TAX AUDIT QUALITY: THE ROLE OF EXPERIENCE AND TECHNOLOGY READINESS IN A DIGITAL WORLD

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Abstract

Society is digitising at a rapid pace and tax authorities must keep up with significant changes in how companies administer their tax liabilities. Tax auditors must be able to achieve an efficient and effective audit quality regardless of the degrees to which digitisation and digitalisation have been implemented by the audited companies. Previous research shows a positive correlation between audit experience and audit quality. However, it is unclear whether more experience—which was most likely acquired in traditional audits of accounting systems with low levels of digitalisation—is also beneficial in a changing environment with more highly digitalised companies. We argue that more experienced tax auditors are only superior to less experienced auditors in this changing environment if they are sufficiently willing and equipped to use new technologies and more digitised data. We expect—and find—that experienced tax auditors with adequate technology readiness achieve a higher audit quality in detecting information technology (IT) risks than tax auditors with less experience and/or less technology readiness. Our results, however, also show that more experienced tax auditors do not perform better when detecting traditional risks (i.e. non-IT-related risks) than less experienced auditors. Overall, our results suggest that experience without the propensity to embrace and use new technologies and more digitised data might not be enough to achieve the required audit quality levels in the future. We therefore emphasise the importance of appropriate training (in order to adopt new ways of working and acquire competencies to understand new technologies) and the strategic composition of the tax authorities' audit teams.

Keywords: Audit Quality, Tax Audits, Experience, Digitalisation, Technology Readiness.

1. INTRODUCTION

Society is digitising at a rapid pace. In combination with new information technology (IT), digitisation implies that significant changes are taking place within companies' business operations, administrative organisation, and internal controls. Consequently, the technological environment also becomes increasingly important in the everyday practices of auditors working for the tax authority (hereafter 'tax auditors') (Bierstaker et al., 2001; Stoel et al., 2012). The guidelines for International Standards on Auditing (ISA), published by the International Auditing and Assurance Standards Board (IAASB), emphasise the importance of the IT

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environment as part of a company's administrative organisation and conclude: "The auditor should obtain an understanding of […] aspects of the entity's IT environment that are subject to risks arising from the use of IT" (IAASB, 2019, p. 14–15). Digitisation affects the auditing process in many ways and brings with it entirely new IT-related risks that require tax auditors to have the appropriate know-how and skills, and the right mindset.

Know-how and skills can be gained from experience. Past research has confirmed that audit performance is positively correlated with audit experience (e.g. Kaplan et al., 2008; Knechel et al., 2013; Lehmann & Norman 2006). However, digitisation is constantly changing the technical environment of audits. With the importance of IT-related risks in tax audits strongly increasing, the question of whether experience gathered in more 'traditional' settings is enough to master the new challenges arises. Prior studies are inconclusive in this regard as they do not distinguish between IT-related audit risks and other, more 'traditional' audit risks. The present paper addresses this gap by analysing the role of tax audit experience in detecting both types of risks (traditional audit risks and IT-related audit risks). Further, we assume that for the detection of IT-related risks, auditors' technology readiness (i.e. how easily they become acquainted with and adopt new technologies) is of similar relevance as their general experience in tax auditing. We argue that the constant change caused by digitisation means that specific IT-related know-how continuously becomes outdated and that new skills must be developed on a regular basis. 'Technology readiness' implies that someone has the right mindset and openness towards technical progress. It forms the basis for tax auditors' motivation to keep abreast of the latest accounting and auditing technologies. Therefore, our second research question is whether tax auditors' technology readiness affects tax audit performance in addition to experience. To the best of our knowledge, neither of our research questions have been studied previously.

In this study, we measure the performance of auditors from four countries' tax authorities in two hypothetical tax audit scenarios. The case described in the scenarios contains either traditional audit risks or both traditional and IT-related audit risks. Unlike previous researchers, we find that more experienced tax auditors are not performing better than less experienced auditors in terms of detecting traditional (i.e. non-IT-related) audit risks. When detecting IT-related risks, however, we find that tax auditors with both experience *and* a high degree of technology readiness perform best in our hypothetical scenario.

The remainder of the paper is structured as follows. In the following section, we provide the institutional and theoretical background on tax auditing and develop our hypotheses. Next, we describe the research method, report the results, discuss our findings and their limitations, and provide suggestions for future research.

2. INSTITUTIONAL AND THEORETICAL BACKGROUND

2.1. Tax Audits and Audit Quality

The primary goal of tax authorities is to maximise compliance with tax laws. Tax audits are an important instrument used by tax authorities to address non-compliance (OECD, 2017). In the past, tax authorities predominantly pursued deterrence strategies in order to prevent and correct non-compliance by means of tax audits. As suggested in the economic theories of crime (Becker, 1968) and income tax evasion (Allingham & Sandmo, 1972), it is assumed that audits and fines enforce compliance. Meanwhile, however, psychology has shifted attention to fairness and trust-building measures that fuel voluntary compliance (Kirchler, 2007; Kirchler et al., 2008; Muehlbacher et al, 2011; Prinz et al., 2014). Accordingly, many tax authorities apply a comprehensive compliance (risk) management strategy comprising a whole toolbox of instruments, e.g. providing services and education, implementing cooperative compliance programmes, pursuing fraud investigations, conducting audits, and punishing non-compliers. Ideally, these instruments are applied in response to the behaviour of taxpayers (Braithwaite, 2007). Although tax authority strategies to address non-compliance have become more varied, "[...] audits remain a major tool for tackling non-compliance and in revenue bodies in most OECD countries constitute the largest deployment of resources for administration of the laws" (OECD, 2006, p. 6).

Given the scarcity of academic research on *tax* audit quality,[5] and lacking a theoretical framework, we rely on theories about audit quality in general. The concept of audit quality has received ample academic attention over the course of several decades, but there is still no agreement on how to define and measure audit quality (Knechel et al., 2013). The assessment of audit quality depends on who is referring to it: auditors, users, or regulators (e.g. Aobdia, 2019; Brivot et al., 2018; Knechel et al., 2013).

To circumvent definition problems, most researchers focus on the prerequisites of audit quality, as summarised in audit quality frameworks. Audit quality frameworks generally comprise (a number of) the following elements: *inputs*, *process*, *outcomes*, *context*, *regulation*, and *client demand* (see DeFond & Zhang, 2014; Francis, 2011; Knechel et al., 2013). Depending on the research context, different aspects of quality are discussed in the literature (Knechel et al., 2013). Many of the mentioned facets can be expected to be similarly relevant in the context of tax audits. For example, audits conducted by the tax authorities are characterised by similar inputs and similar processes as audits of financial statements in general (OECD, 2006). The intended outcome—reporting quality—is also mostly equivalent, although specifically aimed at tax returns instead of financial reporting in general. Given these similarities, we rely on the general auditing literature in developing our hypotheses. However, there are also some potential differences. For example, the context regarding compensation and fees is different for tax auditors. Tax auditors are not paid by their 'clients'. In addition, tax auditors do not experience client demand since the choice to perform an audit is made unilaterally by the tax authority. Furthermore, tax authorities do not provide audit services like commercial firms (e.g. preparing accounting records or providing legal services) that are found to lead to economic bonding and a possible decrease of independence (e.g. Knechel et al., 2013).

Given the scarcity of research into tax audit quality in general and into how it is affected by digitalisation in particular, our study makes an important contribution to the field. In the terminology of the above-discussed framework, our study addresses the following elements: *inputs* (the experience of the tax auditor) and *process* (the quality of the planning phase).

2.2. Experience in Auditing

More than three decades ago, Abdolmohammadi and Wright (1987) noted that "researchers have long been concerned about the effects of experience on decision making" in auditing (e.g., Bonner, 1990; Earley, 2002; Haynes et al., 1998, Kaplan et al., 2008, and Libby & Frederick,

[5] Related to our research question, Drogalas et al. (2015) focus on the effect of tax authorities utilising IT to enhance their tax audit effectiveness. While they focus on the tax auditor who utilises IT as an audit tool, we focus on the tax auditee who uses IT. In addition, Goldman et al. (2021) focus on the effect of task-specific experience on the audit quality of income tax accounts. While they focus on the audit quality delivered by external auditors who audit tax statements, we focus on the audit quality of tax auditors working for the tax authority.

1990) (p. 1). As a result, experience is considered to be an important factor for audit quality, both in theoretical frameworks (e.g. Francis, 2011; Nelson, 2009) and in regulatory standards (e.g. Public Company Accounting Oversight Board, n.d., p.12).

Empirical studies confirm that the quality of auditors' judgements improve with domain-specific knowledge (e.g. Bonner, 1990). According to Knechel et al. (2013), domain-specific knowledge consists of "knowledge accumulated through client, task, and industry experience" (p. 392). Although most studies only focus on one or two types, be it client-, task-, or industry-specific knowledge, they typically find that auditors' performance improves with experience (e.g. Goldman et al., 2022; Moroney & Carey, 2011). We consider client-based experience to be less important in the context of tax audits, because when compared to general auditors, tax auditors are more likely to deal with an array of clients rather than repeatedly cooperating with the same clients. Therefore, we focus on industry- and task-specific experience.

