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The use of CAATTs in tax audits—lessons from some international practices

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Abstract

This article presents a comparative study of the state-of-the-art computer-assisted audit tools and techniques (CAATTs) regulation and practice in five countries (Australia, Finland, Germany, Indonesia, and the US), in an effort to progress the use of CAATTs in supporting effective tax audits. For practitioners, the findings suggest several ways to improve the use of CAATTs. On the theoretical side, we found that not all types of CAATTs are equal in effectively achieving tax audit goals. Data extraction and analysis techniques, also known as generalised audit software, are by far the most prevalent and relevant ones for tax audits. In certain cases, several tax authorities were determined to streamline the use of CAATTs by requesting taxpayers to provide a standardised file format for tax audit purposes. There was also a case when a tax authority had attempted to implement continuous auditing techniques while paying attention to the running of taxpayers' business. The exploratory findings from this study may become a source of reference about CAATTs for tax authorities, taxpayers, and tax agents/advisers.

Keywords: audit, comparative, computer, tax, techniques, tools

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1. INTRODUCTION

It is within a country's tax authorities' power to determine whether a taxpayer has fulfilled their tax obligations in accordance with the provisions of the applicable law. Tax auditors will provide their recommendations on the compliance level of the audited taxpayer following consideration of evidence collected from either the taxpayer or related parties. Rapid advances of information technology in business have made digital trails dominate the form of evidence in tax audits. Consequently, tax auditors will need to deal with electronic data as the output of the computer-based information systems and incorporate them as evidence in tax audits.

The computer audit field addresses the role of the computer from two perspectives; as a subject of assurance (the audit object) and an audit tool (deBoer et al., 2014). Auditing in a broader sense (including, but not limited to, financial, compliance, operational, human resources, and information systems audits) has embraced computer assisted audit tools and techniques (CAATTs), which is defined as a set of audit techniques based on computer functions aimed to improve the efficiency of an audit in all phases: from planning and implementation to reporting of the audit (Braun & Davis, 2003; Coderre, 1998; deBoer et al., 2014; Debreceeny et al., 2005; Flowerday et al., 2006; Hunton et al., 2004; Pathak, 2005; Pedrosa & Costa, 2014). The significant roles of CAATTs have also attracted some audit standards setting bodies to incorporate this tool into their standards (Debreceeny et al., 2005; Widuri, 2014). Recently, IAASB (2013,p. 40) has also observed sensitivity to the various aspects pertaining to audit evidence generated from the application of advanced techniques in data analysis, including the effects on the risk assessment and response made by auditors, the objectives and schedule of other audit procedures and the auditors' capacity to acquire the proper audit evidence. This observation shows that regardless of the type of assurance services rendered, auditors would benefit from familiarity with CATTs (Byrnes et al., 2012; Darono, 2015).

The conduct of audits has largely benefited from the use and development of CAATTs. Most tax administrations around the world have adopted CAATTs as part of their mandatory tax audit procedures, with slight variations between each jurisdiction. The variations can be classified from a number of different perspectives: the underlying legal foundations, use protocols, and actors (Darono 2015; Ernst & Young, 2014; FTA, 2006; IOTA 2010; Nevelsteen & Frenckell, 2014; OBG, 2014). The variations include the use of the term CAATTs in tax audits. The academic literature and several practitioners refer to CAATTs as 'tax e-audit' (for example, Ernst & Young, 2014; Nevelsteen & Frenckell, 2014; OECD, 2010), 'computer assisted audit program' (for example, DOR [no date]) or 'EDP Audit' (for example, IOTA 2010), or 'data analysis technology' (deBoer et al., 2014; Lambrecht et al., 2011). According to Shue (2006), the OECD has also taken a step further in facilitating the use of CAATTs in tax audits (tax e-audit) through the commissioning of a task group which develops guidelines that allow the taxpayers' accounting system relatively easily to produce audit evidences in an electronic data format. The resulting recommendation by the task group is known as Standard Audit File for Tax (SAFT).

However very little research has been conducted on the use of CAATs in tax audits in comparison to research on the use of CAATTs in non-tax audits (for example, the commercial sector). A number of scholars (for example Coderre, 1998; deBoer et al., 2014; Janvrin et al., 2009; Lambrecht et al., 2011; Moeller, 2009; Pedrosa & Costa,

2014; Widuri, 2014) have taken up the issue by suggesting the details on the role, relative position, and innovations around the use of CAATTs in audits of the commercial sector. However, tax practitioners seem to be ‘reasonably content’ with utilising this body of literature (articles, cases and research reports) without taking a more active role in promoting the need for research on CAATTs in tax audits. In this paper, we argue that the tax audit field needs to break this tradition by initially taking up the comparative tax research tradition suggested by Garbarino (2009). To the best of our knowledge, this has not been attempted before and is necessary for building cumulative understandings in the tax audit field. The literature on CAATTs in tax audits is predominantly focused on technical how-to guidelines issued by several research institutions and private consulting firms (for example, Ernst & Young, 2014; IOTA 2010; OECD 2010). From a methodology perspective, most of this body of literature is descriptive in nature (for example, Nevelsteen & Frenckell, 2014). In the educational settings, Boritz and Datardina (2007) paid little attention to CAATTs in comparison to other topics in their academic classes.

