Can Elicitation Methods Increase the Precision of Fair Value Estimates?

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

This dissertation is motivated by recent changes in financial reporting regulation effected by the adoption of IFRS in Europe, Australia, and Canada, and SFAS 142 (FASB 2001) and SFAS 157 (FASB 2007 and 2011) in the U.S., that significantly increased users' exposure to fair values. The implementation of the fair value hierarchy, as well as the switch from amortization to impairment testing of goodwill, highlighted problems with auditing highly complex, judgment-dependent and inherently uncertain fair values. There is a concern that such fair values may not always be auditable, and that requiring auditors to provide positive assurance on them may necessitate changes to the financial reporting model.

The dissertation consists of two parts, the process study and the elicitation study. The process study, using the audit of goodwill/cash generating unit (CGU) impairment under IFRS as a specific example, provides quasi-experimental evidence about the fair value auditing process which can help to better understand and improve the auditing of complex fair values. The study relies on an analysis of verbal protocols to develop an understanding of how auditors and valuation specialists deal with the task. The study finds that for all of the participants who developed an auditor's range, the width of the range is many times the audit materiality, and intervals for the experienced auditors are narrower on average than those for junior auditors. There are signs of possible issues with both interpretation and application of fair value auditing and accounting standards across all groups of the participants. At least some of the issues with application of the standards appear to be related to judgmental shortcuts (heuristics) which have not been researched in a valuation task context in prior auditing literature. Some of the experienced and junior auditors do not appear to have a complete grasp of the applicable valuation methodology. Finally, the results shed light on the division of responsibilities between

assurance and valuation groups and the use of third party experts when auditing fair value impairments. The process study contributes to the literature by obtaining direct quasi-experimental evidence on auditors' and valuation specialists' process when they perform a fair value auditing task, and investigating the process differences among auditors with different levels of experience and experts.

The objective of the elicitation study is to develop techniques that can be used by auditors and valuation specialists when auditing complex fair values, by experimentally testing elicitation methods for fair value models' parameters. The study tests two probability distribution elicitation methods - the cumulative distribution function (CDF) method and the credible interval (CI) method. Quantitative analysis performed in this study indicates that the CDF method has a potential to improve the participants' unaided judgment regarding fair value intervals, at least for junior auditors, while the CI method does not yield similar improvement. When the two methods are compared to each other, the CDF method proves to be more effective for experienced and junior auditors, while the opposite is true for valuation specialists. The distributions developed with the help of the CDF method are subjected to the effects of anchoring heuristic to a lesser degree than those built using the CI method. Qualitative analysis based on verbal protocols in the elicitation study indicates that the CDF distribution elicitation method surpasses the CI method for the purposes of quantification of uncertainty inherent in complex fair value estimates. The study contributes to the literature by combining auditing and elicitation research in fair value auditing settings, and has a potential to improve the practice of auditing of goodwill and possibly other complex fair values, by providing information for the development of relevant decision aids.

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Finally, this dissertation would never have been completed had it not been for the support of my father, Mikhail Timoshenko.

Dedication

To the memory of my mother, Galina Timoshenko.

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Chapter 1 - Introduction

1.1 Motivation

Recent changes in financial reporting regulation effected by the adoption of International Financial Reporting Standards (IFRS) in Europe, Australia, and Canada, as well as the introduction of Statement of Financial Accounting Standards (SFAS) 142 (FASB 2001) and SFAS 157 (FASB 2007 and 2011) in the U.S. significantly increased users' exposure to fair values (FVs) and thus made the issue of fair value auditing extremely important for the stakeholders. The new standards introduced a three-level hierarchy of FV types based on the observability of inputs, as well as annual goodwill impairment testing, replacing goodwill amortization. These changes highlighted problems with auditing highly complex, judgment-dependent and inherently uncertain fair values at the higher levels of the hierarchy. There is a concern that in some circumstances such complex FVs may not be auditable, and that requiring auditors to provide positive audit-level assurance on them may necessitate changes to the current financial reporting model, e.g., reporting ranges or confidence intervals, rather than point estimates (Christensen, Glover, and Wood 2012).

Given the increased significance of FV reporting to the stakeholders, understanding of the various aspects of FV auditing process is an important objective of auditing research. Recent studies of FV auditing process (Cannon and Bedard 2015; Glover, Taylor, and Wu 2016; Griffith, Hammersley, and Kadous 2012 and 2015) rely predominantly on interview- and survey-based methodologies, which provide an understanding of a broad scope of issues that the auditors face when dealing with complex FVs. However, the lack of specific context in interview and/or survey settings does not always permit to perform a more in-depth investigation of the

issues in question. A qusi-experimental study based on methodology such as verbal protocol analysis (Biggs and Mock 1983) and employing a uniform task across all of the participants may be better suitable to achieve the latter objective. The first part of this study applies concurrent verbal protocols analysis methodology to an experimental case based on goodwill impairment to obtain knowledge about the details of FV auditing process related to auditing and reporting standards, auditing and valuation methodological aspects, and judgmental shortcuts employed by the participants.

