The Moderating Role of Big Data and User Satisfaction in the Predictors of Generalized Audit Software among Jordanian Auditing Firms

AHMAD MAREI
Middle East University, Amman, JORDAN
Applied Science Research Centre, Applied Science Private University, Amman, JORDAN

Abstract: - Generalized Audit Software (GAS) is critical for auditing a firm's financial statements. However, the usage of this software is widely limited to developed countries. The purpose of this study is to examine the usage of GAS among auditing firms in Jordan. Based on the technology organization environment framework (TOE), our study proposes organizational factors (technology cost benefits analysis (TCBA), technological compatibility (TC) (technological factors (TF), top management support (TMS), organizational readiness (OR), environmental factors (GAS complexity (GASC), and competitive pressure (CP)) to affect the GAS usage (GASU). Furthermore, auditor satisfaction was proposed as a moderating variable. Moreover, the data was collected from auditors using convenience sampling and analyzed using Smart PLS. The findings showed that TCBA, TC, TMS, OR, and GASC are critical predictors of GASU. Additionally, CP has an insignificant effect on GASU. Also, auditor satisfaction is not a moderating variable while big data moderated the effect of Technological factors on GAS. Lastly, more studies are needed in GASU in developing countries to understand the predictors of this technology among individuals. This means that decision-makers are advised to enhance the knowledge of auditors regarding the usage of GAS and to spread the knowledge regarding the benefits of GAS for auditors and auditing firms.

Key-Words: - Big Data, IS success, Complexity, generalized audit software, TOE, Compatibility

Received: January 15, 2023. Revised: May 28, 2023. Accepted: June 8, 2023. Published: June 23, 2023.

1 Introduction

Throughout the field of auditing, auditing information systems (AIS) have emerged as the golden standard. Comparing the AIS methods of the small and medium-sized enterprises (SMEs) in Jordan to those of other countries reveals that the former is still in its infancy, [1], [2]. However, at the present, IS auditors are already giving audit assurance to businesses, [3]. Professional auditors are usually called in to check up on IT systems to make sure everything is running smoothly. As a corollary, it is safe to say that different auditing standards now apply due to the quick pace of technological development, [4]. Thus, the utilization of IT poses a threat to conventional auditing practices, [5]. Meanwhile, auditors are hampered in doing their duties by the constant evolution of technology.

Due to the increasing prevalence of electronic and paperless evidence, auditors have had to adapt their methods to suit the advances in technology, [6]. The audit should move its emphasis from manual detection to technological prevention, [3]. Well-established tools have been created to aid auditors in reaching audit goals. Auditors use GAS to examine either real-time or obtained data from various software, and CAATs have been developed to assist auditors in conducting audits on computerized accounting information (as stated by [7], [8]). GAS features several tools for data extraction and analysis, statistical analysis, and audit expert systems, [9], [10].

Data extraction, querying, and sampling are all examples of fundamental or broad uses of GAS. Recently, big data has emerged as a new challenge for the accounting profession. Big data plays a significant role in accounting by allowing for more accurate and efficient financial analysis and reporting. With the ability to collect, store, and process large amounts of data, organizations can gain valuable insights into their financial performance and make better-informed business decisions. Additionally, big data can be used to detect fraud and improve internal controls. Overall, big data can help organizations to improve their financial reporting, increase operational efficiency, and make more informed decisions, [11]. The hazards and threats to accounting IS data are

constantly present. As an example, accounting and financial publications often carry daily reports of issues related to computer data, incorrect financial information, violations of internal control, and manipulation (as noted by [12], [13]). One technique to ensure that the data generated for accounting reports are devoid of mistakes and misstatements is through auditing and the use of big data analytical tools, [14], [15].

Studies noted that the use of technology is costly and it might lead to a negative effect on usage, [16]. Therefore, the cost-benefit analysis might discourage auditors to use the technology of GAS. Additionally, GASC might be also an important factor for the user as shown in prior literature, [17]. Nevertheless, auditing firms find themselves in need to use the GAS due to the external pressures from clients and rivals, [18], [19]. Even though GAS has always been marketed as a tool to support the auditor's effective and efficient job, few studies have examined the adoption and usage of this technology among auditing firms in particular in developing countries such as Jordan, [6], [20].

Adoption theories such as TAM and UTAUT were designed specifically for individual usage. However, this study deals with the organizational usage of technology such as GAS, [21], [22]. For this reason, the TOE is deployed in this study because it accounts for the organizational aspects as well as the technological and environmental aspects. Therefore, this study utilizes TOE. This is because the use of GAS in audit companies is influenced by several factors, according to reviews of the literature. These factors can be contained by the TOE, and it includes the TF (TCBA and TC), OF (TMS and readiness), and EF (GASC and CP). In addition, information system success (ISS) is designed to assess the satisfaction of using new technology. User satisfaction is critical and has been used as a moderator by a few studies, [23], [6], [24], [25]. Therefore, this study deployed user satisfaction as a moderating variable.

The research looks at the adoption of GAS, and the terms used here apply to any computer-assisted audit application tool used by audit firms to conduct audit tasks. As a result, the objectives of this study are to investigate the factors that influence the use of GAS. It is also to examine the moderating effect of auditors' satisfaction with GAS as well as the moderating role of BG. The literature review, methods, results, analysis, and discussion are covered in the parts that follow, along with the conclusion.

2 Literature Review

The literature on GAS is reviewed in this part, along with the theoretical and conceptual frameworks, and the hypotheses are presented.