The IOTA (2010) compared the use of CAATTs among its country members. The comparisons included business process mapping and evaluation of internal auditing, coordination with developers of accounting and e-audit software, and use of taxpayers’ data from either internal audits or audits carried out by chartered accountants. To this end, this article aims to supplement the work of IOTA by exploring a few aspects that have not been discussed, for example, the presence of continuous auditing techniques or digital forensics, and expanding the comparative cases of CAATTs use in countries outside of IOTA memberships.

Based on the above, this paper aims to reveal how CAATTs has been utilised by tax administrations in tax audits. It achieves this goal through a comparative study on the use of CAATTs within a number of tax jurisdictions. Using comparative institutional analysis (Cole, 2013; Garbarino, 2009), this study seeks to reveal how CAATTs institutional practices may differ from one tax administration to another. The study is expected to contribute to the larger body of knowledge about CAATTs in the auditing field. Methodology-wise, this study presents a comparative research approach that is built upon interpretive data analysis combined with our accumulated experience in the fields of tax audit, information technology, and CAATTs.

This paper is structured as follows: introduction, research design then the contextual and analytical foundations of the study are presented. Next, the findings of the comparative study are discussed. The paper concludes by outlining the contribution of the study and suggestions for future research.

2. RESEARCH DESIGN

Creswell (2009, p. 22) defines research design as a plan of action and procedure in research that comprises the worldview and detailed techniques for collecting and analysing data. It specifically includes ‘(1) informing this decision should be the worldview assumptions the researcher brings to the study; (2) procedures of inquiry (called strategies); (3) specific methods of data collection, analysis, and interpretation’. This study is qualitative-interpretive in which the researchers construct social reality and offer their interpretation of the reality based on their knowledge, experience, and contextual information that presents to them. The case study method used in this research enables us to thoroughly explore the events,

programs, activities, and processes of an individual and a group of individuals in their natural settings. A case study is bound by time and activities which define the scope of the research (Bhattacharya, 2008; Creswell, 2009; Yin, 2009).

According to Creswell (2009), research design is also concerned with methods; the means through which data is collected and analysed to construct an interpretation of the object of study. In this study, the data was sourced from documentary materials around the implementation of CAATTs issued by each of the tax authorities as well as published by consulting firms, research institutions and media releases. Bowen (2009) defines document analysis as a systematic procedure for examining electronic and print documents to reveal empirical research findings.

More specifically, the study used comparative institutional analysis (hereinafter 'CIA') as a frame of reference in collecting, transforming, analysing, and interpreting the data. Referring to Bowen (2009), document analysis can be part of (or incorporated with) other types of data analysis techniques. In this regard, we combined document analysis and CIA. CIA is one method available for comparative tax research. It uses a technique that combines tax problem, tax model, and tax mechanism; a pattern suggested by Garbarino (2009). The relationship between the three as a data analysis technique is determined by combining them with the core elements of CIA as follows:

1. determining the tax problem, in which case how the use of CAATTs influence tax audits
2. determining the tax model, which is the amount of available institutional choices with regards to tools and audit techniques including regulations surrounding CAATTs
3. determining the tax mechanism, which refers to the working rules or the selected institution for exchange. In this regard, it transpires in how the tax authority eventually determine the tax audit procedures which should use CAATTs.

Detailed explanations on CIA are presented in Section 4.

This study follows the analytical framework in Debreceeny et al. (2005) which uses qualitative methods to examine the extent to which generalised audit software has been utilised in banking sectors. The paper begins with a description on the sequential steps of conducting CIA for the purpose of comparative tax research (Garbarino, 2009). The detailed steps are important to illustrate the trilogy of tax problem, tax model, and tax mechanism in relation to the deployment of CIA. This will also be a critical contribution for other comparative tax research in this area.

Firstly, the context of CAATTs used in the case study is explicated which comprises tax authorities in five countries: Australia, Finland, Indonesia, Germany, and the US. The choice of these countries is based on availability of data to the researchers and also aimed to increase the transferability of findings from the present study. Transferability implies that certain elements and experiences of a study can be related, transferred, and applied in other similar settings. The similarity of research and implementation settings allows the reader to transfer the findings from another study into the new context (Barnes et al., 2012). The explication of the study context is an attempt to situate the tax problem into the exchange arena. As a qualitative study, we

strive for transferability instead of statistical generalisation of the findings (Bhattacharya, 2008; Brown, 2015; Maxwell & Chmiel, 2014; Yin, 2009).

Secondly, the tax model and the choice of available tax institutions are reviewed. CAATTs, as a form of IT applications, can be viewed as a manifestation of institutional choice (Avgerou, 2000) which constitutes part of tax audits. Finally, the last step explores the selected tax mechanism by each tax administration based on the tax problem it encounters and the choices of tax models available. Based on the aforementioned steps, we offer our interpretation, conclusion and recommendations of the findings.

3. AUDIT IN TAX ADMINISTRATION: CONTEXT OF THE CASE

Tax administration has the authority to determine the amount of tax payable regardless of the tax regimes followed: self-assessment, official assessment, or withholding. It will then need to determine the amount of tax in question. Audits are one of the most prevalent ways to obtain that amount. Tax audits are concerned with collecting and transforming evidence from multiple sources in order to conclude whether the audited taxpayer has complied with the law. If the taxpayer were found to be non-compliant, relevant penalties shall be given. In other words, tax audits hold a central role in the enforcement of tax laws. Table 1 shows a summary of tax audit practices used by a number of tax authorities (PwC, 2015). The PwC document consists of key tax regulations in the countries in which they are operating. For the purpose of this study, only the five countries pertinent to the study are considered.

