [12] accordingly examined the perception of local company auditors in Jordan towards the use of AI in auditing. In another study, [13] mentioned the need to perform auditing facilitated by AI and machine learning (ML) to make auditing work more efficiently. Accordingly, financial institutions that are incorporating AI mechanisms into their operations would need more AI disclosure and informed decision-making to be in alignment with their organizational objectives [14].

The strategic roles of accounting and auditing have been reinterpreted by the shifting worldwide focus on sustainable development, especially in view of the escalating environmental issues, the expanding legal framework, and the increased awareness of stakeholders [15]. In this new area, green auditing has emerged as a crucial component of corporate responsibility, leading companies to integrate eco-friendly procedures into their auditing processes [16].

In addition to these advancements, the emergence of digital transformation and cutting-edge technical applications—like intelligent agents, expert systems, and genetic algorithms—has created new opportunities to improve the efficiency, accuracy, and environmental alignment of auditing procedures. While a lot of scholarly research has been done on how artificial intelligence and digital innovation affect traditional auditing, little is known about how these technologies specifically support green electronic auditing. In developing countries like Jordan, where the incorporation of cutting-edge digital solutions into environmental auditing methods is still in its infancy, this knowledge gap is especially noticeable. In order to close this gap, the current study investigates how three cutting-edge technologies—expert systems, intelligent agents, and genetic algorithms—affect Jordanian accounting firms' adoption of green electronic auditing. The study also looks at how organizational culture influences these interactions, providing more information about the factors that help or impede the use of technology in audits with a sustainability focus.

This study adds to the expanding conversation on ecologically conscious auditing by utilizing empirical data collected from Jordanian accounting professionals and examining them using the Smart PLS statistical framework. In addition to highlighting the potential of technology-enabled tools to assist sustainable audit programs, it offers useful recommendations for organizational practice and policy development, especially in the MENA area and similar economic circumstances.

## 2. Literature review

### 2.1. Artificial intelligence

The 21st century has been marked by radical transformations in various aspects of human life, including the process of communication, owing to scientific progress and the use of advanced and innovative applications [17]. Owing to these developments, communication and dispersal of information today are no longer impeded by technical hurdles, political considerations, or geographical boundaries. The revolution of information has now become a pillar of the various human life [18-20]. Accordingly, artificial intelligence (AI) is a concept resulting from the combination of the concepts of intelligence and artificiality. Intelligence encompasses the capacity for thinking, understanding, and making inferences – these are some of the features of the human mind. As for the latter (artificial intelligence), it refers to the capability to enable computers (which are human

creations) to carry out the tasks of thinking, understanding, and making inferences [4, 21, 22]. Jarrahi [23] hence defined artificial intelligence (AI) as making computers possess the capability to think, decide, and execute certain tasks that previously only humans could execute. AI encompasses a system that is programmed to think and act like a human through the experimental side of computer science and to use its intelligence, and AI is, in fact, among the most notable global modern technological inventions in today's modern era [24]. As indicated by McCarthy and Hayes [25], AI stores the accrued human experience by transporting it to the smart machine. However, the author noted that the data used in artificial intelligence systems has not been consistent with the actual world.

Artificial intelligence includes many different dimensions. Among these dimensions are expert systems, intelligent agents, and genetic algorithms, and these three dimensions were examined in this study. In particular, expert systems, as described by [26], encompass software or computer programs with the ability to simulate human logic, copying the capacities of the mind of human mind. With respect to intelligent agents, they include devices and software that carry intelligent properties with the ability to perceive and comprehend their surroundings, interact with these surroundings, and then take the right actions to exploit the opportunities to accomplish the goals previously set [27]. Meanwhile, genetic algorithms generate a set of suitable solutions to the problem to be resolved or the goal to be accomplished, and the encoding of the problem or goal is achieved through the use of binary strings, direct values, or another appropriate format [28].

### 2.2. Green electronic auditing

Green electronic auditing results from the rapid economic development and vast expansion of the business domain, which has increased the significance of the auditing profession in furnishing the vital information to stakeholders, particularly decision-makers [12]. Green electronic auditing provides accurate data output and classification, resulting in increased quality of the auditing process. For auditors, the use of green electronic auditing increases their work effectiveness as it allows them to control the quality of external auditing. In Jordan, the use of green electronic auditing among the auditing offices and companies is rather significant [29].

