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Explaining the information systems auditor role in the public sector financial audit

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ABSTRACT

This paper addresses the research questions, "What is the role of the IS auditor in supporting the financial audit?" and "What key determinants affect that role?" through the development of an explanation theory for the role of the IS auditor in the public sector financial audit. Results are based on semi-structured interviews with 55 senior auditors and IS auditors. These auditors worked in ten practice offices in the Australian, Canadian, New Zealand and United Kingdom public sectors. We manually coded 23 interview transcripts and used the Leximancer tool to extend this coding to the remaining transcripts through automated text analysis. The analysis allowed the identification of relevant "common statements" representing the prominent and shared perceptions of the IS auditor role amongst these auditors. These common statements provided a basis for the development of an initial explanation theory. One new construct presented in this theory is the practice office's "IS audit emphasis", which represents the practice office's emphasis upon the relationship between the IS auditor role and the audit team. The explanation theory provides a richer description of current audit practice regarding the IS auditor's role in public sector financial audit than currently exists. Consequently, this research provides insights for those involved in the education and training of auditors by developing a foundation for a more complete understanding of the IS auditor role.

1. Introduction

The objective of the financial auditor, according to the International Standards on Auditing (ISA) and paragraph 11 of ISA 200, is to obtain reasonable assurance that the financial statements of an audited entity are free from material misstatement (International Auditing and Assurance Standards Board [IAASB], 2009a). ISA 315 (paragraphs A53 to A56) requires the auditor to obtain an understanding of IT systems and controls (IAASB, 2009c). The auditor need not be completely self-reliant, however. ISA 220 allows the auditor to include Information Systems (IS) auditors with specialized expertise in auditing as members of the engagement team (IAASB, 2009b), while ISA 620 allows the auditor to consult an IT expert for technical advice (IAASB, 2009d).

We refer to IS audit work that supports the financial audit as "Financial IS Audit" (Muthukrishnan, 2008). Here, IS auditors examine an entity's IS and advise the auditor in planning the audit and assessing audit risk (Curtis et al., 2009). The nature of financial IS audit work is well known (see, for example, Singleton, 2010). However, the value of the IS auditor role in the

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audit is often poorly communicated and indirect (Bagranoff and Vendrzyk, 2000) and, in practice, the level of engagement between auditors and IS auditors is low (Janvrin et al., 2009).

A tension underlies this relationship. ISA 315 requires the auditor to obtain an understanding of the IS in place (IAASB, 2009c), but the business Information Technology (IT) environment is increasingly more complex and dynamic. The auditor may find complex IS difficult to understand without support from IS auditors, and the auditing standards provide only vague guidance. The auditor may be reluctant to use the work of IS auditors due to the limited resources available to undertake the audit (Canada et al., 2009). The underlying tension is therefore between the need to gather sufficient evidence supporting the audit opinion and the need to provide efficient financial audits.

The auditor needs a clear understanding of the IS auditor role to balance this tension. While others have studied the work of IS auditors in the financial audit (e.g., Bauer and Estep, 2014, 2015; Janvrin et al., 2009; Vendrzyk and Bagranoff, 2003), we know of no work to date that has produced a comprehensive framework describing the reasons for, and the nature of, IS auditor involvement in the financial audit. Therefore this study develops an explanation theory (Gregor, 2006) that identifies key determinants of the IS auditor role in the financial audit. Such a theory explains "what is, how, why, when, and where", and aims to provide "greater understanding or insight by others into the phenomena of interest" (Gregor, 2006, pp. 619–620).

This paper addresses the research questions, "*What is the role of the IS auditor in supporting the financial audit?*" and "*What key determinants affect that role?*" The specific research context considered is the financial audit of government-owned entities ("public sector financial audits"). The research questions were examined through semi-structured interviews with 55 experienced auditors at ten government auditor entities ("practice offices") in four different Commonwealth countries (Australia, Canada, New Zealand, and the United Kingdom). In the Commonwealth context it is usual for the audits of public sector entities to be performed by public sector auditor entities (Barrett, 1996; Free et al., 2013). These interviews were analysed to identify the auditors' prominent and shared understanding of the IS auditor role through their "common statements" addressing the "who, what, why, when, where and how" of financial IS audit using manual and machine coding. These statements are then used to develop a "theory for explaining" (Gregor, 2006, p. 624) the role of the IS auditor in the public sector financial audit. The theory and research findings provide a richer description of the IS auditor role than currently exists.

The rest of the paper proceeds as follows. Section 2 reviews the existing literature relating to the IS auditor role. Section 3 explores the nature of an explanation theory and its implications for the research approach. Section 4 presents the research method for developing an explanation theory, and Section 5 sets out the interviewees' prominent and shared understanding of the IS auditor role as "common statements". Section 6 develops an initial theory explaining the IS auditor role in the public sector financial audit. Finally, Section 7 sets out the contributions of this research, acknowledges its limitations, and identifies opportunities for future research.

2. Background

2.1. Auditing and the business IT environment

The auditor needs a deep understanding of the business itself to formulate their audit opinion (IAASB, 2009a). It is important that the auditor obtain an understanding of IT systems and controls in the audited entity as required by ISA 315 (IAASB, 2009c). Generally, auditors have a reasonable understanding of the technologies in place at the audited entity (Hinson, 2007), and these technologies are increasingly more sophisticated (Curtis et al., 2009; Dowling and Leech, 2014).

In addition, businesses place a great reliance upon IS as part of their business strategy and operations (Kinney, 2005). Businesses innovate and change by adopting new business technologies and practices. Such innovations increase the complexity of the business IT environment, and the auditor may require specialist knowledge to understand the technologies in place.

In the case of material changes to complex information systems, the auditor must still understand the new technologies and practices. The auditor must also be aware of the different risks arising from the adoption of these new technologies. For example, the auditor must understand the implications of implementing new and revamped IS (Vilsanoiu and Serban, 2010), changing to integrated web-based businesses (Kotb and Roberts, 2011), and adopting cloud computing (Alali and Chia-Lun, 2012). The auditor also needs to understand the emerging issues of information security (Steinbart et al., 2016) and cyber security, arising from the increased integration of digital technologies into business models (Joe et al., 2015). Such innovations increase the complexity of obtaining and evaluating the evidence required to assess IS controls (Janvrin et al., 2009). Consequently, the auditor may have a higher need for specialist support.

2.2. Auditing standards guidance on the use of IT specialists

The ISAs recognize that the auditor need not be expert in all matters. ISA 220 allows the auditor to include others with specialist expertise in areas such as IT auditing to gather and interpret evidence as members of the engagement team (IAASB, 2009b).

The auditor may also engage an expert in a domain other than audit to assist with evidence-gathering under their direction. As these experts do not have specialist expertise in auditing, they operate as an auditor's expert under ISA 620 (IAASB, 2009d) rather than as a member of the engagement team under ISA 220 (IAASB, 2009b). For example, such an auditor's expert might be an asset valuation specialist (Griffith et al., 2015). In the case of the business IT environment, an IT expert might review a specific software or infrastructure technology to address a specific need identified by the auditor.

However, neither ISA 220 nor ISA 620 explicitly consider the organization's IT environment (IAASB, 2009b, 2009d). The most specific reference to IS in the ISA is paragraph 18 of ISA 315, which directs the auditor to obtain an understanding of IS as relevant to financial reporting (IAASB, 2009c). ISA 315 draws the auditor's attention to the business processes, basic operations, and controls that relate to financial reporting. Critically, this directive relates only to areas that affect the financial statements, but does not mandate IS auditor involvement. The requirement is that the auditor obtains an understanding of the IS in place. Consequently, the inclusion of the IS auditor role in the engagement team is dependent upon the auditor's assessment of whether the auditor needs support from the IS auditor to obtain this understanding.

2.3. Role of the IS auditor in the financial audit

The auditor may address the requirements of ISA 315 (IAASB, 2009c) in several ways. One option is through IS audit, which is "the process of collecting and evaluating evidence to determine whether a computer system safeguards assets, maintains data integrity, allows organizational goals to be achieved effectively, and uses resources efficiently" (Weber, 1999, p. 10).

