Continued use of intelligent decision aids and auditor knowledge: qualitative evidence

Micheal Axelsen
Business School, University of Queensland, Brisbane, QLD, Australia., m.axelsen@business.uq.edu.au

Follow this and additional works at: http://aisel.aisnet.org/amcis2012

Recommended Citation
http://aisel.aisnet.org/amcis2012/proceedings/AccountingInformationSystems/19
Continued use of intelligent decision aids and auditor knowledge: qualitative evidence

Micheal Axelsen
UQ Business School
The University of Queensland
m.axelsen@business.uq.edu.au

ABSTRACT

The Theory of Technology Dominance proposes that continued use of intelligent decision aids (IDAs) relates to a decrease in auditors’ decision making skills, or deskilling. Prior research has considered deskilling in terms of auditor declarative knowledge. This research considers deskilling in relation to auditor declarative and procedural knowledge through an extended research model. A novel, rigorous and repeatable qualitative research method using automated text analysis (Leximancer) is developed for the analysis of significant bodies of text. Nineteen senior auditors in three audit offices were interviewed, and the transcripts analyzed. The findings indicate strong support for the hypothesized negative relationships between three constructs (the extent an IDA performs routine and time-intensive tasks, the dependence of an auditor on the IDA, and the auditor’s time with an IDA), and an auditor’s declarative and procedural knowledge. The results indicate avenues for future research, and provide guidance to practitioners in the use of IDAs.

Keywords (Required)
Technology dominance, intelligent decision aids, professional judgment, deskilling.

INTRODUCTION

Leach (2008, p4) rang "alarm bells" for the auditing profession, as research indicated that the continued use of Intelligent Decision Aids (IDAs) might be deskilling auditors. Yet, practitioners increasingly rely on IDAs (Janvrin, Bierstaker and Lowe 2008) such as audit workflow tools or applications that assist the auditor by determining a bank audit client’s acceptable levels of loan loss reserves (Arnold and Sutton, 1998).

Proposition 7 of Arnold and Sutton's (1998) Theory of Technology Dominance (TTD) set out the deskilling proposition as a positive relationship between auditor ‘deskilling’ and the continued use of IDAs. IDAs integrate the expertise of audit experts, and assist the auditor to make better decisions than when unaided (Arnold, Collier, Leech and Sutton 2004). Deskilling is a decrease in auditor decision-making skills (Arnold and Sutton 1998). Research to date (Dowling, Leech and Moroney 2008; McCall, Arnold and Sutton 2008) has focused upon auditor declarative, or 'what-is' (Bouwman 1996, p261), knowledge. Procedural, or 'how to' (Bouwman 1996, p261), knowledge more closely aligns with "decision-making skills" (Bedard and Chi 1993).

Dowling and Leech (2007) called for researchers to further investigate the long-term effects of IDA use during the entire audit process. A rigorous qualitative approach to the investigation of this phenomenon will produce insights into the effects of IDA use. Accordingly this paper addresses the question, "Is there qualitative evidence for a negative relationship between the continued use of IDAs and auditor decision making skills across the audit?" through interviews with nineteen auditors in three different audit offices.

The paper is set out as follows. Firstly, the TTD and the deskilling proposition are discussed. An extended research model and associated hypotheses are then set out. The research method used is identified, followed by the research results. The implications of these results for theory and practice are then considered. The paper concludes by identifying the limitations of this research and the implications of these results for future research.

THE THEORY OF TECHNOLOGY DOMINANCE

The TTD (Arnold and Sutton 1998) relates to the use of IDAs by auditors. IDAs are a form of expert system integrating the expertise of a given field to assist the user in making decisions (Arnold et al. 2004). The underlying premise of TTD was that users are insufficiently aware of the limitations of the technology underpinning the IDA. Arnold and Sutton (1998) presented eight propositions in three sections.
The first section considers an auditor’s reliance upon an IDA with four propositions. The second section sets out two ‘dominance-oriented’ propositions. The evidence for the first and second sections of the theory is strong (Arnold et al. 2004; Hunton, Arnold and Reck 2010; Jensen, Lowry, Burgoon and Nunamaker 2010).