With regard to industry-specific experience, industry experts are found, for example, to be more likely to disclose errors and uncertainties in their audit reports (Reheul et al., 2017), to be associated with less earnings management (Balsam et al., 2003), and to be better at detecting errors (Owhoso et al., 2002) than non-industry experts. Similarly, task-specific experience is found to be associated with better analytical risk assessment (Bonner, 1990), with greater effectiveness in assessing the risk of fraud in financial statements (Knapp & Knapp, 2001), and with a greater ability to accurately explain audit findings (Libby & Frederick, 1990). Task-specific experience is developed by acquiring base-level knowledge that has common elements across settings and is organised in a manner that is applicable to multiple other settings (Goldman et al., 2022).

Several points are discussed to explain why the availability of task-specific experience improves audit quality. For instance, it is assumed that such experience enables auditors to become more concise in problem solving, using only information that is most relevant for the specific task (Lehmann & Norman, 2006; Shelton, 1999). In general, experienced auditors are more sceptical than less experienced auditors (Kaplan et al., 2008) and more able to identify errors in analytical reviews (Marchant, 1989). More experienced auditors formulate higher quality explanatory hypotheses (Libby & Frederick, 1991). Experience has also been found to mitigate various decision biases affecting the quality of judgements (e.g. Messier & Tubbs, 1994; Smith & Kida, 1991; Trotman & Wright, 1996). However, it seems that audit experience is particularly beneficial when task complexity is high (Alissa et al., 2014; O'Donnell et al., 2005): experience allows auditors to recognise and correctly interpret any potential uncertainties arising in audits.

The relation between experience and audit quality is often described as non-linear (e.g. Anderson & Maletta, 1994; Bedard & Biggs, 1991). The shape of the relationship, however, is still debated. Some authors argue that the relationship is parabolic (e.g. van Nieuw Amerongen, 2007), whereas others propose a flattening function which submits that auditors attain sufficient expertise after a few years (e.g. Anderson & Maletta, 1994). The cut-off point beyond which more experience yields no or minimal advantages is assumed to be around five years of experience (e.g. Bedard & Biggs, 1991; Ríos-Figueroa & Cardona, 2013). In our study, we consider the number of years of experience and distinguish between low and high experience on basis of this cut-off point.

Is more experience always beneficial for the quality of audits? Experience within a specific audit setting might as well lead to systematic biases in judging new information. Knechel et al.

(2013) call this "the curse of knowledge", implying that experience can result in tunnel vision on part of the auditor (p. 393). When auditors rely too heavily on intuition based on experience, they can overweight familiar cues, and underweight or even ignore other relevant information. In other words, more experienced auditors are more likely to succumb to selective information perception and interpretation that fits their pre-existing knowledge (Cahan & Sun, 2015; Moeckel, 1990). This bias could undermine the positive effect of experience on audit quality and amplify the potential negative effect of tunnel vision. Tax audits and, in particular, audits in highly digitalised environments are undoubtedly examples of high complexity tasks. Hence, the arguments discussed above also seem to be generalisable to the specific case of tax audits. We analyse the relationship between audit experience and tax audit quality in a traditional setting involving a low level of digitalisation. Our first hypothesis for this part of our study is:

> *H_1: Tax audit experience is positively related to audit quality in regard to traditional risks.*

Subsequently, we test whether the effect of experience also prevails in a more complex and highly digitalised environment when the task for the auditors is to detect IT-related risks. To master the challenges of digitalisation, auditors must be willing to continually familiarise themselves with new technologies—as captured in the concept of technology readiness.

2.3. Technology Readiness

In principle, it might be assumed that the relationship between experience and the detection of IT risks is similar to the positive relationship between experience and the detection of more traditional risks, thus H1 could also apply to the detection of IT risks. However, there are reasons to assume that the relationship between experience and the detection of IT risks is less straightforward.

Auditees digitalise and transform their business models using information technology (Wang & Alam, 2007), which requires auditors to acquire the related competencies (Curtis et al., 2009). Technology is becoming increasingly ingrained in internal control systems, the reporting process has changed with tools such as eXtensible Business Reporting Language (XBRL), and audit evidence increasingly stems from data analytics (Pan & Seow, 2016). The pace at which new technologies are developed, introduced, and integrated into businesses is extremely fast. The constantly changing technical environment increases the complexity of an audit (Han et al., 2016). As a result, it is increasingly difficult to gain sufficient experience with these new tools.

On one hand, audit experience might be particularly beneficial when task complexity is high (Alissa et al., 2014). On the other hand, new technologies also bear some new and unconventional risks, which are difficult for even more experienced auditors to recognise and evaluate. Experience in traditional audit settings may even be counterproductive by shaping the auditors' perceptions so that some information is overweighted while other, equally important, information is missed (Moeckel, 1990). Auditors' abilities to cope with the changing IT environment might therefore depend on different characteristics, such as the degree to which they are willing and able to embrace new technologies, i.e. their technology readiness (Parasuraman & Colby, 2015).

We argue that being able to adapt and being willing to learn the necessary skills is of similar importance as experience. Due to the constantly changing audit environment, know-how and skills become outdated quickly, which requires auditors to make continuous learning efforts in order to become acquainted with new technologies. Therefore, in our second hypothesis, we expect that, in a modern, digitalised audit environment, more experienced tax auditors will only perform better if they have a reasonable degree of technology readiness:

> *H_2: Tax auditors' technology readiness moderates the positive relationship between experience and audit quality in regard to IT-related risks.*

3. METHOD

3.1. Participants

Overall, 390 tax auditors from Austria, Ireland, Lithuania, and The Netherlands participated in our study. Participants were invited by the respective tax authorities collaborating with us. Seven participants left all of the relevant questions blank and, in two cases, a technical malfunction occurred. All data from these participants was excluded from the dataset. In addition, the data obtained from 28 IT auditors within the Dutch sample was excluded because, unlike the other participants, they were supporting audit teams by providing IT knowledge rather than auditing tax returns. The final sample consists of *N* = 353 tax auditors.

Table 1: Sample Characteristics by Country

	AT	IE	LT	NL	Total
Expertise					
Payroll taxes	0	4	0	11	15
VAT	0	4	18	59	81
CIT	15	14	6	34	69
Certified auditor	17	5	55	85	162
Other	1	7	7	11	26
Total	33	34	86	200	353
Age					
21-29 years	2	0	4	26	32
30-39 years	6	9	17	49	81
40-49 years	11	14	17	36	78
50-59 years	13	11	29	72	125
60-66 years	1	0	19	17	37
Total	33	34	86	200	353
Education					
Middle school	0	2	0	18	20
Bachelor	8	9	33	82	132
Master	23	12	51	76	162
Ph.D	2	1	0	0	3
Other	0	10	2	24	36
Total	33	34	86	200	353
Gender					
Female	11	18	77	53	159
Male	20	15	5	141	181
Other	2	1	4	6	13
Total	33	34	86	200	353

AT = Austria, IE = Ireland, LT = Lithuania, NL = The Netherlands
CIT= Corporate income tax, VAT = Value added tax

As shown in Table 1, most of the participants worked for the Dutch Tax Administration (*n* = 200), with the others working for the tax authorities of Lithuania (*n* = 86), Ireland (*n* = 34), and

Austria (*n* = 33). Almost half of the participants (*n* = 162) were certified public auditors. Most of the other participants specialised mainly in either auditing value added tax (VAT) (*n* = 81) or auditing corporate income tax (CIT; *n* = 69). The remaining participants specialised in auditing payroll taxes or had another specialisation. Most of the participants held a bachelor's degree (*n* = 132) or master's degree (*n* = 162). In Ireland and the Netherlands, a large number of participants stated that their minimum level of education was "other". This usually means that they were trained by the tax authority internally. Most participants in Austria and in the Netherlands were male; in Ireland and Lithuania, most were female. The exact frequencies for all sample characteristics, in total and separately for each country, are depicted in Table 1.

3.2. Material and Procedure

We developed two versions of a business case for tax auditors containing either only traditional audit risks or traditional and IT-related audit risks. The cases were composed by two of the authors, and experts from the collaborating tax authorities checked that they described realistic audit scenarios for their countries. The descriptions were adjusted in accordance with their feedback. Experts from the collaborating tax authorities translated the original (Dutch) case into English, German, and Lithuanian. Other experts translated this version back to English and a third expert compared the back translation to the original version. All experts confirmed the final translation.

The case described a law firm (labelled with the initialism DH&W) that operated nationwide in the residential country of the participant. The description focussed on the planning stage of a standard audit. In this stage, the materiality was set, key risk areas were identified through understanding the company, and appropriate audit testing was designed as a basis for an efficient and effective audit. Both versions of the case contained six traditional audit risks, such as the risk of overaggressive behaviour. The two versions differed in terms of the inclusion or exclusion of IT-related audit risks (see Appendix I for the wording of both case descriptions). They were developed to test both of our hypotheses and to check whether adding the IT-related risks to the case description also affects the detection of traditional risks.