Financial IS audit provides feedback and assurances regarding the traditional attest objectives of asset safeguarding and data integrity (Weber, 1999). There are three major stages to the IS audit process. First, IS audit contributes to risk assessment as part of initial audit planning. Audit planning requires the auditor to assess whether to rely on the controls in place and, if planning to rely on controls, obtain an initial assessment of whether the controls in place support controls testing (Bagranoff and Vendrzyk, 2000). Second, if the controls are potentially effective, a general computer control review establishes whether these controls are actually operating. This review examines the environment in which computer-based programs are developed, maintained, and operated (Bagranoff and Vendrzyk, 2000; Curtis et al., 2009). Third, the IS audit may review application controls to confirm that they are effective (Bagranoff and Vendrzyk, 2000; Curtis et al., 2009).

One of three parties may evaluate the audited entity's IS. First, the financial auditor may themselves perform IS audit work (Curtis et al., 2009). This auditor is expert in financial audit, but typically has no specialist training in IS audit work and instead follows steps set out in a pre-determined audit program to complete this work. In this case, the auditor does not perceive that specialist support is necessary to obtain an understanding of the IS in place. This may occur, for example, at an entity with low or medium IT sophistication (Singleton, 2010).

Second, an IS auditor may perform financial IS audit work as a member of the engagement team who has specialized auditing expertise (Brazel and Agoglia, 2007) according to ISA 220 (IAASB, 2009b). The IS auditor works according to a set of audit procedures that they tailor for the engagement. For example, an IS auditor might assess controls risk and advise the auditor of their findings.

Third, an IT expert may support the financial audit through their expertise in a specific set of technologies (Kanellou and Spathis, 2011). IT experts have technical expertise but are not experts in financial audit and so work at the direction of the auditor. An IT expert that provides such support operates as an auditor's expert as stated by ISA 620 (IAASB, 2009d) rather than as a member of the engagement team with specialist expertise in auditing under ISA 220 (IAASB, 2009b). For example, an IT expert may review specific infrastructure technology to address the auditor's needs.

The auditor makes the decision to engage IT auditors or IT experts with regard to several factors. The auditor's primary concern is that the audit be efficient, as the market for audit services is competitive and resource-constrained (Houghton et al., 2010; Zeff, 2003). Accordingly, the evidence gathered by engaging an IS auditor must deliver more benefits than the cost incurred in gathering it. However, prior research suggests that auditors perceive the benefits and quality of financial IS audit work to vary greatly (Brazel and Agoglia, 2007; Janvrin et al., 2008) whilst being consistently costly (Canada et al., 2009).

The auditor considers several factors that affect the benefits of financial IS audit work. These include the client's systems and environment, the audit procedures being used, the auditor's understanding of the client, and the auditor's own audit and IT skills (Havelka and Merhout, 2013; Stoel et al., 2012). Other factors that determine whether IS auditors are part of the engagement team include the complexity of client IT systems, the extent of use of IT by the client, and changes to the client's systems (Bauer and Estep, 2014, 2015).

A tension exists between the need to gather evidence in support of the audit opinion and the need to provide competitive financial audits within the constraints of the allocated budget. Although auditors generally acknowledge the importance of IS audit work (Vendrzyk and Bagranoff, 2003), in practice they engage IS auditors infrequently (Curtis et al., 2009; Janvrin et al., 2008; Janvrin et al., 2009). While some specific aspects of the IS auditor role have been explored previously (for example, Bauer and Estep, 2015), no prior research provides a comprehensive description of the IS auditor's role in the financial audit, or the determinants of the role.

3. An initial explanation theory

To the best of our knowledge, no prior work has produced a comprehensive framework that would assist practitioners to evaluate how IS auditors might be used more effectively in the audit context. Such a comprehensive framework requires robust theoretical underpinnings. We address this requirement by developing an initial explanation theory of the IS auditor's role in the financial audit, as outlined in Gregor's (2006) taxonomy of theory for IT research.

In that taxonomy, Gregor (2006, p. 614) deliberately took a wide view of theory to encompass "conjectures, models, frameworks, or body of knowledge". The taxonomy therefore considers theory development work that is an "interim struggle" as a form of theory, rather than restricting the theory to the "ultimate triumph" (Weick, 1995, p. 386).

The taxonomy includes five interrelated types of theory from an initial basic theory to a more complex "grand theory" Gregor (2006, p. 626). The five theory types are analysis (Type I), explanation (Type II), prediction (Type III), explanation and prediction (Type IV), and design and action (Type V) theories. A Type 1 theory is the most rudimentary, and seeks only to describe phenomena. A Type V theory is the most complex and gives explicit prescriptions for undertaking tasks.

We consider the development of an explanation theory (Type II) as most suited to the aims of this research. An explanation theory looks beyond the "what is" and considers "how, why, when, and where" (Gregor, 2006, p. 619). It offers "explanations for how and why things happened in some particular real-world situation" (Gregor, 2006, p. 624). A Type I theory simply describes phenomena and is too basic to develop an understanding of relationships. The other theory types (Type III, IV, and V) are too complex at this early stage. The poor understanding of the IS audit role (Bagranoff and Vendrzyk, 2000; Janvrin et al., 2009) precludes the development of theories with predictive power (Type III and IV) or that prescribe solutions to business problems (Type V).

4. Research method

4.1. Research approach

The research approach used a field study, and engaged with practitioners in the field who were employed by several different organizations (Eisenhardt and Graebner, 2007; Walsham, 2006). Semi-structured interviews were undertaken. The interview protocol used open-ended questions as set out in Lillis (1999) and explored each interviewee's observations regarding the role of the IS auditor. This approach allowed participants to discuss the IS auditor role in depth, while also being consistent with Patton's (1990, p. 295) view that interviewees should be able to "respond in their own terms". On average, interviews were 59 min in duration. The full interview protocol is provided as Appendix A.

The interviewees were 55 senior auditors from ten public sector practice offices in Australia, Canada, New Zealand and the United Kingdom. We purposely sought interviewees with wide-ranging experiences of the IS auditor role to enhance the ability to draw general conclusions for the explanation theory. We sought out participants at practice offices that varied in size. A senior manager at each office provided access to senior staff (of "senior auditor" level or above) as available given their work commitments. Where possible, a mix of auditor and IS auditor interviewees was obtained at each practice office. All interviews were transcribed in preparation for analysis.

4.2. Financial IS audit in Australia, Canada, New Zealand and the United Kingdom

As stated above, the research respondents were drawn from Commonwealth countries. The institutional and regulatory frameworks in these countries are similar. They share Westminster traditions and similar auditing and accounting standards drawn from the International Federation of Accountants (IFAC) standards. However, some practices are not common to other jurisdictions. Three specific issues require clarification.

The first issue is the nature of practice offices operating in the public sector. In Australia, Canada, New Zealand and the United Kingdom, the government-appointed Auditor-General leads a practice office that undertakes audits of public sector entities (Jones, 2009). Furthermore, in Australia and Canada, this is the case not only at the national level but also at the individual state or province level. The government owns and operates the public sector organizations as government-related entities. Both the practice office and the audited entities are public sector organizations. While the Auditors-General do engage private sector firms to undertake audits occasionally, the practice offices undertake the majority of audits in the public sector (Barrett, 1996; Free et al., 2013).

The second issue is the use of external contractors by practice offices. Smaller practice offices regularly supplement their own audit teams with external contractors, or occasionally outsource the entire audit to the private sector (McKeown and Lindorff, 2011). In the former case, the external contractors work at the direction of the practice office. In the latter case, the third-party audit firm uses their own procedures to address the audit goals set by the practice office.

The third issue is that of Information and Communications Technology (ICT) outsourcing. ICT outsourcing occurs where a client organization sources its ICT needs from external suppliers (Lacity et al., 2009). Organizations outsource their ICT to achieve savings and to focus upon their core capabilities (Whitley and Willcocks, 2011). ICT outsourcing is widely adopted and often highly sophisticated (Dibbern et al., 2012). The use of ICT outsourcing has implications for management control systems and the financial audit (Bierstaker et al., 2013).