In a study by [30], the application of AI demonstrated that there is no significant disparity in the perceived impact of AI on audit quality across domestic and international audit firms. In another study, [31] found that the use of AI improves audit quality, lowers fees, and may eventually replace human auditors, although the impact on labor may take time. A study by [32] relevantly reported a significant impact of expert systems, intelligent agents, and genetic algorithms (when tested discretely) on the auditing quality of auditing offices in Jordan. In other words, all these dimensions are crucial in achieving quality in the auditing process.

### 2.3. Organization culture

To change or transform, firms must grow and adapt their positions, beliefs, and values to their goals, mission, strategy, environment, and new technology. Institutional change management involves changing organizational culture [33]. Identifying the current organizational culture will help institutions adopt artificial intelligence technologies by determining the degree of support and the capacity of all institution components to transform to operate with AI, digital, and machine learning applications [3, 5]. This meant institutions had to assess the current state of affairs, compare it to the desired state, and create a correct change management strategy to effectively and quickly transform [4]. Organizational culture change may be crucial to the transformation. Moreover, corporate sustainability reports in Jordan significantly mediate the relationship between efficiency strategy and financial performance [34].

The study of how digitalization drives long-term competitive performance is still relatively new. Specifically, the processes by which digital strategy improves digital competence and, as a result, contributes to long-term competitive performance have gotten less attention. The findings show that digital strategy has a favorable impact on the long-term competitive performance, with digital capabilities serving as a partial mediator. Additionally, the study discovered that digital culture reinforces the relationship between digital strategy and digital capabilities. This study adds to the literature on dynamic capability by emphasizing the importance of

digital strategy and culture as antecedents to long-term competitive performance, with digital capability serving as an intervening variable. The findings indicate that SMEs should develop digital culture and strategies, which will improve their digital competence and long-term competitive performance in dynamic markets [35].

Professionals and intellectuals have defined organizational culture in various ways. Although they define organizational culture differently, most agree on it. Researchers [20, 36] said it was complicated and included belief, knowledge, art, ethics, law, custom, and social capacity. Defined it as a set of shared values, beliefs, ideas, and ways of thinking among institution members [20]. Jordanian SMEs should encourage a digital culture more in order to improve their digital capabilities and sustainable competitive performance. Digital strategy and culture were also considered to be important for sustainable competitive performance [35].

### 2.4. Artificial intelligence and green electronic auditing

If needed, make a subdivision for each section as follows. AI usage in green electronic auditing has great importance. Firstly, AI is a massive advancement in information technology. Also, technological advancement allows the easy and fast processing of data in large quantities by way of automatic scanning. For auditing, the use of such technology (electronic auditing) assures more accurate, efficient, and effective results [37]. In fact, AI is currently a vital tool in economic decision making involving large amounts of data; AI tool perceptively processes the data, and provide fast and accurate reports, particularly in green electronic auditing [4, 5, 38].

AI progression and computer usage have resulted in increased interest in modern technology usage, and in the context of auditing, the use of green electronic auditing is on the rise. The use of such technology counterbalances the inadequacies of human in their professional judgment, in auditing, especially, making the process of auditing more efficient and effective. The new auditing methodologies embrace the concept of risks that include a strategic dimension that relates to the ability of the economic unit to accomplish its goals, whereby the auditors need to utilize advanced technology to ascertain the factors that impede the unit from accomplishing its goals [39].

In business firms, the use of automated information has an impact on the financial, accounting, and control systems, resulting in the need for AI technology use in the electronic auditing work, which consequently resulted in the emergence of green electronic auditing. Consequently, the professional standards to guide the governance of these systems during account auditing within the automated information environment have been introduced [40]. The incorporation of AI technologies in the green electronic auditing process makes the external auditing process more effective and efficient. Not only that, but the tasks of external audit can be completed faster and at lower costs. This results in auditing services of superior quality, while the audit strategy is facilitated in its execution, decreasing audit risks, while increasing the throughput and the market share of auditing companies [41]. AI usage in accounting, in electronic auditing especially, is important, seeing that AI, through its numerous applications, could facilitate the auditor in executing their assigned tasks and role in the most effective and efficient manner. Additionally, the use of AI applications would make the electronic audit process outcomes more accurate, which consequently would result in superior economic and commercial decisions [42].