2.1 Generalized Audit Software (GAS)

GAS has the potential to assist auditors in detecting errors in financial statements by verifying data from accounting software's quality, completeness, ownership, value, accuracy, categorization, and disclosure (as reported by Bradford et al., 2020 and Normahazan et al., 2020). Auditing guidelines favor GAS use due to its benefits. These software programs allow auditors to access accounting systems and analyze client financial data, [17]. Several researchers believe that the use of GAS has been more frequent by companies in the UK and the US while its usage by companies in developing countries is still limited, [1], [2], [8], [26].

The use of GAS by UK external auditors is researched by [27], and the findings showed that audit businesses in the UK have an abnormally low rate of GAS adoption. For auditing small customers, the perceived value of employing GAS is low. As a result, about 73 percent of external auditing firms do not utilize GAS. Some of the individuals who participated in the survey were aware of the benefits of GAS, but they were put off by what they regarded to be its high cost of installation, steep learning curve, convoluted adoption process, and difficult usage. As a result, they opted for more conventional methods of manual auditing.

Other studies that have examined the adoption of GAS noted that other factors might impact the adoption of GAS, and these include ease of use, usefulness, facilitating conditions, and external factors. Nevertheless, recent studies noted that the usage of GAS is still limited among auditors, [28]. In addition, researchers found differences in the perception of using GAS among countries. Competence in IT is crucial for the professional accountant, as stated by [29], who surveyed people in the United States and Germany to gauge their perceptions of their experience with GAS. There are noticeable distinctions between the auditing communities in the two nations. Therefore, this study is focusing on the predictors of using GAS among Jordanian auditors.

2.2 Theoretical Framework

This study utilizes the TOE which was initially created by [30], on the premise that an efficient business model should be tailored to its specific circumstances in terms of both its internal

operations and its external environment. TOE is a comprehensive model that includes technology-related factors as well as OF and EF. Many studies have shown that the TOE framework is consistent with other adoption theories like the Diffusion of Innovations (DOI) and institutional theory, [23], [31].

Variables of DOI in most of the studies are included in TOE. In addition, the internal and external factors are in line with the institutional theory, [32]. Despite the aforementioned drawback, the TOE framework provides a useful jumping-off place for investigating several elements that would aid in comprehending the innovation adoption behavior, as shown by its constant empirical support, [33], [34], [35]. The TOE framework helps analyze the acceptance and performance of technological breakthroughs, [36]. This study is utilizing the TOE to examine the predictors of adopting GAS by auditing companies in Jordan. In addition, the ISS can explain user satisfaction, [37], [38]. Therefore, this study uses this theory to explain the moderating role of auditor satisfaction.

2.3 Conceptual Framework and Hypotheses Developing

Based on TOE and the IS success, this study proposed that TF (TCBA, TC), OF (TMS, OR), and EF (GASC, CP) will have a direct significant effect on the usage of GAS by auditing companies in Jordan. In addition, based on ISS, auditor satisfaction with GAS is predicted to be a moderating variable between the OF, TF, EF, and the GASU. Based on these assumptions, the next sections discuss the hypotheses of this study.

2.3.1 Technology Cost-Benefit Analysis and GASU

According to economists, the current technologies used by businesses are the result of embracing innovations that bring forth novel outcomes and substantial gains, [14]. Therefore, many theories that seek to explain "adoption behavior" rest heavily on the assumption that the potential advantages of innovations are significant factors in the final choice to embrace them. In this research, technology cost-benefit means an audit firm's perceived advantages from audit technology surpass its cost. Auditors must consider TCBA when choosing audit software tools to use in performing their test of controls, [39], [40]. Several researchers, [41], [42], have demonstrated that relative advantage is a major predictor in making the GAS adoption choice. This study predicts that audit companies will be more inclined to utilize GAS if they see its usage as likely to deliver higher benefits.

H1: TCBA affects positively the GASU.

2.3.2 Technological Compatibility and GASU

The term "compatibility" is used to describe how well prospective adopters believe an invention will meet their values, beliefs, experiences, and requirements, [43]. One's confidence in learning and using a new piece of technology and the satisfaction one derives from doing so improves in proportion to the degree to which that technology is seen as compatible with one's current repertoire of skills and knowledge, [44], [45]. Compatibility was found to be a significant factor in the usage of new technology, [46], [47] and is a major factor in using GAS, but the mixed findings on its impact deserve further research, [1]. Therefore, this study proposes the following:

H2: TC affects positively the GASU.

2.3.3 Top Management Support and GASU

Utilizing ICT in the company would be improved with the participation of senior management, [48]. Top management is in charge of the majority of the company's resources (i.e., technical, financial, and human resources), and their support is crucial for the successful deployment of a new IT innovation, [49]. TMS is crucial when deciding whether or not to implement audit technology in an organization, [1], [2]. In this study, the following is proposed:

H3: TMS affects positively the GASU.

2.3.4 Organizational Readiness and GASU

Alignment between the nature of the technological change and the capacities of businesses is a well-established idea in the literature on organization and information technology that is crucial to the effective adoption of GAS technology, [50], [51]. OR refers to an organization's potential to take advantage of new information technologies and apply them to its advantage, [52]. The adoption of computer-assisted auditing techniques has previously been studied, with findings indicating that the availability of appropriate physical and technology resources inside an organization is a major motivator for using auditing technology, [53]. Studies found that OR affected the usage of auditing technology such as GAATs, [1], [54], [55]. Therefore, the following is proposed:

H4: OR affects positively the GASU.

2.3.5 GAS Complexity and GASU

The perceived complexity of new technology is a significant consideration when assessing its value.