Table 1: Summary of the relative position of audits in tax administration

Tax authority	Description
Australia	The Australian tax system for corporations is based on self-assessment; however, the Australian Tax Office (ATO) undertakes ongoing compliance activity to ensure corporations are meeting their tax obligations. The ATO takes a risk-based approach to compliance and audit activities, with efforts generally focused on taxpayers with a higher likelihood of non-compliance and/or higher consequences (generally in dollar terms) of non-compliance. Compliance activities take various forms, including general risk reviews, questionnaires, reviews of specific issues, and audits.
Finland	Tax audits are performed at irregular intervals by tax auditors, who are entitled to examine the accounts of a company and to request additional information necessary to the examination. Generally, the taxpayer receives advance notice of an audit from the tax authorities.
Germany	Germany relies heavily on tax audits as a means of ensuring taxpayer discipline. Audits of small businesses are carried out at random, although those for larger operations and for the local subsidiaries of foreign groups tend to be regular. With some district variations, audits are usually conducted at four to five yearly intervals, though not always with equal intensity for the entire period since the auditors' previous review.
Indonesia	Indonesia uses a self-assessment system under which taxpayers are trusted to calculate, pay and report their own taxes in accordance with prevailing tax laws and regulations. However, the Directorate General of Taxes (DGT) may issue tax assessment letters to a particular taxpayer if it finds that, based on a tax audit or on other information, the taxpayer has not fully paid all tax liabilities. A tax assessment letter may also be

Tax authority	Description
	issued by the DGT to a taxpayer who ignores a warning letter to file a tax return within a specified period. A tax refund request will always trigger a tax audit. Due to the requirement for the DGT to decide on a refund request within 12 months, a tax audit will typically begin within a few weeks to several months from the refund request date
US	Generally, the US tax system is based on self-assessment; however, many large and medium-sized businesses are under continuous audit by the Internal Revenue Service (IRS) and state tax authorities. The audits may include the entire list of taxes for which the business is liable. Smaller business and persons with lower incomes are generally subject to audit on a random basis

Source: PwC (2015)

From Table 1, it can be concluded that tax audits are vehicles for the tax authorities to re-assess the amount of tax payable. This highlights the importance of gathering evidence during an audit and dealing with the inevitable presence of electronic data. In relation to handling electronic data, the tax problem framework (Garbarino, 2009) is most relevant in this situation. The tax problem approach views a situation as a comparative problem to be solved. An analytical framework will be found that can be used to solve a similar problem in the future. In the following section, a description of tax model from Garbarino's comparative tax framework (2009) is presented. In particular, the benefits of the use of CAATTs for tax audits are discussed.

4. CAATTs AS AN INSTITUTION: THE MODEL

Tax audits are an element of tax administration that takes part in the creation of social welfare. They are constructed social realities that could be hindered by social dilemmas (Cole, 2013). To reduce and minimise the dilemmas, relevant actors within tax audits need to decide which institutions are most suitable to act as the 'action arena' (Ostrom, as cited in Cole, 2013) or 'the game being played' (Aoki, 2001). In the literature, there has been a variety of understanding about the structure and relative position of institutions. They differ in the way that they are used in an analytical framework to solve real-world social problems. Thus, we will outline the definition of institutions that is used in this comparative tax research on CAATTs.

Institutions are boundaries created by humans that allow for social, economic and political interactions. The boundaries can be formal (constitution, law, property rights) or informational (traditions, agreements, norms and etiquettes). Institutions exist to facilitate order and reduce uncertainty in humans' lives (North, 1991), or reduce the associated transaction costs (Richter, 2015, p.11). Institutions can be defined as regulations used to specify the quality of the person in charge of making decisions in some spheres, the types of permitted and restricted actions, the rules to be applied, the procedures to follow, the types of information to be provided or to be kept, and the rewards for each person based on their contributions (Ostrom, as cited in Cole, 2013, pp. 109). Regulations determine what actions are prohibited, permitted, or required, and consist of rules which are effectively in place when each individual decides what to do. Komesar, cited in Cole (2013), defines institutions as an alternative mechanism for actors to achieve their goals in the form of markets, communities, political process, and courts. Understanding the different meanings of institutions is important to denote the operational definition of which actors will apply in terms of using CIA as a framework (Cole, 2013).

In response to the variety of institutional roles and positions, Williamson (1998) suggests four levels of social analysis to differentiate institutional roles and positions based on the level of durability and maturity. These four levels distinguish one form of institution from another in which the lower level assumes less maturity than the higher level. The four levels of analysis are:

1. social embeddedness level; the level in which norms, customs, mores, and traditions are located
2. institutional environment as a product of politics that provide the rules of the game within which economic activity is organised. The polity, judiciary, and bureaucracy of governments are located here
3. institutions of governance, which are concerned with the play of the game,
4. resource allocation and employment.

In this study, changes in audit techniques (level 4) are easily comparable to changes in tax assessment system (levels 2 and 3).