The third section sets out two ‘epistemological’ propositions. Proposition 7 of the TTD, or the ‘deskilling’ proposition, was that "a positive relationship between continued use of an intelligent decision aid and the de-skilling of auditors' abilities for the domain in which the aid is used" exists (Arnold and Sutton 1998, p189). The deskilling proposition is the focus of the current research.

Arnold and Sutton (1998) identified two prominent factors in deskilling. Firstly, as the IDA frees "the auditor of all these mundane and time-consuming chores" (Arnold and Sutton 1998, p188), the auditor does not undertake the detailed work that leads to experiential knowledge (Rochlin 1997). Secondly, Arnold and Sutton (1998) considered that deskilling also arises when auditors are dominated by technology. Dominance occurs where the novice auditor does not understand how the IDA’s recommendations are made (Arnold and Sutton 1998).

Arnold and Sutton (1998, p192) acknowledged the difficulty of testing the deskilling proposition using the “traditional scientific method” as control over variables (for example, ‘continued use’) is impractical, and measurement of professional skill levels over time is difficult. Nevertheless, some indicative findings exist. Mascha (2001) showed that IDA use over a relatively short period can significantly affect end user skills. Mascha and Smedley (2007) found that task-experienced participants presented with a less complex decision task, as with an IDA, will deskill.

Dowling, Leech and Moroney (2008) found a negative relationship between auditors’ declarative knowledge and the continued availability of IDAs that provided high levels of decision support. Declarative knowledge is the ‘what is’ knowledge of facts and events, and includes a knowledge of the semantic rules (Bouwman 1996, p261). Declarative knowledge is distinct from procedural, or ‘how to’, knowledge that is the application and extension of declarative knowledge (Bouwman 1996, p261). A novel approach to testing the proposition was adopted by Dowling, Leech and Moroney (2008) in that the subjects were selected based on their continued and long-term (at least two years) professional use of a single IDA. The findings of Dowling, Leech and Moroney (2008) are echoed by the results of Sparrow, Liu and Wegner (2011), where users had poor recall of information held in information systems the user expects to have continued access to.

Similarly, McCall, Arnold and Sutton (2008) examined deskilling in relation to end users’ explicit knowledge. Explicit knowledge is knowledge that can be explicitly stated and contrasts with tacit knowledge arising from contextual experience (Nonaka 1994). Explicit knowledge aligns strongly with declarative knowledge (Alavi and Liedner 2001). McCall, Arnold and Sutton (2008) found poorer performance when the participants in the experiment did not have the knowledge management system available.

Limitations in this research exist. Both Dowling, Leech and Moroney (2008) and McCall, Arnold and Sutton (2008) used laboratory experiments with a restricted opportunity to ensure both internal and external validity. Dowling, Leech and Moroney (2008) were unable to randomly assign subjects, had no control group, and could not pre-test subjects to determine skill levels prior to IDA use. McCall, Arnold and Sutton (2008) acknowledged student participants may have studied outside of the experimental setting, and may not be representative of audit professionals. Further, this study reports upon an experiment that took over three consecutive class sessions rather than the two years continued use suggested by Arnold and Sutton (1998).

Both studies also addressed declarative knowledge, rather than procedural knowledge. Auditor expertise is not always directly measured by ‘what’ the auditor knows (Libby and Tan 1994). Procedural knowledge is central to the development of expertise by professionals, and knowing ‘how-to’ audit is more complex and different to knowing ‘what is’ audit (Bedard and Chi 1993; Libby and Tan 1994).

Dowling and Leech (2007) reflected that IDA use was now pervasive enough, and that IDAs had been deployed for a sufficient period of time, to allow researchers to design studies considering the deskilling proposition. Dowling and Leech (2007) recognized that research considering the relationship between continued IDA use and procedural knowledge is required to obtain a deeper understanding of the deskilling proposition. This research addresses this requirement.