The degree to which a newly developed piece of technology is difficult to both grasp and apply is referred to as its complexity (Rogers, 2003). Many auditors previously believed that using audit software required extensive training and experience due to technical issues like the complexity of the audit software itself and difficulties in accessing client data, [2], [54], [55]. More complexity leads companies to not use GAS, [56], [57]. Accordingly, GASC is expected to harm its users.
H5: GASC negatively affects the GASU.

2.3.6 Competitive Pressure and GASU

In a competitive business climate, those that implement information systems stand out from those who do not, [58]. Even though CP was not a major driver of ERP adoption according to [59], research in other IT adoption contexts, such as e-business, found the reverse to be true, [60], [61], [62]. The use of GAATs was favorably impacted by CP, [39], however, the research on TOEs provides conflicting findings on the topic of CP. Nonetheless, the researchers here are assuming a beneficial outcome.
H6: CP affects positively the GASU.

2.3.7 Satisfaction as a Moderator

Satisfaction is defined as the match between the expected benefits with the obtained benefits from using specific services or products, [23]. High auditor satisfaction can enhance their perception of the organizational, technological, and EF, [1]. Auditor satisfaction as predicted in this research moderates the impact of variables such as TF, EF, and OF on GASU. This is because the high satisfaction of auditors with GAS will lead them to a better perception of the variables and vice versa. In line with this proposition, prior literature indicated that satisfaction with the auditing technology is critical for its usage, [2], [4], [14]. Accordingly, the following is proposed:
H7: Auditor satisfaction with GAS moderates the effect of TF on GASU.
H8: Auditor satisfaction with GAS moderates the effect of OF on GASU.
H9: Auditor satisfaction with GAS moderates the effect of EF on GASU.

2.3.8 Moderating Role of Big Data

Big data is the term for massive datasets that may be processed computationally to uncover patterns, trends, and relationships, often pertaining to human behavior and interactions, [63]. In the field of accounting, big data can be used to analyze large amounts of financial data, such as transactions, tax records, and financial statements, to identify trends and patterns that may not be immediately apparent. There are several ways that big data can be used in accounting research.

Big data can play a moderating role in the effect of TF on accounting by providing a large and diverse set of financial information that can be analyzed to identify patterns and trends. This can help organizations make more accurate and informed decisions, such as identifying areas for cost savings, forecasting revenue, and detecting fraud. Additionally, big data can be used to automate and streamline accounting processes, such as invoice processing and financial reporting, which can improve efficiency and reduce the potential for human error, [64], [65], [66], [67]. Big data in this study is proposed as a moderating variable between TF and GAS. Accordingly, the following is hypothesized:
H10: Big data moderates the effect of TF on GASU.

Table 1. Data Screening

Variable	Response	Missing value	Normality		Multicollinearity	
			Skewness	Kurtosis	Tolerance*	VIF
TCBA	148	0	-.564	-.313	.615	1.412
TC	148	0	-.409	-.491	.623	1.343
TMS	148	0	-.283	-.412	.643	1.577
OR	148	0	-.316	-.531	.688	1.431
GASC	148	0	-.540	-.643	.761	1.286
CP	148	0	-.411	-.518	.645	1.745
BG	148	0	-.419	-.522	.649	1.752
AS	148	0	-.274	-.438	.766	1.288
GASU	148	0	-.301	-.597		

3 Methodology

This study uses a quantitative approach and employs a survey questionnaire to gather data. The target population for the study is auditing companies located in Jordan. Due to the lack of information regarding these auditors, the convivence sampling technique is deployed. A snowballing and network referral technique is used to reach the auditor. As a role of thumb, [68], pointed out that several 100-150 responses are sufficient for the use of structural equation modelling (SEM). Using the G*power technique, the minimum sample size for six predictors with a confidence level of 0.95 and margin error of 0.05, is 89 responses.

Data was gathered in Jordan through an online survey questionnaire. The variables were measured using methods from previous studies, [23], [69], [43], [70]. To accommodate the official language in Jordan, the questionnaire was translated into Arabic. A validation process was conducted by inviting experts who can understand Arabic and English to validate the measurement. Pilot testing was initiated to evaluate the measurement reliability, after which the data collection process began. The questionnaire was distributed to respondents, and they are asked to forward it to those who are fit to answer the questionnaire. This has resulted in the collection of 157 questionnaires. Five questionnaires were removed due to the notion that they are empty. No missing value is recorded due to the use of the "required" function where respondents cannot proceed without filling out all the questions. The outliers were checked using a boxplot and four responses were deleted. The data was found to have a normal distribution as the skewness and kurtosis values were less than one (1). This is in line with the suggestion of [68]. The presence of multicollinearity was assessed by checking the tolerance value (>0.20) and the variation inflation factor (VIF) (<5), which is in accordance with the recommendations of [68]. The values of VIF and tolerance are within the accepted range and this has led to the conclusion that there is no multicollinearity among the variables. The results of missing values, normality, and multicollinearity are presented in Table 1.

Using Smart PLS version 4, the data are processed, and both the measurement model (MM) and the structural model (SM) are evaluated.

4 Findings

The outputs of this research look at both the MM and SM models and analyze the descriptive information that the respondents provided.

4.1 Profile of Respondents

This research contains a total of 148 replies that are reliable and comprehensive. Seventy-six percent of the people who responded were males, whereas just 24 percent were females. The majority of respondents have at least a bachelor's degree (71%) and have worked in auditing for more than ten years on average (63%). The majority of respondents are also older than 35 years old (63%).

