SUSTAINABILITY IN INFORMATION SYSTEMS AUDITING

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Abstract

Auditing is a systematic process of obtaining and evaluating evidence of activities, events or transactions. Currently, audit practices have been revolutionized by the development of information technology and basically information systems auditing focuses on assessing proper implementation, operation and control of information systems resources within organisation. Several frameworks have been formulated for information systems auditing implementation to achieve improvement in auditing performance related to compliance requirements, internal controls evaluation and information systems success. However, sustainability dimensions in the information systems auditing practices and the development of appropriate framework are not enough discussed in the literature although sustainability is becoming significant in achieving certain organisation's objective. Therefore, this study intends to analyse the relevant requirements by auditors and sustainability factors and use them to formulate IS audit by integrating sustainability in the auditing process. Thus, improve audit performance and enhanced accountability and integrity of auditors.

Keywords: Sustainability, Continuous Auditing, Information Systems Auditing

Introduction

The main purpose of IS auditing is to provide assurance that the information systems are functioning in an efficient and effective manner to achieve organisation's objective. As IS are inter related, Sayana (2002, p. 2) suggested that information systems assessment should be carried out by implementing an integrated evaluation of all IS components. In general, the major elements consist of physical and environmental, systems and administration, application software, network security, business continuity and data integrity. Each element may have different priority, therefore the most significant elements may be selected for auditing.

Hall and Singleton (2005, cited in Abdolmohammadi & Boss, 2011, p. 141) indicated that IS audits includes the assessment of controls, computer resources, operation and IS implementation. In addition, a number of audit techniques are used for gathering evidence such as reviewing documents, interviewing and data analysis by using automated programs According to AICPA, 2007, AU319.30, IS audit must be performed when;

a) The client utilizes complex business systems and relies extensively on IT controls
b) The client has replaced or made any significant changes to its IT systems
c) The client extensively shares data between systems internal organizational systems
d) The client is involved in electronic commerce
e) The client uses emerging technology

f) Significant amounts of required audit evidence are electronic.

Another consideration of IS audit framework is proposed by the IIA Global Technology Auditing Guide. Juergens (2006, cited in Majdalawieh and Zaghloul , 2009, p.355) stated four aspects of IS audit universe from the Guide; a) IT Management, b) Technical Infrastructure, c) Applications and d) External connections. Under this context IT Management refers to the assessment of IT Governance and process, technical infrastructure is the evaluation of supporting systems such as network, database management systems and security. IS auditor is also required to evaluate the applications systems that are related to business processes such as processing controls, access controls and input and output controls. Going by this framework, external connections are related to audit activities within virtual business environment such as e-commerce and online transactions.

Prior work on IS auditing has focused on the evaluation of controls and risks assessment. Wulandari (2003, cited in Majdalawieh & Zaghloul, 2009, p.353) stated that Information System audit is an assessment of system compliance to applicable policies, procedures, rules and regulations and gives assurance that data integrity, suitable system controls and value for money. Similarly, Mahzan &Veerankutty (2010, p.1557) also highlighted the IT auditing activities of public sector in Malaysia is focusing on the effectiveness of controls evaluation to ensure the policies, procedures, practices and organisational structures are complied with the rules and regulations. Amancei and Surcel (2010, p. 55) proposed systematic procedures in carrying risks assessment in organisations by focusing key IT audit activities, namely IT strategic plan, organisation and operation of IT department, IT systems and IT security. As the significant role of public sector auditors are to provide assurance that public assets are safeguarded, value for money for government's investment and integrity, the nature of IS audit conducted is to evaluate the effectiveness of controls, systems are secured and functioned as intended, Petterson (2005, cited in Mahzan and Veerankutty, 2011,p.1552).

According to ISACA, evaluation of the information systems covers a wide range of IT areas that would have significant impact on the electronic service delivery; it comprises controls assessment, IT investment, system reliability, software capability maturity model, managing information system, project management and information security management. In relation to information systems evaluation, COBIT specified a number of approach for performing IT audit such as the balance scorecard for IT/business alignment, maturity models for benchmarking, key goal indicators (KGI) for measuring the outcome and key performance indicators (KPI) for performance measurement.