4.3. Research analysis

A key requirement of an explanation theory is that the theory explains "how, when, where, and why events occurred" (Gregor, 2006, p. 624). In this requirement, Gregor (2006) draws upon the classical Greek-Latin rhetoric discipline and the "5w + 1h" convention (Cramerotti, 2009, p. 18) to describe the "who, what, why, when, where and how" of a role. Prior IS research has used the "5w + 1h" model to describe and understand the setting and context of the phenomena under investigation. For example, Jia et al. (2016) used the "5w + 1h" model as a basis for conducting their systematic literature review of cloud software testing, while Laplante et al. (2004) used the model to identify factors in the adoption of ICT outsourcing approaches.

The "5w + 1h" framework was used to analyse each interview and develop the explanation theory. This interview analysis provided a foundation for understanding "how and why things happened" and "the causal factors" (Gregor, 2006, p. 624). The

analysis focused on the interviewees' "common statements" to support general conclusions and so "qualify as theorizing" (Gregor, 2006, p. 625). These common statements represented the prominent and shared understanding of the IS auditor role held across the interviewees. Fig. 1 presents the research analysis method in five stages.

4.3.1. Stage 1: thematically code

A single researcher coded all 22,692 statements in the 55 transcripts according to the theme of each statement. The theme was identified according to the interview protocol question associated with the statement and the topic addressed by the statement. Although the transcripts addressed several themes, two related themes are the focus of this research: "IS Auditor Role" and "IS Audit Approach". Statements that did not address these two related themes were removed from further consideration.

In this way 4697 interviewee statements were identified relating to IS audit.

4.3.2. Stage 2: manually categorize and code

A subset of interviews from the first four practice offices were then manually categorized and coded. This subset consisted of 23 interviews from two "large" practice offices and two "small" practice offices. A practice office was considered "large" when it maintained a separate IS business unit and "small" when it did not. The subset selected for manual coding deliberately included both large and small practice offices to support the ability to generalize from the findings to different sized practice offices through machine coding (Grech et al., 2002). Such generalizability is a hallmark of an explanation theory according to Gregor (2006). The subset included 2205 statements.

The statements were next manually categorized into the "5w + 1h" framework according to the "who, what, why, when, where, or how" aspects of the IS auditor role the statement addressed. For example, a statement might identify "who" undertook the role, or "why" the role was undertaken. A single statement might address multiple aspects of the "5w + 1h" framework and thus be assigned to multiple aspects of the framework. That is, the categories were not mutually exclusive.

A single researcher then manually coded these statements into emergent statements (Glaser, 1992; Sutton et al., 2011). Emergent statements address shared topics across interviewees. For an exploratory study, Lillis (1999) argues that a single coder, rather than multiple coders, is appropriate. In a study using extensive qualitative data to build a theory, it is "arguably less important to invest in such validation" (Lillis, 1999, p. 97) than for a study that tests a theory. Further, in this theory-building study the explicit focus is upon prominent and shared perceptions rather than the development of a detailed and refined taxonomy.

In this way, the researcher coded the 2205 statements in the subset of 23 interview transcripts to identify the aspects of the "5w + 1h" framework each statement addressed. This coding summarized and interpreted the statements made into emergent statements regarding the role of the IS auditor. An audit trail was maintained from the statements in the interview transcripts to the related emergent statements that summarized and interpreted the statements (Lillis, 1999).

4.3.3. Stage 3: extend coding via machine

We then used Leximancer to extend the manual coding. Prior research indicates a "very close proximity" between manual coding and Leximancer's machine coding in terms of "hit rates" (Grech et al., 2002, p. 1720). That is, both manual and machine

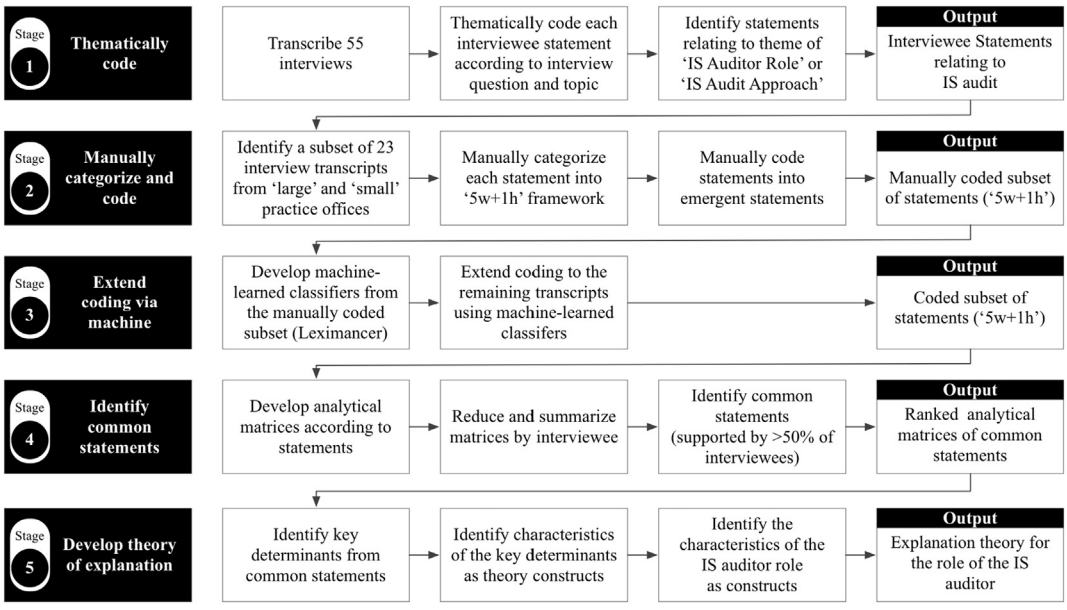

Fig. 1. Five stages of the research analysis method to develop an explanation theory for the role of the IS auditor.

coding identify broadly similar codes in the same body of text. Leximancer was set to develop machine-learned classifiers by identifying thesaurus words in the 23 manually coded transcripts according to the Leximancer algorithm.

These machine-learned classifiers were then applied to the remaining 32 interviews (2492 statements) to "extend" the manual coding. As with the manual coding, only statements by interviewees relating to the themes of "IS Auditor Role" or "IS Audit Approach" were machine coded by Leximancer. All default settings were adopted with the exception of setting context blocks for coding as single sentences. By default, Leximancer codes context blocks made up of two sentences. By changing the context blocks to be single sentences, the manual coding and Leximancer's machine coding used comparable bases. This also ensured that the context block was a cohesive statement.

As with the manual coding, an audit trail was maintained from the statements in the interview transcripts to the related emergent statements that summarized and interpreted the statements.

4.3.4. Stage 4: identify common statements

The theory needed to support the development of general conclusions (Gregor, 2006). Thus, the analysis did not need to identify *all* perceptions of the role, but only the most prominent and shared perceptions of the IS auditor role.

Analytical matrices were developed according to the coded statements. These matrices identified emergent statements and their related interviewee statements. These matrices were summarized by interviewee to indicate the interviewee and a count of statements supporting each emergent statement. Finally, "common" statements were identified where at least half the 55 interviewees (28 or more) supported the emergent statement.

In this way, the analysis focused on only the most prominent and shared views held by the interviewees. The final analytical matrix reduced and summarized the transcripts into the common statements by rank order according to the number of interviewees supporting the statement.

4.3.5. Stage 5: develop theory of explanation

Key determinants of the IS auditor role were identified from these common statements, and characteristics of these key determinants were identified as constructs in the theory. The role of the IS auditor was identified from these common statements as one construct. Taken together these constructs formed a theory of explanation that described the nature of the relationship between the key determinants and the role of the IS auditor. In this way, we developed an explanation theory for the role of the IS auditor in public sector financial audits.

5. Results

5.1. Research participants

Table 2 provides an overview of each participating office. We coded the practice offices as Offices A-J to maintain anonymity and confidentiality.

The research team interviewed 55 auditors in 2009 and 2010. The sample consisted of 36 auditors and 19 IS auditors. Participants had the rank of "senior auditor" or above, with a mean experience of 15.67 years in audit roles. Audit experience ranged from 1.5 years to 36 years.

5.2. The role of the IS auditor

The 23 interview transcripts from two small offices (A, C) and two large offices (B, D) were manually coded. Leximancer extended the manual coding to the remaining 32 transcripts. Table 3 provides an example of coded statements presented as a structured data display (Lillis, 1999). Table 3 provides the first three of 118 manually coded, and the first three of 127 machine coded, statements assigned to the "WHY-1" category.

