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The Use of CAATTs in Tax Audits: A Comparative Study

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Abstract

Rapid advances of IT applications in the business world have made tax administrations around the world rely on the use of computer-assisted audit tools and techniques (CAATTs) more than ever before. Following the ubiquity of enterprise system solutions, business transactions nowadays are predominantly enabled through means of electronic records. This leaves tax auditors with a huge amount of electronic audit trails in varying degrees of complexity. Over the years, CAATTs have come about in a variety of forms from parallel simulation to data extraction and analysis. However, little has been known about the situational practices of CAATTs use to achieve effective audit outcomes. This article presents a comparative study of the state-of-the-art CAATTs regulation and practice in five countries (in alphabetical order: Australia, Finland, Germany, Indonesia, and USA), in an effort to progress the use of CAATTs in supporting effective tax audits. The study contributes to both theory and practice. 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. Based on our comparative analysis, there are several implications from the study findings. First, tax authorities need to take more substantive measures to start impose continuous online auditing techniques for taxpayers with certain threshold. Second, there needs to be more integration using standardised data format to improve interoperability and avoid unnecessary micro-specialisation within tax auditors. Finally, the e-auditors team should focus more on unravelling more delicate practices of financial transactions which would have a much bigger deterrent impact like that of digital forensics.

1. Introduction

It is within a country's tax authorities' power to audit 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 a series of evidence, collected from either the taxpayer itself or from 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 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

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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 (Coderre, 1998; Braun and Davis, 2003; Hunton et al., 2004; Debreceny et al., 2005 ; Pathak, 2005; Flowerday et al., 2006; deBoer et al., 2014; Pedrosa and Costa, 2014). The role of CAATTs has also been a subject of concerns by the professional bodies of auditing (Debreceny et al., 2005; thistle, 2014). Recently, IAASB (2013) has also published a directive towards the development of the audit profession in relation to audit risks from electronic data:

“...Consideration of emerging issues about audit evidence obtained through the use of sophisticated data analytics techniques, including the implications on the auditor’s risk assessment and response, as well as the effect on the nature and timing of other planned audit procedures and the auditor’s ability to obtain sufficient appropriate audit evidence. ...” (pp. 40)

The above shows that regardless of the type of assurance services rendered, every auditor needs to increase his/her capacity in using CAATTs to add values and quality to his/her professional work. (Byrnes et al., 2012; Darono, 2015).

The conduct of audits has largely benefited from the use and development of CAATTs. Most tax administration around the world have adopted CAATTs as part of their mandatory tax audit procedures with slight variations between them. The variations can be classified from a number of different perspectives: the underlying legal foundations, use protocols, and actors (FTA, 2006; IOTA 2010; EY, 2014; Nevelsteen and Frenckell, 2014; OBG, 2014; Darono 2015). The variations include the use of the term CAATTs itself in tax audits. The academic literature and several practitioners refer to CAATTs as *tax e-audit* (e.g.: OECD, 2010; EY, 2014; Nevelsteen and Frenckell, 2014), *computer assisted audit program* (e.g.: DOR, without-year) or *EDP Audit* (see for example: IOTA 2010) or *data analysis technology* (Lambrecht et al., 2011; deBoer et al., 2014). According to Shue (2006), 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 SAFT (Standard Audit File for Tax).

Yet, 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 (e.g. the commercial sector). A number of scholars (e.g. Coderre, 1998; Moeller, 2009; Janvrin et al., 2009; Lambrecht et al., 2011; deBoer et al., 2014; thistle, 2014; Pedrosa and Costa, 2014) have taken up the issue by suggesting the details on the role, relative position, and innovations around the use of CAATTs use in audits of the commercial sector. On the contrary, 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 situating the needs of research on CAATTs use in tax audits. In this paper, we argue that the tax audit field needs to break this tradition by, at the initial step, taking up the comparative tax research tradition suggested by Garbarino (2009). To our best of knowledge, this has not been attempted before and is necessary for building cumulative understandings in the tax audit field. The literature on CAATTs use in tax audits is predominantly focused on technical how-to guidelines issued by several research institutions and private consulting firms (see for examples: OECD, 2010; IOTA 2010; EY, 2014). From a methodology perspective, most of this body of literature is descriptive in nature (e.g.