To date, sustainability issue has gained a significant amount of attention from several disciplines. The introduction of sustainability into business operation including government's agendas has been the subject of many researchers. In response to this issue, a number of studies have examined sustainability, its definition, research framework, concept, approach, and its implementation (Afgan and Andre, 2006; Searcy *et al.* 2007; Fuchs, 2008 and Erek *et al.* 2009).The most widely recognised definition is given by the Brundtland Commission (World Commission on Environment and Development, 1987, p.24) which mentioned that sustainability is the progress that meets the needs of present without comprising the ability of future generations to meet their own needs. To date, the term sustainability refers to an integration of social, environmental and economic dimensions. Under this consideration, Shrivastava (1995a, cited in Carter and Rogers, 2008, p. 363) claimed that sustainability has the potential in minimising long term risks that associated with resource depletion, fluctuations in energy cost, product liabilities, pollution and waste management.

Recent research has shown that in achieving sustainability values and competitive advantages, it needs an integration of strategy plans and goals that bring benefit and greater value to the organisation. Business continuity, resiliency and business endurance is also an

effort for sustainability in order to maintain competitiveness (Smith and Scharicz, 2011 cited in Smith, 2012, p.5 and Asif *et al.*, 2008, p.423).

Previous literatures have also identified influences on the process associated with sustainability to improve organisational performance while simultaneously preserving environmental system and safeguarding social benefit. Smith & Sharicz (2011, p.81) denoted that a systematic governance structure and effective leadership are the key components to adopt TBL sustainability. Millar *et al*. (2012, p.493) enhanced the views of Smith & Sharicz (2011) by investigating and analysing the organisational change for sustainability. Sustainability involves transformation in business structures and therefore, an effective communication and collaboration to every hierarchy is essential to implement new strategies.

Sustainability is also perceived as a strategy for continuous improvement. Under this context, Prajog and Sohal (2004, cited in Jaca *et al.*, 2012, p.143), indicated that sustainability is the ability of organisations to meet changes requirement in the business processes, applying contemporary best practice methods and remain competitive in market. Concerning continuous improvement, Jaca *et al.*, (2012) analysed and measures several factors for achieving systematic management of improvement activities.

Sustainability in information systems

Wide review of studies has indicated that information systems play a role as a key element for sustainable development in health practices, supply chains, IS projects and information security governance (Kimaro and Nhampossa, 2007; Silvius and Nedeski, 2011; Piotrowicz and Cuthbertson, 2009). Korte *et al.*,(2012) and Silvius (2009) proposed sustainability to be incorporated into information systems evaluation and for ICT projects. Misund and Hioberg viewed sustainability in the context of information system (2003, quoted in Nurdin *et al.* 2012, p. 70) as a technology that is capable of being maintained over a long period of time. Kiggundu(1989 cited in Ali and Bailur, 2007) emphasised that sustainability is an operational simplicity, flexibility, maintainability, robustness, availability and capability of technical and managerial personnel. Similarly, Braa, Monteiro and Sahay (2004, cited in Nurdin *et al*., 2012) claimed that sustainability is about making information systems work over time. In conjunction with technology advancement, Oyomno (1996, quoted in Kimaro and Nhampossa, 2007, p.3) noted that sustainability of IT is actually dependent upon technology as the main role of IT is tosupport system utilization. Sustainability is also encompasses a set of process including design, development and implementation and also associated risks to the achievement of objectives.

A review by Silvius *et al*., (2009, p.43) proposed a framework of performance indicators or criteria for sustainability in ICT projects by considering the triple P concept and the project life cycle. Indicators were categorised as people, planet and profit and the effect is actually depends on certain constraint such as cost, time and quality. Silvius and Nedeski (2011, p. 6) enhanced the sustainability principles into project management by developing a maturity model to monitor project performance.

Bagheri and Hjorth (2007, quoted in Esquer *et al*., 2008, p. 1028) claimed that the concept of sustainability has been very challenging for many practitioners as it varies according to the interest, needs and values of different communities. In this sense, sustainability is necessary to consider the integration of both conceptual and practical dimensions which include the principle or values, specific actions, processes and strategies to achieve objectives.