Table 2
Overview of practice offices participating in this research.

Practice office	Regulatory setting	Participants		Full-time equivalent employees	Annual audit opinions	IS audit business unit
		Auditors	IS auditors			
A	Australia	7	0	40	170	No
B	Australia	2	2	140	550	Yes
C	Australia	5	1	34	75	No
D	Australia	3	3	350	250	Yes
E	Australia	4	2	254	495	Yes
F	Australia	4	3	212	335	Yes
G	Australia	4	2	108	207	Yes
H	Canada	2	1	629	118	Yes
I	United Kingdom	3	1	908	475	Yes
J	New Zealand	2	4	350	3940	Yes
Average		3.6	1.9	302.5	661.5	

Table 3
An example subset structured data display (Lillis, 1999) identifying statements coded as "WHY-1".

Core category (WHY-1): Auditor needs an understanding of critical financial systems.	
Reference	Original statement
Manually coded ("WHY-1" found in 118 of 2205 statements)	
A1 (#50)	From a financial audit perspective an IT auditor [PAUSE].
A1 (#52)	Yeah I guess their role is to come in and probably as a manager I'd like [PAUSE] I'd go into a client first and I'd try and understand the client and probably get some understanding of the critical systems and then [PAUSE] I'd probably then liaise with the IT auditor with two things in mind.
A1 (#56)	I think when you get an understanding of the client it's really important [PAUSE] I think the IT general control environment is every time [PAUSE] at least an aspect of it and from an IT general control environment just certain aspects I guess you look at and probably user access and security is one of them and general backup and policies and procedures is another aspect.
Machine coded ("WHY-1" found in 127 of 2492 statements)	
E1 (#10164)	So they do general controls – they do the general computer control work in the dominant *(sic)* every year; at least every third year for the all the significant clients.
E1 (#10179)	So whilst they do – they manage separately from the other teams, they hire their own team because of their specialist skills, once they get involved and engaged and once they've been identified as involved then they become – and that's become increasingly so I think since the introduction of the Black Letter Standards whereas before it was less formalized than that.
E1 (#10192)	Yes and they've got to do it at least once every three years [PAUSE] oh business control cycles, sorry not general computer controls.

Table 4 identifies the rank of each common statement according to each aspect of the "5w + 1h" framework, the common statement, and the relative extent of support for the common statement across all interviewees. No common statements relating to the "where" aspect of the "5w + 1h" framework were identified. This matrix includes both manually coded and machine coded statements.

In the following discussion, each common statement is considered for insights into the IS auditor role. The statement's category and rank order (for example, "WHO-1") are identified, and the extent of support is expressed as a ratio of respondents making the common statement relative to all respondents. The statements are illustrated with example statements identifying the interviewee by practice office and sequential order. For example, "C4" is interviewee 4 at Office C. Interviewees that are IS auditors are explicitly noted.

Table 4
Common statements made by interviewees according to the "5w + 1h" framework.

Ranking	Common statement	Total	Extent of support
"Who" undertakes tasks during the audit.			
WHO-1	Some aspects of IS audit are regularly outsourced	37/55	67%
"What" tasks IS auditors undertake during the audit.			
WHAT-1	The IS auditor primarily undertakes a general computer controls review	53/55	96%
WHAT-2	IS auditors might rarely undertake an application controls review - only for material systems	44/55	80%
WHAT-3	IS auditor and auditor together plan scope of IS audit and outcomes	43/55	78%
"Why" IS auditors undertake tasks during the audit			
WHY-1	Auditor needs an understanding of critical financial systems.	48/55	87%
WHY-2	IS auditors are called in at the choice of the auditor - only where the auditor doesn't feel they have the capacity to identify the general computer controls and the numbers are material	45/55	82%
WHY-3	Might request an IS auditor review where the client is risky overall	43/55	78%
WHY-4	Tend to rely on substantive testing rather than controls and testing by IS auditors - as may not be able to rely on the system anyway	42/55	76%
WHY-5	IS audit supports the auditor in their decision to rely on information systems	42/55	76%
WHY-6	Size is an important factor in whether an IS auditor review is requested	41/55	75%
WHY-7	Audits of clients with complex systems tend to have IS auditors called in	40/55	73%
WHY-8	IS auditors are never used on small clients.	39/55	71%
WHY-9	Need to have IS audit work done if going to rely on controls rather than substantive testing	35/55	64%
WHY-10	IS auditors are called in on an audit relatively infrequently.	34/55	62%
WHY-11	If you do not use IS audit now to assess controls you might not have the complete picture of the business	34/55	62%
WHY-12	It's usually more efficient to not rely on IT Controls in an audit but instead do more substantive testing	33/55	60%
WHY-13	The role of the IS auditor is very important	32/55	58%
WHY-14	The choice of whether to use an IS auditor depends on client resources	30/55	55%
"When" IS auditors undertake tasks during the audit			
WHEN-1	IS auditor needs to be able to come back with a view on controls prior to planning of substantive audit elements.	37/55	67%
"How" IS auditors undertake tasks during the audit			
HOW-1	The auditor tends to rely on the audit procedures as a guide to formulating judgment	48/55	87%
HOW-2	IS Audit is a fundamental part of audit itself	35/55	64%

5.2.1. "Who"

The respondents identified that an external IS auditor frequently assisted with the audit of high-risk clients where specialist expertise was required or resources were low (WHO-1, 67%). At Office I such outsourcing was prevalent, with I4 noting that "*If we don't have enough in house skills… we have a framework agreement with I think it's about half a dozen private sector firms (that provide) IT technical expertise where we need it…*" As the requirements of some audit engagements exceed the level of capacity or capability available inside the practice office, an external provider is used.

5.2.2. "What"

A majority of the respondents identified the general computer control review as the task most frequently performed by the IS auditor (WHAT-1, 96%). B1, an IS auditor, noted the need to understand the general computer controls:

> "If your remote access is no good then from a business point of view, hey, anyone can dial into your system. If you've got good controls over your server, well they can't get access to the server…"

However, in these findings IS auditors did not often review application controls (WHAT-2, 80%). Cost was a factor. F7, an IS auditor, observed "*if you engage an IT expert to do their controls reliance and, you know, they'd probably chew up half of your financial audit budget… it would be more cost effective… to just undertake it substantively*". The respondents emphasized the need to manage costs. Application control reviews were usually constrained to key financial applications. D6, an IS auditor, confirmed that IS audit work was "*limited to the impact of the financial systems*".

Nonetheless, there was an emphasis upon the involvement of the IS auditor in planning the financial audit (WHAT-3, 78%). D5 saw that IS audit's involvement in planning "*needs to be staggered back so that IT audit goes in, does general controls work, you get that underlying assurance in terms of this is what is likely to impact on your risk or not.*" An efficient audit requires involvement of the IS auditor early so that audit planning can take this information into account.

5.2.3. "Why"

The first seven common statements (WHY-1 to WHY-7) provide the substance of the analysis of "why" IS auditors undertake tasks, and broadly reflect the remaining seven common statements (WHY-8 to WHY-14). The respondents identified the need to understand the critical systems affecting the financial statements as the primary reason for engaging IS auditors (WHY-1, 87%). A4 stated that "*nowadays all the financial information based on which reports is processed in the system so… we need to make sure that the system functions properly and maintains the integrity of the data (sic)*".

Amongst the respondents, the choice of engaging the IS auditor usually rested with the financial auditor (WHY-2, 82%). The financial auditor engaged the IS auditor when they lacked the capacity to identify the general computer controls in place. Understanding these controls was important to the audit outcome. For auditor I1 in the UK, "*it's either where the team have (sic) come to view that the system is just a little bit too complicated for them to handle and they want some extra expertise.*"

Client risk was another important factor (WHY-3, 78%). J2 noted that practice office J's "*approach has really been designed around ensuring we actually apply that resource and expertise to our highest risk clients*". This viewpoint suggests that a client of moderate risk would usually not require specialist IS audit skills.