### 2.5. Hypotheses development

#### 2.5.1. Expert systems and green electronic auditing

Expert systems (ES) are a notable use of artificial intelligence (AI) that replicate human decision-making abilities to address intricate situations. These systems acquire and employ expert knowledge in an organized manner, enabling them to reason and offer answers without depending exclusively on numerical computations [43]. The use of expert systems in electronic auditing has been examined in various studies. According to [44], in IT companies, expert systems usage in the auditing process increases the performance of the auditor. In addition, the use of expert systems in commercial banks eases the procedures of electronic auditing, making task execution and data and information extraction faster [45]. Through expert systems, auditing work becomes more efficient, easier, cheaper, and faster to complete, increasing its quality. Additionally, expert systems usage

significantly affects the efficiency of external audit activities, making the activities more efficient [43]. Expert systems usage has proven efficiency in deducting risks linked with financial reporting [46]. Research [43] accordingly mentioned the need for companies to adopt modern technologies like expert systems and neural networks in all their operations. Hence:

*H1: There is a significant relationship between expert systems and green electronic auditing.*

### 2.5.2. Genetic algorithms and green electronic auditing

Genetic algorithms are components of artificial intelligence associated with system interconnection. Genetic algorithms operate as mathematical algorithms capable of identifying solutions to defined problems, adhering to an artificial intelligence framework grounded in natural selection and evolution [47] [48]. Furthermore, [48] asserts that genetic algorithms equilibrate selection and mutation to develop parallel, noise-resistant hill-climbing algorithms while averting premature convergence. Research [49] noted that genetic algorithms are fundamentally linked to the efficient operation of artificial intelligence in rapid and precise data processing and financial reporting. Kustono [50] identified several elements that would facilitate the use of electronic auditing in the training component. The author also discussed the electronic checks and technical support departments that would ease information technology usage in auditing. Additionally, [51] indicated that AI can facilitate both practitioners and researchers in adopting the technology in their auditing process. Therefore:

*H2: There is a significant relationship between genetic algorithms and green electronic auditing.*

### 2.5.3. Intelligent agents and green electronic auditing

Intelligent agents are AI-driven systems that engage with their environment to evaluate facts and make choices aligned with certain objectives. In contrast to conventional software, which adheres to strict protocols, these agents possess the ability to learn from experience and function autonomously. AI agents have the potential to revolutionize financial auditing processes through their integration [52]. AI usage positively and significantly affects customer satisfaction and audit quality, and customer satisfaction is positively affected by audit efficiency [53]. Additionally, the efficiency of the auditor is increased through the use of AI, consequently resulting in customer satisfaction [54]. Furthermore, the audit process has been dramatically transformed by AI systems, and unlike the separate AI systems, auditors generally find the assistive and augmented AI systems easy to use in their auditing tasks [55]. Hence:

*H3: There is a significant relationship between intelligent agents and green electronic auditing.*

### 2.5.4. Organizational culture and green electronic auditing

An organization's culture is a crucial element of overall organizational success. Various management cultures correlate with quality indicators, and comprehending this link will empower managers to cultivate successful and competitive organizations [33]. Organizational culture is positively correlated with knowledge exchange inside enterprises, leading to favorable results; hence, culture is seen as a crucial success component for every organization [10, 20]. Previous research has shown that organizational culture affects both individual and group behavior, and it has also shown that present-day organizations cannot succeed without organizational culture[20]. Thus, [56] found that a company's green culture positively moderates the effect of AI utilization on green product innovation. Alqaraleh et al. [57] identified a significant correlation between audit effectiveness and artificial intelligence. The mediation of the relationship between information technology and audit success is contingent upon organizational culture. AI has the capacity to enhance the quality of audits and provide clients of audits with value-added services [10]. The study indicates that altering organizational culture is the primary barrier to the successful implementation of artificial intelligence technologies.