The term ‘Sustainability’ is a universal or macro concept that is being used to define entire system or infrastructure such as health system (Kimaro, 2006: Kimaro and Nhampossa, 2007), information system (Marcel *et al*., 2012) information (Todorov and Marinova, 2010) and economy (Majdalawieh *et al.*, 2009). From the information systems viewpoint, it can be

observed that most of sustainability research pertaining to this area have extensively discussed environmental issues such as green information technology (green IT), green information system (green IS) or green IT investment which focuses on reduction of energy consumption or addresses issue on sustainability efforts on green supply (Erek *et al*., 2009; Harmon *et al*., 2010)

Another consideration for sustainability literatures is sustainability for ICT development and five (5) main dimensions have been identified, namely; financial, social, institutional, technological and environmental. These five dimensions are crucial to be considered in planning and implementing ICT projects. Proenza, (2001 cited in Ali and Bailur, 2007) indicated that financial sustainability refers to the long term ability of ICT projects to generate monetary benefit for maintaining the obligations of the organisation. Technological sustainability is the ability for a technology to sustain and continuously available for a long period of time, Misund and Hoiberg (2003 quoted in Ali and Bailur, 2007). Social sustainability refers to user satisfactions by considering cultural differences, empowering marginalised groups, sharing and aligning goals with local people and adapting to evolving community needs (Gómez and Casadiego, 2002; Harris *et al.*, 2003; Stoll and Menou, 2003; Delgadillo, 2004 quoted in Ali and Bailur, 2007). Institutional sustainability refers to the long term ability of process and structures of organisation to perform their functions, Batchelor and Norrish (2003 cited in Ahmad Nawi *et al.,* 2013, p. 696)

In addition to sustainability dimensions of environmental, social and economy, recent literature has introduced sustainability from the hybrid systems perspective or systems of systems. Hessami *et al.,* (2009,p.84) applied Weighted Factor Analysis methodology (WeFA) to examine the context, components, topology and the scope of sustainability from micro systems to macro systems. Systems sustainability framework was formulated from WeFA schema consisting of economy, environmental, social, technology, resource, uncertainty, rapid change in the domain of deployment and complexity.

Sustainability measurement

Having defined sustainability and issues to be considered, it is important to explore how to assess sustainability. Piotrowicz (2009, p.492) claimed that sustainability cannot be assessed by traditional performance measurement. As sustainability is a holistic concept which involves integration and interdependence among systems, the sustainability measurement has to be connected to economy, environment and social aspects.

Sustainability can be measured by using a set of indicators or indexes. In addition to business's Guidelines, Standards and Regulations to be complied, many organisations have developed their own mechanism as a sustainability performance indicators or sustainability metrics for assessing their sustainability performance. Previous studies have introduced several initiatives to measure sustainability. Delai and Takahashi (2011, p.440) denoted that sustainability measurement implementation needs to consider four (4) situations; 1) the sustainability measurement criteria, 2) theme and sub themes to be applied, 3) selection of groups in the measurement process and 4) sphere of the company impacts to be taken into account.

It is reported by United Nation 2002, that sustainability refers to the effort of minimising negative impact on economy, environmental and social activity. The current practices of laws, policies and regulations may also have impact to the development of a good sustainability performance.

According to Nicho and Cusack (2007), IT auditing is able to develop quality assurance, benchmarking and measurement. Prior sustainability literatures in information systems evaluation were mainly discussed the effective use of computing resources to meet business demands and to achieve sustainability objectives. However, less number of research

has examined the importance of information systems in the area of sustainable information systems auditing to collect audit evidence, analyse, execute audit work and report IS audit findings. Therefore, there is a need to construct the dimension of sustainability from IS auditing perspective.

In this study, the author proposed a continuous auditing methodology to be adapted to measure sustainability in information systems. Identification of the important aspects of sustainability in conducting information systems auditing will be determined by the current literatures. The author engaged three phases to gain the objective of this study; includes 1) current IS audit, 2) developing IS audit criteria and objective, 3) IS audit method (continuous auditing).

