An Examination of the Relationships Between Audit Automation and Performance Measurement Implementation in Government Internal Audits

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This study examines the effects of audit automation such as the uses of Computer Assisted Audit Techniques on successful implementation and integration of performance measures into management of government internal audits. The researcher analyzed a survey of local government auditors in the USA. Results reveal that successful integration of performance measures into ongoing audit management is influenced by audit use of Computer Assisted Audit Techniques. Additionally, successful implementation and integration of performance measures into audit management are influenced by the use of audit time reporting system, presence of dedicated information technology audit staff, and posting audit reports on audit websites.

Keywords: government internal audit, performance measurement, information technology, computer assisted audit techniques, audit automation

INTRODUCTION

The objective of this study is to investigate the uses and effect of information technology (IT) such as audit automation on successful implementation and integration of performance measures into the management of government internal audit departments. Performance measurement system supports the management control system as a formal information-based routines and procedures that managers use to maintain or alter patterns in organizational activities (Jamil & Mohamed, 2013; Simons, 1994). Ideally, a well-developed, broad-based performance measurement system could be used to improve organizations' strategic focus (Kaplan & Norton, 1996). Performance measurement has an important role to play in the efficient and effective management of an organization (Kennerly & Neely, 2002), and performance measures allow organizations to allocate economic responsibilities and decision rights, set performance targets, and reward target achievements (Merchant & Van der Stede, 2007). Through their monitoring and risk mitigation role, internal auditors can add value through audit reviews (Erasmus & Coetzee, 2018; Vadasi et al., 2019) to ensure IT is effectively utilized in their organizations to enable adequate and accurate measurement and linking of performance to organizational outcomes.

Successful use of IT to implement and integrate performance measurements into operations could result in audit productivity and overall quality performance. In a global IT audit benchmarking study, GAIN (2009) found 63 percent of survey respondents use Computer Aided Audit Technique (CAAT) tools such as data extraction software, 76 percent use data analysis software and 52 percent use automated working paper software. When asked to indicate how the software has improved their capabilities and also provide best practice linked to the use of the software identified, many respondents stated the use of the above-mentioned software has led to improved productivity and efficiency of work. The results also showed some

of the common software used include ACL, Excel and MS Access (GAIN, 2009). Other studies (e.g. Stacoikas & Rupsys, 2005; Coderee, 1993) have also concluded the use of IT has impact on audit effectiveness, and others (e.g. Devaraj & Kohli, 2003; Doll & Torkzadeh, 1998) found a link between IT usage and organizational performance.

Although the above-mentioned studies make significant contribution toward the literature on audit automation and IT impact on organizational performance, the extent to which the use of IT influence successful integration of performance measures into the management of government audit department has been largely ignored. Investigating the impact of IT on successful implementation and integration of performance measures into audit management is important because facilitation of such integration by IT will enable audit to standardize the needed benchmarks to strengthen audit performance management.

THEORETICAL FRAMEWORK

The literature on IT and audit automation abounds with several studies on uses and impacts of IT on internal audit value creation regarding performance, quality, efficiency and effectiveness (e.g. Stacoikas & Rupsys, 2005; Saikh, 2004; Deloitte & Touche, 1996; Debrecency et al., 2005; Jackson, 2004; Moorthy et al., 2011; Kim et al., 2009). Many scholars (e.g. Devaraj & Kohli, 2003; Doll & Torkzadeh, 1998) have discussed the significance of the link between IT usage and organizational performance. In a study that examined the performance impact of information technology, Devaraj and Kohli (2003) concluded there is a general support for the proposition that the greater the actual usage of technology, the financial and quality performance of hospitals. Thus, for IT impact to occur, it is imperative that usage is tied to organizational performance metrics (Devaraj & Kohli, 2003). Indeed, tying IT to organizational performance metrics implies IT serving as an enabler for performance measurement data to be integrated into management processes.