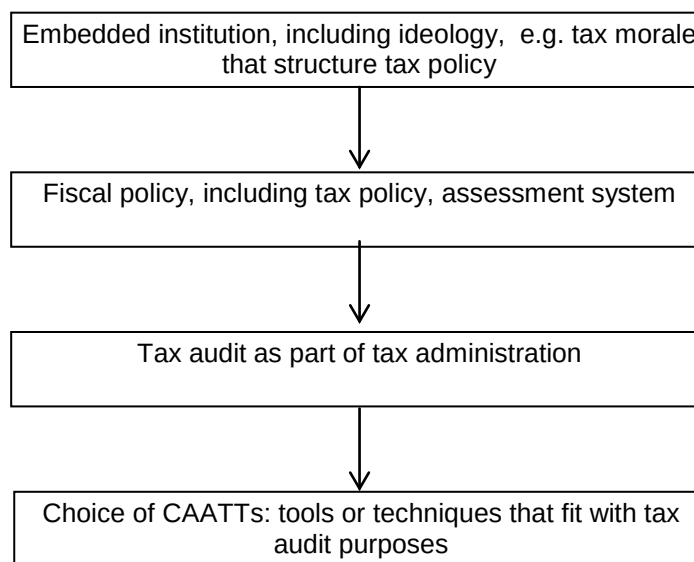
Institutional analysis is principally concerned with selecting the appropriate institution to accomplish the game being played (Aoki, 2001; Garbarino, 2009). Williamson (1998) denotes this as the 'rules of the game' and the 'play of the game'. Ostrom, in contrast, labels these as 'prescription' and 'working' rules (as cited in Cole, 2013). There are a multitude of schools of thought within institutional analysis which result in the proliferation of analytical techniques within each of the different traditions. To name a few, institutional pressure and isomorphism, institutional logics, institutional arrangements, and institutional entrepreneurship are amongst the more popular techniques. They highlight certain viewpoints in examining how a social situation can be explained or predicted using the many different features from each of the analytical lenses available (Darono & Panggabean, 2015; Richter, 2015; Wahid & Sein, 2013).

CIA is not a 'comparative analysis of institutions'. It does not aim to differentiate between one institutional feature and another. CIA techniques emphasise how an institution works to achieve social welfare (Cole, 2013). The understanding is derived from the multiple definitions and shapes of institutions. Cole (2013) denotes 15 definitions of institutions from a variety of disciplines. Consequently, institutional analysis (including CIA) will be influenced by the operational definition of institutions. (Cole, 2013). CIA functions to understand why an institution fails to become a social interaction medium and why it instead causes social-cost problems or social dilemmas. For example, if the market as an institution fails to become a socio-economic interaction medium, would that imply total replacement by the country? Furthermore, what would happen if the country as an institution also fails? What sort of replacement will be needed? CIA provides a framework to conduct such analyses with the view of facilitating institutions to perform as expected.

An institutional perspective of a social situation is needed to resolve social interaction problems (human relationships within a society). This includes social interactions that comprise completing tax obligations of an individual within the broader society. According to Garbarino (2009), society needs fiscal institutions that include regulations and procedures that facilitate effective tax administration (as a social interaction). Following the above propositions, the use of CAATTs for tax audits is a

form of fiscal institution. Tax audits and CAATTs are both the selected institutions to realise the expected social interactions, that is, tax compliance. Building upon Williamson (1998), CAATTs can be positioned as a configuration shown in Figure 1. CAATTs in this setting are situated within levels 3 and 4 which afford a discussion on institutional choices and the most relevant mechanism options available to the environment.

Figure 1: Choice of CAATTs and tax administration in four levels of social analysis—adapted from Williamson (1998)



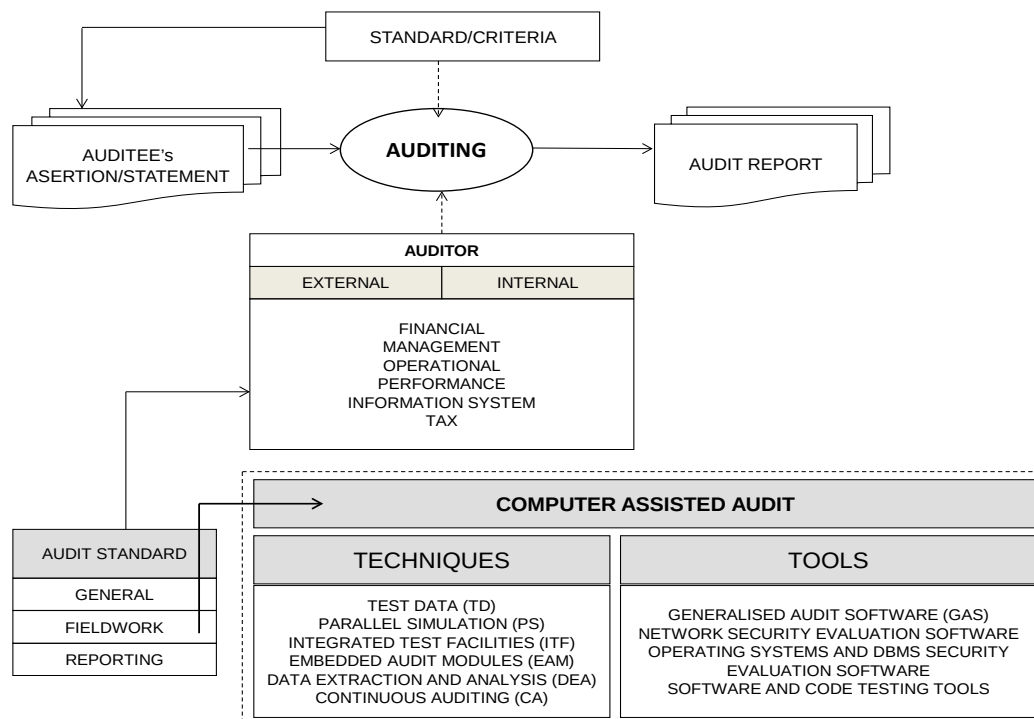
From a conceptual and practical perspective, CAATTs use in audits is a response to the ubiquity of enterprise information systems which produce digital audit trails. Such a response manifests in the handling of digital audit trails from data test techniques to continuous auditing. Hardware-wise, CAATTs can take place in the form of spreadsheet or decision support systems. The following section will elaborate on the practices of CAATTs from an institutional perspective in light of eliciting the features of CAATTs relevant for comparative tax research.