4.2 Measurement Model

To assess the MM, we first looked at its factor loading (FL), then at its validity, and finally at its reliability, [68]. All of the objects' FLs were analyzed, and those with the lowest FL were removed from consideration. The elements OR1 from OR, GASC5 from GASC, and GASU3 from GASU were all removed from the analysis since they had a low FL. Both Cronbach's alpha (CA) and the composite reliability (CR) increased after the items were eliminated from the study. Because the average variance extracted (AVE) is larger than 0.50 for all variables, it has been determined that the research satisfies the criteria for having good convergent validity. As a result of the fact that the square root of AVE (which is shown in bold in Table 2) is more than the cross-loading of the variables, the discriminant validity was also considered to be acceptable. Table 2 presents the findings that were obtained using the measurement model.

Table 2. Result of the Measurement Model

Variable	Response	Missing value	Normality		Multicollinearity	
			Skewness	Kurtosis	Tolerance*	VIF
TCBA	148	0	-.564	-.313	.615	1.412
TC	148	0	-.409	-.491	.623	1.343
TMS	148	0	-.283	-.412	.643	1.577
OR	148	0	-.316	-.531	.688	1.431
GASC	148	0	-.540	-.643	.761	1.286
CP	148	0	-.411	-.518	.645	1.745
BG	148	0	-.419	-.522	.649	1.752
AS	148	0	-.274	-.438	.766	1.288
GASU	148	0	-.301	-.597		

Table 3. Result of Structural Model

H	Path	B	Std.	T	P	*Conclusion*	f^2	R^2
H1	TCBA→GASU	0.301	0.11	2.69	0.01	Supported	0.06	0.509
H2	TC→GASU	0.382	0.08	4.57	0.00	Supported	0.00	
H3	TMS→GASU	0.101	0.03	3.16	0.00	Supported	0.01	
H4	OR→GASU	0.223	0.08	2.84	0.00	Supported	0.05	
H5	GASC→GASU	-0.214	0.09	-2.24	0.03	Supported	0.04	
H6	CP→GASU	0.011	0.09	0.12	0.90	Rejected	0.09	
H7	TF*AS→GASU	-0.004	0.13	-0.81	0.94	Rejected	0.00	
H8	OF*AS→GASU	-0.041	0.11	-0.41	0.74	Rejected	0.00	
H9	EF*AS→GASU	-0.022	0.10	-0.18	0.42	Rejected	0.00	
H10	TF*BD→GASU	0.118	0.03	3.26	0.00	Supported	0.04	0.541

4.2 Structural Model

The R-square, F-square, and path coefficient are used to evaluate SM. According to the model's R-square, which is 0.509, 50.9% of the variance in GASU can be accounted for. The allowable value for the f-square (f^2) is 0.02. Except for the CPGASU, all the pathways' f-squares (effect sizes) are adequate. These numbers are, however, low since the corresponding assumptions are not accepted. The results of the SM evaluation are presented in Table 3.

4.3 Hypotheses Testing

This study developed direct hypotheses and moderating hypotheses. The hypotheses were tested as shown in Table 3 and Figure 1. The figure shows the path and the path coefficient as well as the p-value.

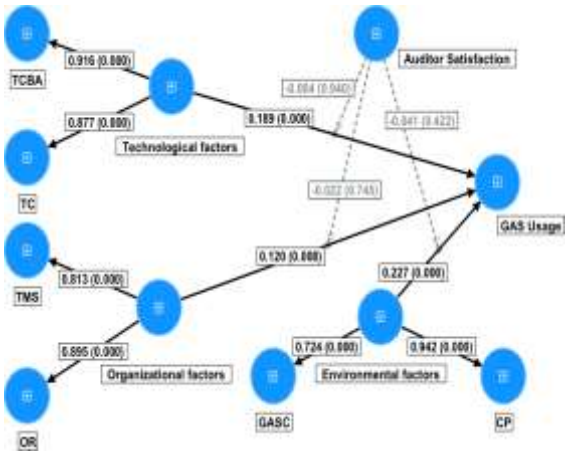

Fig. 1: Results of Structural Model

For the first hypothesis, the H1 is supported because the effect of TCBA on GASU is positive (B=0.301, P<0.05). Thus, H1 is supported as shown in Table 3. For H2, the effect of TC on GASU is significant (B=0.382, P>0.05). Therefore, H2 is supported. H3 is supported because the effect of TMS on GASU is significant (B=0.101, P>0.05). Similarly, the effect of OR on GASU is positive and significant at a path coefficient of 0.223 and a p-value less than 0.05. Thus, H4 is supported. For H5, the GASC negatively affected the GASU at B=-0.214 and the P-value is less than 0.05, indicating that H5 is supported. For H6, the p-value of the effect of CP on GASU is insignificant because it is

greater than 0.05. Thus, H6 is rejected. Overall, H1-H5 is supported while H6 is rejected.

For the moderating effect of AS between TF and GASU, the findings in Figure 2 showed that AS did not moderate the effect of TF on GASU. The P-value of the path is -0.004, indicating that the effect is not significant. Thus, H7 is rejected. For H8, the effect is not significant, and this indicates that AS did not moderate the effect between OF and GASU. Thus, H8 is rejected. For H9, the moderating effect AS between EF and GASU is also insignificant leading to the rejection of H9.
For H10, BG moderated positively the effect of TF on GASU. As shown in Figure 2. Thus, H10 is supported.