The relationship between IT use and successful implementation, as well as successful integration, of performance measures into audit management activities can be explained using the theory of resource based view (RBV). This is because IT is an organizational resource that can be strategically managed and deployed to enhance organizational performance. RBV suggests that the resources possessed by an organization are the primary determinants of its performance, and may contribute to sustainable competitive advantage of the organization (e.g. Hoffer & Schendel, 1978; Wenerfelt, 1984). According to Barney (1991), the concept of resources includes all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by an organization that enable it to conceive of and implement strategies that improve its efficiency and effectiveness (Barney, 1991; Daft, 1983). Grant (1991) argues resources are inputs into the production process. They include skills of individual employees, finance, capital equipment, etc. On their own, few resources are productive, which implies productive activity requires the cooperation and coordination of teams of resources. In this respect, Powell and Dent-Micallef (1997) maintain that as a resource, information and communication technology (ICT) alone does not provide sustainable competitive advantage: its use along with complementary human and organizational resources such as flexible culture, integration of ICT and the organization's strategy, is what allows organizations to obtain competitive advantage.

Breznik (2012) suggests IT can be seen as a bundle of resources, not merely a single resource. Ross et al. (1996) recognized the composition of three IT resources: (1) human resources; (2) technology base; and (3) relationships between IT and business management that can lead to expected business value. From the standpoint of government internal audit, technology base resource include having various information systems with different functionalities, including audit sampling, workpaper file, audit workpaper formats, audit time reporting, report development and a computer assisted audit (CAAT) for data extraction and analysis. Additionally, IT human resources include having a dedicated IT audit staff with the capability of effectively utilizing the above-mentioned systems to enhance audit performance. Gustavson and Sundström (2018) argue enhanced human resources and educational skills are among the essential requirements for good auditing in public organizations. Carr (2003) asserts that the economic and strategic IT impact comes from continual innovation of IT and that many organizations have gained important advantages through the

innovative use and exploration of IT. For example, in the case of government internal audit, the use of CAAT software for data extraction and analysis can help to integrate performance measures into audit management and enhance overall audit performance by focusing audit attention on areas of significance and high risks, and by helping to set a benchmark for assessing the extent to which audit is able to detect frequency of auditee errors and fraudulent transactions.

Similarly, the use of audit time reporting system can help audit management to determine the percentage of auditors' time spent on specific tasks and auditors' contribution toward achievement of audit goals. Considering the fact that cooperation and coordination of teams of IT resources can enhance productivity (Barney 1991), and that human and other resources can complement IT to provide meaningful advantage (Powell and Dent-Micallef 1997), the case can be made that successful implementation and integration of performance measures into the management of the audit function can be achieved if IT resources are utilized by audit personnel. Therefore, we can expect positive relationships between audit staff uses of IT resources in the form of automated tools like CAAT, audit time reporting system, audit sampling system, audit workpaper format, audit report development system as well as audit workpaper file and successful implementation, as well as integration of performance measures into management of government internal audit.

RBV theory also discusses IT capability to help explain IT impact on organizational performance. Capability is the capacity for a team of resources to perform some task or activity (Grant, 1991). Bharadwaj (2000) distinguishes capability from resources and explain "IT capabilities are abilities that mobilize and deploy IT resources, such as automated tools, in combination with other resources and capabilities (p.171). Amit & Schoemaker (1993) also distinguish resources from capabilities by defining resources as stocks of available factors that are owned or controlled by an organization, which are converted into final products or services. Capabilities, in contrast, refer to an organization's capacity to deploy resources, usually in combination, using organizational processes to produce a desired outcome (Amit & Schoemaker, 1993). Explaining how CAAT-based programs can help automate certain audit functions, Coderee (1993) argued an automated tool such as CAAT has several benefits for audit planning and reporting because it can be deployed to increase audit coverage, improve integration of audit skills, strengthen independence of auditing from information system functions, foster greater credibility and increase cost-effectiveness through the development of reusable computerized techniques.