RESEARCH MODEL AND HYPOTHESES

Deskilling is complex. Although the TTD provides a solid platform in relation to auditor deskilling, an extension of the theory is required to support a deeper understanding. Arnold and Sutton (1998) considered the extent to which the IDA frees the auditor of routine tasks and where the auditor is overly dependent on the IDA as prominent factors in deskilling. Two
related constructs are proposed. The first construct considers the 'extent IDA performs routine and time-intensive tasks'. The second construct is 'Auditor IDA dependence', being the extent to which the auditor is dominated by the IDA technology.

Following Arnold and Sutton (1998), Dowling, Leech and Moroney (2008) considered two years as the minimum period of continued use of an IDA for deskilling to occur. This period guides the selection of cases as well as supporting the incorporation of the 'Time with IDA' construct, being the time spent using the IDA by the auditor.

The research model considers auditors' skills and abilities in terms of declarative and procedural knowledge (Bedard and Chi 1993; Dowling, Leech and Moroney 2008). The 'Declarative Knowledge' construct is the auditor's ability to recall facts and events from memory - the auditor's "what is" knowledge (Bouwman 1996, p261). The 'Procedural Knowledge' construct represents the auditor's skills and process, or "how to" knowledge used in the application of their "what is" knowledge (Bouwman 1996, p261). Deskilling occurs where declarative or procedural knowledge of IDA users decreases.

Thus the research model set out in Figure 1 was developed for hypothesis testing. The research model presents an extended theoretical basis for the deskilling proposition.

![Figure 1: An extended research model of the deskilling proposition set out in Arnold and Sutton (1998).](image)

Six hypotheses are considered in this research study. Each hypothesis presents a proposed negative relationship between the continued use of an IDA and auditor abilities and skills:

H1: The greater the extent to which the IDA performs routine and time-intensive tasks the less declarative knowledge possessed by the auditor.

H2: The greater the extent to which the IDA performs routine and time-intensive tasks the less procedural knowledge possessed by the auditor.

H3: The greater the auditor's dependence on the IDA the less declarative knowledge possessed by the auditor.

H4: The greater the auditor's dependence on the IDA the less procedural knowledge possessed by the auditor.

H5: The greater the time the auditor has spent with the IDA the less declarative knowledge possessed by the auditor.

H6: The greater the time the auditor has spent with the IDA the less procedural knowledge possessed by the auditor.

This research adopts a novel but robust qualitative research model in testing these hypotheses as outlined in the next section.
RESEARCH METHOD

A qualitative approach provides the opportunity for insight into auditor deskilling and to increase understanding of the deskilling proposition (Silverman 1998). A common criticism of qualitative research methods is a lack of rigor and reliability (Marshall 1985). This paper develops a rigorous and transparent qualitative approach in addressing the research question.

Semi-structured interviews were undertaken with nineteen public sector auditors in Australia at three different public sector audit offices. Semi-structured interviews ensure complete and consistent coverage of pre-specified interview questions while allowing the interviewer to explore themes identified at interview (Lillis 1999). The number of participants in this study ensures robustness and generalizability in these findings. These offices had been using their current IDA for a period of at least two years. The section of the interview protocol relating to deskilling is presented in Table 1 below.

<table>
<thead>
<tr>
<th>Interview protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much do you feel that you rely upon IT-enabled audit support tools in carrying out audits?</td>
</tr>
<tr>
<td>Do you believe that your ability to recall details recorded in the IT tool (for example, industry-specific risks and the details of accounting standards) is impacted as a result of your use of the tool? How important do you think it is that you be able to recall these details?</td>
</tr>
<tr>
<td>Do you believe that your ability to run an audit without access to the IT tools is impacted as a result of your use of the IT tools? Do you think it is important that you be able to run an audit without access to the IT tool?</td>
</tr>
<tr>
<td>To what extent does your organization require you to follow the steps outlined in the IT tool? Are you able to adjust the audit program in accordance with each audit’s requirements?</td>
</tr>
<tr>
<td>What training and other support programs do you have access to in order to keep your skills up in the field of audit?</td>
</tr>
<tr>
<td>If we had only three minutes to discuss your use of IT-based audit support tools in the audit process, what would your main message to me today be?</td>
</tr>
</tbody>
</table>

Table 1: Interview protocol relating to the use of IT-enabled audit support tools.