Nevelsteen and Frenckell, 2014). In the educational settings, Boritz and Datardina (2007) paid little attention on introducing CAATTs in comparison to other topics in their academic classes.

IOTA (2010) compared the use of CAATTs among its country members. The comparisons included: “ ... flowcharting and internal control system evaluation; cooperation with producers accounting software e-audit software; access to the data from the internal audits of Taxpayers or audits of chartered accountants ...” . To this end, this article aims to supplement the work of IOTA by unfolding a few aspects that have not been discussed, e.g. 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 administration in tax audits. It achieves this goal through a comparative study on the use of CAATTs within a number of tax jurisdictions. Using a comparative institutional analysis (Garbarino, 2009; Cole, 2013), 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 in CAATTs that comprises the auditing field in general. 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.

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

2. Research design

Creswell (2009:22) 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 research approach is case study through which the researchers are able to explore in great depth the events, programs, activities, and processes of an individual and a group of individuals in their natural settings. A case is bounded by time and activities which defines the scope of the research (Bahattacharya, 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 were sourced from documentary materials around the implementation of CAATTs issued by each of the tax authorities as well as published by consulting forms, research institutions and media releases. Bowen (2009) defines document analysis as a systematic procedure in examining electronic and print documents to reveal empirical research findings.

More specifically, the study used comparative institutional analysis (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 technique available for comparative tax research. It uses a technique that combines tax problem, tax model, and tax mechanism; a pattern suggested by Garbarino (2009). Next, the pattern is merged with the inner parts of CIA. Tax problem is the exchange that is intended to be settled while tax model is prescription or the number of choices available on the institutions. Tax mechanism is the working rules or the final institution to be selected for the exchange. 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. Following this, 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 CIA. This will also be a critical contribution for other comparative tax research in this area.

The detailed steps are shown as follows. First, the context of CAATTs use in the case study is explicated which comprises tax authorities in five countries: Australia, Finland, Indonesia, Germany, and the USA. 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. 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; Yin, 2009, Maxwell and Chmiel, 2014; Brown, 2015).

The next step is to explain tax model; the choice of institutions available. 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 discloses 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 accordingly.

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 evidences from multiple sources in order to conclude whether the audited taxpayer has complied to 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 in a number of tax authorities based on a document released by PricewaterhouseCoopers titled “*Worldwide Tax Summaries Corporate Taxes 2015/16*” (PwC, 2015). The document consists of key tax regulations in the countries which they are operating. For the purpose of this study, only the five countries pertinent to the study are described.

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

Tax authority	Description
Australia	The Australian tax system for companies is based on self-assessment; however, the 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 an 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 visit
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 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 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
USA	Generally, the US tax system is based on self-assessment; however, many large and mid-size businesses are under continuous audit by the 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 for the tax authorities tax audits are vehicles to re-assess the amount of tax payable. This brings forward, the importance of gathering evidences during an audit and the inevitable presence of electronic data. To deal with the surging amount of electronic data, the framework of tax problem (Garbarino, 2009) is most relevant in this situation. Tax problem sees a situation as a comparative problem to be solved. From the discourse about this problem, an analytical framework will be found that can be used to solve a similar problem in the future. In the following, a description of *tax model* from Garbarino's (2009) comparative tax framework 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 minimize 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, 2011). In the literature, there has been a variety of understanding about the structure and relative position of institutions. They differ in the way they are used 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 human’s lives (North, 1991), or reduce the associated transaction costs (Richter, 2015:11). Institutions can be defined as:

“... set of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependent on their actions. All rules contain prescriptions that forbid, permit, or require some action or outcome. Working rules are those actually used, monitored, and enforced when individuals make choices about the actions they will take. ...” (Olstrom, as cited in Cole, 2013, pp. 109).