Independence is the cornerstone of internal audit (Al-Akra et al. 2016) and helps to demonstrate capability of the auditor. Consequently, the degree of perceived independence affects the role of internal audit mechanisms (Drogalas et al (2020) including capability of the audit function. This implies the presence of IT auditor capability enables resources to begin to be utilized effectively, and the potential for the creation of output and outcome arises. Auditors' cognitive and technical skills constitute an important capability affecting internal control implementation and effectiveness (Petridis et al., 2019; Mahadeen et al. 2016). Based on the arguments of RBV, if government internal audits have the capability manifested by the presence of a dedicated IT audit staff utilizing audit IT resources, such as CAAT and audit time reporting system, such efforts could produce desired outcomes regarding successful implementation, as well as successful integration of performance measures into the management of the audit function. Therefore, we can expect positive relationships between the presence of dedicated IT audit staff, uses of automated tools and successful implementation, as well as integration of performance measures into the management of the audit function.

Staciokas & Rupsys (2005) explored the implications of IT for internal audit functions and analyzed the advantages of internal audit in organizational governance. The authors concluded although IT resources like automation of workpaper files has drawbacks such as network breakdown and data loss, the use of Computer Assisted Audit Tools (CAAT) increased internal audit effectiveness. In another study, Debrecency et al. (2005) concluded one of the most widely deployed CAATs is generalized audit software (GAS), examples of which are the audit command language (ACL), interactive data extraction and analysis (IDEA) and Panaudit Plus. In its annual benchmarking study that determined performance measurements for internal audit activities worldwide, GAIN (2009) reported that 76 percent of the survey respondents measure the quality, effectiveness and efficiency of internal audit processes. Therefore, if resources like

CAAT increases audit effectiveness as stated above, then we can expect a positive relationship between the use of CAAT and successful implementation and integration of the measures of effectiveness such as the use of audit issue tracking system to determine the number of audit recommendations implemented.

Shaikh (2004) explored the impact of e-commerce on audit processes and methodologies, the application of technologies that may assist auditors in improving audit quality, and how to use CAATs effectively with emerging technologies. The author disclosed that emerging technologies such as object-oriented distributed middleware, Internet security technology and intelligent agents constitute software frameworks that facilitate electronic auditing – a process where some audit tasks are conducted electronically over the Internet with the support of ITs (Moorthy et al., 2011). From this finding, it is obvious that IT resources that facilitate electronic auditing such as work paper formats, work paper filing and report development systems improve audit performance from the standpoint of efficiency and effectiveness because they speed up supervisory review and reduce the number of audit travels and audit costs. Audit efficiency through enhanced scientific approach to internal control reviews and risk management can lead to improved organizational performance and management processes (Danescu et al., 2015; Khalid et al. 2017). Therefore, to the extent that audit time reporting management (i.e., planned versus actual reporting time), for example, is audit performance metric, then we can expect internal auditors' use of the above-mentioned audit IT resources to generate audit reports for electronic auditing to have direct impact on successful implementation and integration of that performance measure through speedy supervisory review.

Government internal auditors' specific uses of a resource such as Internet technology could also have impact on successful implementation and integration of performance measures into audit management activities. The implementation of internal audit in the public sector is of paramount importance because it helps to improve governance processes of local government organizations (Noraini et al. 2018). The exponential growth of the Internet has contributed immensely to electronic, web-based Internet reporting in both government and the private sector. Currently, many government internal audit departments have web presence and post audit reports online for public access. In a study that explored the widespread organizational reporting on the Internet and its implication for the auditing profession, Khadaroo (2005) found a significant increase of use of the Internet to supply information to the public. Brown (2008) argues transparency and public access to performance management results and data will provide external pressure to ensure its sustainability and will also have the potential to create a positive force to reward and support improved results. From government internal audit perspective, having web presence and posting audit and performance measurement reports online ensures transparency and aids in the accountability of auditors to citizens and elected officials. This could facilitate the monitoring of auditor performance and motivate the internal audit departments to develop and successfully implement performance measurements. Based on the discussion above, the following hypothesis are developed for testing:

H1. *There is a positive relationship between the use of audit sampling system and successful implementation, as well as successful integration, of performance measures into audit management activities.*