Recorded interviews were transcribed and de-identified for confidentiality. The automated text analysis tool 'Leximancer' (Smith 2000) offers an efficient, effective and valid approach to the analysis of large transcripts (Penn-Edwards 2010) and was used in this research. Only a subset of the transcript interview relating directly to the deskilling theme was retained for analysis. The potential for bias in this thematic grouping was minimal as themes derived directly from the interview protocol (Lillis 1999). Statements by the interviewer were removed.

Automated text analysis requires that each statement incorporate meaning derived from its context. Interviewees use filler words (e.g. ‘um’, ‘ah’) as well as ambiguous pronouns for complex concepts. Interviewees often provide one-word responses (e.g. ‘Yes’) to complex interviewer questions. Including the context of the interviewer's statements is necessary for automated text analysis to avoid prevarication by Leximancer (Grech, Horberry and Smith 2002). As with prior research (Grech et al. 2002), pronouns were replaced with grammatical antecedents, filler words removed, and statements in response to a question 'expanded' to incorporate the full meaning of the question.

The 'expansion' process according to a narrow and mechanistic set of rules ensured each statement maintained full contextual meaning with the introduction of minimal bias. The expansion of text eliminates "noise and distraction" from the transcripts for Leximancer (Grech et al. 2002). A full audit trail from the altered transcript to the original statement was maintained. Summary and sample data relating to this expansion process is reported below.

The statements were imported into Leximancer. Leximancer was not used to automatically identify concepts. Rather, a single researcher identified words relating to, or synonyms for, the research model constructs from words appearing in the transcripts to create user-defined concepts. Leximancer's 'word-like concept classification threshold' was set to two to eliminate statements with little meaning. This threshold is a proprietary Leximancer setting used to determine the presence of a ‘word-like concept’ in a statement.

---

1 A copy of the interview protocol is available from the author upon request.
2 Leximancer 3.51.15 (www.leximancer.com).
Leximancer provides a visual concept cluster map (Smith 2000), and indicates a knowledge pathway between concepts. The K score is a proprietary Leximancer statistic that measures the most likely pathway between concepts. The K score indicates correlation, but not causation, between concepts in the transcripts. Causation may be implied from the statements along the path, but cannot be automatically determined.

Statements relating to the hypothesized relationships between the concepts identified from the research model were identified from the knowledge pathway. A cross case analytical matrix (Lillis 1999) allowed manual coding by a single researcher to identify statements that agreed (A), disagreed (D), or did not relate (N) to the relevant hypothesis. This approach highlights causal links identified by respondents and has been adopted by qualitative researchers seeking to ensure trustworthiness (e.g. Lillis 1999).

A visual map identifying statement counts and multi-vocality (that is, the number of interviewees making each statement) for each concept is developed. For each hypothesized relationship, the number of statements supporting or not supporting the hypothesis (as well as multi-vocality) is also presented. The K score for each hypothesized relationship is also provided.

RESULTS

Three Australian public sector audit offices (A, B, and C) participated in the research. Gatekeepers at each office nominated participants. Interviews were undertaken at less busy times of the audit cycle. Nineteen senior auditors of ‘Senior’ level and above were interviewed as indicated by the auditors have an average of 15.8 years of audit experience. Table 2 presents demographic information relating to the interviewees.