*H4: There is a significant relationship between organizational culture and green electronic auditing.*

*H5: Organization culture significantly moderates the relationship between intelligent agents and green electronic auditing.*

*H6: Organization culture significantly moderates the relationship between expert systems and green electronic auditing.*

*H7: Organization culture significantly moderates the relationship between genetic algorithms and green electronic auditing.*

## 3. Research method

Research is guided by a master plan or research design, which includes the methods to be employed in data gathering and analysis. The data used in this study were primary data, which were collected using a questionnaire comprising items on the study constructs, namely green electronic auditing, expert systems, intelligent agents, and genetic algorithms. The study population comprised accounting auditing firms operating in Jordan, and the study questionnaire was probabilistically distributed to 480 internal auditor respondents. SPSS and SmartPLS were used in data analyses, which involved the generation of descriptive statistics and the estimation of the study model for the measurement model and the structural model. The correlation level of the items (internal consistency) was determined using Cronbach's alpha, and [58] proposed that the attained alpha should be between 0.7 and 0.9 to denote internal consistency. It should be noted that Cronbach's alpha is merely a measure of reliability, rather than a statistical test [58].

### 3.1. Framework of the study

The theoretical framework for the investigation is shown in Figure 1.

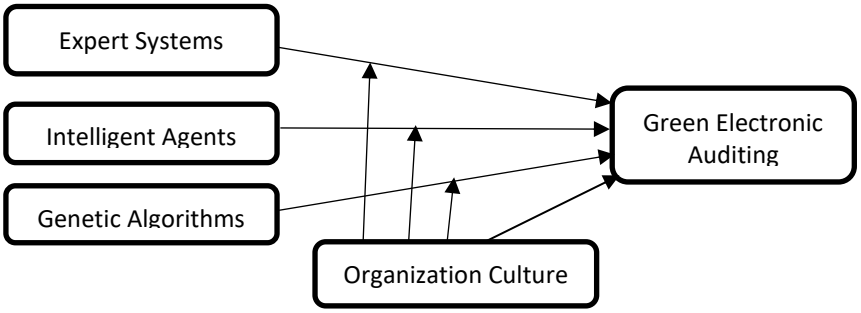


Figure 1. Theoretical framework

### 3.2. Instrument variable research

The questionnaire was the instrument employed in collecting the study data from the respondents. In the questionnaire, each item representing the study construct was provided with a 5-point Likert scale. The use of this scale facilitates the respondents in determining their most accurate response to the item. Specifically, the scale of 1 signifies "strongly disagree," the scale of 2 shows "disagree," the scale of 3 denotes "neutral," the scale of 4 shows "agree," and the scale of 5 signifies "strongly agree." All items representing the study constructs (expert systems, intelligent agents, and genetic algorithms) are provided in the following Table 1. The questionnaire items were adapted from prior research [12, 20, 42, 43] and tailored to the objectives of this study.

Table 1. Study instrument

| Study Variables | Indicators |
|---|---|
| **Green electronic auditing** | 1. The auditor coordinates the data obtained from the banks with the data needed in the audit process.<br>2. The auditor assures that the data is according to the bank's requirements and instructions.<br>3. Using auditing inputs in the bank optimizes operational efficiency.<br>4. Using valid data from the auditor makes the audit process more accurate.<br>5. The input audit process helps the auditor in predicting the potential problems and errors in the audit process. |

| Study Variables | Indicators |
|---|---|
| **Expert systems** | 6. Expert systems facilitate the Jordanian commercial banks' database in problem resolutions.<br>7. Expert systems facilitate Jordanian commercial banks in simulating human logic.<br>8. Expert systems present the Jordanian commercial banks with the needed data and information for decision-making.<br>9. Expert systems facilitate the Jordanian commercial banks' management in their planning, control, and decision-making.<br>10. Expert systems facilitate Jordanian commercial banks in ways similar to a human being. |
| **Intelligent agents** | 11. Intelligent agents provide the Jordanian commercial banks with intelligent tools and software with the ability to see and understand their environments.<br>12. Through their interactive capabilities, intelligent agents allow the Jordanian commercial banks to take the best actions to accomplish their goals.<br>13. Through their sensors, intelligent agents facilitate Jordanian commercial banks to gain a full understanding of the received data.<br>14. Using intelligent agents decreases the work time of the staff of Jordanian commercial banks.<br>15. Using intelligent agents facilitates the clients of Jordanian commercial banks in viewing their financial statements. |
| **Genetic algorithms** | 16. Genetic algorithms facilitate Jordanian commercial banks in determining the best solution(s) to their problem(s).<br>17. Genetic algorithms facilitate the Jordanian commercial banks in achieving their goal(s).<br>18. Binary strings, direct values, and other formats in genetic algorithms facilitate Jordanian commercial banks in encoding.<br>19. Genetic algorithms facilitate Jordanian commercial banks in managing huge, multifaceted, and complex research.<br>20. Genetic algorithms facilitate the Jordanian commercial banks' management in selecting the most appropriate alternative or in finding and testing a new solution. |
| **Organizational culture** | 21. My organization frequently adopts new technologies and applications.<br>22. My organization creates new products or services.<br>23. Our accounting system complies with the recent trends.<br>24. Our digital infrastructures provide operational convenience.<br>25. Our firm offers training to learn about systems and emerging technologies. |