H2. *There is a positive relationship between the use of audit workpaper filing system and successful implementation, as well as successful integration, of performance measures into audit management activities.*

H3. *There is a positive relationship between the use of audit workpaper formats and successful implementation, as well as successful integration, of audit performance measures into audit management activities.*

H4. *There is a positive relationship between the use of audit time reporting system and successful implementation, as well as successful integration, of performance measures into audit management activities.*

H5. *There is a positive relationship between the use of audit issue tracking system and successful implementation, as well as successful integration, of performance measures into audit management activities.*

H6. *There is a positive relationship between the use of audit report development system and successful implementation, as well as successful integration, of performance measures into audit management activities*

H7. *There is a positive relationship between the use of CAAT and successful implementation, as well as successful integration, of performance measures into audit management activities.*

H8. *There is a positive relationship between the presence of dedicated IT audit staff and successful implementation, as well as successful integration, of performance measures into audit management activities.*

H9. *There is a positive relationship between having an audit web site and successful implementation, as well as successful integration, of performance measures into audit management activities.*

H10. *There is a positive relationship between posting audit report on audit web site and successful implementation, as well as successful integration, of performance measures into audit management activities.*

METHODOLOGY

This research utilizes data from a 2012 survey conducted by the Association of Local Government Auditors (ALGA). The survey was sent to audit heads of 263 audit shop members and 114 returned the survey, yielding a 43 percent response rate. Fifty-two percent of the respondents work for city government, 27 percent work for county government, and 21 percent work for other types of governmental entities, including schools/Universities, utilities and transportation. Twelve percent of the respondents are in the Midwest of the United States, 18 percent in the pacific west, 12 percent in the mountain west, 5 percent in the northeast, 46 percent in the south east and south west and 5% are international. Twenty-five percent of respondents have audit staff of between 1-2, 34 percent have 3-5 staff, 21 percent have 6-10 staff, 11 percent have 11-15 staff, and 9 percent have 16 or more staff. Based on the profile presented above, the case can be made that the survey respondents constitute adequate and fairly balanced representation of the local governments and regions of the United States, as well as departmental size in terms of the number of audit staff.

The areas surveyed include performance measurements and uses of IT, i.e. audit automation such as CAAT to help measure the effect of audit automation on successful implementation and integration of performance measurements into management of the government internal audit function. Respondents were asked whether their government organization uses performance measurements and whether their audit departments use performance measurements. Additionally, they were asked to state on a seven point scale, their agreements regarding the following statements: 1) Your department has developed and implemented performance measures; and 2) Your department has integrated performance measures into management of the department. The scale was as follows: 1= Completely Disagree; 2 = Strongly Disagree; 3 = Somewhat Disagree; 4 = Neutral; 5 = Somewhat Agree; 6 = Strongly Agree; and 7 = Completely Agree. Respondents were also asked to state on a seven point scale, their agreement regarding the following question: Overall, to what extent do you agree the following have been successful in your department? 1) development and implementation of performance measures; and 2) integration of performance measures into the management of the audit function.

Respondents were also provided a list of automated audit tools and asked the following question: What automated tools does your audit department use? Select all that apply, or specify other. The following are

the list of automated audit tools provided to respondents: Audit Sampling, Work Paper Formats, Work Paper File System, Audit Time Reporting, Issue Tracking, Report Development, Computer Aided Audit Techniques (ACL, IDEA, etc.). Additionally, respondents were asked to indicate whether they have dedicated IT audit staff, whether they have a website and whether their reports are posted on the websites. Descriptive statistics was used to analyze the uses of performance measures and Chi-Square tests were used to determine the relationships between uses of automated audit tools and successful implementation and integration of performance measurements into the management of the audit functions.