Many auditors interviewed tended to rely on substantive testing rather than controls testing (WHY-4, 76%). IS auditor B1 was not aware of any client where "*we've got a high level of controls reliance*", and substantive testing was dominant at practice office B. Some auditors in the sample preferred to adopt substantive testing rather than controls testing. These auditors saw controls testing as expensive as, if the controls were unreliable, the auditor still needed to perform substantive testing.

Auditors nonetheless often asked the IS auditor to support the decision to rely on the client's IS controls (WHY-5, 76%). D4 believed the IS auditor's role was "*to do the risk assessments and perform control assessments and testing of design and implementation of controls in support of a financial audit*". However, this request occurred in only the minority of cases.

Organizational size was often a factor in decisions to engage an IS auditor (WHY-6, 75%). H1, an IS auditor, noted Office H′s policy that, "*if you're a large audit I don't care if you have a complex IT environment or not, you're going to have to involve IT audit*". An audit of a larger organization tended to engage with an IS auditor to at least undertake the initial planning and risk assessment.

Auditors also tended to engage an IS auditor where the audit client had complex IS (WHY-7, 73%). Complex IS meant the effectiveness of substantive testing decreased. For example, for A7 the question of engaging IS audit would usually be "*around complexity of the system… which makes it really difficult to do substantively*" and so controls testing with an IS auditor became necessary.

These first seven common statements (WHY-1 to WHY-7) are reflected in five of the remaining seven statements (WHY-8 to WHY-14). WHY-8 (71%) relates to client size (WHY-6), whereas WHY-9 (64%) and WHY-11 (62%) relate to the auditor's preference for substantive or controls testing (WHY-4). WHY-10 (62%) and WHY-13 (58%) relate to the view of the IS audit role (WHY-5).

Two common statements in these final seven statements do provide new insights. Some auditors in the sample preferred substantive testing as more efficient than IT controls testing in the short term (WHY-12, 60%). They valued audit efficiency in the short term rather than consider the long-term benefits of controls testing by an IS auditor. The other new common statement related to the available client resources as the final factor in engaging an IS auditor (WHY-14, 55%). B3 considered that "*it all depends on resources budget as well as to how much they can get in there and do it*".

5.2.4. "When"

In the sample, an important aspect of the work done by the IS auditor was that the work needs to be undertaken with sufficient time to impact decisions in planning the audit (WHEN-1, 67%). G6 likened the role of the IS auditor to a project manager as "*if you don't fully define your requirements at the start of the project, then there's a fair chance that you won't deliver something that meets business requirements*". Thus, the timing of IS auditor involvement in the audit may affect the execution of subsequent audit steps and consequently, overall audit effectiveness.

5.2.5. "How"

In the sample of respondents, the auditor generally relied on a set of defined IS audit procedures to obtain their understanding of the relevant IS in place (HOW-1, 87%). H1, an IS auditor, said that auditors "*all have to fill out a BA (Business Analysis) planning questionnaire, they all have to fill in a Section CF3 document called an IT audit planning document that sets the level of our (IS auditor) involvement.*"

Although the respondents in the sample identified that an IS auditor was not always included as a member of the audit team, the task of IS audit was still considered fundamental to the financial audit (HOW-2, 64%). The majority of audits undertaken by auditors in the sample assessed IT controls in some way. I4 indicated that, "*if it's mainstream work, it's integrated within our mainstream normal financial audit.*" By this, I4 meant that the audit methodology included standard IT audit procedures rather than an integrated audit team consisting of auditors and IS auditors. The lack of an integrated audit team frequently created issues, however, with IS auditor D3 noting that, "*some financial auditors are less comfortable dealing with IT auditors and conversely some IT auditors are less comfortable dealing with financial auditors.*"

6. Explaining the IS auditor role

6.1. Introduction to the explanation theory

Our aim to set out an explanation theory (Gregor, 2006) of the IS auditor role in public sector financial audits requires that we identify the IS auditor's role, and the key determinants of this role. To address this task, the common statements identified in Table 4 were reviewed and consolidated into constructs of an explanation theory. Fig. 2 introduces the explanation theory.

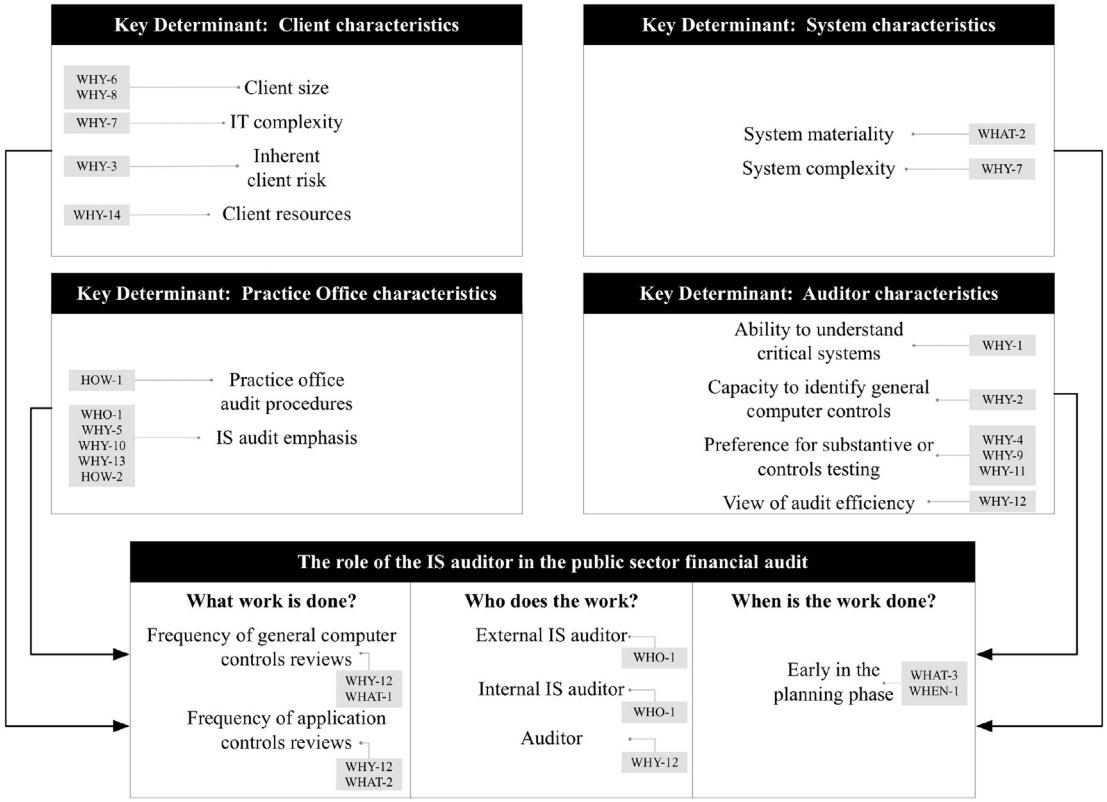

Fig. 2. An explanation theory for the role of the IS auditor in public sector financial audits. Supporting common statements are cross-referenced to Table 4.

The theory has five components. Four of the components relate to the characteristics of the client, the individual systems in place, the practice office itself, and the auditor. The final component reflects the role of the IS auditor. The first four components are key determinants that affect the role of the IS auditor in public sector audits identified in the final component. Fig. 2 cross-references each construct to the common statements set out in Table 4.

6.2. The role of the IS auditor in the public sector financial audit

The common statements identified in Table 4 suggest constructs related to the five components of the theory. The five components of the theory and the related characteristics are discussed below.

6.2.1. IS auditor role characteristics

The role of the IS auditor is represented as the core component of the theory. This role has characteristics that are presented as the constructs "what work is done", "who does the work", and "when is the work done". These constructs group together related characteristics identified from the findings. The nature of this component is determined by the other four components.

The first construct of "what work is done" represents the type of work undertaken by an IS auditor. This construct identifies the scope and amount of IS audit work in terms of the "frequency of general computer control reviews" (WHY-12, WHAT-1) and the "frequency of application controls reviews" (WHY-12, WHAT-2) in financial audits. The scope of the IS auditor role from the results aligns with that previously identified in the literature (Curtis et al., 2009; Daigle et al., 2005).