Participants were invited to become involved in a study on tax audits by our contact people in their respective countries. No further information about the goal of the study was provided. The contact people provided all participants with the link to an online questionnaire. Participants were randomly assigned to one of the two versions of the case. They had 24 hours in which to complete the study and were instructed not to communicate with colleagues about it.

Participants were instructed to imagine that they were part of the team auditing DH&W for CIT and VAT for the year 2018, and were requested to evaluate the company's risk profile and to identify the risks in the described case. They were also asked how realistic they considered the case to be: (a) was the case description similar to that of an actual organisation in their residential country? (1 – totally disagree, 7 – totally agree; *M* = 4.6, *SD* = 1.6); and (b) was it likely that they would have to deal with a similar organisation in their daily work? (*M* = 4.0; *SD* = 1.9). The responses show that the cases were realistic, especially when considering that the case had to be suitable for all four countries and for tax audit employees, who can audit a wide variety of organisations—both in terms of size and activities.

Each participant was provided with only one of the two versions of the case and instructed to identify as many of the tax risks hidden in the case description as possible. The *traditional* *audit risks only* version of the case contained six audit risks that are common in standard audit settings and that are mostly independent from the IT environment of the audited company. The *traditional + IT-related audit risks* version of the case included the same six traditional audit risks as the other version (the placing and wording of these risks in the case description were also exactly the same), but it also included four additional risks related to the IT environment of the company to be audited. Thus, the traditional audit risks only version of the case contained six risks and the traditional + IT-related audit risks version contained ten risks (see Table 2 for a complete list of all risks hidden in the two case descriptions). The risks that we placed in the case descriptions were selected by a panel of experts from all four countries. After several rounds of debates, these experts agreed the final wording of both the case and the risks.

3.3. Measures

Given the complex nature of the concept (Knechel et al., 2013), we used two different proxies for audit quality as dependent variables, namely the correct identification of the risks in the case, and a composite measure regarding participants' risk assessments of the case (in the tradition of previous research: see, for instance, Anderson & Maletta, 1994; Bonner & Lewis, 1990; Ríos-Figueroa & Cardona, 2013). The first proxy, percentage of *risks detected*, was operationalised as follows. After reading the scenario, participants were asked to name the most significant audit risks that they found in the description of the DH&W case. The questionnaire allowed a maximum of ten risks to be named (in both versions of the case). To make it easier for us to understand the participants' responses, we instructed them to include the text passage from the case description in which they detected the respective risks (it was possible to copy and paste this). The exact wording of the instructions was: "Describe briefly the significant risks related to this audit, with a maximum of ten risks. Link each risk to a part of the text in the case. Please include in your answer the sentence(s) of the case based on which you included this risk".

All risks named by the participants were checked separately for each country by dyads of coders (officials deemed to be experienced experts by the collaborating tax authorities). The named risks were coded in two steps. First, the coders—independently from each other—assessed whether the named risks (and the attached text passages) referred to one of the six (version: *traditional audit risks*) or ten (version: *traditional + IT-related audit risks*) risks that we had pre-defined and hidden in the case description. One of the authors combined the categorisations from all coders and highlighted any differences. In total, the 353 participants named 2,313 risks, of which 1,036 (45%) were also on our pre-defined list of risks that were hidden in the case description.

The remaining named risks that were not on our list were also assessed by the coders independently and were finally considered as not significant or not relevant in the context of the case (i.e. none of the remaining risks were agreed to be significant or relevant by both coders of a specific country). Inter-coder reliability was relatively low for all of the risks combined (Kappa = .68, $p < .001$), although coder agreement was above 59% for all risks. Agreement between the various teams of coders was 69% or higher for all teams. Next, all differences were discussed within the coding teams for each country and, where necessary, with one of the researchers, until agreements were reached. The final categorisation from each team was pooled.[6]

Panel A in Table 2 shows how often each of the risks hidden in the case description was identified (note that risk numbers seven to ten were only included in the *IT-related audit risks* version of the case). There was high variance in how often each of the risks was identified, with risk number six named only 23 times (6% of N = 353 participants) and risk number five named almost ten times more often (217 times; 62%). In relation to the number of participants that completed the version of the case that included the IT risks (n = 182 participants), risk numbers seven (143 times, 79%), eight (151 times, 83%), and nine (140 times, 77%) were named most often.

Because both versions of the case contained traditional audit risks, but only the second version contained IT-related risk factors, we computed two separate indices for each risk type mirroring the quality of the participant's risk analysis. First, we calculated the percentage of traditional risks (i.e. risks that were not related to the company's IT environment) that were correctly identified (number of risks correctly identified/six) for both versions of the case (M = 26% SD = 0.18). As these risks were the same in both versions of the case, and because these are not related to IT issues, we did not expect to find any difference between the two versions in the detection of the six traditional risks. However, the percentage of correctly identified traditional risks (*traditional risks detected*) was slightly higher in the version of the case that did not contain IT risks (27%) than in the version that included them (24%). This difference was close to significance (t (df = 351) = 1.93, p = .054) and probably arose because the inclusion of IT-related risks detracted the participants from detecting the traditional risks. Next, we calculated a separate index for the four additional IT-related risks in the second version of the case (*IT risks detected;* M = 68%, SD = 0.27). Note that this latter index is only available for the IT-related audit risks version of the case (n = 182).

On the next screen of the online questionnaire, after they had specified all of the risks that they had detected in the case, the participants were provided with a complete list of all of the risks that were hidden in the case description that they had just read (returning to the previous screen and editing the risks that they had mentioned or missed was not possible). Participants were asked to indicate how relevant they considered each of the listed risks, with the following instruction: "The following six [ten] risks were named by another auditor in a different audit team. Please indicate for each risk how relevant this risk would be in your opinion to the audit of DH&W on a scale from very low relevance (1) to very high relevance (7)". The results from this exercise provided us with information on the perceived relevance of our listed risks which we used to validate our risk detection measures. All means for these items are 3.94 or higher and the highest mean is 5.96 (see Panel B in Table 2), indicating that the participants judged the hidden risks to be relevant.

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[6] For three of the risks (risks three, six, and ten) the coders agreed on less than 70% of occasions in the first round of coding. From discussions with the expert coders, we learned that these risks were deemed to be a little more ambiguous and harder to identify. Furthermore, in the creation of the list of predefined risks, these three were part of the bottom four in terms of relevance according to the expert panel (with risk number two being the fourth risk in the bottom four). Table 2, Panel B also includes the results of the assessment of the seeded risks by the participants. From the mean assessments, it can be concluded that participants deemed risks number six and ten to be among the least relevant risks. Given all of the above, we performed additional analyses excluding risks number three, six, and ten. These analyses are fully in line with our inferences from the main analyses.

Table 2: Frequencies of Correctly Identified Risks and Assessments of Their Importance

Risk	Panel A: Number of times that risks were identified by participants						Panel B: Importance of all risks as assessed by participants					
	Total (*N* = 353)		Traditional (*n* = 171)		+IT risks (*n* = 182)		*n*	Min	Max	Mean	*SD*	% coder agreement
1. Incidental transactions	54	*15%*	33	*19%*	21	*12%*	353	1	7	4.65	1.40	90%
2. Collusion	40	*11%*	21	*12%*	19	*10%*	353	1	7	4.34	1.51	84%
3. Complexity	72	*20%*	45	*26%*	27	*15%*	353	1	7	3.94	1.50	59%
4. Aggressiveness	136	*39%*	66	*39%*	70	*39%*	353	1	7	5.01	1.41	88%
5. Decentralisation	217	*62%*	103	*60%*	114	*63%*	353	1	7	5.36	1.35	81%
6. Services	23	*6%*	14	*8%*	9	*5%*	353	1	7	3.97	1.49	60%
7. IT interfaces	143				143	*79%*	182	2	7	5.75	1.10	90%
8. IT segregation	151				151	*83%*	182	1	7	5.96	1.13	88%
9. IT access control	140				140	*77%*	182	1	7	5.53	1.30	84%
10. IT rights	60				60	*33%*	182	1	7	4.82	1.51	68%
Total	1,036		282		754							

Note: See Appendix 2 for wording of all risks.

As our second proxy for audit quality, participants were presented with four items relating to how risky they considered the case that was described to them (e.g. the quality of the internal control framework and the quality of the IT control; see Appendix 3 for the wording of all four items). These items were developed on basis of previous studies on audit quality that used a similar method (e.g. Low, 2004). Factor analyses yielded one component (EV = 2.37; % of variance = 59%), scale reliability is satisfactory with Cronbach's alpha = .77 (Hair et al., 1998). Hence, responses to the four items were averaged to form a *perceived riskiness* score.

The section in the questionnaire regarding the operationalisations of the dependent variables (detected risks and perceived riskiness) was followed by items serving as predictor and control variables. With regard to the predictors, we first measured participants' *technology readiness* (TRI) with eight items (see Appendix 3 for the exact wording used) from the TRI 2.0 framework developed by Parasuraman and Colby (2015). We used two items (presented in random order) for each of the four components of this framework (i.e. optimism, innovativeness, discomfort, and insecurity). As for our other items, we used a seven-point scale (1 – low technology readiness, 7 – high technology readiness) instead of the original five-point scale.