RESEARCH FINDINGS

Use of Performance Measures

Ninety one respondents answered the questions on whether their audit departments use performance measures and 67 (74%) responded in the affirmative. A total of 86 respondents provided responses regarding the success of developing and implementing performance measures, and of integrating performance measures into the management of the audit function. Table 1 provides details of responses provided. Twenty six respondents said they somewhat agree that development and implementation of performance measures in their audit department has been a success, 22 indicated they strongly agree and 6 noted they completely agree. Together, these also represent 63% of the 86 respondents. Twenty five respondents said they somewhat agree that integration of performance measures into their audit functions has been a success, 20 indicated they strongly agree and 7 noted they completely agree. Together, these represent 60% of the 86 respondents. Clearly, a strong majority of the respondents believe implementation and integration of performance measures in their audit departments have been a success.

TABLE 1
SUCESSFUL IMPLEMENTATION & INTEGRATION OF PERFORMANCE MEASURES

	Success of Developing and Implementing Performance Measures in Audit Department	Success of Integrating Performance Measures into Audit Functions	N
Completely Disagree	4	5	86
Strongly Disagree	4	6	86
Somewhat Disagree	5	5	86
Neutral	19	18	86
Somewhat Agree	26	25	86
Strongly Agree	22	20	86
Completely Agree	6	7	86

Use of Audit Automation

Table 2 shows the details of respondents' use of various types of software applications for audit automation. As can be seen from Table 2, 46% of respondents use audit sampling system, 54% use audit work paper formats,

TABLE 2
USES OF AUTOMATED TOOLS, DEDICATED IT AUDIT STAFF & WEB PRESSENCE

Automated Tool, Dedicated IT Audit Staff and Web Presence	Frequency	Percentage of Total Survey Respondents	N
Use Audit Sampling System	52	46%	114
Use Work Paper Formats	62	54%	114
Use Work Paper File System	50	44%	114
Use Audit Time Reporting	51	45%	114
Use Issue Tracking	36	32%	114
Use Report Development	28	25%	114
Use Computer Assisted Audit Techniques-CAAT (ACL, IDEA etc.)	57	50%	114
Use Other Automated Tools	107	94%	114
Has Dedicated IT Audit Staff	26	23%	114
Has Audit Website	70	61%	114
Post Audit Report on Website	51	45%	114

44% use work paper file system and 45% use audit time reporting system. The results in Table 2 also show only 32% of respondents use issue tracking and even a smaller 25% use automation for report development.

An issue tracker is an important tool that enables auditors to monitor resolution of outstanding recommendations issued, and to make informed decisions regarding the audit client's internal controls as well as follow-up audit activities. Additionally, the results reveal that 50% of respondents use CAAT data extraction and analysis tools such as ACL and IDEA. Among other capabilities, these tools help to extract and analyze data to enable auditors to form an opinion on audit evidential matter. Ninety four percent of respondents also use other automated tools for audit. These tools typically include but are not limited to Microsoft Excel and Access. As noted in Table 2, only 23% of the survey respondents said they have dedicated IT audit staff. This could be due to the fact that many of audit shops outsource their IT audits. The results also show while a majority of 61% of respondents have audit websites, only 45% post their reports on the websites.

IT Use, Performance Measures Implementation and Integration

Chi-Square tests of independence were used to test the relationships between IT and successful implementation, as well as successful integration, of performance measures. Table 3 shows the details of the test of the relationships between the use of automated tools, having dedicated IT audit staff as well as web presence, and the successful implementation of performance measurements. As noted in Table 3, Successful implementation of Performance Measurements is influenced by the use of: Audit Time Reporting System ($p = 0.016$), Dedicated IT Audit Staff ($p = 0.017$), as well as having Audit Reports on Website ($p = 0.039$). These confirm research hypotheses 4, 8 and 10. Good performance measurements measure efficiency of audit activity such as actual audit hours versus planned hours. Using an audit automated tool such as audit time reporting system helps to track audit hours and determine whether actual hours worked measure favorably against planned hours. The result in Table 3 therefore reveals that audit use of a time reporting system provides that monitoring mechanism which influences successful implementation of the efficiency measure of actual versus planned audit hours.