<table>
<thead>
<tr>
<th>Office</th>
<th>Number of Participants</th>
<th>Audit Experience (Years)</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average</td>
<td>Min</td>
</tr>
<tr>
<td>Office A</td>
<td>7</td>
<td>14.2</td>
<td>3</td>
</tr>
<tr>
<td>Office B</td>
<td>6</td>
<td>25.7</td>
<td>15</td>
</tr>
<tr>
<td>Office C</td>
<td>6</td>
<td>7.8</td>
<td>3</td>
</tr>
<tr>
<td>All Offices</td>
<td>19</td>
<td>15.8</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 2: Average audit experience of interviewees

Office A had used an audit support tool for thirteen years, but two years prior to the time of interview implemented a new audit support tool. Similarly, Office B at the time of interview had used an audit support tool for ten years. Finally, Office C had used its audit support tool for eight years at the time of interview, but anticipated the implementation of a new audit support tool several months after the interviews took place.

Two researchers undertook the interviews at Office A. A single researcher undertook the interviews at Offices B and C. As part of a larger research study, only a proportion of the interview transcripts related to the research question of this paper. The recorded interviews were 18.7 hours (average: 0.98 hours) in duration. The transcripts were 299 pages (8,523 statements) in length. Each statement was coded thematically directly from the interview protocol. Discussion not related to the deskilling portion of the interview protocol, as well as interviewer statements, were removed. 1,377 statements (56 pages) from the original 8,523 statements (299 pages) were thus selected for analysis.

Each statement was expanded as outlined previously. 69 of 1,377 statements did not require expansion prior to import. Expansion increased the transcript text selected for analysis from approximately 37,814 words to 48,002 words (26.9%). Table 3 provides three randomly selected examples of expanded text.
Axelsen

Intelligent decision aids and auditor knowledge: qualitative evidence

<table>
<thead>
<tr>
<th>Transcript Reference</th>
<th>Statement Reference</th>
<th>Original Transcript</th>
<th>Expanded Transcript</th>
</tr>
</thead>
<tbody>
<tr>
<td>140</td>
<td>962</td>
<td>Respondent: No not so much.</td>
<td>No not so much training in the use of the IDA and IT based support tools.</td>
</tr>
<tr>
<td>330</td>
<td>2682</td>
<td>And then because it selected certain procedures it showed that the level of assurance from those procedures covered the risk and then you can delete a procedure and add a different one and the risk [PAUSE] your level of assurance may change but you had to always exceed the assessed risk.</td>
<td>And then because the IDA selected certain procedures the IDA showed that the level of assurance from those procedures covered the risk and then the auditor can delete a procedure and add a different one and the risk, your level of assurance may change but the auditor had to always exceed the assessed risk.</td>
</tr>
<tr>
<td>1110</td>
<td>19304</td>
<td>And if you survive okay you're employed.</td>
<td>And if you survive okay you're employed.</td>
</tr>
</tbody>
</table>

Table 3: Randomly selected transcript text to indicate changes from the original transcript to the expanded transcript. Transcript Line 1110 required no alteration.

The expanded transcripts (1377 statements) were imported into Leximancer. Compound concepts were defined from synonyms and related keywords selected by a single researcher from those occurring in the transcripts. The occurrence of a selected keyword in the statement marked the statement as including the ‘compound concept’. As a result, it is likely that a ‘false positive’ occurs where some statements are considered to erroneously include the compound concept. Table 4 presents the compound concepts and related keywords.

<table>
<thead>
<tr>
<th>Compound Concept</th>
<th>Keywords</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent IDA performs routine and time-intensive tasks</td>
<td>activities, activity, balance, compliance, comply, control, controls, efficiency, mandatory, manual, manually, outlined, process, processes, program, programme, programs, requirement, requirements, requires, step, steps</td>
</tr>
<tr>
<td>Auditor IDA Dependence</td>
<td>depending, depends, driven, drives, file, fill, fillers, filling, follow, following, form, form-filling, forms, manual, manually, refer, reliance, rely, tick, tool, tools</td>
</tr>
<tr>
<td>Time with IDA</td>
<td>hours, junior, presenting, senior, time, times, week, year's</td>
</tr>
<tr>
<td>Auditor Declarative Knowledge</td>
<td>accordance, balance, compliance, detail, detailed, details, document, documentation, documented, documents, doing, framework, guidance, guide, list, outlined, recall, recite, refer, standard, standards, technical, template, templates</td>
</tr>
<tr>
<td>Auditor Procedural Knowledge</td>
<td>ability, decisions, experience, explain, explanatory, judgement, judgment, knowledge, learning, methodology, performance, plan, planning, procedure, procedures, professional, skill, skills, thinking, thought, understand, understanding</td>
</tr>
</tbody>
</table>

Table 4: Compound concepts and related keywords.