In a more practical context, adopting a CAATTs vision for effective handling of digital audit trails is not so easy. Using Indonesian public accounting firms as a setting, Widuri (2014) concludes that CAATTs (that is, generalised audit software) has yet to be fully embraced although the professional body of auditing practices has mandated such techniques to be used. Darono (2009) reveals the need for adequate legal support that outline the audit protocols for CAATTs and the inception of a special unit dealing with CAATTs in tax authorities. Likewise, attempts to increase the comprehensiveness and dynamics of continuous auditing techniques should continue to be prioritised in relation with advanced use of CAATTs (Kiesow et al., 2015; Kiesow et al., 2014). Coderre (2005) suggests a practical and conceptual framework to implement continuous auditing. Similar initiatives have been underway by the Indonesian Supreme Audit Board which promotes ‘e-audit’ to indicate continuous online audit techniques across its auditees. In this type of e-audits the data centres of the auditors and auditees remain connected (Darono, 2015).

Coderre (1998) states that CAATTs are a mechanism that enables auditors to examine data and information interactively and react timely on an audit finding by changing and improving the audit approaches. CAATTs increase the effectiveness and efficiency of audit procedures in obtaining and evaluating audit evidences. This is facilitated by way of (1) examining more transactions in a shorter period of time at a fraction of a cost of the manual procedures; (2) enabling more reliable substantive tests through the use of supplementary audit procedures, hence increasing the level of confidence of the auditors.

However, CAATTs seem to be confused with other terms in the literature. Misconceptions occur when generalised audit software/GAS (as a tool) is interpreted the same as data extraction and analysis/DEA (as a technique) or make GAS and DEA equivalent to CAATTs (deBoer et al., 2014; Lambrecht et al., 2011; Widuri, 2014) or even equating DEA/GAS/CAATTs with information systems audit. To clarify this, Darono (2015) suggests a scheme to depict the relationship between tools and techniques in CAATTs. From Figure 2, it can be seen that regardless of the audit types and the auditors, CAATTs can be used in accordance with the variety of tools and techniques available.

Figure 2: CAATTs in audit—adapted from Darono (2015)



The term 'tools' in CAATTs include multiple forms from spreadsheets and database management systems to expert systems. Meanwhile, the term 'techniques' can include data filter procedures which are then matched with certain criteria, and the use of artificial intelligence tools as a way to predict financial failure or financial statement structures. Sayana (2003) classifies CAATTs hardware into four major categories: (1) data analytics software; (2) network security evaluation software; (3) operating systems and database management systems evaluation software; (4) code

testing software. Newer schemes of categorisation are suggested by Pedrosa and Costa (2014) which include: big data analytics, cloud analytics, and security and privacy tools.

Weber (2001) categorises audit approaches into two main strands: audit through the computer and audit around the computer. Cerullo and Cerullo (2003) add an audit approach known as ‘audit with the computer’. Audit with the computer is, in essence, an audit using GAS (Byrnes et al., 2012). Coderre (1998) further suggests a classification scheme between ‘system approach’ and ‘data approach’. System approach is a procedure to test data by examining the system flow and control in order to assess reliability of the data. On the contrary, data approach is focused on testing of the data with less attention on how the system produces the data. Hunton et al. (2004) label system approach as ‘application controls test’ and data approach as ‘data integrity test’.

ISACA (2010) denotes that CAATs can be used for a range of audit procedures such as balance and transaction details testing, testing of general and application controls, or penetration testing. Following Hall (2001), Cerullo and Cerullo (2003), Braun and Davis (2003), Hunton et. al (1998), as well as Coderre (2005), testing techniques can be divided into:

1. test data (TD)
2. parallel simulation (PS)
3. integrated test facilities (ITF)
4. embedded audit module (EAM)
5. generalised audit software (GAS)
6. continuous audit techniques (CAT).

The professional judgment of the auditors will determine when the above techniques are to be used. Darono (2010) suggests a summary of relationships between the goals and types of audit testing. For instance, if an auditor is to compare aggregated data with the transaction details of the data, then s/he can use professional judgment to select from the range of available techniques shown in Table 2.