TABLE 3
CHI-SQUARE TEST – IMPACT OF IT USE ON PERFORMANCE MEASURES (PM) IMPLEMENTATION

Uses of Audit Automated Tools, Having IT Audit Staff, And Audit Web Presence	Successful Implementation of PM		
	Pearson Chi-Square		
	Value	df	Asymp. Sig. (2-sided)
Use of Audit Sampling System	11.660	6	.070
Use of Audit Work Paper Formats	1.893	6	.929
Use of Work Paper File System	.646	6	.996
Use of Audit Time Reporting	15.612	6	**.016**
Use of Issue Tracking	10.194	6	.117
Use of Report Development	11.774	6	.067
Use Computer Assisted Audit Techniques-CAAT (ACL, IDEA etc.)	10.101	6	.120
Use of Other Automated Software	8.622	6	.196
Has Dedicated IT Audit Staff	15.468	6	**.017**
Has Audit Website	11.035	6	.087
Posts Audit Reports on Website	13.277	6	**.039**

Having dedicated IT audit staff usually helps to maintain an in-house expertise in the use of CAAT tools like ACL to effectively perform data extraction for analysis and efficient audits. This helps audit to sort, view and analyze large amounts of data in order to identify internal control weaknesses and risks inherent in the audit clients' operations. The result in Table 3 implies that by having dedicated IT audit staff, a government internal audit department most likely has the capability to extract and analyze high volume of data that results in successful implementation of efficiency measures such as the breadth of audit coverage, and degree of identifying high risk transactions for targeted audit. Posting reports of audit activities online helps to ensure transparency, accountability and public awareness of audit effectiveness. Based on the results in Table 3, public access to performance management results over the Internet influences government internal auditors' successful implementation of performance measures in order to meet the expectation of accountability from a well-informed public about audits' activities.

Table 4 shows the details of the test of the relationships between the use of automated tools, having dedicated IT audit staff as well as web presence and the successful integration of performance measures. The results shown reveal that Successful Integration of Performance Measures is a function of the use of: Audit Time Reporting ($p = 0.005$), Computer Assisted Audit Techniques like ACL and IDEA ($p = 0.032$), as well as having Dedicated IT Audit Staff ($p = 0.017$), and Audit Reports on Website ($p = 0.010$). These results confirm research hypotheses 4, 7, 8 and 10.

These results indicate that the same factors (audit time reporting, dedicated audit staff and audit report on website) that influence successful implementation of performance measures of government internal audit departments also impact successful integration of performance measures into the management of the audit function. However, unlike successful implementation of performance measures, successful integration into the management of the audit function is also significantly influenced by CAAT data extraction and analysis software such as ACL.

TABLE 4
CHI-SQUARE TEST – IMPACT OF IT USE ON PERFORMANCE MEASURES (PM) INTEGRATION

Uses of Audit Automated Tools, Having IT Audit Staff, And Audit Web Presence	Successful Integration of PM		
	Pearson Chi-Square		
	Value	df	Asymp. Sig. (2-sided)
Use of Audit Sampling System	10.180	6	.117
Use of Audit Work Paper Formats	4.609	6	.595
Use of Work Paper File System	.595	6	.892
Use of Audit Time Reporting	18.588	6	**.005**
Use of Issue Tracking	10.653	6	.100
Use of Report Development	11.856	6	.065
Use Computer Assisted Audit Techniques-CAAT (ACL, IDEA etc.)	13.833	6	**.032**
Use of Other Automated Software	7.527	6	.275
Has Dedicated IT Audit Staff	15.468	6	**.017**
Has Audit Website	11.496	6	.074
Posts Audit Report on Website	15.170	6	**.010**