Elsewhere, Komesar (as cited in Cole, 2013) defines institutions as an alternative mechanism for actors to achieve their goals – in forms of markets, communities, political process, and courts. Understanding the different meanings of institutions is important to denote the operational definition on which actors will use 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 organized. The polity, judiciary, and bureaucracy of governments are located here, (3) institutions of governance; that is concerned with the play of the game, and (4) resource allocation and employment. In this study, changes in audit techniques (level 4) are easily comparable to changes in tax assessment system (level 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*. Olstrom, in contrary, labels this 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 (Wahid and Sein, 2013; Darono and Panggabean, 2015; Richter, 2015).

CIA is not a “comparative analysis of institutions”. It does not aim to differentiate between one institutional feature and another. CIA techniques emphasise on the understanding of 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. CIA is useful to understand the causes of institutional failures in facilitation social interactions that would instead create social dilemmas. CIA provides a framework to analyse this kind of questions so that institutions can work to achieve what they are aimed for.

An institutional perspective of a social situation is needed to resolve social interaction problems (human relationship within a society). This includes social interactions that make up part of completing tax obligations of an individual within the broader society. According to Garbarino (2009), the 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 audit is a form of fiscal institution. Tax audits and CAATTs are both the selected institutions to realise the expected social interactions, i.e. tax compliance. Building upon Williamson (1998), CAATTs can be positioned as a configuration shown in Figure 1. CAATTs in this setting are situated within level 3 and 4 which afford a discussion on institutional choices and the most relevant mechanism options available to the environment.

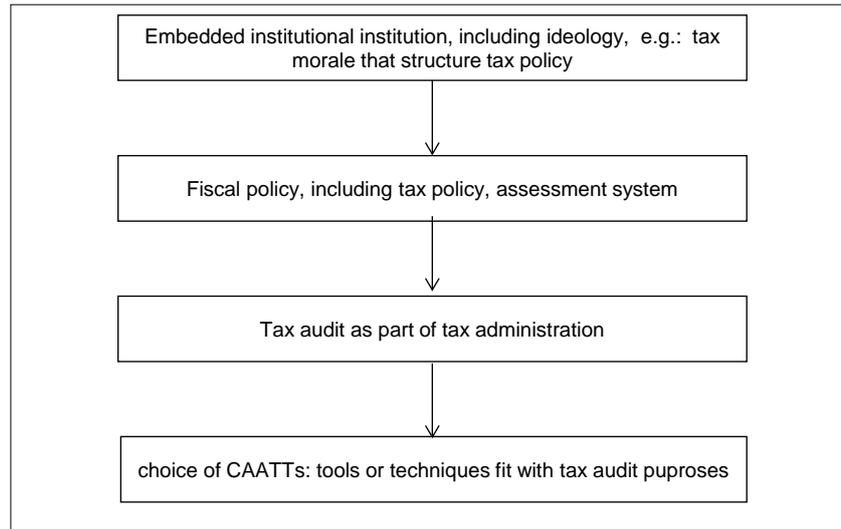


Figure 1. CAATTs and tax administration in four level of social analysis, adapted from Williamson (1998)

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 form of spreadsheet or decision support systems. The following section will elaborate 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 CAATTs visions for effective handling of digital audit trails is not so easy. Using Indonesian public accounting firms as a setting, Widuri (2014) concludes that CAATTs (i.e., 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 of adequate legal support that outlines 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 CA should continue to be prioritised in relation to CA (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 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 GAS (as a tool) is interpreted the same as DEA (as a technique) or make

GAS and DEA equivalent to CAATTs (Lambrecht et al., 2011; deBoer et al., 2014; 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 1, 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.