Table 2: Type of audit and its CAATTs form of tests

Reference	Type of audit tests	Form of tests
Hall (2001); Braun & Davis (2003)	Application control	TD, PS, ITF
	Substantive test	EAM, GAS
	Direct test to internal application logic	TD, PS, ITF, EAM
	Indirect test to internal application logic	GAS
Hunton et. al (2004)	Application control	TD, PS, ITF
	Data integrity test	GAS, CAT
Coderre (1998)	System approach	TD, PS, ITF

Reference	Type of audit tests	Form of tests
	Data approach	GAS, EAM
Cerullo & Cerullo (2003)	Application control	TD, PS, ITF, EAM

Source: adapted from Darono (2009)

Further development of CAATTs shows a possibility of changes in CAATTs use in the future. DeBoer et al. (2014) suggest a reengineering concept of CAATTs in financial audits by giving weight to audits on process mining, metadata and big data. Kiesow et al. (2014) take a similar position in this regard. From late 1990s, continuous audits have also been very popular due to the pervasive use of enterprise information systems (Byrnes et al., 2012; Coderre, 2005; Flowerday et al., 2006;; Pedrosa & Costa, 2014). Pedrosa and Costa (2014) conclude from their surveys that financial audits are mostly dominated with the use of GAS and DEA. They suspect that the overall landscape of CAATTs will change along with the rise of data mining, big data, analytics, text mining, controls related to bring your own device (BYOD), and cloud auditing.

To sum up, this section has presented the key features of CAATTs and their recent developments which will be compared using an institutional analytical framework with respect to tax audits. The next section will describe how tax audits can benefit from CAATTs by means of comparison between different institutional mechanisms.

5. INSTITUTIONAL COMPARATIVE FOR USE OF CAATTs: THE MECHANISM

The section will begin with a description of CAATTs used for tax audits in the aforementioned five countries. We will then submit a comparative analysis using the framework of North (1991) and Williamson (1998): examining institutions within their socio-organisational constellations, then deciding which institution has the lowest transaction cost, or finding a new equilibria from the game being played (Aoki, 2001). Transaction cost is nothing new in tax administration. Within the tax field, it is commonly referred to as compliance cost. It is costs incurred by taxpayers in complying (or sometimes not complying) with their tax obligations (Evans et al., 2013; Tran-Nam et al., 2000).

The notion of CAATTs emphasises the use of techniques or devices irrespective of the actors. They can be the auditors themselves or any other parties, for example, IT experts from database administrators to data communication specialists, from whom the auditors ask for assistance. Consequently, the tax auditors must equip themselves with a variety of tools and techniques should they use CAATTs on their own. Another option is through the inception of a special unit which provides assistance to the auditors. Within the perspective of comparative institutional analysis, this poses a choice for the organisation to determine which option has the lowest transaction cost (North, 1991; Williamson, 1998) or to find a new-equilibria (Aoki, 2001).

The options available to minimize transaction costs in the context of the tax audit CAATs is coupled with the results of the OECD study on SAFT (Standard Audit File for Tax). This SAFT file format allows for a standardised data format that reduces uncertainty and increase compatibility of data files. It is important to note that the

introduction of SAFT will place a burden on taxpayers in their efforts to meet the requirement of the standardised data format.

Based on the above, the authors propose some important criteria to compare how those tax authorities apply CAATTs in their tax audit. The criteria are useful to help tax practitioners identify which CAATTs to use that will fit the overall audit context, for example, how taxpayers must prepare documentation of system that they use or what techniques should be used by tax auditors if examining a taxpayer who uses a particular accounting information system. The following are key comparative criteria of CAATTs in tax audits that we examined:

1. terms used: his to delineate the extent of agreement in labelling similar practices of CAATTs utilization in the five countries
2. tools used to perform CAATTs: to determine techniques deployed in analysing gathered data
3. data standards imposed on taxpayers to meet the requirements
4. a dedicated CAATTs unit to assist tax auditors.

Table 3 displays the four categories of CAATTs use. In Table 3, we compared ‘the mechanism’ with CAATTs (‘the model’) and effective tax audits (‘the problem’) in one instance. Nevertheless, there are a number of things that remain to be addressed:

1. The lack of attention to SAFT. If seen as a form of institution, SAFT does not seem to offer lower total transaction costs. It only shifts the cost from tax auditors to taxpayers. The tax authorities seem to consider that transaction cost from using SAFT is much higher than the cost of increasing the capacity of tax auditors in dealing with multiple data formats or a dedicated CAATTs unit has lower transaction cost than having SAFT in place.
2. SAFT was formulated to make it easier and faster for auditors to carry out the audit as all the required data is available in an accessible and processable format. However, a further question to ask is whether the auditors will still need other (accounting) data in addition to the ones available in SAFT forms.
3. The dominance of DEA techniques through GAS. This brings the question of the positioning of other audit techniques in a tax audit. Continuous auditing techniques have been regarded as ‘killer apps’ to the auditing profession. As was found in Finland’s case (Vero Skatt, 2010), the tax authority was very careful in maintaining relationships with taxpayers that tax audits (and the use of audit techniques within them) were not to interfere with the taxpayers’ running of their businesses:

It is less disruptive to business. —Electronic audits permit tax auditors to work at the tax office most of the time. Computer-assisted tax audit techniques reduce on-site audit time. In this way, there is minimal interference with the normal business of your company.