DISCUSSION

The result of this study reveals that many local government auditors use performance measures and majority of those believe their implementation and integration of performance measures into audit management functions have been successful. The findings also reveal that 94% of local government internal auditors use some form of automated tools for their audit work, although less than half of them (46%) use audit sampling, 54% of use audit work paper formats, and 44% use work paper filing system. The use of audit work paper format and work paper filing system are a bit less than the findings of the GAIN (2009) worldwide benchmarking study which showed a little more than half of study respondents (52%) use software to automate their working papers. Automating audit work papers can provide standardization and consistency of audit processes, which could lead to high productivity and efficiency of work, thereby facilitating the development of benchmarks for measuring audit performance. Additionally, the use of automated work paper software can reduce the time required for audit file reviews, help with better organization of audit information and enable review of audit work papers from remote locations. Despite its findings, GAIN (2009) concluded there is the need for improvement in the use of audit software because most of its study respondents do not use software to detect or investigate fraud, perform control self-assessment, monitor compliance activities and assess risks for the annual audit plan. The relatively low use software to automate working papers may be due to budgetary constraints of some audit departments stemming from inadequate allocation of resources. Therefore, the result of this study appears consistent with that of Jackson (2004) who found several limitations in implementing audit software, including cost implications and auditor resistance to training.

As revealed in Tables 3 and 4, the use of an audit time reporting system is significantly related to successful implementation, as well as successful integration of performance measures into the management of the audit function ($p = 0.016$ and $p = 0.005$ respectively). Effective time management goes to the core of audit efficiency and workload management. Having a time reporting system imply possession of an IT resource that accurately tracks audit hours can help monitor audit performance by comparing planned hours

to actual hours in order to determine audit efficiency and put in place needed corrective measures to improve performance. Therefore, the finding that the use of audit time reporting system significantly impact both the implementation and integration of performance measures into audit management is consistent with the RBV theory (e.g. Hoffer & Schendel, 1978; Wenerfelt, 1984) that resources possessed by an organization are the primary determinants of its performance. Efficient time management can also enhance audit cost-effectiveness and workload management by ensuring that time savings on work performed are utilized on more engagements. In those government agencies where internal audit operates as a cost center, an effective time reporting system will help to determine billable hours to auditees.

Tables 3 and 4 also reveal that there is a statistically significant relationship between having a dedicated IT audit staff and successful implementation and integration of performance measures into the management of the audit function ($p = 0.017$). IT audit staff usually are individuals who possess the capability and expertise in the use of data extraction and analytical software. As indicated above, their use of data analytics helps to increase efficiency by auditing more areas and reviewing higher volumes of data while using fewer resources. This finding is consistent with RBV arguments (e.g. Grant, 1991) that productive activity requires the cooperation and coordination of teams of resources, and that capability such as the ability to mobilize IT resources can lead to desired outcome (Bharadwaj, 2000; Amit & Schoemaker, 1993). The implication here is that automated tools like CAAT are, on their own, not productive unless they are coordinated and utilized by human resources like dedicated IT auditors with the capability to effectively utilize them for efficient risk-based audit, and enhanced audit performance. Additionally, the finding confirms the argument of Ross et al. (1996) that the composition of IT resources include not only the technology base but also the human resources.

The research findings also reveal that a majority of 61% of respondents have audit websites while 39% post the reports of their activities on audit websites. As revealed in Tables 3 and 4, there are statistically significant relationships between posting report of audit activities on audit website and successful implementation as well as successful integration of performance measures into the management of the audit function. By posting reports online, the results of audit performance measurement activities become available to relevant stakeholders such as citizens as well as elected and appointed government officials. Granted that these stakeholders view the audit function as effective and efficient based on its outputs that are placed in the public domain, the credibility of the audit function will not only be boosted but will also place it in a better position to compete effectively for much needed funding to help automate many of its activities. Therefore, the statistically significant relationship between posting audit reports online and successful implementation and integration of performance measures into audit management is consistent with the arguments of Brown (2008) and the National Performance Measurement Advisory Commission that public reporting will provide external pressure to have the potential to create a positive force to reward and support improved results.