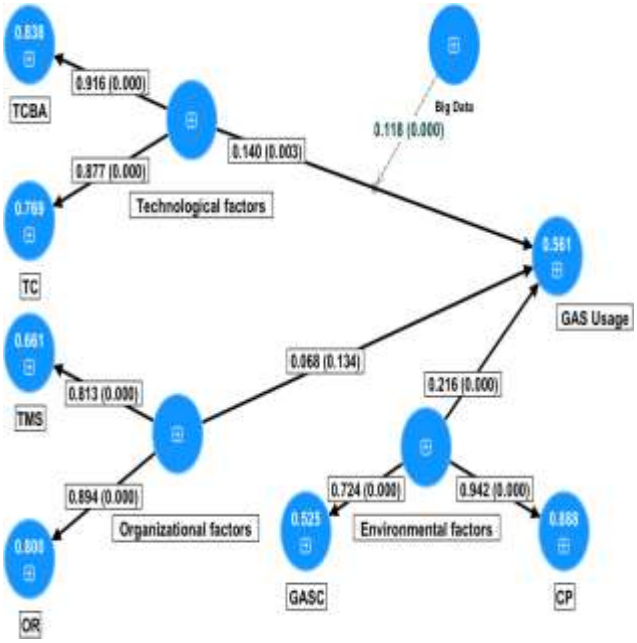

Fig. 2: Moderating Role of Big Data

5 Discussion and Implications

This research effort was conducted to identify the predictors of using GAS by auditing firms in Jordan. The findings showed that TCBA, TC, TMS, OR, and GASC are important predictors for auditing firms in Jordan to use GAS. The benefits of using GAS as well as its compatibility with the existing systems might be encouraging factors to use the system. In addition, the support of the management of the use of GAS is critical in this process. The OR played an essential role. The existing hardware, software, and network to support the usage as well as the knowledge of auditors in using the GAS can be behind the significant effect. The high complexity of the GAS might discourage auditors from using the system. Interestingly, the results of this study support the previous research that found that TCBA, TC, TMS, OR, and GASC are critical for the usage of the GAS and other auditing systems, [1], [2], [54], [55].

For the effect of CP, it was found that this variable is not an important predictor of GASU. This could be due to the notion that using GAS is still relatively new in the context of Jordan and rivalry is still limited. This finding of CP is in line with the findings of researchers who indicated that the effect of CP on using new auditing technology is not significant, [59]. This study also found that auditor satisfaction did not moderate the effect of TF, OF, and EF on GASU. This could be due to the notion that those who used the GAS are still limited and their satisfaction level is similar at a moderate level, which has not caused any statistical differences. BG is a moderating variable, and this suggests that auditing companies in developing countries should benefit from the technology to improve the efficiency of auditing.

This study contributed to the usage of GAS especially in developing countries by examining the predictors and deploying a combination of theories that help in explaining almost half of the variation in GASU. The study validated the theory of TOE as well as ISS in the context of Jordan. The study also contributed by identifying the role of auditor satisfaction. For decision-makers, they are recommended to increase the benefits that can be obtained from the GAS. Decision makers are also advised to conduct training courses for auditors to master the knowledge regarding the use of GAS. Decision makers are advised to assess the usage of GAS among the auditing firms in Jordan and make action to increase this usage by administrating seminars and workshops for auditors and auditing firms to teach them how to use the GAS technology.

6 Conclusion

This study was conducted on auditing firms in Jordan to understand the predictors of using GAS. The data was collected from auditors and analyzed using Smart PLS. The validities and reliabilities of the data were confirmed, and the hypotheses were tested. The findings showed that TCBA, TC, TMS, OR, and GASC are critical predictors of GASU. Auditor satisfaction did not moderate the effect of TF, OF, and EF on GASU while BG moderated the effect of TF on GASU. The findings are limited to the context of auditors in Jordan. The use of the convivence sampling technique was due to the lack of information about the auditor. For future work, it is suggested to duplicate this study using

different sampling techniques such as random sampling. Future work is also recommended to include more variables such as trust and IT knowledge. These variables could help in explaining the variation in GASU. Also, more studies are needed in GASU in developing countries to understand the predictors of this technology among individuals. Decision makers are advised to enhance the knowledge of auditors regarding the usage of GAS and to spread the knowledge regarding the benefits of GAS for auditors and auditing firms.

Acknowledgments:
The author would like to express their gratitude to Middle East University in Amman, Jordan for the financial support that was provided to cover the publication fee of this article.

References:

[1] L. Daoud, A. Marei, S. Al-Jabaly, and A. Aldaas, "Moderating the role of top management commitment in usage of computer-assisted auditing techniques," *Accounting*, vol. 7, no. 2, pp. 457–468, 2021.

[2] A. Marei, L. Daoud, M. Ibrahim, and S. Al-Jabaly, "Moderating role of top management support in electronic procurement usage of Jordanian firms," *Manag. Sci. Lett.*, vol. 11, no. 4, pp. 1121–1132, 2021.

[3] T. F. A. Qushtom, F. S. Al-Fasfus, H. M. I. Alshawahneh, and A. Marei, "Exploring the Expected Moderating Effect of COVID-19 on the Effectiveness of ISA 520-Analytical Procedures-on the Quality of Auditors' Reports in Jordan," in *International Conference on Business and Technology*, 2023, pp. 1395–1404.

[4] S. A. Shatnawi, M. Eldaia, A. Marei, and S. A. L. Aaraj, "The Relationship between Audit Committee Characteristics on Accounting-based Performance (ROA and ROE) as a Measure of Performance Evidence from Jordan," *Int. J. Bus. Digit. Econ.*, vol. 2, no. 2, pp. 15–27, 2021.