This means that the use of continuous auditing as a type of CAATTs applications for tax audits may be considered to complement the DEA

techniques so long as the implementation does not temper the taxpayers' running of business while being audited.

4. The relative position of digital forensics in the landscape of CAATTs use in tax audits. Tax audits have the potential to reveal fraud. This would require further treatment in the form of investigative audits. Questions remain on how the transition from CAATTs use in tax audits can be facilitated productively towards investigative audits. The former emphasises the form of electronic audit evidence while the latter is concerned with constructing electronic evidence for the court.
5. Following Aoki (2001), there existed a new-equilibria. This was related to the presence of a special unit which deals with CAATTs (that is,. e-tax auditor). The unit catered for tax audit purposes through standardisation of file formats. It also contributed to digital forensic activities. The audited taxpayers were required to render a standardised file format to assist with the work of the tax auditors without necessarily involving e-tax auditors. E-tax auditors will have time to focus more on the specific audit skills such as digital forensics. The area of digital forensics is one that, in our view, requires more attention for the tax administration than the standard e-tax audit skills.

Table 2: Comparing the main features of CAATTs in tax audits

Tax authority	Features of CAATTs				
	Term used	Tools	Techniques	Data standard	Dedicated CAATTs unit
Australia	Computer assisted verification (CAV), Computer-Assisted Tax Audit (CATA) or e-audit	GAS	DEA with Caseware IDEA	Not specifically described	CATA-team to help case officers
	<u>Additional information:</u> • ‘[c]onduct a series of tests on your data to ensure you comply with the tax law. Tests are conducted in accordance with the nature of the compliance activity being undertaken. CAV software will read the electronic information provided but does not allow any changes to be made to the data you have supplied’.³ • ‘Accessing electronic information should be considered, including what assistance is required and what information should be accessed—the Computer-Assisted Tax Audit (CATA) team can help case officers with the gathering, accessing and analysing of electronically-held information’.⁴ • ‘E-audit involves the collection of electronic data from taxpayers which, through the use of Data Analysis software, can be read, displayed, analysed, sampled and reported on. This is known as Data Analysis’.⁵				
Finland	CATA techniques, electronic auditing is computer-assisted auditing that uses electronic records to complete all or part of the tax audit	GAS	DEA but the software used is not specifically described	Accounting transactions and additional files (see additional information below)	Not specifically described
	<u>Additional information:</u> • The files should consist of fixed-length consecutive strings and be free of software-specific characters (and they should not be backup files). • Accounting transactions and additional files such as charts of accounts and lists of cost centres should be delivered to us on a physical data medium, which is usually a CD or DVD. • The following technical information is mandatory: encoding (ASCII; EBCDIC), existence of zipped/compressed data elements (please				

³ Australian Taxation Office (ATO), *Computer assisted verification for businesses* (17 August 2016) <<https://www.ato.gov.au/General/Building-confidence/In-detail/Computer-assisted-verification-fact-sheet-for-businesses/>>.

⁴ <https://www.ato.gov.au/Business/Large-business/In-detail/Key-products-and-resources/Large-business-active-compliance-manual---income-tax/?page=44#3_9_Issues_to_consider>.

⁵ ATO, *Public and private groups (indirect tax) compliance risk manual—chapter 3* (18 September 2014) <[https://www.ato.gov.au/Business/Bus/Public-and-Private-Groups-\(Indirect-Tax\)-Compliance-risk-manual---Chapter-3/](https://www.ato.gov.au/Business/Bus/Public-and-Private-Groups-(Indirect-Tax)-Compliance-risk-manual---Chapter-3/)>.

	unzip/uncompress), number of records, length of records. • If company cannot deliver accounting system files where transactions are primarily recorded, tax auditors alternatively utilise reporting files or list files. Accounting systems create reporting files and transaction lists associated with the general ledger and journal, accounts receivable and accounts payable. ⁶				
Germany	Not specifically described	Direct access (Z1): Auditor has the right to independently access the taxpayer's computer systems which contain tax-relevant data by using a user role that has been set up for the auditor. The taxpayer has to provide the hardware and software so that the auditor can inspect the data and evaluate it automatically. Indirect access (Z2): Requires the taxpayer or an authorised third party to evaluate the data according to his/her specifications automatically with a read-only access. The taxpayers are obliged to support the auditors by providing persons who are familiar with the computer system. Transfer on machine-readable data medium (Z3): Use of data extraction and	Adjusted with type of access. If the auditor comes with Z1 or Z2 type, practically speaking he/she can use any CAATTs techniques. In the case of Z3 type access, actually this is a 'GAS using DEA' approach.	Should comply with 'GDPdU', ('Grundsätze zum Datensugriff und zur Prüfbarkeit digitaler Unterlagen', which is German for 'principles of data access and auditing of digital documents).	Some Federal States have established or are establishing jobs for special computer auditors to support the auditors, while other Federal States are pursuing the objective that the auditors themselves access the data.