New requirements for improvised the current audit practice

Auditors are required to investigate, collect and evaluate evidence to ensure the process of compliance and controls are effective for organisation to achieve its goal. To date, the current IS audit process is compliance oriented, as a result majority of IS audit findings are compliance based rather than value for money audit assessment. The main role of auditing is providing facts and reliable information, therefore the audit conclusion needs to be comprehensive, value added and reliable in producing facts and supporting audit evidence. In order to achieve this purpose, IS auditing activities need to be improvised, well defined process and consistent. The development of the sustainable IS auditing process will be taking into consideration IT Audit Management framework (Rosário *et al.*, 2012, p. 2), sustainabilityobjective, CA methodology and IS audit management processes to integrate compliance and value for money audit assessment.

Current IS audit processes

Generally, IS auditing is performed according to four phases; planning, executing, reporting and follow up. Audit standards require audit work to be properly planned to ensure the effectiveness and the efficiency of audit performance. Planning audit work begins with the establishment of audit objective, determines audit scope and defines audit criteria. ISACA (1998) defined IT audit objective as a statement of the desired result or purpose to be achieved by implementing control procedures in a particular IT activity. Innovation of technology has affected the way auditing is conducted, however overall audit objectives are not change, Yang & Guan (2004, p.554). Audit criteria are described in a measurable way which includes policies, procedures and standards that should be complied by the organisations. At the execution phase, it consisting the assessment or evaluation of the IS process by following specific procedures, applying audit techniques and methodology to gather audit evidence. IS auditing also includes the use of CAATTs to support audit work for analysing the efficiency and the effectiveness of controls. At the end of the processes, audit findings will be documented into a formal report for distribution. Follow up audit will be performed on all audit issues subsequent to the issuance of audit reports by the Auditor General.

Continuous auditing as IS audit method

The concept of continuous auditing (CA) has been discussed for several years. The concept of continuous auditing has been studied by many researchers for example real time assessment on financial statements (Rezaee *et al*., 2001), investors perceptions of a firm risk (El-Masry and Reck, 2008) and later Majdalawieh *et al*., (2012) studied the integration of continuous auditing within an enterprise system environment.

Rezaee *et al.*, (2001, p. 151) defined CA as a systematic process of gathering electronic audit evidence as a reasonable basis to render an opinion on fair presentation of

financial statements prepared under the paperless, real-time accounting systems. They introduced CA as a concurrent audit technique to be used in extracting evidence as the application systems processing occurs. The emerging of technology has changed the audit approach form traditional manual process to a paperless. Under this consideration, Rezaee *et al.,* (2002, p.160) defined CA as a comprehensive electronic audit process that enable auditors to provide some degree of assurance on continuous information simultaneously with, or shortly after, the disclosure of information. They proposed data warehouses and data marts to be created for separating audit evidence on a real time basis. Data captured by using CA application are held in data marts for testing and analysis. In relation to secured transmission, Onion (2003, cited in Majdalawieh *et al*., 2012, p. 310) proposed keystroke level data examination to monitor the integrity of the data by introducing the Extensible Continuous Auditing Language.

According to ISACA (2011) continuous auditing is a methodology or framework that enables auditors to provide written results on the subject matter. The ability to report on events in a real time or near real time environment can provide significant benefits to the users of audit reports. The main differences between traditional audits and continuous auditing are the shortened time to release reports. Majority of literatures assumed that continuous audits are conducted online, however, it is important to note that continuous auditing may be performed either online or offline subjected to internal or external audit requirements (El- Masry and L. Reck, 2008, p.782)

The most accepted CA definition given by CICA/AICPA research report) CICA/AICPA, (1999 cited in Majdalawieh and Zaghloul, 2009, p. 360) defined that CA is a methodology that enables auditors to provide written assurance on a subject matter using a series of auditor's report issued simultaneously with or a short period of time after the occurrence of events underlying the subject matter. In this context, CA may have to rely on the current technology such as broad bandwidth, web application server technology, web scripting solutions and ubiquitous database management systems with standard connectivity (Sarva, 2006).