[5] M. A. Ali, N. Hussin, H. Haddad, D. Alkhodary, and A. Marei, "Dynamic capabilities and their impact on intellectual capital and innovation performance," *Sustainability*, vol. 13, no. 18, p. 10028, 2021.

[6] E. E. Alharasis, A. S. Tarawneh, M. Shehadeh, H. Haddad, A. Marei, and E. F. Hasan, "Reimbursement Costs of Auditing Financial Assets Measured by Fair Value Model in Jordanian Financial Firms' Annual Reports," *Sustainability*, vol. 14, no. 17, p. 10620, 2022.

[7] M. Bradford, D. Henderson, R. J. Baxter, and P. Navarro, "Using generalized audit software to detect material misstatements, control deficiencies and fraud: How financial and IT auditors perceive net audit benefits," *Manag. Audit. J.*, 2020.

[8] N. N. Normahazan, I. S. Mohamed, and N. Rozzani, "Drivers contributing to the implementation of generalized audit software (GAS) within audit firms in Malaysia," *Bus. Econ. Res.*, vol. 10, no. 2, pp. 341–354, 2020.

[9] A. Asniarti and I. Muda, "The effect of computer assisted audit tools on operational review of information technology audits," in *1st International Conference on Social Sciences and Interdisciplinary Studies (ICSSIS 2018)*, 2019, pp. 23–27.

[10] B. L. Handoko, N. Ayuanda, and A. T. Marpaung, "Organizational, social and individual aspect on acceptance of computerized audit in financial audit work," *Adv. Sci. Technol. Eng. Syst. J*, vol. 5, no. 3, pp. 55–61, 2020.

[11] J. Gao, "Analysis of enterprise financial accounting information management from the perspective of big data," *Int. J. Sci. Res.*, vol. 11, no. 5, pp. 1272–1276, 2022.

[12] D. T. Irafahmi, P. J. Williams, and R. Kerr, "Redesigning an Auditing Course to Develop Technology Competence," in *Conference on International Issues in Business and Economics Research (CIIBER 2019)*, 2021, pp. 148–155.

[13] M. M. Thottoli, "Impact of information communication technology competency among auditing professionals," *Учет. Анализ. Аудит*, vol. 8, no. 2, pp. 38–47, 2021.

[14] S. A. Shatnawi, A. Marei, M. M. Hanefah, M. Eldaia, and S. Alaaraj, "Audit Committee and Financial Performance in Jordan: The Moderating Effect of Ownership Concentration," *Montenegrin J. Econ.*, vol. 17, no. 4, pp. 45–53, 2021.

[15] S. A. Shatnawi, A. Marei, M. M. Hanefah, M. Eldaia, and S. Alaaraj, "The Effect Of Audit Committee On Financial Performance Of Listed Companies In Jordan: The Moderating Effect Of Enterprise Risk Management," *J. Manag. Inf. Decis. Sci.*,

2022.

[16] S. Alaarj, Z. Abidin-Mohamed, and U. S. B. A. Bustamam, "Mediating Role of Trust on the Effects of Knowledge Management Capabilities on Organizational Performance," *Procedia - Soc. Behav. Sci.*, vol. 235, pp. 729–738, Nov. 2016.

[17] M. Kartikasary, S. Laurens, and M. Sitinjak, "Factors affecting the use of generalized audit software in audit process in Indonesia," *Accounting*, vol. 7, no. 4, pp. 819–824, 2021.

[18] P. Purnamasari, N. A. Amran, and R. Hartanto, "Modelling computer assisted audit techniques (CAATs) in enhancing the Indonesian public sector," *F1000Research*, vol. 11, p. 559, 2022.

[19] B. Awuah, J. M. Onumah, and K. C. T. Duho, "Determinants of adoption of computer- assisted audit tools and techniques among internal audit units in Ghana," *Electron. J. Inf. Syst. Dev. Ctries.*, vol. 88, no. 2, p. e12203, 2022.

[20] A. Marei and E. Iskandar, "The impact of Computer Assisted Auditing Techniques (CAATs) on development of audit process: an assessment of Performance Expectancy of by the auditors," *Int. J. Manag. Commer. Innov.*, vol. 7, no. 2, pp. 1199–1205, 2019.

[21] N. Shaheen, S. Al-Haddad, A. Marei, and L. Daoud, "The Effect of Creativity on Entrepreneurial Behavior: The Moderating Role of Demographics," .Information Sciences Letters, 2023, 12(3), pp. 1365–1372. DOI 10.18576/isl/120326. 2023.

[22] A. Marei, A. Abou-Moghli, M. Shehadeh, H. Salhab, and M. Othman, "Entrepreneurial competence and information technology capability as indicators of business success," *Uncertain Supply Chain Manag.*, vol. 11, no. 1, pp. 339–350, 2023.

[23] M. Kayali and S. Alaaraj, "Adoption of Cloud Based E-learning in Developing Countries : A Combination A of DOI , TAM and UTAUT," *Int. J. Contemp. Manag. Inf. Technol.*, vol. 1, no. 1, pp. 1–7, 2020.

[24] A. M. K. Alkhazaleh and A. Marei, "Would Irregular Auditing Implements Impact The Quality Of Financial Reports: Case Study In Jordan Practice," *J. Manag. Inf. Decis. Sci.*, vol. 24, no. 6, pp. 1–14, 2021.

[25] S. Shatnawi, A. Marei, L. Daoud, D. Alkhodary, and M. Shehadeh, "Effectiveness of the board of directors' performance in Jordan: The moderating effect of enterprise risk management," *Int. J. Data Netw. Sci.*, vol. 6, no. 3, pp. 823–836, 2022.