The second construct of "who does the work" represents the type of IS auditor who does the work. This construct identifies whether the IS audit work is done by the "external IS auditor" (WHO-1), the "internal IS auditor" (WHO-1), or the "auditor" (WHY-12). Together, these concepts identify whether the IS audit work is undertaken by the outsourced IT audit service provider, IS auditors, or auditors themselves. These categories of IS auditor are also reflected in the prior literature (Brazel and Agoglia, 2007; Curtis et al., 2009; Kanellou and Spathis, 2011).

The third construct of "when the work is done" represents the timing of the IS audit work. This construct identifies that IS audit work is done "early in the planning phase" (WHAT-3, WHEN-1) of the financial audit. Again, this concept is reflected in prior literature (Bagranoff and Vendrzyk, 2000; Janvrin et al., 2009; Vilsanoiu and Serban, 2010).

6.2.2. Client characteristics

The theory identifies four key characteristics of the client from the common statements. These characteristics are client size (WHY-6, WHY-8), IT complexity (WHY-7), inherent client risk (WHY-3), and client resources (WHY-14). These four constructs are all reflected in the prior audit literature.

The "client size" construct represents the overall size of the client. In general, the construct of client size is positively related to IT complexity. However, the construct of client size is not the same as IT complexity, as a large organization measured by assets may have relatively unsophisticated technology systems. For example, a holding company of a public infrastructure asset such as a dam has a large asset base but the company's IS need not be sophisticated. Indeed, the interviewees distinguished between client size and IT complexity. The client size construct is reflected in prior literature, and has previously been measured according to the value of the organization's assets (Jackson et al., 2008), market capitalization (Lawrence et al., 2011), or number of employees (Huang et al., 2015).

In contrast, the "IT complexity" construct represents the complexity of the client's IT, irrespective of the size of the client. In considering IT complexity, interviewees assessed the audited entity's automation of financial IS as well as its reliance on IT and the IT controls used in the financial reporting process. Prior literature (e.g., Janvrin et al., 2009) similarly represents IT complexity as the extent of automation of financial IS.

The "inherent client risk" construct is central to the audit task, and represents the level of risk inherently associated with the client. Interviewees identified the overall risk of the client as a factor to consider in planning the audit. Assessment of inherent client risk is a common auditor concept, and interviewees assessed this factor by considering the client's industry, nature, past audits and performance. Interviewees considered that an audit client with inherently high risk might require the financial auditor to engage an IS auditor to undertake an IS audit. Prior literature points to the audit practice of identifying inherent client risk by considering management competency, management integrity, and the client's financial condition (Ruhnke and Schmidt 2014; Wallace and Kreutzfeldt, 1995).

The "client resources" construct represents a constraint on the budget allocated to the engagement. Although the auditor sets the budget and plans the audit, in a competitive audit marketplace the resources available for the audit are affected by the price of the audit accepted by the client. The auditor has budget pressure to recognize the available budget without compromising the quality of the audit. Prior literature recognizes the role of such budget pressure upon the auditor in influencing the auditor's decision to engage with the IS auditor role (Curtis and Payne, 2008).

The common statements suggest several apparent relationships between these four constructs and the IS auditor role. As client size increases, the involvement of internal IS auditors in audit planning and review of general computer controls is more likely. The complexity of the client's IT systems similarly influences the IS auditor's role, as does inherent client risk. Finally, the client resources available for the engagement represent a constraint on the budget for the audit and, indirectly, the auditor's decision to engage with the IS auditor.

6.2.3. System characteristics

The theory identifies two key characteristics of the client's discrete systems from the common statements. These characteristics are system materiality (WHAT-2) and system complexity (WHY-7). These two constructs are also reflected in the prior audit literature.

The "system materiality" construct represents the materiality of a specific system for financial reporting. Such a system must be integrated with the financial reporting IS as well as be material. That is, the system must directly provide information into the financial report that, if misstated, has the potential to lead to a material misstatement of the financial report. Prior literature recognizes the role of system materiality in considering the professional requirements of paragraph 18 in ISA 315 (Curtis et al., 2009; IAASB, 2009c).

Conversely, the "system complexity" construct represents the complexity of a specific system. The "system complexity" construct and the "IT complexity" construct are related, as a complex business IT environment likely incorporates at least one complex system. Nevertheless, "system complexity" is distinct from "IT complexity" as it considers a single system rather than the total business IT environment. The relationship between "system complexity" and the IS auditor role is more specific. A system must be both complex and integrated with the financial reporting IS to directly affect the IS auditor role. Consistent with these findings, prior literature considers that higher system complexity means substantive testing is likely to be ineffective and, for this reason, the IS auditor may instead need to test controls (Janvrin et al., 2009). Curtis et al. (2009) also identifies system complexity by considering whether a system is large, integrated, and automated.

The common statements suggest several apparent relationships between these two constructs and the IS auditor role. Material systems are more likely to require IS auditor advice (either the internal IS auditor or, for very material systems, the outsourced IT audit service provider). In particular, material systems are liable to require the IS auditor to undertake an application controls review for the individual system. Complex systems similarly influence the IS auditor's role.

6.2.4. Practice office characteristics

The theory identifies two key characteristics of the practice office from the common statements. These characteristics are the practice office audit procedures (HOW-1) and the practice office's IS audit emphasis (WHO-1, WHY-5, WHY-10, WHY-13, HOW-2). The first construct is reflected in the prior audit literature, but the "IS audit emphasis" construct is new.

The "practice office audit procedures" construct represents the audit procedures in use at the practice office. These audit procedures determined the scope and nature of IS audit work undertaken, and the parties that performed the IS audit work. Most practice offices assessed the level of IT sophistication of their clients, and that assessment mandated the type and extent of the IS audit work. For example, the audit procedures might mandate substantive testing for an entity with low IT sophistication. In contrast, the procedures might mandate that a financial auditor review IT controls for an entity with medium IT sophistication whereas the procedures might require an IS auditor to perform the review for an entity with high IT sophistication. Prior literature reflects this relationship between the audit procedures, the IS audit work undertaken, and the role of the IS auditor (Singleton, 2010).

The "IS audit emphasis" construct represents the practice office's view of the relationship between the IS auditor and the audit team in the practice office. The findings indicate that IS audit emphasis differed markedly between offices. Fig. 3 provides our assessment of the relative IS audit emphasis (low, medium, and high) of the ten practice offices.

In some cases, integrated audit teams of auditors and IS auditors existed. As Interviewee I1 observed, their office previously "*had a dedicated IT audit group which undertook all the IT audit work on clients*". It was disbanded as "*it was seen as a bit divorced from main stream and financial audits*". Some practice offices looked to IS audit to provide value to their clients (A7: "*if you're looking at systems then you are adding a lot of value potentially*").

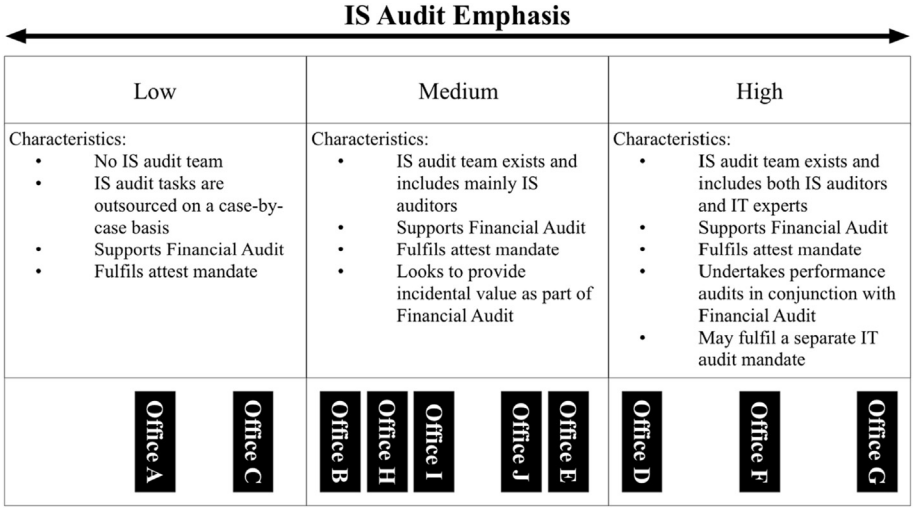

Fig. 3. The relative IS audit emphasis of the ten practice offices considered in this research. Our assessment identifies that Office A has the lowest IS audit emphasis whereas Office G has the highest.