Many studies addressing the feasibility of CA to reduce firm risks and increase investor's confidence (El-Masry and Reck, 2008), capability to receive results of the audit procedures almost immediately after their occurrence (Rezaee *et. al.,* (2001, p. 151), capable to test key controls on recurring basis by applying embedded audit modules software e.g ACL (Daigle *et al.,* 2008). In terms of red flag detection, Debreceny *et al*., (2003 cited in Davidson *et al*., 2013, p. 45) suggested that sufficient understanding of business processes and controls risks are required to implement CA systems in order to ensure that appropriate red flags are generated.

As processing systems becomes more complex due to the expansion of business and networks, the security of the system and of the system's internal controls becomes more critical. Therefore, it is crucial for a continuous assessment for accuracy and reliability of the systems and CA allows auditors to examine internal controls structure in a whole, provides capability to perform audit more frequently and offers the ability to expand the scope and magnitude within critical areas of the organisation, ACL (2006, cited in Majdalawieh et al., 2012, p. 307). In this context, Chen (2004, cited in Moorthy *et al.,* 2011, p. 3528) has explored the use of strategic systems approach in CA implementation as it offers continuous monitoring in a real time environment and capable to detect material errors in financial transactions.

CA is also perceived to enhance corporate governance effectiveness (Warren and Parker, 2003 cited in Davidson *et al.,* 2013, p. 45). With the implementation of the Sarbanese-Oxley (SOX) Act2002, many companies are now concern about the adequacy of internal controls over the systems that produced financial information. Vasarhelyi *et*

al.,(2004, cited in Brown *et al.,* 2007,p. 3) claimed that CA and analytic monitoring techniques are capable to support the implementation of SOX (section 404) and Harrison (2005, cited in Brown *et al.,* 2007,p. 3) believed that CA techniques are the only way to achieve compliance requirements of Federal regulations. In regards to SOX implementation, El-Masry and Reck, 2008 confirmed that CA has significant impact on investors' perception of firm risk and the value of a firm. The result of their study confirms that CA has positive impacts on investor's perceptions of firm risk and investor confidence in their investing decisions. In addition to investors' concern, CA is also able to satisfy the external parties of organisation such as suppliers and the customer with real time information (Hao and Zhang, 2010, p.445)

One of the greatest advantages of CA is continuous assessment and the ability to provide frequents report to decision makers (Hunton, *et al.,* 2002 cited in Brown *et al.,* 2007, p.1), timely detection of abnormalities, thus allowing the management to adapt the strategic planning process in order to deal with risks (Ramaswamy & Leavins, 2007 cited in Charlton and Marx, 2009, p. 50) and improve audit quality as CA is able to examine financial and non financial information (Hao and Zhang, 2010, p.445). In addition, utilising CA provides auditors to use advanced network technology and therefore can test larger samples or even complete samples more efficient and effective than traditional audit. Under this consideration, Groomer (2006, cited in Davidson et al., 2013, p. 45) claimed that CA can eliminate statistical inferences.

While, the automation of evidence gathering process enables the auditor to reduce the amount of time and cost in conducting examinations of transactions thus provides sufficient time for auditors to understanding business processes and evaluate internal control structures. In this sense, CA contributes to reduce audit risks (Rezaee *et al.,* 2002, p. 151, Hao and Zhang, 2010,p. 445).Under CA, auditor needs to employ a control risk oriented audit plan which focus on the effectiveness and the sufficiency of internal controls activities, assess inherent and control risks and a detail set of audit tests to be performed (Rezaee *et al.,* 2002, p. 151).

Limitation of continuous auditing

Despite early evidence of CA to improve audit practices by implementing real-time assessment, real-time auditing is not always efficient in terms of cost benefit (Shin *et al*., 2013,p. 596). According to Chan and Vasarhelyi, 2011, p. 154), the level of risk will determine the work of CA, if there is high risk of business processes, then CA is the most effective method. If the level of risks is lower, it will be more effective to conduct regular auditing.