[26] M. R. Yasoa *et al.*, "The Adoption of Generalized Audit Software (GAS) and Digital Analytics by Shariah Auditors in Islamic Banks," *ZENODO*, 2021.

[27] A. Ahmi and S. Kent, "The utilisation of generalized audit software (GAS) by external auditors," *Manag. Audit. J.*, 2013.

[28] M. K. Chihande, "Post-adoption framework for continued use of generalised audit software in Southern African SOEs." 2022.

[29] M. Greenstein-Prosch, T. E. McKee, and R. Quick, "A comparison of the information technology knowledge of United States and German auditors," *Int. J. Digit. Account. Res.*, vol. 8, no. 14, pp. 45–79, 2008.

[30] L. G. Tornatzky and M. Fleischer, "The processes of technological innovation," *J. Technol. Transf.*, vol. 16, no. 1, pp. 45–46, 1990.

[31] T. Oliveira and M. F. Martins, "Literature review of information technology adoption models at firm level," *Electron. J. Inf. Syst. Eval.*, vol. 14, no. 1, p. 110, 2011.

[32] Q. Al-Mamari, B. Corbitt, and V. O. Gekara, "E-government adoption in Oman: motivating factors from a government perspective," *Transform. Gov. People, Process Policy*, vol. 7, no. 2, pp. 199–224, 2013.

[33] O. Sohaib, M. Naderpour, W. Hussain, and L. Martinez, "Cloud computing model selection for e-commerce enterprises using a new 2-tuple fuzzy linguistic decision-making method," *Comput. Ind. Eng.*, vol. 132, no. April, pp. 47–58, 2019.

[34] N. Pawar, S. C. Misra, and S. Singh, "Assessment of Success Factors for Cloud adoption in Semiconductor Industry using Hybrid DEMATEL-ANP," *Proc. - 2020 IEEE Int. Conf. Eng. Technol. Innov. ICE/ITMC 2020*, 2020.

[35] M. H. Kayali, N. Safie, and M. Mukhtar, "Adoption of Cloud Based E-Learning: A Systematic Literature Review of Adoption Factors and Theories," *J. Eng. Appl. Sci.*, vol. 11, no. 8, pp. 1839–1845, 2016.

[36] M. Kayali, N. Safie, and M. Mukhtar, "The Effect of Individual Factors Mediated by Trust and Moderated by IT Knowledge on Students ' Adoption of Cloud Based E - learning," *Int. J. Innov. Technol. Explor. Eng.*, vol. 9, no. 2, 2019.

[37] R. J. Angelina, A. Hermawan, and A. I. Suroso, "Analyzing e-commerce success

using DeLone and McLean model," *J. Inf. Syst. Eng. Bus. Intell.*, vol. 5, no. 2, pp. 156–162, 2019.

[38] A. Jeyaraj, "DeLone & McLean models of information system success: Critical meta-review and research directions," *Int. J. Inf. Manage.*, vol. 54, p. 102139, 2020.

[39] A. Marei, "The effect of e-procurement on financial performance: Moderating the role of competitive pressure," *Uncertain Supply Chain Manag.*, vol. 10, no. 3, pp. 855–866, 2022.

[40] A. Marei, S. Al-Haddad, L. Daoud, A. Habashneh, R. Fariz, and R. Aldamisi, "The impact of innovation on customer satisfaction in the commercial banks: Business performance as a mediating variable," *Uncertain Supply Chain Manag.*, vol. 10, no. 3, pp. 887–894, 2022.

[41] E.-G. Siew, K. Rosli, and P. H. P. Yeow, "Organizational and environmental influences in the adoption of computer-assisted audit tools and techniques (CAATTs) by audit firms in Malaysia," *Int. J. Account. Inf. Syst.*, vol. 36, p. 100445, 2020.

[42] G. Aerts, T. Grage, M. Dooms, and E. Haezendonck, "Public-private partnerships for the provision of port infrastructure: An explorative multi-actor perspective on critical success factors," *Asian J. Shipp. Logist.*, vol. 30, no. 3, pp. 273–298, 2014.

[43] Rogers, Everett M. "Elements of diffusion." *Diffusion of innovations* 5.1.38 (2003)

[44] A. M. Shaltoni and A. M. Shaltoni, "From websites to social media : exploring the adoption of internet marketing in emerging industrial markets," *J. Bus. Ind. Mark.*, vol. 32, no. 7, pp. 1009–1019, 2017.

[45] F. Mohammed, O. Ibrahim, M. Nilashi, and E. Alzurqa, "Cloud computing adoption model for e-government implementation," *Inf. Dev.*, vol. 33, no. 3, pp. 303–323, 2017.

[46] N. Al Mudawi, N. Beloff, and M. White, "Cloud computing in government organizations-towards a new comprehensive model," *Proc. - 2019 IEEE SmartWorld, Ubiquitous Intell. Comput. Adv. Trust. Comput. Scalable Comput. Commun. Internet People Smart City Innov. SmartWorld/UIC/ATC/SCALCOM/IOP/SCI 2019*, pp. 1473–1479, 2019.

[47] H. Sallehudin, R. C. Razak, and M. Ismail, "Factors Influencing Cloud Computing Adoption in the Public Sector: An Empirical Analysis," *J. Entrep. Bus.*, vol. 3, no. 1, pp. 30–45, 2015.