## 4. Findings and empirical examination

### 4.1. The outer measurement model

Measurement model evaluation is the first step in PLS application. There are four steps in the measurement model evaluation [58]. Through loadings of indicators, the reliability of the indicators can be affirmed, and loadings should be 0.70 at a minimum. The internal consistency is ascertained by determining the composite reliability (CR), and the proposed value for CR is 0.70 at least. AVE or average variance extracted is computed to determine the convergent validity. In this regard, AVE should be at least 0.50. Meanwhile, the discriminant validity can be affirmed when the AVE of each latent factor is greater than the factor's highest squared correlation with another latent factor [59], which means that the square root of AVE of each construct should be higher than the correlations with other latent constructs [58]. Other methods that can be used in determining

the discriminant validity include the (HTMT) ratio, Fornell-Larcker correlation matrix, and cross-loading. Among these three methods, the Fornell-Larcker correlation matrix is sensitive and specific enough to detect problems of detecting discriminant validity and is the most commonly used among researchers [59]. Figure 2 and Tables 2–4 show that the obtained results are all acceptable, which means that the structural model can be evaluated next.

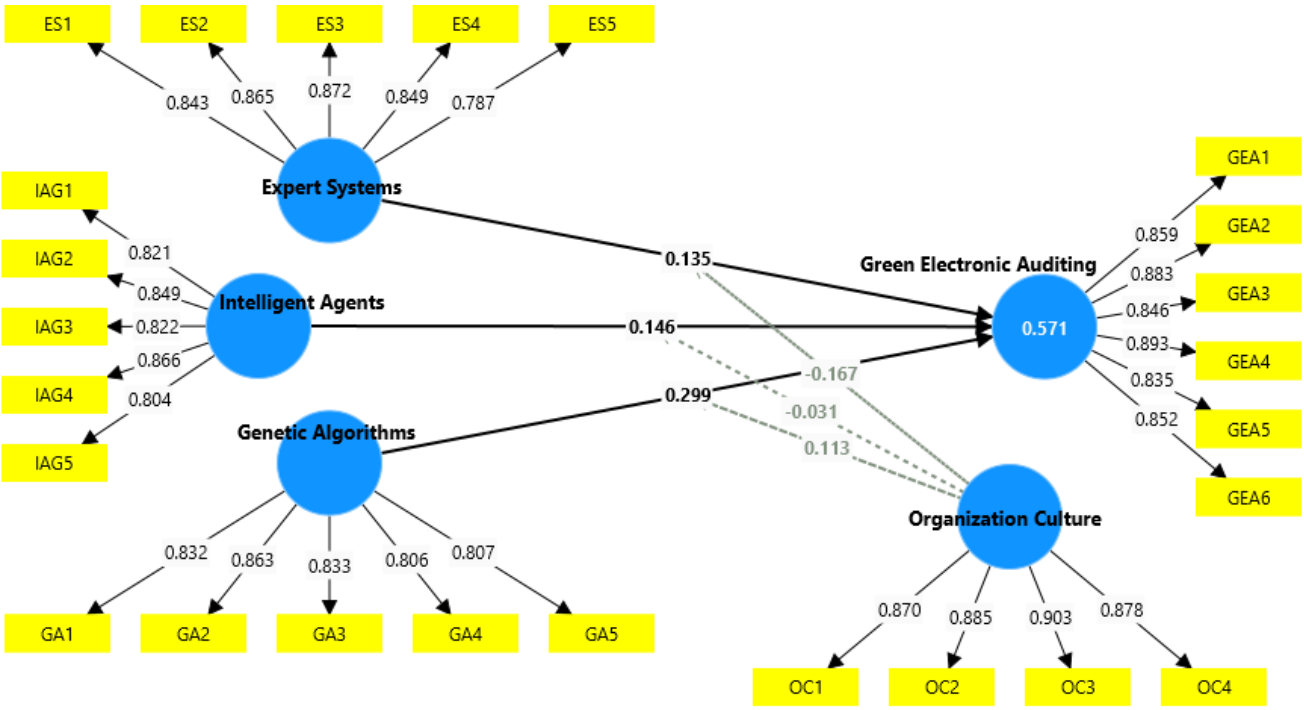


Figure 2. The measurement model

Table 2. Overview of reflective measurement model outcomes

| Variables | Cronbach's alpha | Composite reliability (rho_a) | (rho_c) | (AVE) |
|---|---|---|---|---|
| Expert Systems | 0.898 | 0.900 | 0.925 | 0.712 |
| Genetic Algorithms | 0.886 | 0.886 | 0.916 | 0.687 |
| Green Electronic Auditing | 0.931 | 0.931 | 0.945 | 0.743 |
| Intelligent Agents | 0.889 | 0.893 | 0.919 | 0.693 |
| Organization Culture | 0.907 | 0.908 | 0.935 | 0.782 |

Table 3. Fornell-Larcker correlation matrix

| Variables | Expert Systems | Genetic Algorithms | Green Electronic Auditing | Intelligent Agents | Organization Culture |