According to the research findings, while only 23% of respondents have dedicated IT audit staff, 50% of them use CAAT data extraction and analysis software like ACL and IDEA. As revealed in Table 4, the research results show local government auditors' use of CAAT is significantly related to successful integration of performance measures into the management of the audit function ($p = 0.032$). The significance of this finding lies in the fact that these CAAT software help to analyze entire population rather than a sample in order to focus audit attention on areas of significance and high risks and to detect frequency of errors and fraudulent transactions. In so doing, they enable audit management to get a broader view of audit efficiency in terms of audit coverage, and provide the needed data and knowledge to standardize and manage measures of audit performance such as the degree to which audit identifies clients' internal control weaknesses. Thus, the use of data analytics help to automate and facilitate more efficient internal audit processes, thereby helping to identify and manage risks more promptly, effectively and efficiently. Therefore, the finding of significant relationship between the use of CAAT and successful integration of performance measures is also consistent with the argument of RBV theory that resources are primary determinants of performance. Additionally, it is consistent with the argument of Coderee (1993) that CAAT has several benefits for audit planning and reporting because it can increase audit coverage, improve

integration of audit skills, and increase cost-effectiveness. Furthermore, it is consistent with that of Staciokas & Rupsys (2005) that the use of CAAT increases audit effectiveness.

An important finding regarding local government audit use of automation is the low percentage of respondents that use issue tracking system. This may be due to the fact that 94% of respondents use other automated tools, as Microsoft Excel and Access can also be used to track issues and outstanding recommendations. The finding from this study regarding the use of issue tracking appears consistent with some prior studies. In a study that examined the determinants of auditee adoption of audit recommendations, Aikins (2012) found that local government auditors are not keen on maintaining an issue tracker to enable them document control weaknesses identified in their audits. That study also found that while they perform follow-up audits to ensure audit recommendations are being implemented, they seemed indifferent regarding the timeliness of follow-up audits. Most importantly, that study found that the use of issue tracker and follow-up audits are significantly related to auditee adoption of audit recommendations. The implication here is that automation of audit issue tracking could enhance the effectiveness of government internal auditors because managers are more inclined to implement audit recommendations to address weaknesses identified in the course of the audit, and enhance public accountability, as long as government auditors document, track and follow-up to verify management's actions on those recommendations.

This study is limited in that it focuses on the uses of IT and their effects on successful implementation and integration of performance measures into audit functions. The study did not focus on the systems for measuring government internal audit performance. Additionally, the best practices associated with the creation and use of performance metrics was outside the scope of this study. Furthermore, the data analyzed in this study was sourced from a survey conducted several years before the study, and it is possible that an analysis of new data could yield different results. These limitations notwithstanding, the findings are useful in that there is very little empirical research on the effect of information technology on successful implementation and integration of performance measures into government internal audit management. Further research is required to focus exclusively on the systems for measuring government internal audit performance. Future research direction may include examination of the extent to which audit performance measures align with other elements of broader management control systems such as planning and administrative controls, and their effects on successful use of IT to integrate performance measures into audit management. For example, audit planning sets the goal of the audit function and the standards to be achieved, and directs auditor efforts and expected behaviour. Audit administration provides governance regarding line of accountability, rewards and monitoring of auditor behaviour to ensure conformance to standards. Future research into the alignment between the audit function's goals, standards and performance measures, and their effects on successful integration of performance measures into audit management will be a useful study.

CONCLUSION

Overall, the findings in this study suggest that the use of information technology such as CAAT, time management system and online reporting of audit activities can enhance government internal auditors' ability to measure the efficiency and effectiveness of their operations. In an era where government internal audit resources are limited due to fiscal stress of state and local governments, the efficient management of all aspects of government to enhance accountability becomes prevalent. This study contributes to the literature on government performance measurement because it adds technological perspective to the literature on the determinants of successful implementation of performance measurements from the standpoint of government internal audits. The study also contributes to the theory and practice of public administration. From theoretical perspective, it confirms the link between technology uses and organizational performance as noted in prior studies. From practical perspective, the findings suggest that government internal auditors who want to improve their performance will benefit from appropriate use of information technology to integrate their activities and improve implementation of selected measures in order to enhance efficiency. For this to happen, the limitation regarding the use of technology by government internal auditors has to be addressed.

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