Chan and Vasarhelyi, (2011, p.155) claimed that the implementation of CA needs automation auditing procedures to test automated business processes, however, it is impossible to automate of all traditional audit procedures. Similarly, Shin *et al.,* (2013,p.597) argued that some businesses processes may require manual auditing practices and professional judgment by the auditors.

CA may be implemented by internal and external auditors, therefore there is a tendency for duplication of works. To be effective, Chan and Vasarhelyi (2011, p. 597) suggested that internal auditors focus on supervision and testing a large volume of data and external auditors high dimensional analyses, implement audit trail monitoring in the CA systems and check for fraud among managers.

From continuous auditing to continuous monitoring

According to Alles *et al*., (2006, p.138), continuous monitoring is the subset of continuous auditing known as continuous monitoring of business process controls (CMBPC)

which is most relevant to the Section 404 of the Sarbanese/Oxley Act that require the participation of managers and auditors to ensure the effectiveness and the efficiency of controls over the firm's financial reporting processes. In this sense, Kogan *et al.*, (1999, cited in Alles *et al.*, 2006, p. 138) highlighted the problem of CA implementation, either it is a control oriented or data oriented as there are instances that process controls are not automated or their settings are not readily accessible. In such environment, CA is perceived to be data oriented where it works on automated substantive procedures and analytical procedures, and involve manual procedures for testing controls.

Shin *et al.*, (2013, p. 621), studied the implementation of the CA in the ERP-based environment which involve significant role of CM in enhancing the effectiveness and efficiency of auditing. They argued that CA system implementation can be divided into two stages; 1) extraction of CM scenario and 2) the implementation of risks monitoring systems.

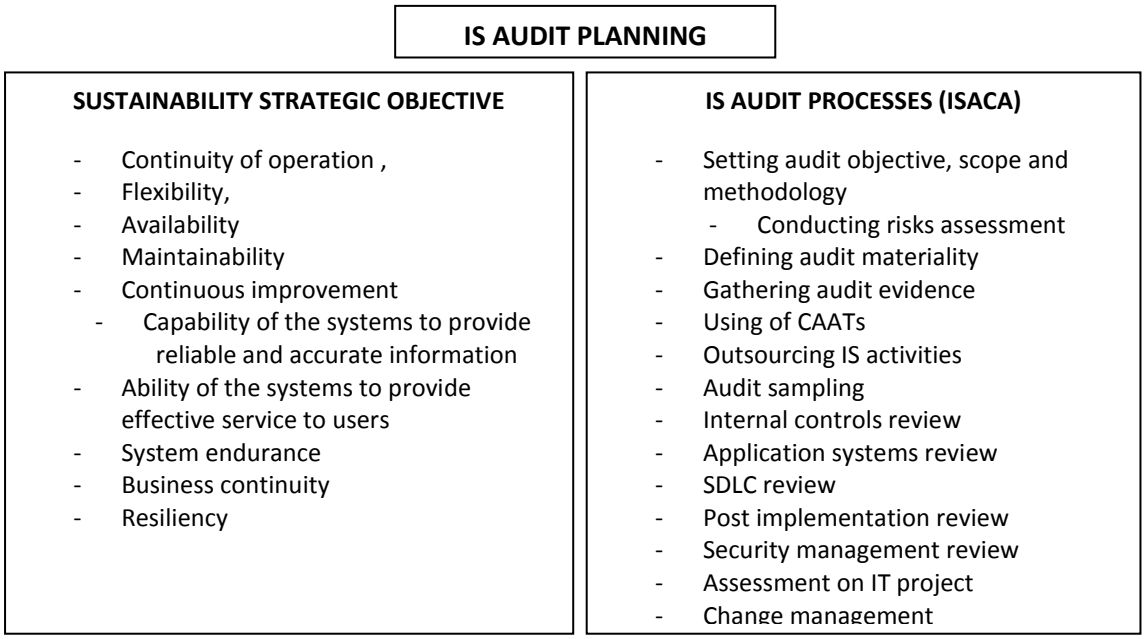
Framework: Integrating CA in the IS audit process

In achieving sustainability values of information systems auditing and using CA as a tools, a systematic and conceptual framework of information systems auditing needs to be established. It is important to consider the element of public sector auditing in developing the framework therefore it was created based on the International Standards of Supreme Audit Institutions (ISSAI, 2007). In light of sustainability developments, this paper includes the concept of sustainability from the information systems perspective in conducting IS audit works. Under this context, the proposed framework is designed based on literatures from continuous auditing, sustainability and auditing related to information systems auditing.The framework contains of three essential factors; audit plan audit execution, audit reporting/follow up. Follow- up audit will be conducted on all audit issues subsequent to the issuance of audit reports.