|---|---|---|---|---|---|
| Expert Systems | 0.844 | | | | |
| Genetic Algorithms | 0.621 | 0.829 | | | |
| Green Electronic Auditing | 0.591 | 0.664 | 0.862 | | |
| Intelligent Agents | 0.534 | 0.700 | 0.606 | 0.833 | |
| Organization Culture | 0.714 | 0.630 | 0.645 | 0.621 | 0.884 |

Table 4. Items' outer loadings

| Items | Expert Systems | Genetic Algorithms | Green Electronic Auditing | Intelligent Agents | Organization Culture |
|---|---|---|---|---|---|
| ES1 | 0.843 | | | | |
| ES2 | 0.865 | | | | |
| ES3 | 0.872 | | | | |
| ES4 | 0.849 | | | | |
| ES5 | 0.787 | | | | |
| GA1 | | 0.832 | | | |
| GA2 | | 0.863 | | | |
| GA3 | | 0.833 | | | |
| GA4 | | 0.806 | | | |
| GA5 | | 0.807 | | | |
| GEA1 | | | 0.859 | | |
| GEA2 | | | 0.883 | | |
| GEA3 | | | 0.846 | | |
| GEA4 | | | 0.893 | | |
| GEA5 | | | 0.835 | | |
| GEA6 | | | 0.852 | | |
| IAG1 | | | | 0.821 | |
| IAG2 | | | | 0.849 | |
| IAG3 | | | | 0.822 | |
| IAG4 | | | | 0.866 | |
| IAG5 | | | | 0.804 | |
| OC.1 | | | | | 0.870 |
| OC.2 | | | | | 0.885 |
| OC.3 | | | | | 0.903 |
| OC.4 | | | | | 0.878 |

### 4.2. Structural model analysis

The hypothesized relationships are examined as the last step in the PLS-SEM structural model using the PLS bootstrapping algorithm. In PLS analysis, path coefficients are considered very important, but when they contradict the conjectured direction, the earlier hypothesis should be rejected [58]. In its place, significant paths viewing the hypothesized track empirically support the proposed causal relationship. In this study, the bootstrapping technique was used in path coefficients evaluation, involving a bootstrap sample of 5,000. According to [58], the cases should be identical in number to the observations in the initial sample. In this study, a spare bootstrap of 480 cases similar to the size of the initiative sample was used to achieve t-value and medium errors. For the structural paths, the standardized path coefficients and their notable values were used in hypothesis testing. Table 5 and Figure 3 can be referred to.