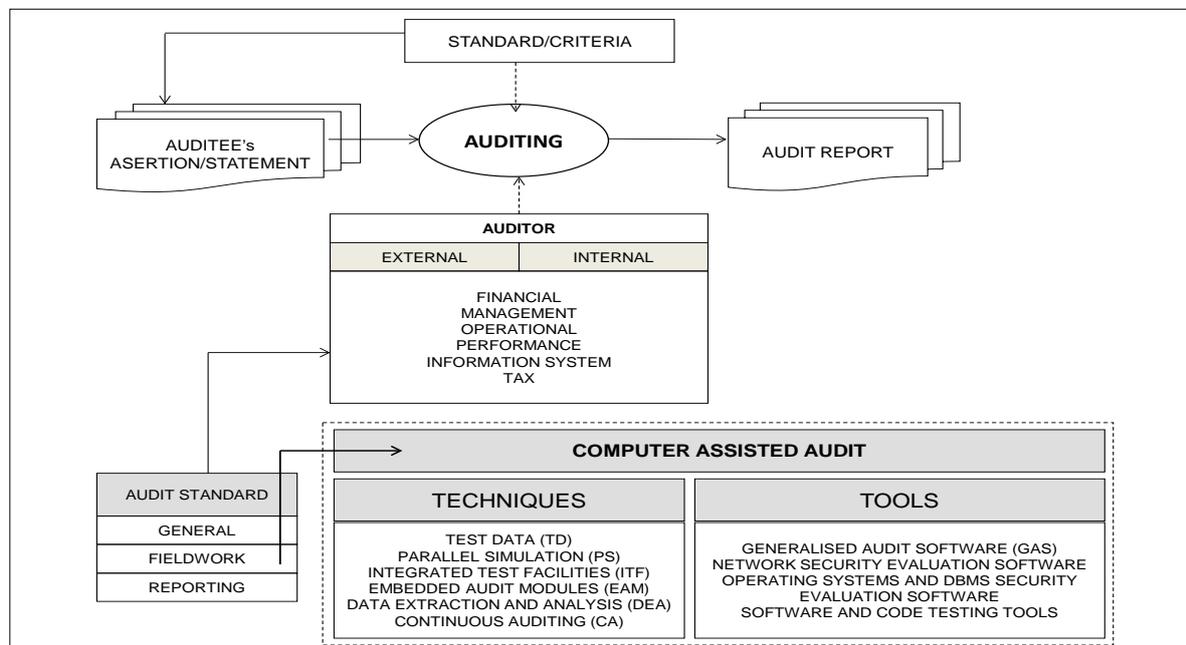


Figure 1. CAATTs in audit (adapted from Darono (2015))

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 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, dan security and privacy tools*

Weber (2001) categorises audit approaches in 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 dan Cerullo (2003), Braun dan Davis (2003), Hunton et. al (1998) dan 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 between aggregated data and the transaction details of the data, then s/he can use his/her professional judgment to select from the range of available techniques shown in Table 2.

Tabel 2. Type of audit and its CAATTs form of tests

Refers to	Type of audit tests	Form of tests
Hall (2001); Braun dan Davis (2003)	application control	TD, PS, ITF
	substantive test	EAM, GAS
	direct test to intern application logic	TD, PS, ITF, EAM
	indirect test to intern application logic	GAS
Hunton et. al (2004)	application control	TD, PS, ITF
	data integrity test	GAS, CAT
Cerullo dan 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 weights to audit 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 (Coderre, 2005; Flowerday et al., 2006; Byrnes et al., 2012; Pedrosa and 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 development which will be compared using 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 use cases for tax audits in the five countries. We will then put forward 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 compliance cost. It is costs incurred by taxpayers in complying (or sometimes not complying) with their tax obligations (Tran-Nam et al., 2000; Evans et al., 2013)

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, e.g. experts, 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 special unit which provides assistance to the auditors. Within the perspective of CIA, 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 choice of minimising transaction cost or finding a new equilibria is further animated by the recommendation of the OECD on SAFT. SAFT 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 for taxpayers in their efforts to meet the requirement of the standardised data format.