Statements along the pathway between the relevant concepts were extracted from Leximancer in a cross-case analytical matrix. Each individual statement along the pathway was coded to "A" (Agreed), "D" (Disagreed), or "N" (Neutral) to the hypothesized relationship by a single researcher. This approach addresses the issue of ‘false positive’ statements through researcher review. Statements coded as "N" are either ‘false positive’ statements, or are statements including the concept but not discussing the hypothesized relationship. The extent of multi-vocality (the number of interviewees making the statement) was also identified. Figure 2 presents these results (omitting statements coded as "N" for clarity).
Figure 2: Results indicating commonly observed support for hypotheses.

Figure 2 indicates generally high K scores ranging from 0.54 to 0.81. These results indicate a high correlation of the concepts identified from the research model in the expanded transcripts.

Figure 2 indicates commonly observed support for all six hypotheses. H1, H2, H3, and H4 are commonly supported. That is, the majority of interviewees identified and agreed with hypotheses H1, H2, H3 and H4. The results for H5 and H6 are less clear, with fewer than 50% (H5: 32%; H6: 47%) of all interviewees identifying and agreeing with the proposed relationships. However, the clear majority of interviewees considering the relationship supported both H5 and H6, indicating some support for both hypotheses.

DISCUSSION OF RESULTS

Consistent with Dowling, Leech and Moroney (2008) and McCall, Arnold and Sutton (2008), the results support the hypotheses that the continued use of an IDA has a negative relationship with the auditor's declarative knowledge (H1, H3 and H5). The results also support a similar negative relationship between the continued use of an IDA and auditor procedural knowledge (H2, H4 and H6). Taken together the results indicate common support for a negative relationship between the continued use of an IDA and auditor abilities and skills.

The evidence for auditor deskilling in terms of declarative knowledge is generally strong. Interviewee A4 conceded "I think there is an impact on our knowledge of the details of the accounting standard requirements or industry risks and so on, as the IDA has got the dot points there." C5 felt that deskilling depended on the auditor, saying "I think those auditors that rely on the tool are those auditors that will never go and research the standards". An attribute intrinsic to the auditor is suggested here by C5, perhaps reflecting C4's observation that "auditors that have passion in audit and those auditors that do not have a passion in audit, you can see them."

In contrast, the evidence for a negative relationship between the auditor's time with the IDA and the auditor's declarative knowledge (H5) is less strong. This negative relationship was identified by 32% of interviewees. C2 said "...if the auditors are just going... year to year just following the same plan and professional development... how much learning are the auditors really getting?", although A4 felt "over time... with more time as an auditor... that ability to recall the details of the standards will improve."

Similarly, the evidence for a negative relationship between auditor dependence upon an IDA and procedural knowledge (H4) is generally strong. B2 identified the weakness "that always follows is that the auditor can get too caught up in the form...
filling process and not apply their professional thinking." B1 noted the same propensity, saying, "I think that auditors becoming form fillers without thinking about the task is definitely the downside of the methodology this office has."

The evidence for a negative relationship between the auditor’s time with the IDA and procedural knowledge (H6) was less strong, with 47% of interviewees agreeing with the hypothesis. B5 observed "...whenever I've taken the audit groups over you don't have to tell me who's been there 15 years because I can tell after a while just by the kind of work that, you know, that – the routineness of the auditors' work, the lack of thinking in the auditors' work." C5 also agreed strongly with H6 by stating "I think that there is a big time effect on some auditors' ability to run an audit without access to the IDA." Time with the IDA was perceived to affect auditor procedural knowledge, but individual auditor attributes had an effect as well.