Basically, the audit processes are divided into 3 phases; 1) audit plan, 2) audit execution and 3) audit reporting/follow up. The audit plan phases start with the determination of audit approaches, either compliance oriented or performance oriented. This identification requires the sustainability mechanism where auditors need to take into account the concept and factors contributing for sustainability development. At the planning phases, the requirements of sustainability mechanisms need to be addressed with the establishment of audit objectives, audit criteria and audit scope, usually it is defined according to decision making level; specifically strategic, tactical and operational.

At the strategic level, it involves top management to formulate audit objectives and identify strategies to accomplish those objectives. In setting audit plan, it comprises several activities such as understanding entity, determining business objectives, understanding the information systems of the entity, understanding the IT projects invested (if any) conducting risk assessment to determine IT risks factors and business risk factors, isolate significant information systems that are supporting the business processes, selection audit topic, establishing audit schedule for conducting fieldwork to the preparation of audit report and lastly conform the plan with management.

The tactical level refers to the implementation of strategic decisions. In this regards, the sustainability initiative is need to be embedded in the audit objectives in terms of structuring work flow, establishing audit criteria, defining audit techniques and procedures, acquisition of resources. The operational level refers to routine activities, decisions and responsibilities in managing resources and delivery services. At planning phase, the IS audit team needs to consider strategic and tactical design for embedding sustainability into the IS audit work.



In addition to common audit practices, sustainable strategic objectives may be developed at the planning phase. Compliance auditing and performance auditing have different audit objectives, however the scope of audit works for both approaches such as risks assessment, assessment on laws, regulations and policies requirements are similar as well as for internal controls evaluations. In this sense, the researcher highlighted audit quality and efficiency in achieving sustainability objectives through CA implementation.

In general, at the audit execution phase, the audit team begins to integrate the sustainability strategic plan in performing the audit works either it will be for compliance audit or performance audit. These activities involve the process of evaluating the effectiveness of controls, reliability of information systems and the integrity of information. These assessments must be aligned and correspond to the audit objectives and audit criteria

Many business processes are dominated by IT/IS applications, therefore CA is able to provide timely, reliable information, capable to reduce audit cycle thus results in cost savings and promote positive social impacts. In this regards, CA is perceived as a technical solution to address the needs of sustainability in information systems auditing. The features of CA The integration of sustainability into the audit works may be accomplished through a continuous auditing approach cum continuous monitoring, in which features CA actually tied to sustainability goals and targets.