Based on the above, the followings are key comparative criteria of CAATTs in tax audits that we examined: (1) terms used, this is to delineate the extent of agreement in labelling similar practices of CAATTs use in the five countries; (2) tools used to perform CAATTs; to determine techniques deployed in analysing gathered data; (3) data standards imposed to taxpayers in order to meet the requirements; (4) dedicated CAATTs unit to assist tax auditors.

Table 2 displays the four categories of CAATTs use. In Table 2, we compared “*the mechanism*” with CAATTs (“*the model*”) and effective tax audits (“*the problem*”) in one instance. Nevertheless, there are a number of things remain to be addressed:

- The lack of attention to SAFT. If seen as a form of institution, SAFT does not seem to offer lower total transaction cost. It only shifts the cost from tax auditors to taxpayers. The tax authorities seem to consider that (1) 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 (2) a dedicated CAATTs unit has lower transaction cost than having SAFT in place.
- The combination of tools and device of DEA/GAS. Considerations must be taken into account whether they are in final forms. Scholars have unanimously dubbed continuous auditing techniques as “*killer apps*” for the auditing profession. In many respects (e.g. Finland case), the tax administration has taken careful consideration in maintaining respectful relationships with taxpayers as manifested in the conduct of audits that are non-intrusive to their business. “ ... 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. ...”

(source: [https://www.vero.fi/en-](https://www.vero.fi/en-US/Precise_information/Taxpayer_rights_and_obligations/Auditing_in_an_Electronic_Environment_eA(14895))

[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))).

Consequently, continuous auditing require a more complex installation of audit modules in taxpayers’ computer systems.

- The relative position of digital forensics in the landscape of CAATTs use in tax audits. Tax audits have the potential to reveal fraud cases. This would require further treatment in form of investigate audits. Questions remain on how the transition from CAATTs use in tax audit 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 before the court.

- The creation of new equilibria between special units on CAATTs (e.g. e-auditor), standardised file format in relevance to digital forensic activities. When being audited, the taxpayer needs to render standardised file format to the auditors without the involvement of e-auditors. Following this, e-auditors can direct their focus to digital forensics which is of utmost necessity at the moment due to the ubiquity of electronic transactions.

Table 2. Main features of CAATs comparison in tax audit

Tax authority	Features of CAATs				
	Term used	Tools	Techniques	Data standard	Dedicated CAATs unit
Australia	computer assisted verification (CAV), Computer-Assisted Tax Audit (CATA) ataupun E-Audit	GAS	DEA with Caseware IDEA	not specifically described	<i>CATA-team to help case officers</i>
	<p><u>Additional information:</u> <i>... conduct 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.</i> <i>CAV software will read the electronic information provided but does not allow any changes to be made to the data you have supplied. ...</i> https://www.ato.gov.au/Print-publications/Computer-assisted-verification-fact-sheet-for-businesses/</p> <p><i>... 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. ...</i> 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</p> <p><i>... 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. ...</i> https://www.ato.gov.au/Business/Bus/Public-and-Private-Groups-(Indirect-Tax)-Compliance-risk-manual---Chapter-3/</p>				
Finland	computer-assisted tax audit techniques, electronic auditing is computer-assisted auditing that uses electronic records to complete all or part of the tax audit	GAS	DEA but software used not specifically described	Accounting transactions and additional files (see additional information belows)	not specifically described

Tax authority	Features of CAATTs				
	Term used	Tools	Techniques	Data standard	Dedicated CAATTs unit
	<p><u>Additional information:</u></p> <ul style="list-style-type: none"> • 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 centers 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 unzip/uncompress), number of records, length of records. • If the company cannot deliver the accounting system files where transactions are primarily recorded, tax auditors can alternatively utilize 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. <p>https://www.vero.fi/en-US/Precise_information/Taxpayer_rights_and_obligations/Auditing_in_an_Electronic_Environment_eA(14895)</p>				
Germany	not specifically described	<p>direct access (Z1): auditor has the right to access independently the taxpayer's computer systems which contain tax-relevant data, by using a user role that has been set up for him/her. The taxpayer has to provide the hardware and software, so that the auditor can inspect the data and evaluate it automatically.</p> <p>indirect access (Z2): but demands that the taxpayer or an authorised third persons evaluates the data according to his/her</p>	<p>adjusted with type of access. if auditor comes with Z1 or Z2 type, practically speaking he/she can use any CAATTs techniques</p> <p>in case of Z3 type access used, actually a "GAS using DEA"</p>	should comply with "GDPdU", i.e: 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 have to cope with data access themselves.