⁶ Vero Skatt, *Auditing in an electronic environment (e-auditing)* (24 September 2014) <[https://www.vero.fi/en-US/Precise_information/Taxpayer_rights_and_obligations/Auditing_in_an_Electronic_Environment_eA\(14895\)>](https://www.vero.fi/en-US/Precise_information/Taxpayer_rights_and_obligations/Auditing_in_an_Electronic_Environment_eA(14895)>).

		analysis techniques.			
	<u>Additional information:</u> The term ‘tax-related data’ has not been defined nor specified respectively within the scope of the legal provisions for data access. The statutory record retention requirements and the data access refer to the documents mentioned in § 147 Sect. 1 AO. • Accounts and records, inventories, financial statements, management reports, opening balance sheet as well as the instructions required for their comprehension and other organisational documents. • The received commercial or business letters. • Reproduction of the sent commercial or business letters. • Accounting records. • Documents that have to be attached to a customs declaration, which has been submitted with data processing media in accordance with Art. 77 Sect. 1 in connection with Art. 62 Sect. 2 Customs Code, provided that the customs authorities in accordance with Art. 77 Sect. 2 Cl. 1 Customs Code have dispensed with the submission of originals or has returned the originals after submission. • Other documents if they are significant for taxation.⁷				
Indonesia	e-Audit	Not specifically described, under Ministry of Finance Number 17/PMK.03/2013 concerning Tax Audit Procedures as well as Circulair Number: SE-25/PJ/2013 concerning e-Audit Procedures. Practically speaking, the e-auditor/tax auditor has a right to use any technique in order access electronic data. Auditee (the taxpayer) has to provide a person to help the tax auditor in case they need it to access the taxpayer’s electronic data.	DEA using audit software such as ACL, IDEA, MS-Excel or MS-Access ⁸	Requested by e-auditor and tax auditor during audit process	e-auditor, tax officer or expert hired by tax authority to conduct e-audit

⁷ DSAG Work Group GDPDU, *Recommendations on how to apply the GDPDU* (25 August 2008) <https://www.dsag.de/fileadmin/media/Leitfaeden/101125_Handlungsempfehlung_engl_AK2.pdf>.

⁸ Auditors Online Forum <<http://forum.tax-auditors.com/index.php>>.

	<u>Additional information:</u> • e-audit is a process of understanding the taxpayer's organisation, business processes, and electronic systems as well as the acquisition and conversion of electronically-managed data in order to assist the tax audit. • The tax audit has to be performed by tax auditors or e-auditors as part of tax auditor team. • The e-auditor could download the data directly from the taxpayer's computer or ask the taxpayer to do this.⁹				
US	Not specifically described	GAS	DEA using MS-Excel or MS-Access	Not specifically described	Computer Audit Specialist (CAS) is an experienced revenue agent who has completed an intensive computer-training program. This training concentrates on large multi-user computer systems that process voluminous data.
	<u>Additional information:</u> • The complexity of computer-based records makes the use of a CAS a necessity. Most of the records of larger cases are computer-generated and frequently can involve millions of transactions per year. The use of CAS is imperative to maintaining an efficient and well-organised examination that effectively utilises resources. • The role of the CAS is varied and complex. From the perspective of the an Examination Process (EP) agent, there are three main areas to consider: systems analysis and record evaluation, computer applications (reports and downloading files, etc.), and statistical sampling. The request for a CAS should be made as far as possible in advance of the examination. This will ensure maximum availability of a CAS to examine the computerised books and records in a timely matter.¹⁰				

⁹ Peraturan Ortax Circulair Letter of Director General of Tax Number SE - 25/PJ/2013 concerning e-Audit Guidelines
<http://www.ortax.org/ortax/?mod=aturan&hlm=7&page=show&id=15307>.

¹⁰ Johnson, K, Quaal, L & Chesney, A [no date], *Audit techniques for electronic records and data systems*, report to Internal Revenue Service (IRS) <https://www.irs.gov/pub/irs-tege/epche403.pdf>.

6. CLOSING REMARK

This paper describes the first qualitative-interpretive study on the use of CAATTs in tax audits by comparing numerous regional tax authorities' practices and various economic scales. The findings benefit various participants in the tax system, for example, tax authorities may gain a greater overall understanding, taxpayers can better position themselves in discussions with the tax authorities, and professional bodies can enhance their audit standards as well as tax adviser/professional practices.

6.1 Contributions of this study

This paper has shown the use of comparative tax research with an interpretive approach which is different from previous studies that are mostly descriptive (for example, IOTA, 2010; Nevelsteen & Frenckell, 2014, OECD, 2010). The paper has provided an interpretation of the existing practices and given recommendations to improve such practices. It has applied the functional analytical framework ('tax problem', 'tax model', 'tax mechanism') and CIA (Garbarino, 2009). The study however has limitations particularly on its reliance to secondary data. Further research should include primary sources such as interviews, surveys, and observation through interaction with stakeholders (tax authorities, taxpayers, tax agents/advisers).

With regards to the use of CAATTs in tax audits, the paper promotes further research on relatively unaddressed topics such as: (1) the adoption of continuous auditing techniques (deBoer et al., 2014; Hunton et al., 2004); (2) the readiness of digital forensic functions as a continuation of fraud cases in tax audit findings (IOTA, 2010; Pedrosa & Costa, 2014).

6.2 Suggestions for tax practitioners

Consequential to the nature of the interpretive study, the study findings are transferable to similar contexts (tax authority, tax payer, tax professional association) especially with institutions which have similar socio-organisational settings. For practitioners, this study is also relevant to inform state-of-the-art practices amongst tax auditors in the five countries. The tax professionals, who provide their services while dealing with tax authorities' behaviour and all the complicated provisional details, could take the research results at least as an additional reference for improving the quality of their services.

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