We calculated the mean of each of the four components and averaged these to a total TRI score (M = 4.30, SD = 0.69). The analyses of the relation between TRI and audit quality (i.e. the detection of traditional and IT risks) yielded no significant results. This is unsurprising because we expect TRI, like experience, to be non-linearly related to audit quality. While there is no theory on this subject, it seems likely that, once above a certain threshold, having a higher degree of TRI will not help auditors to further improve their audit quality. Therefore, we dichotomised this variable and split it into two groups: low (0) and high (1) TRI. However, there is no clear theoretical cut-off point. Since business IT environments are complex, the performance task that we developed might require higher than average levels of TRI. We therefore split this variable at the 75% percentile (4.75).[7]

[7] In section 4.4 of this paper, we also report results using the median (4.25) as the cut-off point. The results remained unchanged when we used this as a cut-off point.

Secondly, we assessed participants' *experience in tax auditing* by asking for the number of years that their main task while working for the tax authority had been related to auditing.[8] Based on the existing literature on the relationship between experience and audit quality (as discussed in the previous section), we differentiated between participants with low (five years or less) and high (six years or more) levels of experience in tax auditing.[9]

With regard to the control variables, we first measured *professional scepticism*, which is "widely viewed as essential to audit quality" (Quadackers et al., 2014, p. 639). Six items from Brewster et al. (2021), such as "I always try to look at all sides of a problem" (p. 1689), presented in random order (see Appendix 3 for the exact wording) were applied to measure the degree of *professional scepticism*. Due to a low factor loading ($< .4$) we dropped one item and averaged the five remaining items to a score (1 – low professional scepticism, 7 – high professional scepticism; $M = 5.81$, $SD = .69$, $\alpha = .75$). Next, we assessed participants' *sector experience* through a single item. This control variable concerned participants' experience in the professional service sector, the sector in which our fictional company, DH&W, operates (see Appendix 3 for the exact wording). Responses were collected using a five-point scale (1 – "0%", 2 – "1%–25%", 3 – "26%–50%", 4 – "51%–75%", and 5 – ">75%"; M = 1.79, SD = .92). We also controlled for country and expertise (e.g. VAT auditing or CIT auditing) in the following analyses.

4. RESULTS

4.1. Descriptive Statistics

Table 3 shows the means, standard variations, and frequencies of all predictor and control variables separately for the two versions of the case. Perceived riskiness is lower in the traditional audit risks version ($M = 3.70$, $SD = 0.97$) than the version that also included IT-related audit risks ($M = 4.51$, $SD = 0.99$, t ($df = 351$) = -7.75, $p < .01$). The other variables did not differ between the two versions.

The intercorrelations are presented in Table 4. More experienced auditors score lower on the TRI scale ($r_s = -.11$, $p < .05$) and have spent more of their auditing time in the last three years auditing firms in the professional services industry ($r_s = .16$, $p < .01$). Auditors with more professional scepticism seem to be more technology ready, as they have higher TRI scores ($r_s = .21$, $p < .01$).

Further, the zero-order correlations in Table 4 show that, in the full sample, regardless of the version of the case, our dependent variable—perceived riskiness—is not correlated with any of the predictor variables. In the traditional audit risks version, however, we found a positive relationship with experience, although this correlation is only statistically significant at the 10% level ($r_s = .14$, $p < .10$). The other two dependent variables—the number of traditional

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[8] It could be argued that more experienced auditors could also have had more IT training, making it difficult to disentangle the TRI score and audit experience. It might, however, also be that less experienced auditors have had more IT training, as part of a modernised training syllabus. We do not have direct information about the level of IT training received by the participants. We do have information about the level of self-reported IT knowledge and the degree to which each participant would have wanted to consult with an IT auditor in a similar case. Both variables were uncorrelated with experience, suggesting that experience and IT training are not correlated.

[9] In section 4.4 of this paper, we also report results using a cut-off point of seven years. Due to the low number of participants, we could not use a cut-off point of less than five years.

risks detected and the number of IT-related risks detected (only available for the second version of the case description)—were not related to experience. We did not find a significant relationship in either version or across the versions. However, when considering just the traditional audit risks version of the case, we found two unexpected significant correlations. First, the TRI score is positively related to the percentage of detected traditional audit risks ($r_s = .15$, $p < .10$). Secondly, auditors who audited more firms in the professional services industry in the past three years detected fewer traditional risks in the version of the case that included the IT-related risks ($r = -.27$, $p < .01$).

Table 3: Descriptive Statistics of All Variables by Case Version

	Traditional risks (*n* = 171)				Traditional + IT-related risks (*n* = 182)			
	Min	*Max*	*M*	*SD*	*Min*	*Max*	*M*	*SD*
Traditional risks detected	0%	100%	27%	19%	0%	67%	24%	16%
IT risks detected					0%	100%	68%	27%
Perceived riskiness[a]	1.75	6.25	3.70	0.97	2.25	7	4.51	0.99
Experience	0	1	0.71	0.46	0	1	0.70	0.46
TRI	0	1	0.25	0.43	0	1	0.24	0.43
Professional scepticism	3.80	7.00	5.77	0.68	3.40	7.00	5.85	0.70
Sector experience	1	5	1.75	0.90	1	5	1.83	0.95

Note. [a] perceived riskiness differs significantly ($p < .01$) between the two versions of the case. All other variables are not significantly different.

Traditional risks detected = percentage of seeded risks correctly identified.

IT risks detected = percentage of seeded IT risks correctly identified.

Perceived riskiness = mean score on four items related to the subjective risk assessment.

Experience = dummy with 0 = low experience (< 5 years) and 1 = high experience (> 6 years).

TRI = technology readiness, dummy with 0 = low TRI and 1 = high TRI.

Professional scepticism = mean score of six items related to the degree of professional scepticism.

Sector experience = sector experience on a scale from 1 (0%) to 5 years (> 75%).

4.2. Hypotheses Tests

To test H_1 (regarding the effect of experience on audit quality in respect of traditional risks), we conducted a multivariate analysis of covariance (MANCOVA) with audit experience (low vs high) and technology readiness (low vs high), and the version of the hypothetical case (traditional risk version vs traditional + IT-related risk version) as independent variables. In addition, we controlled for each participant's sector experience, professional scepticism, type of expertise, and country. The MANCOVA was performed on the full sample of $N = 353$, including both versions of the case, as both included the same traditional risks. The analysis (for cell means, see Table 5, Panel A) yielded a marginally significant main effect of experience (F (2, 335) = 2.70, $p = .07$) and technology readiness (F (2, 335) = 2.42, $p = .09$), but none of the interaction effects reached statistical significance (Experience x TRI: F = (2, 335) = 1.34, $p = 0.26$); Experience x TRI x Case version F (6, 670) = 1.04, $p = .40$).

The MANCOVA was followed up by two separate analyses of covariance (ANCOVAs), one for each of the two dependent variables (traditional risks detected and perceived riskiness). Panel A in Table 5 shows the descriptive statistics for these dependent variables and Panel B summarises the ANCOVA results. In respect of the percentage of traditional risks detected and the perceived riskiness, we did not find a significant main effect for our independent variables experience and TRI, or for their interaction. Furthermore, we did not find a statistically significant three-way interaction effect for experience, TRI, and the version of the case for both dependent variables. To summarise our results for H_1, surprisingly, we found no indication for an effect of experience. It did not play a role in the detection of traditional audit risks or in the perception of risk of the case. We discuss this finding in the last section and provide potential explanations for the null result.

Table 4: Intercorrelations Between All Variables

	Full sample (*n* = 353)					Traditional risk version (*n* = 171)		Traditional + IT-related risk version (*n* = 182)		
	Experience	TRI	Prof. scepticism	Sector experience	Perceived riskiness	Perceived risk	Traditional risks detected	Perceived riskiness	Traditional risks detected	IT-related risks detected
Experience		_-.11**_	_.00_	_.16***_	_.04_	_.14*_	_-.03_	_-.01_	_-.09_	_.07_
TRI	-.11**		_.21***_	_-.04_	_.02_	_-.06_	_.15*_	_.09_	_.12_	_.06_
Professional scepticism	-.01	.21***		_.02_	_.09*_	.09	.13	.04	.04	.01
Sector experience	.13**	-.07	.03		_-.05_	-.08	-.11	-.04	-.27***	-.03
Perceived riskiness	.05	.03	.08	-.04			.09		.16**	.21***
Traditional risks detected	-.04	.13**	.08	-.19***	.07	.09		.16**		-.02

Correlations in italics are Spearman and all others are Pearson * p < .10, ** p < .05, *** p < .01
Traditional risks detected = percentage of seeded traditional risks correctly identified.
IT risks detected = percentage of seeded IT risks correctly identified.
Perceived riskiness = mean score on four items related to the subjective risk assessment.
Experience = dummy with 0 = low experience (< 5 years) and 1 = high experience (> 6 years).
TRI = technology readiness, dummy with 0 = low TRI and 1 = high TRI.
Professional scepticism = mean score of six items related to the degree of professional scepticism.
Sector experience = sector experience on a scale from 1 (0%) to 5 years (> 75%).