Tax authority	Features of CAATTs				
	Term used	Tools	Techniques	Data standard	Dedicated CAATTs unit
		<p>specifications automatically with a read-only access. The taxpayers are obliged to support the auditors,48 by providing persons who are familiar with the computer system. transfer on machine readable data medium (Z3): DEA</p>			
<p><u>Additional information:</u></p> <ul style="list-style-type: none"> • 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, the 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, which 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. <p>https://www.dsag.de/fileadmin/media/Leitfaeden/101125_Handlungsempfehlung_engl_AK2.pdf</p>					
Indonesia	e-Audit	not specifically described, under Ministry of Finance Number 17/PMK.03/2013 concerning Tax Audit Procedures as well as	DEA using ACL, IDEA, MS-Excel and MS-Access. source: http://forum.tax-auditors.com/index.php	as asked by e-Auditor and tax auditor during audit process	e-Auditor, tax officer or expert hired by tax authority to conduct e-Audit

Tax authority	Features of CAATTs				
	Term used	Tools	Techniques	Data standard	Dedicated CAATTs unit
		<p>Circular Number: SE - 25/PJ/2013 concerning e-Audit Procedures:</p> <p>practically speaking e-Auditor/tax auditor have their right to use any techniques in order access electronic data.</p> <p>auditee (the taxpayer) have to provide person to help tax auditors in case they need it to access electronic data.</p>			
	<p><u>Additional information:</u></p> <ul style="list-style-type: none"> • e-Audit is a process of understanding the taxpayer's organization, business processes, and electronic systems, as well as the acquisition and conversion of electronically-managed data in order to assist tax audit. • Tax audit have to perform by tax auditors, e-Auditor as part of tax auditor team • e-Auditor could download data directly from taxpayer's computer or asks taxpayer to do this <p>http://www.ortax.org/ortax/?mod=aturan&hlm=7&page=show&id=15307</p>				
USA	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

Tax authority	Features of CAATTs				
	Term used	Tools	Techniques	Data standard	Dedicated CAATTs unit
	<p><u>Reason to Use a CAS</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 a CAS is imperative to maintaining an efficient, well-organized examination and to effectively utilize resources.</p> <p>Role of CAS The role of the CAS is varied and complex. From the perspective of the an EP agent, there are three main areas to consider: Systems analysis and record evaluation, Computer applications (reports and downloading files, etc.), and Statistical sampling.</p> <p>The request for a Computer Audit Specialists (CAS) should be made as far as possible in advance of the examination. This will ensure the maximum availability of a CAS to examine the computerized books and records in a timely matter with regard to the examination.</p> <p>https://www.irs.gov/pub/irs-tege/epche403.pdf</p>				

source: authors' analysis

6. Closing remark

Being the first qualitative research in the use of CAATTs in tax audits that compare tax authorities from *various region* as well as *economic scales*, the findings are beneficial for related stakeholders: the tax authorities to allow for better understanding; the taxpayers in general to better position themselves in discussions with the tax authorities, and the professional bodies for enhancement of audit standards and tax adviser/professional practices.

6.1. Contributions of this study

This paper has shown the use of comparative tax research with interpretive approach which is different from previous studies that are mostly descriptive (e.g. OECD, 2010; IOTA, 2010; Nevelsteen and Frenckell, 2014). The article 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 *comparative institutional analysis* (Garbarino, 2009). The study 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 authority, taxpayers, tax agents/advisers).

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

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