[48] E. O. Yeboah-Boateng and K. A. Essandoh, "Factors Influencing the Adoption of Cloud Computing by Small and Medium Enterprises in Developing Economies," *Int. J. Emerg. Sci. Eng.*, vol. 2, no. 4, pp. 13–20, 2014.

[49] M. Alkebsi and K. A. Aziz, "Information technology usage, top management support and internal audit effectiveness," *Asian J. Account. Gov.*, vol. 8, no. 1, pp. 123–132, 2017.

[50] R. G. Richey, P. J. Daugherty, and A. S. Roath, "Firm technological readiness and complementarity: capabilities impacting logistics service competency and performance," *J. Bus. Logist.*, vol. 28, no. 1, pp. 195–228, 2007.

[51] I. M. A. Alfaki and A. Ahmed, "Technological readiness in the United Arab Emirates towards global competitiveness," *World J. Entrep. Manag. Sustain. Dev.*, 2013.

[52] M. Fathian, P. Akhavan, and M. Hoorali, "E-readiness assessment of non-profit ICT SMEs in a developing country: The case of Iran," *Technovation*, vol. 28, no. 9, pp. 578–590, 2008.

[53] N. Mahzan and A. Lymer, "Examining adoption of computer assisted audit tools and techniques (CAATTs) by internal auditors: Cases of UK internal auditors," in *Proceedings of 12th International Business Information Management Association (IBIMA) Conference*, 2009, pp. 1–46.

[54] K. Rosli, P. Yeow, and S. Eu-Gene, "Adoption of audit technology in audit firms," in *ACIS 2013: Information systems: Transforming the Future: Proceedings of the 24th Australasian Conference on Information Systems*, 2013, pp. 1–12.

[55] K. Rosli, P. H. P. Yeow, and E.-G. Siew, "Factors influencing audit technology acceptance by audit firms: A new I-TOE adoption framework," *J. Account. Audit.*, vol. 2012, p. 1, 2012.

[56] H.-J. Kim, M. Mannino, and R. J. Nieschwietz, "Information technology acceptance in the internal audit profession: Impact of technology features and complexity," *Int. J. Account. Inf. Syst.*, vol. 10, no. 4, pp. 214–228, 2009.

[57] P. L. Bagley, "Negative affect: A

consequence of multiple accountabilities in auditing," *Audit. A J. Pract. Theory*, vol. 29, no. 2, pp. 141–157, 2010.

[58] T. Oliveira and M. F. Martins, "Information Technology Adoption Models at Firm Level: Review of Literature," *Proc. 4Th Eur. Conf. Inf. Manag. Eval.*, no. Wade, pp. 312–323, 2010.

[59] M. Bradford and J. Florin, "Examining the role of innovation diffusion factors on the implementation success of enterprise resource planning systems," *Int. J. Account. Inf. Syst.*, vol. 4, no. 3, pp. 205–225, 2003.

[60] S. Sujata and C. Shalini, "Exploring Factors Influencing Adoption of Blockchain in Accounting Applications using Technology – Organization – Environment Framework Exploring Factors Influencing Adoption of Blockchain in Accounting Applications using Technology – Organization – Envir," *J. Int. Technol. Inf. Manag.*, vol. 30, no. 1, pp. 30–68, 2021.

[61] S. S. Abed, "Social commerce adoption using TOE framework: An empirical investigation of Saudi Arabian SMEs," *Int. J. Inf. Manage.*, vol. 53, no. October 2019, p. 102118, 2020.

[62] K. Zhu, K. L. Kraemer, S. Xu, and J. Dedrick, "Information Technology Payoff in E-Business Environments : An International Perspective on Value Creation of E-Business in the Financial Services Industry," *J. Manag. Inf. Syst.*, vol. 21, no. 1, pp. 17–54, 2004.

[63] T. A. T. Ali, "Geospatial big data analytics applications trends, challenges & opportunities," *Asian Basic Appl. Res. J.*, pp. 1–5, 2022.

[64] P. Sen, R. Jain, V. Bhatnagar, and S. Illiyas, "Big data and ML: Interaction & Challenges," in *2022 6th International Conference on Intelligent Computing and Control Systems (ICICCS)*, 2022, pp. 939–943.

[65] M. Alloghani, C. Thron, and S. Subair, "Artificial Intelligence for Data Science in Theory and Practice." Springer, 2022.

[66] G. C. Oatley, "Themes in data mining, big data, and crime analytics," *Wiley Interdiscip. Rev. Data Min. Knowl. Discov.*, vol. 12, no. 2, p. e1432, 2022.

[67] F. de Barros Filgueiras, "Big data, artificial intelligence and the future of regulatory tools," in *The Routledge Handbook of Policy Tools*, Routledge, 2022, pp. 534–545.

[68] Hair, T. M. Hult, C. M. Ringle, and M. Sarstedt, *A primer on partial least squares structural equation modeling*, 2nd ed. Thousand Oakes, 2017.

[69] J. W. Lian, "Critical factors for cloud based e-invoice service adoption in Taiwan: An empirical study," *Int. J. Inf. Manage.*, vol. 35, no. 1, pp. 98–109, 2015.

[70] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User acceptance of information technology: Toward a unified view," *MIS Q. Manag. Inf. Syst.*, vol. 27, no. 3, pp. 425-478, 2003.

Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

Ahmad Marei carried out the theoretical framework, prepared study hypotheses after the gap appeared in previous studies, prepared methodology, statistics and write the conclusion of the study

Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself

The financial support from Middle East University in Amman, Jordan that will provide to cover the publication fee of this article.

Conflict of Interest

There is no conflict related to this study