Next, we tested our second hypothesis, regarding the impact of experience on detecting IT-related risks and the moderating role of technology readiness. This analysis was based only on the subsample of $n = 182$ participants who completed the version of the case that included IT-related audit risks. Panel A in Table 6 shows descriptive statistics for the percentage of IT-related risks detected and for perceived riskiness in this version of the case, and Panel B summarises the corresponding ANCOVA results. In respect of the percentage of IT-related risks detected, we observed that more experienced auditors found more risks, although this effect is only close to being significant (F (1, 181) = 3.07, p = .08). In line with our hypothesis, we found that, when an experienced auditor also had a high TRI score, they detected most of the IT-related risks hidden in the case description (M = 79%). This interaction effect reached statistical significance (F (1, 181) = 4.77, p = .03) and is visualised in Figure 1. In respect of perceived riskiness as the second proxy for audit quality, we found a similar pattern, although the interaction effect was not significant in this analysis (F (1, 181) = 2.60, p = .11). In addition, we found no significant main effect of experience on perceived riskiness for this version of the case.

Table 5: Descriptive Statistics and ANCOVA Results for Traditional Risks Detected and Perceived Riskiness for Both Case Versions (N = 353)

Panel A: Descriptive statistics

Traditional risks		Experience < 6y	Experience > 5y	Total	Perceived Riskiness		Experience < 6y	Experience > 5y	Total
Traditional risks version of the case	Low TRI	26% (.17) *34*	26% (.21) *95*	26% (.20) *129*	Traditional risks version of the case	Low TRI	3.57 (0.98) *34*	3.78 (0.90) *95*	3.72 (0.92) *129*
	High TRI	31% (.13) *16*	33% (.20) *26*	32% (.17) *42*		High TRI	3.38 (1.18) *16*	3.81 (1.06) *26*	3.64 (1.12) *42*
	Total	28% (.16) *50*	27% (.21) *121*	27% (.19) *171*		Total	3.51 (1.04) *50*	3.79 (0.93) *121*	3.70 (0.97) *171*
Traditional risks + IT risks version of the case	Low TRI	23% (.16) *38*	23% (.16) *100*	23% (.16) *138*	Traditional risks + IT risks version of the case	Low TRI	4.59 (0.86) *38*	4.41 (1.00) *100*	4.46 (0.96) *138*
	High TRI	31% (.17) *17*	25% (.14) *27*	27% (.15) *44*		High TRI	4.43 (1.07) *17*	4.84 (1.04) *27*	4.68 (1.06) *44*
	Total	26% (.16) *55*	23% (.16) *127*	24% (.16) *182*		Total	4.54 (0.92) *55*	4.50 (1.02) *127*	4.51 (0.99) *182*
Total	Low TRI	25% (.16) *72*	24% (.19) *195*	24% (.18) *267*	Total	Low TRI	4.10 (1.05) *72*	4.10 (1.00) *195*	4.10 (1.01) *267*
	High TRI	31% (.15) *33*	29% (.17) *53*	30% (.16) *86*		High TRI	3.92 (1.23) *33*	4.33 (1.16) *53*	4.17 (1.20) *86*
	Total	27% (.16) *105*	25% (.19) *248*	26% (.18) *353*		Total	4.05 (1.10) *105*	4.15 (1.04) *248*	4.12 (1.06) *353*

Panel B: ANCOVA

Traditional risks	Mean Square	F	p	Perceived Riskiness	Mean Square	F	p
Intercept	0.29	9.49	.00	Intercept	55.69	69.33	.00
Experience	0.00	0.00	.97	Experience	2.09	2.96	.11
TRI	0.08	2.58	.11	TRI	0.95	1.18	.28
Case version	0.08	2.52	.11	Case version	50.75	63.17	.00
Experience x TRI	0.00	0.03	.87	Experience x TRI	0.03	0.04	.84
Experience x TRI x case version	0.01	0.27	.85	Experience x TRI x case version	1.39	1.73	.16
Professional scepticism	0.03	0.82	.37	Professional scepticism	0.08	0.10	.76
Sector experience	0.33	11.00	.00	Sector experience	1.54	1.91	.17
Country and expertise fixed effects	*yes*			*Country and expertise fixed effects*	*yes*		
Adj r2	.05			*Adj r2*	.28		

Traditional risks = percentage of seeded traditional risks correctly identified.

Perceived riskiness = mean score on 4 items related to the subjective risk assessment.

Experience = dummy with 0 = low experience (< 5 years) and 1= high experience (> 6 years).

TRI = technology readiness, dummy with 0 = low TRI and 1 = high TRI.

Case version= dummy with 0 = traditional version and 1 = traditional + IT risks version of the case.

Professional scepticism = mean score of six items related to the degree of professional scepticism.

Sector experience = sector experience on a scale from 1 (0%) to 5 years (> 75%).

Country and expertise = Dummies for country (four countries, three dummies) and expertise of the participant (six types of expertise and four dummies included, IT expertise was excluded) were included in the analyses.

Table 6: ANCOVA Results for IT Risks Detected and Perceived Riskiness for Case Version: Traditional + IT Risks (n = 182)

Panel A: Descriptive statistics: Mean, (Standard Deviation), *Number of observations*

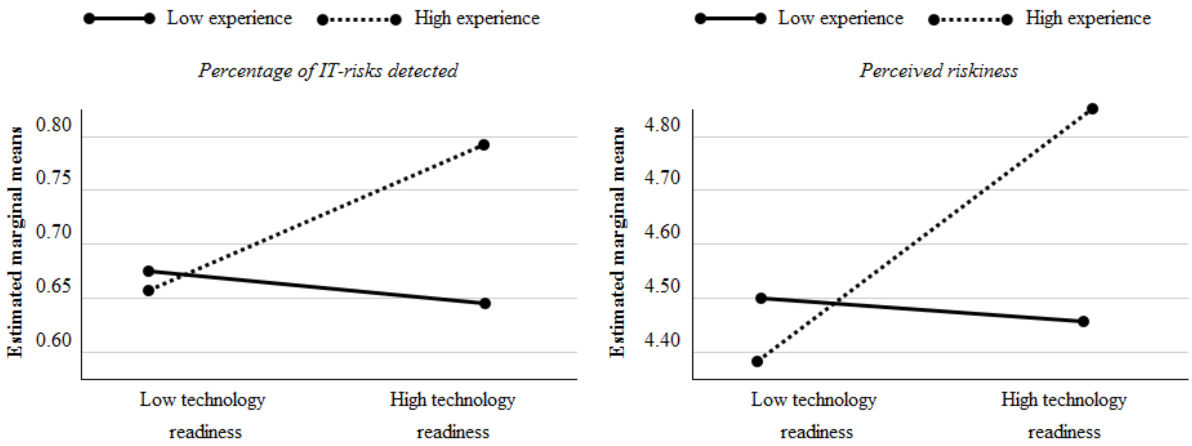
IT risks detected	Experience <6y	Experience >5y	Total	Perceived riskiness	Experience <6y	Experience >5y	Total
Low TRI	69% (24%) *38*	66% (29%) *100*	67% (28%) *138*	Low TRI	4.59 (0.86) *38*	4.41 (1.00) *100*	4.46 (0.96) *138*
High TRI	59% (31%) *17*	79% (17%) *27*	71% (25%) *44*	High TRI	4.43 (1.07) *17*	4.84 (1.04) *27*	4.68 (1.06) *44*
Total	66% (26%) *55*	69% (27%) *127*	68% (27%) *182*	Total	4.54 (0.92) *55*	4.50 (1.02) *127*	4.51 (0.99) *182*

Panel B: ANCOVA

IT risks detected	Mean Square	F	p	Perceived riskiness	Mean Square	F	p
Intercept	1.14	17.48	.00	Intercept	49.07	55.23	.00
Experience	0.20	3.07	.08	Experience	1.43	1.61	.21
TRI	0.01	0.11	.74	TRI	0.63	0.71	.40
Experience x TRI	0.31	4.77	.03	Experience x TRI	2.31	2.60	.11
Professional scepticism	0.00	0.02	.90	Professional scepticism	0.27	0.30	.58
Sector experience	0.00	0.02	.90	Sector experience	0.04	0.04	.84
Country/expertise effects	*Yes*			*Country/expertise effects*	*yes*		
Adj r2	.10			*Adj r2*	.09		

IT risks detected= percentage of seeded IT risks correctly identified.
Perceived riskiness = mean score on 4 items related to the subjective risk assessment.
Experience = dummy with 0 = low experience (< 5 years) and 1= high experience (> 6 years).
TRI = technology readiness, dummy with 0 = low TRI and 1 = high TRI.
Professional scepticism = mean score of six items related to the degree of professional scepticism.
Sector experience = sector experience on a scale from 1 (0%) to 5 years (> 75%).
Country and expertise = Dummies for country (four countries, three dummies) and expertise of the participant (six types of expertise and four dummies included, IT expertise was excluded) were included in the analyses.