In discussing Office A's use of its previous IDA, A7 observed "Over time auditors got to, just kept using what the IDA said rather than thinking and that's dangerous, that's dangerous because the auditors are not really understanding the risks fully." B2 believed "You never make blanket statements because there'll always be exceptions... you will find that there are some very bright auditors at those junior levels and the bright junior auditors have a logical mind" in comparison with "those junior auditors who may be more mechanical in their process and just look through and say okay, yes well the IDA says to answer that question".

The interviewees consistently and strongly supported the deskilling proposition of Arnold and Sutton (1998), but indicated that deskilling is complex. Auditor deskilling concerned the senior auditors interviewed. C3 worried "about what auditors will be like as auditors in a few years time", noting that as a junior auditor their mentor "always drilled it into me that the key thing is when an auditor walks into an audit the auditor has to understand the business and the auditor has to understand the risks of the business." A7 also felt that the previous highly supportive IDA "made the auditors lazy, made the auditors stop thinking... after 13 years of the other IDA... our auditors had to learn to audit again."

Interviewees did note the use of different tactics in response to the risk of deskilling, such as regularly changing the methodology to have "much more emphasis at the planning stage and understanding" (B1), ensuring that "junior auditors straight away go out and get in the field... not saying I'm learning auditing by just looking through this audit tool" (C3), and designing training that encouraged auditors to not "just be a form filler, auditors have got to think about the audit" (B1).

Overall, interviewees commonly observed the deskilling proposition. Several other factors, including an auditor's ability and 'passion for audit', were identified. That is, some interviewees observed that an auditor with high ability or a high level of interest in the audit role was observed to be less likely to deskill than an auditor without such ability or interest. The evidence also indicates practitioners are aware of the deskilling effect but consistently mitigate deskilling through training and modifying their use of IDA. Auditor deskilling concerns nevertheless remain. Auditor deskilling and IDA use is a complex relationship, and the need for future research enhancing the understanding of the relationship is warranted.

LIMITATIONS, FUTURE RESEARCH AND CONCLUSION

This research found strong commonly observed support to indicate a negative relationship between the continued use of IDAs and auditor declarative and procedural knowledge. The findings regarding auditor declarative knowledge are consistent with prior research.

Limitations are acknowledged. As a qualitative study with Australian participants, the findings may not generalize to other settings. However, the substantial number of participants across different organizations alleviates this concern. Perceptual bias may also affect the results as the findings are based upon interviewee observations. Likewise, the use of a single researcher rather than dual-coding for the identification of compound concept keywords and the coding of key statements limit the claims supported by these findings. Nonetheless the research found strong results identifying observations upon the deskilling proposition occurring in practice.

This paper makes several contributions to theory and practice. An extension of the deskilling proposition of the TTD through the development of a meaningful research model is presented. Further, the paper tests the TTD through explicit consideration of auditor procedural knowledge. The qualitative analysis method built upon the Leximancer automated text analysis tool is novel, rigorous and repeatable, although scope for further increases in robustness is acknowledged. The approach provides efficiency and transparency in the research, particularly in addressing the challenges raised by a significant body of text for analysis. Finally, audit practitioners are provided guidance in IDA design so as to reduce the deskilling of auditors.

The findings indicate several prospective mitigating factors, such as auditor ability and a high interest in the audit role, in relation to the deskilling proposition. Practitioners observe the deskilling effect but mitigate the effect through training and modifying their use of the IDA. Practitioners remain concerned by IDA use and auditor deskilling. Future research considering the complexity of deskilling and related mitigation strategies is warranted.
Overall, this paper presents evidence to indicate the alarm expressed by Leech (2008) was not unwarranted, but neither has the alarm gone unheeded. Auditors commonly support the observation that continued use of IDAs has a negative relationship with auditor knowledge, and act accordingly to mitigate the perceived deskilling effect.

REFERENCES