Some practice offices had a high technical capability in the assessment of IT. Particularly, some IS audit teams had strong IT technological expertise. For example, the Director of IS Audit at Office G, G1, observed, "*Other guys may have other bits and pieces like Microsoft certifications as administrators and engineers and bits and pieces so - technical I guess is where we're at.*"

In some cases, a legislative imperative supported this capability. For example, one IS auditor noted: "*…we do a compliance audit so that will be a specific audit that's reported to parliament, nothing to do with the financial audit support…*". Here, the IS auditors "*might come up with a topic - a specific topic that we would report on*" and so the IS audit function might set its own agenda.

In other cases, the technical capability existed to provide a "value add" in the financial audit. For example, D1 considered that "*the value add for IT audit is less of us being able to understand accounting principles and more of us being able to apply complex data analysis or forensic analysis to streamline the audit*". That is, the IS audit team undertakes value-for-money, or performance, audits as well as compliance audits.

Consequently, practice offices with a high IS audit emphasis include IT experts in the IS audit team as well as IS auditors. We recognize three separate levels of "IS audit emphasis":

- **Low IS audit emphasis**: The practice office does not maintain an internal IS audit team, and outsources the IS audit task according to the support needs of each financial audit.
- **Medium IS audit emphasis**: The practice office maintains an IS audit team that supports financial audit. Involvement of this team is mandatory for clients with high IT sophistication, and the practice office looks to deliver incidental value to clients through IS audit services.
- **High IS audit emphasis**: The practice office maintains an IS audit team that supports financial audit. The IS audit team includes IT experts as well as IS auditors, and provides technical analysis and IT expertise to the client as a "value-add" to the audit. In the public sector, this level of IS audit emphasis is sometimes characterized by legislative support for an IT audit mandate, or a strategic intent to provide value-for-money audits to clients.

Prior literature does not explicitly consider the "IS audit emphasis" construct. However, there are parallels with the "IT intensity" construct identified in Clarkson et al. (2003).

The common statements suggest several apparent relationships between the "practice office audit procedures" and "IS audit emphasis" constructs and the role of the IS auditor. The first construct of "practice office audit procedures" affects the IS auditor role. That is, the procedures determine the nature and extent of general computer control reviews and application control reviews, and who undertakes these reviews. In the case of the second construct, a practice office with a high IS audit emphasis is both more able and more likely to engage an IS auditor for the review of general computer controls and the review of application controls. Auditors at practice offices with a high IS audit emphasis are likely to engage earlier with IS auditors and in a more sophisticated manner.

6.2.5. Auditor characteristics

The theory identifies four key characteristics of the auditor from the common statements. These characteristics are the auditor's ability to understand critical systems (WHY-1), capacity to identify general computer controls (WHY-2), preference for substantive or controls testing (WHY-4, WHY-9, WHY-11), and their view of audit efficiency (WHY-12). These four constructs are reflected in the prior audit literature.

The "ability to understand critical systems" construct represents the auditor's ability to review application controls of critical IS without assistance. The "capacity to identify general computer controls" construct represents the auditor's capacity to review the general computer control environment without assistance. Both constructs relate to the constraints of the auditor's ability acknowledged in ISA 220 and ISA 620 (IAASB, 2009b, 2009d), and recognize that the auditor relies on the work and expertise of others when needed. Prior literature reflects these two constructs in identifying the implications of the auditor's technical skills and knowledge for IT audit quality (Havelka and Merhout, 2013).

The "preference for substantive or controls testing" represents the auditor's preference to rely on substantive testing or controls testing. This construct is related to the "view of audit efficiency" construct that represents the auditor's perspective of the role of the financial audit, and how it achieves efficiency. The auditor might prefer to invest in controls testing for long-term efficiency, or prefer to use substantive testing to keep audit costs low in the short term. Prior literature has considered this concept in terms of the auditor's willingness to rely on weaker analytical procedures (Glover et al., 2005; Janvrin et al., 2009).

The common statements suggest several apparent relationships between these four constructs and the IS auditor role. The auditor is more likely to engage the IS auditor where the auditor's ability to understand critical systems is low and the auditor's need to understand the same suite of systems is high. An auditor will also be more likely to engage with IS auditors when the auditor has a limited capacity to identify general computer controls. If, though, the auditor prefers to rely on substantive testing rather than upon controls testing, the auditor is less likely to engage IS audit. This preference relates strongly to the auditor's view of "efficiency" in the audit.

7. Summary and conclusion

This research examined the role of the IS auditor in public sector financial audits by addressing the research questions, "*What is the role of the IS auditor in supporting the financial audit?*" and "*What key determinants affect that role?*" We conducted a field study to identify the prominent and shared understanding of the role of the IS auditor held by 55 auditors in the public sector in Australia, Canada, New Zealand and the United Kingdom. We then developed an "explanation theory" (Gregor, 2006) of the IS auditor role in the public sector financial audit from these common statements. This initial theory identifies constructs relating to the client, the client's systems, the practice office and the auditor, which are presented as four key determinants of the IS auditor role.

In this research, several theoretical contributions are made through the development of an explanation theory. First, this research identifies core constructs that affect the IS auditor role. Particularly, a new "IS audit emphasis" construct is identified that shows how the practice office's emphasis upon the role of IS audit affects the role of the financial IS auditor. Although there are similarities with the "IT intensity" construct identified in Clarkson et al. (2003), IS audit emphasis is specific to the IS audit role and incorporates characteristics of the practice office. The research therefore contributes to theory by identifying "what" (Whetten, 1989) factors affect the IS auditor role.

Second, Gregor (2006) judges the contribution of an explanation theory primarily on the new or interesting insights it provides. Prior research has not focused upon the theoretical foundations of the relationship between the auditor and the IS auditor. This research provides an initial explanation theory that offers a cohesive foundation for future theoretical work to explain *and* predict the role of the IS auditor. A contribution to theory is made by identifying "how" the factors affecting the IS auditor role are related (Whetten, 1989).

Third, Gregor (2006) also considers the contribution to knowledge made by a theory of explanation according to its plausibility, credibility, consistency and transferability. In this case, relating statements made by 55 experienced auditors in ten practice offices across four countries to the common statements underpinning the theory strengthens the theory's plausibility. Furthermore, these arguments are consistent with prior literature. The rigorous use of an audit trail (Lillis, 1999) in developing the theory also demonstrates the credibility and consistency of the theory. Finally, the development of the theory from multiple contexts and regulatory settings demonstrates the transferability of the theory to other contexts. Although limitations are recognized, the theory is likely to provide insight when transferred to other contexts.

This research also presents a methodological contribution through the use of Leximancer coding to develop the theory. While Fisher et al. (2016) identified an accounting paper (Crofts and Bisman, 2010) that used Leximancer in their synthesis of the accounting, auditing and finance literature related to text processing, we are unaware of any auditing studies employing Leximancer. Our approach to qualitative data analysis using Leximancer is less resource intensive, less time-consuming, and easier to implement than the traditional manual coding of large textual data sets. Therefore, this research makes a methodological contribution to auditing and accounting IS research.

This research also claims several practical contributions. The theory of explanation provides the financial auditor with guidance on when to engage IS auditors to assist in the financial audit. Furthermore, the explanation theory developed in this paper provides a richer description of current practice with regard to the IS auditor's role in the financial audit than currently exists. In particular, this research identifies the primary role of the IS auditor in undertaking general computer control reviews. This primary role is in contrast with prior research that gives greater standing to the IS auditor task of application control reviews (Bagranoff and Vendrzyk, 2000; Daigle et al., 2005). Consequently, the research provides insights for those involved in the education and training of auditors to better understand the IS auditor role in the "technology-laden auditing environment" (Vasarhelyi et al., 2010, p. 415).

Of course, in any research there are some limitations and this work is no different. Contextual factors establish a boundary for the generalizability of the theory (Whetten, 1989). Transferability of the theory to the private sector may be limited, as the interviewees are drawn solely from the public sector. Prior researchers identify many similarities with respect to audit teams and processes (Fargher et al., 2005) between private sector and public sector auditing, but many significant differences such as their intended audience, compliance focus, and accountability also exist (Carslaw et al., 2012; Kearns, 1994).