Figure 1: Estimated Marginal Means of the Two Audit Quality Proxies in the IT-related Audit Risks Version of the Case



We hypothesised that more experienced auditors perform better only if they are technology ready enough, i.e. if their TRI scores are sufficiently high. To test this, we used contrast weights with 3 for experienced auditors in the high TRI group and -1 for auditors in the three other groups. This contrast was not significant in the traditional risks version of the case. However, in the traditional + IT-related risks version, this contrast was significant at the 5% level (p = .01) for the percentage of IT risks detected (see the first row in Table 7). In line with the non-significant results in Table 5 and Table 6 for perceived riskiness, the contrast for this dependent variable was not significant. As expected, participants with more experience and a higher degree of TRI showed the best performance in the audit task involving IT-related risks.

Table 7: Planned Contrasts for the Interaction of Experience and Technology Readiness

		Planned contrast, *p*-values (2-tailed) *low exp/low TRI (-1), low exp/ high TRI (-1), high exp/ low TRI (-1) and high exp/ high TRI (+3)*			
		Traditional risks version		Traditional + IT risks version	
		Risks detected	*Perceived riskiness*	*IT risks detected*	*Perceived riskiness*
Cut-off exp 5y	Cut-off TRI 75%	.49	.48	.01	.22
	Cut-off TRI median	.14	.88	.02	.31
Cut-off exp 7y	Cut-off TRI 75%	.49	.48	.01	.22
	Cut-off TRI median	.14	.88	.02	.31

4.3. Robustness Checks

Variations in cut-off points for experience and TRI

We performed the same planned contrast analyses using different cut-off points for the TRI and for experience to check the robustness of our results. For the TRI, we used the median as an alternative cut-off point. For experience, we used a cut-off point of seven instead of five years. Although the previous literature on audit experience suggests that no or only minimal advantages are achieved beyond a cut-off point of five years in experience (e.g. Bedard & Biggs, 1991; Ríos-Figueroa & Cardona, 2013), we also tried the seven-year mark as alternative cut-off to check whether the findings held. The results from these analyses were similar to those from our main analyses. In the traditional risks version, we still found no significant contrast (untabulated). In the traditional + IT-related risks version, we found a significant contrast in the percentage of IT-related risks detected for all three additional variations of these cut-off points for TRI and experience (see the three bottom rows of Table 7). With regard to perceived riskiness, the patterns for all four variations were similar to the pattern of the IT-related risks detected, but were non-significant.

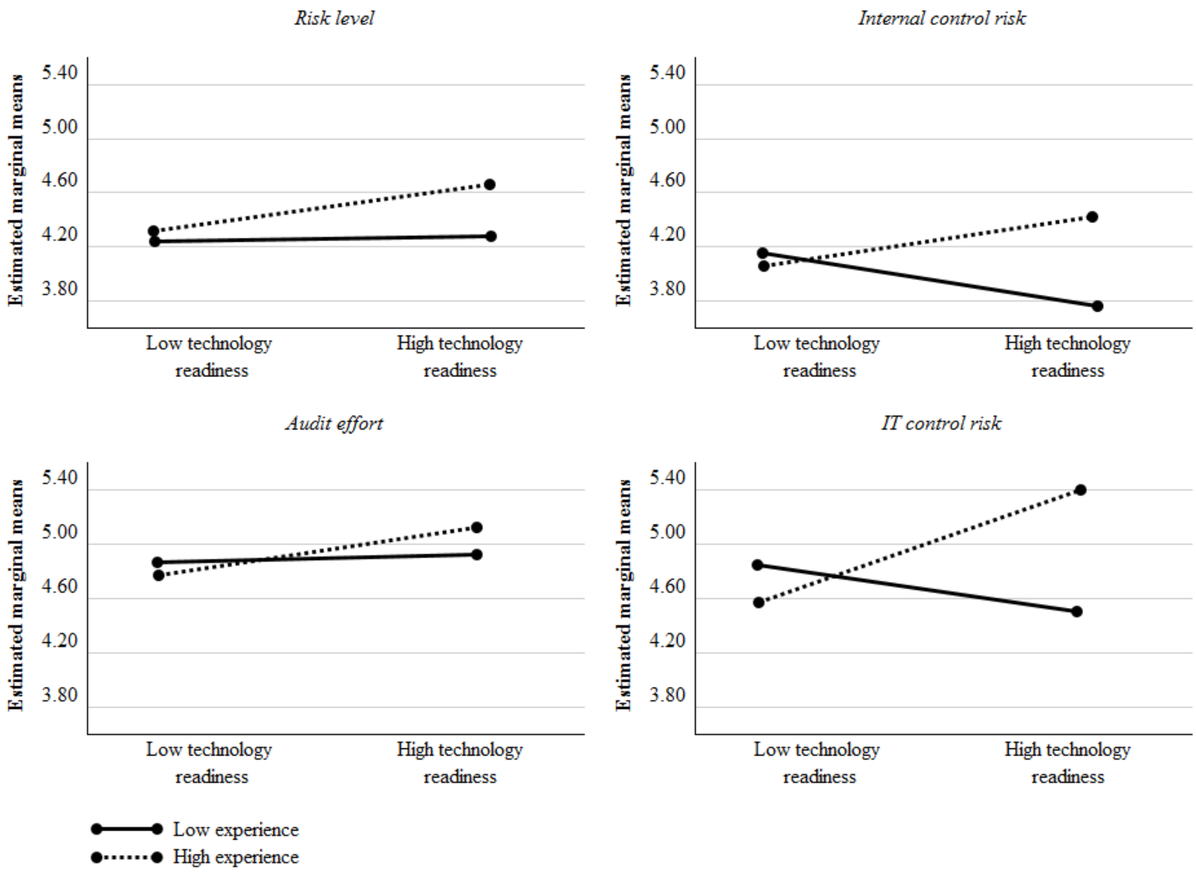
Equal group sizes

The proportion of participants in groups differed depending on the chosen cut-off points. For example, in the ANCOVAs presented above, the shares of experienced and inexperienced participants were not equal. This is in line with the skewed distribution of the degree of experience of tax auditors in practice (OECD, 2019), but might have impacted our results. To test this, we performed the same analyses using the median as a cut-off point for both experience and TRI. While group sizes were still not equal (both variables had multiple participants that scored the median), they were much closer to equal size with these cut-off points. The results from these analyses (untabulated) were all qualitatively similar to the analyses presented in Table 7.

Perceived riskiness separated

That the *p*-value for the interaction variable was higher for perceived riskiness than for risk detection might be explained by the fact that our composite variable, perceived riskiness, also included all other risks and aspects of the case, while the detection of the IT-related risks focussed solely on the seeded IT-related risks. The inclusion of these other aspects might have diluted the interaction effect of experience and technology readiness. To test this explanation, we analysed the four items of perceived riskiness (risk level, audit effort, internal control risk, and IT control risk) separately. If our suspicion was correct, we would expect the ordinal interaction to be strongest for the item IT control risk. In Figure 2, we visualised the ordinal interactions in the traditional + IT risks version for these four items. In line with our reasoning, the pattern was strongest for the item IT control risk. Furthermore, in the planned contrast, this was the only item for which the ordinal interaction was significant (p = .02). This held for all variations of the cut-off points for experience and TRI.

Figure 2: Estimated Means for the Four Perceived Riskiness Items in the High Risk Setting



Experience with auditing in general

About one in five of the participants had experience of auditing outside of the tax authority (e.g. at a 'big four' auditing firm). Although such auditing experience seems to be less relevant in the context of auditing on behalf of a tax authority, it still contributes to the general experience of auditors and to their skills and knowledge. To account for this, we calculated a measure for total experience by adding up the number of years that each participant indicated they had worked as an auditor at the tax authority and the years they had worked as an auditor outside of the tax authority. The resulting variable was used as a predictor in additional analyses. Conducting the same contrast analyses as in the main analysis yielded similar results. The analyses with the percentage of IT risks detected in the traditional + IT risks version as a dependent variable showed significance for all four cut-off point variations (see the first column in Table 8, Panel A). Furthermore, none of the four contrast analyses with perceived riskiness as a dependent variable yielded significant results (see the second column in Table 8, Panel A).

Table 8: Planned Contrasts for Additional Analyses in the Traditional + IT Risks Version*

Panel A: *p*-values (2-tailed) with total experience			
		IT Risks detected	Perceived riskiness
Cut-off exp 5y	Cut-off TRI 75%	.01	.22
	Cut-off TRI median	.02	.31
Cut-off exp 7y	Cut-off TRI 75%	.01	.20
	Cut-off TRI median	.02	.31
Panel B: *p*-values (2-tailed) excluding risks with low coder agreement			
		IT risks detected	
Cut-off exp 5y	Cut-off TRI 75%	.01	
	Cut-off TRI median	.01	
Cut-off exp 7y	Cut-off TRI 75%	.00	
	Cut-off TRI median	.01	

** = low exp/low TRI (-1), low exp/ high TRI (-1), high exp/ low TRI (-1) and high exp/ high TRI (+3)*
TRI = technology readiness.