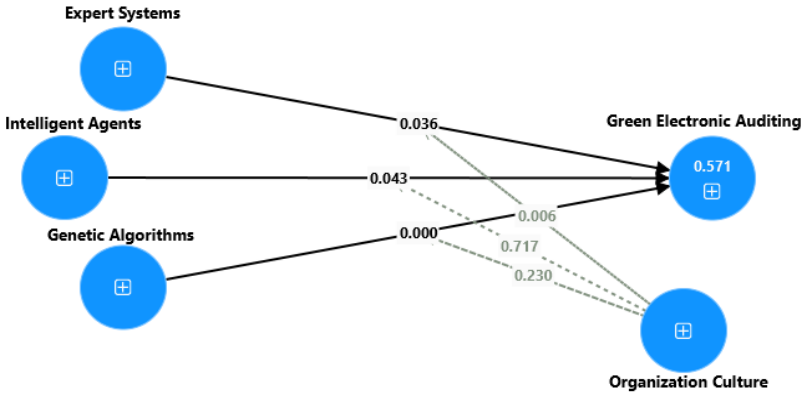


Figure 3. Structural model analysis

Table 5. Hypothesis results

| Hypotheses | Original sample (O) | Sample mean (M) | Standard deviation | T statistics | P values | Decision |
|---|---|---|---|---|---|---|
| Expert Systems -> Green Electronic Auditing | 0.135 | 0.139 | 0.064 | 2.096 | 0.036 | Supported |
| Genetic Algorithms -> Green Electronic Auditing | 0.299 | 0.293 | 0.081 | 3.699 | 0.000 | Supported |
| Intelligent Agents -> Green Electronic Auditing | 0.146 | 0.146 | 0.072 | 2.025 | 0.043 | Supported |
| Organization Culture -> Green Electronic Auditing | 0.223 | 0.230 | 0.067 | 3.329 | 0.001 | Supported |
| Organization Culture x Intelligent Agents -> Green Electronic Auditing | -0.031 | -0.023 | 0.086 | 0.362 | 0.717 | Rejected |
| Organization Culture x Expert Systems -> Green Electronic Auditing | -0.167 | -0.165 | 0.061 | 2.726 | 0.006 | Supported |
| Organization Culture x Genetic Algorithms -> Green Electronic Auditing | 0.113 | 0.104 | 0.094 | 1.201 | 0.230 | Rejected |

## 5. Research discussion

*H1: There is a significant relationship between expert systems and green electronic auditing:*

Results of the analysis show a significant positive relationship between expert systems and green electronic auditing. This is evidenced by the achieved T-statistic of 2.096 and a p-value of 0.036. Hence, the use of expert systems makes green electronic auditing practices more effective, and so, it is likely that organizations that utilize expert systems would have better auditing processes in environmentally friendly manners.

*H2: There is a significant relationship between genetic algorithms and green electronic auditing:*

Results of analyses show a strong linkage between genetic algorithms and green electronic auditing. This is evidenced by the achieved T-statistic of 3.699 and a p-value of 0.000. Results imply the integral role of genetic algorithms in the enhancement of green electronic auditing efforts. As such, it can be perceived that for an organization, the implementation of genetic algorithms will lead to superior auditing outcomes and increased sustainability.

*H3: There is a significant relationship between intelligent agents and green electronic auditing:*

Results of analyses show a significant positive effect of intelligent agents on green electronic auditing, as proven by the achieved T-statistic of 2.025 and a p-value of 0.043. This means that intelligent agents, when incorporated into auditing practices, would make their promotion of green initiatives more effective. In other words, using intelligent agents significantly improves the outcomes of green electronic auditing.

*H4: There is a significant relationship between organizational culture and green electronic auditing:*

Analysis results demonstrate a strong connection between organizational culture and green electronic auditing, as evidenced by the achieved T-statistic of 3.329 and a p-value of 0.001, implying the importance of having an accommodating organizational culture in nurturing effective green electronic auditing practices. It can thus be assumed that organizations with a positive culture are more likely to succeed in their green auditing initiatives.

*H5: Organization culture significantly moderates the relationship between intelligent agents and green electronic auditing:*

Analyses results on the interaction between organizational culture and intelligent agents show no significant effect, as evidenced by the achieved T-statistic of 0.362 and a p-value of 0.717. This means that these two factors in combination do not significantly improve the outcomes of green electronic auditing. As such, it can be presumed that there is no significant interaction between organizational culture and intelligent agents to affect the practices of green electronic auditing.