In addition, the findings may similarly be bounded to Westminster system nations that have adopted international auditing and accounting standards, as with the practice offices in this study. However, most developed nations have adopted versions of the IFAC auditing and accounting standards, or have national standards that are substantially consistent with them (Mala and Chand, 2012). Notably, the US has not adopted the IFAC auditing standards, and the auditing standards used for US publicly traded companies are based less on judgment and more on rules than the ISAs (Kleinman et al., 2014). Publicly traded companies in the US – with some exceptions for smaller issuers and some growth companies – are required to perform control audits under Section 404(b) of the Sarbanes-Oxley Act (Kinney et al., 2013). The ISA do not have this requirement. Nevertheless, our theory is expected to generalize to the US setting as US standards are considered compatible with the IFAC standards (Kleinman et al., 2014).

The study's results suggest opportunities for future research to extend and validate the explanation theory. A clear opportunity for future research is the confirmation and refinement of the theory as part of a long-term research program. Such future research should consider the limitations of this research and extend the domain of the theory by empirically testing its boundaries (Dubin, 1978). One option is to replicate the field study approach used in this research in the private sector or in different regulatory contexts. Other options are to confirm and refine the explanation theory using case study, survey, ethnographical, phenomenological or hermeneutic research approaches (Gregor, 2006). These options for future research are "progressively coherent" (Locke and Golden-Biddle, 1997, p. 1035) and potentially create developed and focused lines of inquiry as part of a research program.

Future research may also use the explanation theory to develop greater insights into the IS auditor role. Gregor (2006) considers theories for explaining (Type II) to have strong interrelationships with theories for explaining and predicting (Type IV) and theories for design and action (Type V). This interrelationship provides a basis for two further opportunities for future research.

The first opportunity is that our explanation theory can provide a basis for the development and testing of a future Type IV theory for explaining and predicting that sets out formal propositions. Opportunities for future research therefore include the development and refinement of the constructs, and theoretical propositions regarding their inter-relationship. As discussed above, the constructs identified in our theory have parallels in existing research that future research ought to consider. Similarly, future research may consider the interrelationships between these constructs that our explanation theory does not address. For example, a future Type IV theory might consider the interaction of the auditor's "view of audit efficiency" and the practice office's "IS audit emphasis". Finally, future research might develop survey instruments and/or experimental designs that empirically test a future Type IV theory.

The second opportunity is that our explanation theory can also provide a possible basis for a Type V theory for design and action that "says how to do something" (Gregor, 2006, p. 628). A Type V theory draws upon the design-science paradigm to create and evaluate "new and innovative" IT artifacts with the intention of solving identified organizational problems (Hevner et al., 2004, p. 87). For example, a practical contribution of our theory is to provide the financial auditor with guidance regarding when to engage IS auditors. This suggests an opportunity to develop a new and innovative decision aid that considers the characteristics of the client, systems, practice office and the auditor as set out in the explanation theory to advise the auditor on engaging the IS auditor in the financial audit.

In conclusion, we present in this paper an explanation theory for the role of the IS auditor in public sector financial audits. This theory is an "interim struggle" (Weick, 1995, p. 386) as it provides a foundation for a more complete understanding of the IS auditor role in the public sector financial audit. The theory provides an integrated framework for future research regarding the extent, manner, and nature of the IS auditor role.

Acknowledgements

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Appendix A. Interview protocol

1. Demographic questions
   Question: What is your position within your organization?
   Question: What is your role within the audit team?
   Question: For how long have you been an auditor? By way of background, can you provide a general overview of your qualifications and past experience?
2. Interview background
3. Invite questions to clarify purpose or focus of interview
4. Confirmation of the role of IS Audit
   Question: For a moderate size organization with reasonable controls, what is your perception of the role of information system auditors in the financial statement audit?
5. Confirmation of the accounting standards with most impact upon audit effort and complexity
   This research examines the impact of the 'Audit Risk', 'A-IFRS', and 'Black Letter Law' changes to accounting and auditing standards upon the IS Audit Process.
   Research to date indicates that the following accounting standards have the most impact upon audit effort and complexity (primarily based upon de George, Ferguson, & Spear, 2007):
   - IASB 2 Share-based Payment
   - IASB 112 Income Taxes
   - IASB 116 Property, Plant and Equipment
   - IASB 119 Employee Benefits
   - IASB 132 Financial Instruments: Presentation
   - IASB 136 Impairment of Assets
   - IASB 138 Intangible Assets
   - IASB 139 Financial Instruments: Recognition and Measurement

   Question: Do you agree that these accounting standards have the most impact upon audit effort and complexity?
   Question: Can you identify other Australian accounting standards that have a significant impact upon IS audit effort and complexity?
   Question: How have these changes affected IS audit effort and complexity?
6. Confirmation of the major computer-based registers implied by the accounting standards
   A register is a type of special journal - for example, the payroll register (Hall, 2004).
   Our review of the computer-based registers implied by the accounting standards with the most impact upon audit effort and complexity indicates the following computer-based registers that will be common to most IS audits:

   An overview of the requirements for these registers is provided.
   Question: Do you agree with the names assigned to the implied computer-based registers? Can you suggest a more relevant title for the computer-based register outlined that is more in line with your experience?
   Question: Can you identify other generic computer-based registers that you consider are common and significant to the IS Audit Process?
   Question: How would you say these new registers have affected the IS audit process?
7. Confirmation of the auditing standards with the most impact upon the role of IS Audit
   Our research indicates the following significant implications of the auditing standards for the IS audit process.

Question: Do you agree that these auditing standards have significant implications for the IS audit process?
Question: Can you identify other Auditing Standards that are relevant to and focused upon the IS audit process?
Question: Are there any other relevant and focused implications of the Australian accounting and auditing standards for the IS audit process that you can identify?

8. Approach to information systems audit

   Question: What weaknesses do you perceive, if any, with your organization's current approach to information systems audit? Why are these seen as problems?
   Question: ISA 315 directly addresses IT related issues. However, it may also be interpreted as a financial audit issue. Is ISA315 treated as an IT audit issue within your organization or is it dealt with by the financial audit team?
   Question: When do you use specialist IT auditors (or IT audit methodologies) during the course of a financial audit?
   Question: When *should* you use specialist IT auditors (or IT audit methodologies) during the course of a financial audit? If your current use differs from this, how does it differ and why?
9. Other issues

   Question: If we had only 3 min to discuss the role of information systems audit in the audit process, and your use of IT-based audit support tools in the audit process, what would your main message to me today be?
10. Thank participant for their contribution to the research.

All responses will be kept confidential to the review project.

Common implied computer-based register title	Implied by accounting standard(s)[a]:
Asset Register	IASB 1050, IASB 1052, **IASB 136**
Employee Benefits Register	**IASB 119**
Financial Instruments Register	IASB 1023, IASB 1038, **IASB 132**, **IASB 139**, IASB 7
Intangible Assets Register	**IASB 138**
Property Plant and Equipment Register	IASB 1023, IASB 1038, **IASB 116**
Share Based Payment Transactions Register	**IASB 2**
Tax Payable Register	**IASB 112**

[a] **Bold** entries indicate an accounting standard with a major impact.

Audit methodology step	Auditing standard
Perform completion phase of review of internal (accounting) control	ISA 315 Understanding the Entity and Its Environment and Assessing the Risks of Material Misstatement
Understanding the entity and its environment	ISA 240 The Auditor's Responsibility to Consider Fraud in an Audit of a Financial Report
Understanding the entity and its environment	ISA 315 Understanding the Entity and Its Environment and Assessing the Risks of Material Misstatement
Make preliminary estimate of materiality	ISA 320 Materiality and Audit Adjustments
Decide on overall planned reliance on internal (accounting) control	ISA 315 Understanding the Entity and Its Environment and Assessing the Risks of Material Misstatement
Design control tests and substantive tests based on planned reliance	ISA 330 The Auditor's Procedures in Response to Assessed Risks

Appendix B. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.accinf.2016.12.003.

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