Accounting for low coder agreement

For three of the risks categorised by the expert coders (risks three, six, and ten), agreement was below 70% in the first coding round. From discussions with our coders, we learned that they considered these risks to be more ambiguous and harder to interpret than the other pre-defined risks. Hence, it is unclear whether the audit quality is really lower when participants do not name these risks. Furthermore, in the creation of the list of predefined risks, these three were in the bottom four in terms of relevance according to the expert panel (with risk number two being the fourth risk in the bottom four). Also, when presented with the full list of seeded risks (see Table 2, Panel B), the participants' evaluations indicated that these specific three risks were not as relevant as we thought when designing the material for our study: in fact, they were among the risks evaluated as least relevant of all seeded risks. To account for this, we performed additional analyses excluding risks number three, six, and ten (note that risks three and six are traditional risks, while risk ten is an IT-related risk). The results were in line with the main analyses (see Table 8, Panel B).

5. CONCLUSIONS AND DISCUSSION

The rapid digitalisation of society affects the operations, administrative organisation, and internal control of many organisations. Therefore, the IT environment of organisations plays an increasingly important role when tax authorities are auditing financial statements. Tax auditors must have the appropriate skills to evaluate an entity's IT environment, and to perform effective and efficient tax audits. As the IT environment is constantly changing, however, specialised knowledge and skills can rapidly become obsolete and need to be updated frequently. In this paper, we argue that, in audit environments involving complex IT infrastructures, tax auditors' 'traditional' experience is not enough on its own. In addition, tax auditors need to be motivated and able to continually acquire IT-related knowledge; they must be technology ready. We tested this in a sample of tax auditors of tax authorities from four countries. The auditors dealt with one of two hypothetical cases which either involved only 'traditional' audit risks or 'traditional' audit risks and IT-related risks. We found that audit experience had no effect on audit quality in the 'traditional' setting, but we observed the expected effect of experience and technology readiness on audit quality in respect of IT-related risks. We discuss both findings in the following paragraphs.

In our study, more experienced auditors did not perform better when detecting traditional audit risks. This result was unexpected and contradicted the prior literature (e.g., Goldman et al., 2022). We can only speculate about the reasons for our null finding and will discuss several potential explanations. First, the cut-off point that we used for experience (five years) was probably too high. Some authors argue that two years of experience are enough to master the planning phase of an audit (e.g. Anderson & Maletta, 1994). Since we had too few participants with three or fewer years of experience, we could not test this alternative cut-off point. However, we tested several other cut-off points for experience and found no support for H_1.

Secondly, the complexity of the traditional audit risks in our fictional case may have been too low, so that experience could not have had an effect. However, detection rates for the six traditional risks varied between 5% and 63%, which suggests that the task was not too easy for all participants. Interestingly, 55% of the risks identified by the participants were not on our predefined list of risks that were hidden in the case description, and the coders indicated that more experienced auditors highlighted significantly more of these risks as being potentially relevant than less experienced auditors (m =.34 respectively m = .21, p = .01). Because the coders did not agree on these risks, we could not use these in our analyses. It is possible that we did not find an effect of experience because this effect can mainly be found in more original and creative risks, something which is hard to measure with a list of predefined risks.

Thirdly, one of the main arguments as to why more experienced auditors provide higher quality audits is that they are more sceptical than less experienced auditors (Kaplan et al., 2008). By asking the participants to detect risks, we might have primed them to behave in a more sceptical way and thus we might have negated some of the advantages that experience brings to the table. Further research could delve deeper into this effect, for example, by using archival data from actual tax audits.

Fourthly, both experienced and inexperienced tax auditors may have used different judgement and decision processes when evaluating a case. Previous research shows that more experienced auditors select fewer cues and make judgements in less time (Cahan & Sun, 2015). In our study, more experienced participants finished the experiment slightly faster, although this difference was not statistically significant. A more 'heuristical' evaluation such as this might be efficient in one situation, but in another might lead to the auditor having 'tunnel vision'. Although we found no support for the effects of experience, we consider it important to report our null findings (i) to overcome the file drawer problem in published research and (ii) to stimulate more research into the issue—particularly in the context of tax auditing.

For our hypothetical auditing case which also contains IT-related risks, we observed that the combination of experience and technology readiness ensures the best performance in detecting risks hidden in complex IT environments. Therefore, the overall takeaway of our results might be that experience plays a role in achieving higher tax audit quality, just like it does in achieving higher audit quality in general. These results held for various cut-off points for experience and technology readiness. However, for our second audit quality measure—the perceived riskiness of the case—this interaction effect was not significant. The level of perceived riskiness of our fictional case was measured as a composite variable, consisting of the intended audit effort, the perceived tax risks, the quality of internal control, and the quality of IT control. We did find that more experienced auditors with sufficient technology readiness perceived the IT control risk to be higher than auditors who were less experienced and/or insufficiently technology ready. Accordingly, they also detected more IT-related risks. Interestingly, participants did not infer from the number of IT-related control risks they detected that a higher tax risk could be the result or that more audit effort was required. This might indicate that these participants could identify the IT risks but not the potential impact of such risks on tax returns.

Several limitations should be taken into consideration when interpreting our results. The fact that we failed to replicate the effect of experience on audit quality in the context of tax auditing raises the question of whether our study design was appropriate for testing our hypotheses. The answer to this also, to some degree, affects the validity of our second result, regarding the interaction between experience and technology readiness. However, because the second hypothesis related to a different dependent variable (the number of IT-related risks detected), a cautious interpretation of this result still seems feasible. The subsequent discussion of limitations emphasises some problematic aspects of our method but, overall, we recommend that further research is conducted on both hypotheses before generalising the results to the practice of tax authorities.

The first limitation is that we did not obtain the same proportion of experienced and inexperienced participants for the analyses, mostly due to the skewed distribution of experience amongst the participants—which is in line with statistics provided by the OECD (2019). Although we found similar results when we grouped our data into roughly equal group sizes, the skewed group sizes might have affected our findings. Secondly, the case descriptions used in the scenarios included a number of predefined risks. Determining the relevant tax risks is subjective by nature. We used a large expert group to determine the most relevant risks, but our participants still might have interpreted the predefined risks and the other information in the scenario differently. A third limitation, also related to how the audit scenarios were perceived, is that coder agreement was initially relatively low. We tried to minimise this by using teams of coders and by enabling them to jointly discuss the final coding result. Additionally, we re-ran the analyses after excluding the three risks with lowest coder agreement, which did not change our results.

Despite these limitations, our study contributes to the literature in several ways. First, it addresses *tax audit* quality, a subject that hitherto has received scarce attention despite its importance to the tax system. Secondly, many previous studies have explored the role of experience in auditing (e.g. Cahan & Sun, 2015), whereas we examine empirically whether such experience is generalisable to a highly digitalised setting, and analyse the role that technology readiness plays in this. Thirdly, we add to the literature on technology readiness by applying the framework of Parasuraman and Colby (2015) in the context of (tax) auditing. Fourthly, there is an emergent number of studies focussing on the impact of IT in the audit process (e.g. Bentley, 2021; Cao et al., 2021; Eilifsen et al., 2020; Koreff & Perreault, 2023), but this stream of research focusses on the digitisation of toolkits of auditors rather than on the impact of digitalisation of the audited businesses on the work of the auditor. By addressing how the degree of technology readiness of tax auditors might be related to their performance in settings involving complex, tax-relevant IT risks, we add to a previously largely neglected area of research.

Our study also provides some cautiously drawn insights for tax authorities. In the coming years, many tax authorities will be confronted with the retirement of a large number of employees

(OECD, 2019). Our findings show the types of organisation to which the tax authorities should deploy their decreasing number of experienced auditors and under what conditions these auditors' experience could or could not improve audit quality. This might inform tax authorities' hiring policies and internal tax auditor training programmes.

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APPENDIX I: CASE

General

With over 80 auditors, lawyers, notaries and tax advisors, Doyle, Holmes & Watson (DH&W) is a nation-wide operating professional services firm in Ireland. The firm has offices in Dublin, Belfast, Cork, Derry and Limerick and has grown historically through a number of mergers and acquisitions. DH&W offers assurance, audit, tax, financial and business advisory services to various economic sectors. The organization is managed from the head office in Dublin.

Organization

DH&W focuses on the challenges of its clients in order to contribute to the success of those organizations. They do this by, among other things, providing top-level advice and also providing excellent service. DH&W works with multidisciplinary teams.

DH&W monitors the markets and sectors in which its customers are active and keeps this knowledge up-to-date. As a result, they quickly identify new developments. DH&W determines the impact thereof and proactively approaches their clients. The multidisciplinary teams combine this sector knowledge with the highest level of expertise. Thanks to the extensive service portfolio, DH&W offers business solutions for every challenge. The firm attaches great importance to its long-term relationships with customers, which sometimes go back 100 years.

Number of employees at January 1, 2020

Partners	15
Fee-earners	75 (including partners)
Staff employees	55

Board

The board consists of five members. After three years a new board is elected from within the partner group (primus inter pares).