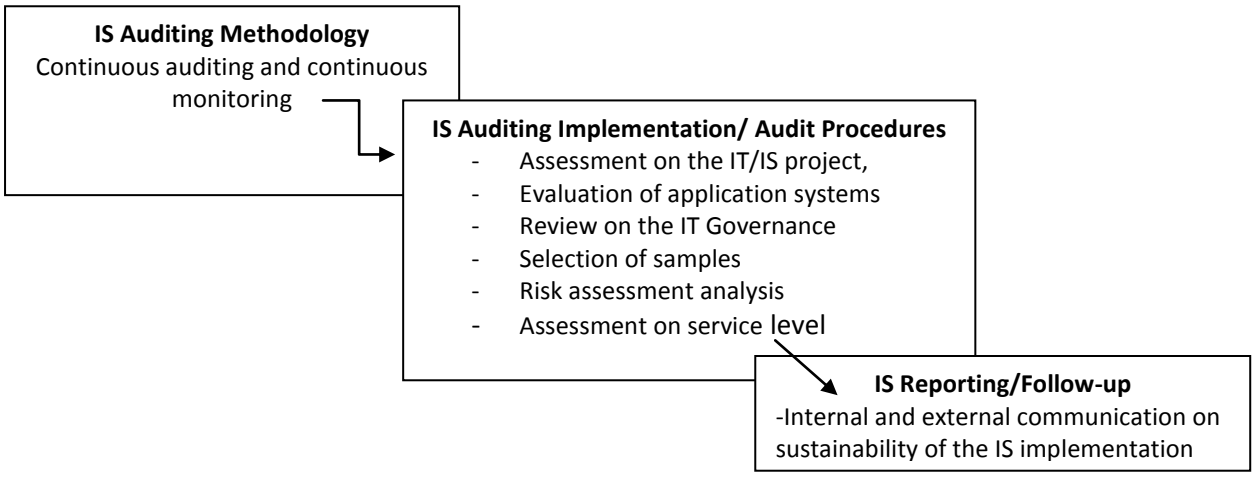


Figure 2: is audit execution and reporting phase

The final stage of the sustainability integration into IS auditing process are follow up activities. The purpose of follow up is to ensure the implementation of sustainability into IS projects or application system development or IT Governance is satisfactory.

Figure 3: Use of the CA/CM concept in defining and generating IS audit questions based on the sustainability objectives

(FOR COMPLIANCE AUDIT)

IS Procedures

Personnel activated the application systems and input data	The application systems process transactions/ input	The application systems reconcile transactions/input	The application systems generates output

Audit objective	To ensure appropriate controls are in place for input, process and output.
Sustainability strategic objective	To ensure the continuity of IS operations
CA objective	Transactions are generated timely and accurately.
Potential CA methods: Audit hooks, Continuous and intermittent simulation (CIS)	

Figure 3: procedures flow diagrams by using ca/cm

(FOR PERFORMANCE AUDIT)

IS Procedures

The establishment of audit objectives for IS project: economy, efficiency andeffectiveness	Implementation of the IS project.	The assessment of the 3e by auditors: economy, efficiency and effectiveness

Audit objective	To ensure the IS project implementation are value for money
Sustainability strategic objective	The IS project are planned and implemented according to 5 dimensions-financial, social, institutional, technological and environmental.
CA objective	Continuous monitoring on the internal controls and the implementation of projects.
Potential CA methods: Continuous monitoring - Shin *et al.* (2013)	

Figure 4 : procedures flow diagrams by using ca/cm

Implication of study for the audit profession

From the discussion and analysis, CA is an appropriate audit method in performing compliance audit and performance audit works. From the compliance audit perspective, CA is capable to detect unauthorised activity, reduce errors and produce timely report. In conjunction to sustainability requirement, CA has a technology that provides opportunity for the auditors to examine the ability of the system to provide service to users, the capability of the systems to provide accurate and reliable information to users and stakeholders and resiliency of the systems.

From the performance audit viewpoint, CA allows manual procedures that require professional judgment by the auditor for example the evaluation of management estimates, (Chan and Vasarhelyi, 2011, p. 155). Performance audit objective is to assess whether the government's activities/programmes/projects have been carried out in effective, efficient and economy manner to achieve their desired objectives. In relation to sustainability strategic objective, previous literatures has identified five (5) dimensions that need to be considered in planning and implementing ICT projects; namely financial, social, institutional, technological and environmental. Under this context, the continuous auditing cum continuous monitoring procedures provides the opportunity for auditors to fulfil the sustainability requirements such

as reducing the potential of IS project failure, cost overrun and project delayed. The adoption of CA and its techniques could enhance audit works by providing objective information to public.

Conclusion

This study has attempted to explore the use of CA techniques to provide advantage for IS auditing implementation. As sustainability is becoming important issue in many organisations, the integration of sustainability to IS audit work is crucial to produce reliable and objective report to public. The application of CA to achieve sustainability strategic objective in IS auditing is perceived to have advantage to auditors and have great impacts upon the process of IS auditing, implementing audit procedures and audit assurance as a whole.

The current study has provided a brief views from the initial investigation. Further studies are necessary to explore how important of sustainability dimension in information systems evaluation and how views and perceptions expressed in applying CA as part of audit methods in compliance and performance auditing.

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