*H6: Organization culture significantly moderates the relationship between expert systems and green electronic auditing:*

Results of analyses show significant and positive interaction between organizational culture and expert systems, as proven by the achieved T-statistic of 2.726 and a p-value of 0.006. In other words, the alignment of supportive organizational culture with expert systems usage results in significantly more effective green electronic auditing. As such, it can be presumed that the interaction of organizational culture and expert systems significantly contributes to successful auditing practices.

*H7: Organization culture significantly moderates the relationship between genetic algorithms and green electronic auditing:*

Lastly, results of analyses show no significant impact of the interaction of organizational culture with genetic algorithms, as evidenced by the achieved T-statistic of 1.201 and a p-value of 0.230. In other words, the combined impact of organizational culture and genetic algorithms does not significantly improve the outcomes of green electronic auditing. As such, it can be presumed that the interaction between organizational culture and genetic algorithms does not significantly affect the improvement of green electronic auditing initiatives.

Table 6. The R-squared

| | R-square | R-square adjusted |
|---|---|---|
| Green Electronic Auditing | 0.571 | 0.559 |

As can be viewed in Table 6, for green electronic auditing in Jordanian accounting auditing firms, the achieved value of R-squared is 0.571, which means that approximately 57.1% of the variation in green electronic auditing practices is attributable to the factors of expert systems, intelligent agents, and genetic algorithms. The percentage is considered rather significant, implying the crucial role of these technologies in sustainably improving auditing practices in Jordanian accounting auditing firms. Furthermore, the achieved adjusted R-squared value is 0.559. This means that even after taking into account the number of variables in the model, a significant fraction of the variance is still explained. In essence, the attained results demonstrate the importance of having these advanced technologies incorporated into the processes of auditing in order to encourage greener practices among accounting and auditing firms in Jordan.

## 6. Research implications

The present study highlights both the theoretical and practical insights into the adoption of green electronic auditing among accounting firms in Jordan. In theory, this study elaborates on the significant improvement of auditing practices through the use of expert systems, intelligent agents, and genetic algorithms, implying the importance of these technologies to increase sustainability in the accounting domain. Also, this study enriches the innovation theories on auditing, in addition to promoting the significance of organizational culture in facilitating the successful adoption of these technologies.

In practice, the outcomes of this study can guide those accounting firms in their preparation towards greener practices. These advanced technologies, when integrated into the processes of auditing, can improve outcomes, and with a supportive organizational culture, the effectiveness of these technologies could be improved further. Hence, training should be provided to staff to ensure that they can effectively use these technologies. Consequently, the practices of auditing of the firm could be improved, and the firm could achieve sustainability in this competitive market. Additionally, the outcomes of this study filled the gap in the literature.

## 7. Conclusions, limitations, and future research

In essence, this study proves the important role of expert systems, intelligent agents, and genetic algorithms in improving green electronic auditing practices among accounting firms in Jordan. As evidenced by the results, adopting these technologies alongside a positive organizational culture would increase the sustainability of the auditing outcomes. Nonetheless, limitations did exist in this study, the first being the study location, that is, the study focused on just one geographical area, which means that results may not reflect the experiences of firms operating in other geographical areas. Another limitation relates to the use of self-reported data, which means that there may be bias, and this may impair the generalizability of the study results.

The findings of this study could be expanded in future studies. Firstly, future studies could consider looking into the effect imparted by these technologies in other contexts or industries. Other factors, including market pressures and regulatory environments, could be examined as well, in terms of their impact on green auditing practices. The inclusion of more context and factors will broaden the study scope further and deepen the understanding of the dynamics of green electronic auditing. This would facilitate those firms seeking to increase their sustainability efforts. Lastly, future studies may consider including moderator variables in the relationship, such as auditing office size and innovation capability of the firm.

### Declaration of competing interest

The authors declare that they have no financial or nonfinancial competing interests in any material discussed in this paper.

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### Author contribution

The contributions to the paper are as follows: Ali M. Alrabei and Basel J. A. Ali conceptualized and designed the study; Munther Talal Momany, Kashif Munir, Mohammad Salem Oudat, and Mohammed H. M. Qeshta collected the data. Ali M. Alrabei and Basel J. A. Ali did the analysis and interpretation of results. Omar Jawabreh, Munther Talal Momany, and Kashif Munir are preparing the draft. All authors approved the final version of the manuscript.

### Ethical approval statement

Ethical approval is not applicable to this research.

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