Organization

The partners and other fee-earners located in Dublin, are divided into six so-called ‘practice groups’. The staff employees are divided into 30 secretaries and 25 staff members, the latter are divided amongst the following departments:

- Financial Administration (FA)
- Tax function
- Research and Development (R&D)
- Human Resources (HR)
- Facility Services
- Information technology (IT)

Financial figures

Turnover 2018	€ 25.000.000
Profit before profit distribution	€ 2.500.000

Number of taxpayers

Number of taxpayers VAT	4
Number of taxpayers corporate income tax	3
Number of taxpayers payroll taxes	3

Compliance history

DH&W has not been audited for VAT and CIT in the last ten years.

Business Value Cycle and Internal control in general

DH&W is a service-oriented organisation, which delivers services to the market with the aim of making profit. The cyclic interrelationship between all primary processes (e.g. services, payment, purchase, sales) of the organisation follows the value cycle of a standard service oriented organisation.

DH&W uses the so-called ‘Three Lines of Defense’ model:[10]

[10] https://erm.ncsu.edu/library/article/cosos-take-on-the-three-lines-of-defense

1) The first line of defense is the management itself.
2) The second line is the FA department that operates on behalf of management as an adviser but also as a ’reviewer’.
3) The third line of defense is the internal control officer who reports to the DH&W Supervisory Board.

The business control framework – that helps the organisation to establish, assess and enhance its internal control – is maintained by the compliance staff in collaboration with the board and is based on COSO.[11]

Tax function of DH&W

At the head office of DH&W, three full-time tax specialists are responsible for tax matters. The local branches report directly to the head office. The tax function at the head office is also responsible for training the practice groups in all tax matters. These training sessions take place every year. The tax specialists’ team has knowledge of (corporate) income tax, VAT as well as payroll taxes. The tax strategy is coordinated within DH&W and can be characterized as business-like (“we pay what we have to, but we do not want to leave opportunities unused”).
The tax function can be characterized as professional. Most employees have been in the same place for more than 20 years and have developed highly structured working methods. The Financial Administration, HR and the Tax function have a good working relationship and meet on a monthly basis. DH&W has a small team of internal auditors. They perform various test activities, also regarding tax. It draws up an annual audit plan and communicates the results directly to the board in a formal report.

IT

<u>Situation IT-1: No additional IT risks</u>

All DH&W offices make extensive use of the same solid ERP system.[12] All business cycles and data flows (from order-to-cash, from purchase-to-pay, from hire-to-pay /fire) are based on uniform working methods and as such are fully supported by the ERP application. Special attention is paid to data gathering and the possibilities of Standard Business Reporting (SBR) applications. The processing of VAT-related matters is therefore fully automated, including intercompany transactions. VAT codes are part of the central master data. The IT and Tax departments meet on a regular basis to discuss parameterisation of fiscal aspects of transactions.

User-IDs to all IT-systems are issued centrally from the head office. All passwords have to comply with strict requirements and have to be changed every 45 days. Within the ERP system DH&W uses a limited number of user profiles for assigning user rights. The Financial Administration verifies the mutations in the user IDs on a monthly basis.

The partners within the practice groups are authorized for all purchases. Suppliers can use a web application to log in to the DH&W server for the collection of their orders and order confirmation. All purchase invoices are received centrally in Dublin via a web application,

[11] COSO: https://www.coso.org/_files/ugd/3059fc_1df7d5dd38074006bce8fdf621a942cf.pdf
[12] Enterprise Resource Planning (ERP) is usually referred to as a category of business management software—typically a suite of integrated applications—that an organisation can use to collect, store, manage, and interpret data from many business activities.

automatically coded (including the VAT), digitally scanned, sent to the responsible partner through an automated workflow for approval and subsequently processed in the general ledger. DH&W has a formal back-up and recovery process.

Regarding sales invoices, the Financial Administration receives digital pro forma invoices from the partners. Subsequently, based on client and activity codes in the master data, the correct VAT code is determined and the Financial Administration performs a final check of the invoice.

Situation IT-2: Additional IT risks

All DH&W offices make extensive use of financial accounting software. Five different financial accounting software programs are in use at the various branches. As a result of the various financial accounting software programs, the Financial Administration establishes a monthly manual consolidation process. Special attention is paid to data gathering and the possibilities of Standard Business Reporting (SBR) applications. However, VAT codes are not part of the central master data and can be changed by all users. The IT and Tax departments do not meet on a regular basis; they consult only on when incidents in the parameterisation of fiscal aspects of transactions occur.

User-IDs to all IT-systems are issued centrally from the head office. Due to long waiting times in the issuing of new user-IDs, new employees often use the user-IDs of colleagues until they receive their own IDs. All passwords have to comply with strict requirements and have to be changed every 45 days. Within the financial accounting software programs, DH&W assigns user rights on an individual basis. When employees change function or get additional/ different responsibilities, they automatically get the additional rights needed in the financial accounting software programs. Their supervisor has to report this to the IT-department so that the IT-department will withdraw no longer needed rights within the financial accounting software program.

The partners within the practice groups are authorized for all purchases. Suppliers can use a web application to log in to the DH&W server for the collection of their orders and order confirmation. All purchase invoices are received centrally in Dublin via a web application, automatically coded (including the VAT), digitally scanned, sent to the responsible partner through an automated workflow for approval and subsequently processed in the general ledger. DH&W has a formal back-up and recovery process.

APPENDIX II: SEEDED RISKS

Nr.	Risk name	Risk Description	Text in case
1	Incidental Transactions	Risk of incorrect tax processing of incidental transactions	A number of mergers and acquisitions
2	Collusion	Risk of conspiring with clients	The firm attaches great importance to its long-term relationships with customers, which sometimes go back 100 years
3	Complexity	Complexity due to large number of taxpayers	Number of taxpayers VAT 4, Number of taxpayers corporate income tax 3, Number of taxpayers payroll taxes 3
4	Aggressiveness	Risk of overaggressive behaviour	We pay what we have to, but we do not want to leave opportunities unused
5	Decentralization	Decentralized control	The partners within the practice groups are authorized for all purchases.
6	Services	Tax risks due to wide range of services, because a wide range of services relate to different types of taxation	With over 80 auditors, lawyers, notaries and tax advisors, Doyle, Holmes & Watson (DH&W) is a nation-wide operating professional services firm
7	IT Interfaces	Risk of incorrect and/or incomplete of data due to multiple financial accounting software programs with manual interfaces	A monthly manual consolidation process is established
8	IT Segregation	Tax risks due to faulty segregation of duties	VAT codes are not part of the central master data and can be changed by all users
9	IT Access Control	Tax risks due to faulty logical access controls	Due to long waiting times in the issuing of new user-IDs, new employees often use the user-IDs of colleagues for a long period of time.

10	IT Rights	Tax risks due to faulty rights management	When employees change function or get additional/ different responsibilities, they automatically get the additional rights needed in the financial accounting software programs. Their supervisor also has to report this to the IT-department so that the IT-department withdraws no longer needed rights within the financial accounting software program.

N.B. Risks 7 through 10 were only seeded in the version with additional IT risks.

APPENDIX III: ITEM WORDING

Perceived riskiness

1. Given the description of the organization, how would you score the audit effort needed for this organization on a scale from relatively few audit hours (1) relatively many audit hours (7)?

2. Given the description of the organization, how would you score the risk profile of this organization on a scale from very low risk (1) to very high risk (7)?

3. How do you estimate the quality of the internal control framework of DH&W on a scale from very low quality (1) to very high quality (7)?

4. How do you estimate the quality of IT control of DH&W on a scale from very low quality (1) to very high quality (7)?

Items 3 and 4 were reverse coded before calculating the composite variable.

Technology Readiness

Score the following 8 items on a scale from 1 (strongly disagree) to 7 (strongly agree):

1. New technology contributes to a better quality of life

2. Technology gives me more freedom of mobility

3. Other people come to me for advice on new technologies

4. In general, I am among the first in my circle of friends to acquire new technology when it appears

5. When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do

6. Technical support lines are not helpful because they don't explain things in terms I understand

7. People are too dependent on technology to do things for them

8. Too much technology distracts people to a point that is harmful

Items 5 through 8 were reverse coded before calculating the composite variable.

<u>Professional scepticism</u>

Score the following 6 items on a scale from 1 (strongly disagree) to 7 (strongly agree):

1. I always try to look at all sides of a problem

2. One can usually overcome difficulties by thinking about the problem, rather than through waiting for good fortune

3. I try to look at everybody's side of a disagreement before I make a decision.

4. One should disregard evidence that conflicts with one's established beliefs.*

5. A person should always consider new possibilities

6. People should always take into consideration evidence that goes against their beliefs

**Item 4 was removed due to low factor loading*.

<u>Specialism</u>

The *professional service sector* is that part of the economy in which (a group of) trained specialist provide services to clients. Examples of such specialist are lawyers, accountants and architects.

Looking at the last three years, what percentage of your auditing hours have you spent on auditing businesses in the *professional service sector*?

- o 0%
- o >0% ≤25%
- o >25% ≤50%
- o >50% ≤75%
- o >75%

<u>Expertise</u>

What is your main field of expertise at the tax authority? (Choose one)

1. Payroll taxes
2. Value added taxes
3. Corporate income taxes
4. Auditing
5. IT-auditing
6. Other