Another major motivation for the study is the absence of direct evidence on valuation specialists' involvement in fair value audits.[1] As many fair values are based on highly technical models with unobservable input parameters and rely on complex judgment calls (Christensen et al. 2012; Ramanna and Watts 2012), they often require involvement of specialists. Current assurance standards define a specialist as "a person (or firm) possessing special skill or knowledge in a particular field other than accounting or auditing" (AU sec. 336, paragraph .01), or "an individual or organization in a field of expertise other than accounting or auditing" (ISA 620), so persons/firms possessing such skill or knowledge in fair valuation field are called valuation specialists. As mentioned above, current FV auditing literature provides primarily indirect evidence on the involvement of valuation specialists in FV audits. For example, in Cannon and Bedard (2015), of 96 FV auditing experiences analyzed by the authors, only three are supplied by valuation experts. Both Griffith et al. (2012 and 2015) are based solely on interviewing 24 experienced auditors with no feedback from valuation specialists. Similarly, Glover's et al. (2016) sample consists exclusively of auditor participants. This concern is also applicable to Griffith (2014, 2015, and 2016), where only auditors' perspective is taken into

[1] "Direct" (vs. "indirect") evidence on the involvement of valuation specialists is defined as evidence obtained from the valuation specialists themselves. Indirect evidence is secondary type of evidence obtained from other parties involved in FV audits, such as auditors.

account, even though the studies concern the use of valuation experts. This study obtains direct evidence of valuation specialists' involvement in FV audits as 22% of its total sample (or 30% of the experienced participants sub-sample) is represented by practicing valuation specialists employed with major public accounting firms.

Finally, extant analytical, archival, and behavioral studies on FV auditing identify a number of problems in audits of complex FVs related, but not limited to, high estimation uncertainty, difficulty with developing auditors' ranges, and auditors' possible preference to follow the management's approach when auditing FV estimates instead of developing their own estimate or ranges (e.g., Christensen et al. 2012; Griffith et al. 2012 and 2015; Smieliauskas 2012). At the same time, the extant studies recommendations are mostly concerned with a modification to current auditing guidance (Cohen, Gaynor, Montague, and Wayne 2016; Maksymov, Nelson, and Kinney 2015) or auditor's mindset intervention (Griffith, Hammersley, Kadous, and Young 2014) which would change auditors' behavior in some way, leaving decision aid-related solutions out of consideration. This opens an avenue for future research on decision aids which might assist auditors with developing auditor's ranges for complex FVs. As Smieliauskas (2012) notes, a systematic method needs to be found which would help auditors with quantifying accounting risk and improve the FV estimates ranges calibration. The second part of this study offers and tests one class of decision aids which auditors can use for developing FV auditor's ranges – decision aids based on probability distribution elicitation methods.

1.2 CGU (Cash Generating Unit) Impairment as an Example of FV Task

There are several potential candidates available to be the exemplar FV audit task in a behavioral study. These are financial instruments, pension liabilities, as well as impairments of

assets arising from business combinations valued at FV under IFRS (including goodwill, intangibles, and fixed assets). As impairments arising from business combinations are determined via CGU(s) impairment according to IAS 36 (IASB 2004a), the terms "CGU impairment" and "goodwill impairment" can and will be used interchangeably in this study. The selection of the audit task for this study has been influenced by three main factors: 1) The level of overall complexity, and particularly estimation uncertainty, inherent in the task; 2) Importance of the task for the stakeholders; and 3) Novelty and scale of the contribution. Below, I discuss each of these factors in more detail.

Goodwill impairment is a multi-step process requiring extensive use of professional judgment by both client management and the auditors, which creates a potential for "judgmental misstatements" discussed previously. According to IAS 36 (IASB 2004a), goodwill impairment testing involves identifying the organization's cash generating units (CGUs), allocating the goodwill balance to the identified CGUs, and comparing the carrying value of each CGU to it recoverable amount to quantify the impairment, if any. Neither of these steps is straightforward. Identification of CGUs is challenging because under IAS 36 (IASB 2004a) management needs to find (and the auditors need to verify) the smallest possible subset of assets that produces independent cash inflows for the company.[2] IAS 36 (IASB 2004a) explicitly states that the CGUs identification process requires judgment, while goodwill allocation to CGUs depends on the expected synergies of the business combination and does not directly depend on the allocation of other assets or liabilities acquired in a business combination, which makes the allocation a subjective and difficult judgmental task. Determination of a CGU's recoverable amount involves calculating its FV less costs to sell and/or its value in use, which includes the

[2] This is different from identification of CGUs under SFAS 142 (FASB 2001), which permits the use of management's reporting structure to define the CGUs – a much more straightforward approach.

identification of appropriate active markets, the determination of the amount and timing of future cash flows and the estimation of relevant discount and growth rates. In line with this reasoning, Cannon and Bedard (2015) in their field study find that the impairments are most frequently characterized by the highest level of estimation uncertainty among other FV auditing tasks (about 41%), while 83% of those impairments with the highest estimation uncertainty relate to goodwill.[3] Ramanna and Watts (2012) state that estimation uncertainty inherent in goodwill impairments may render them unauditable, while their empirical results indicate that goodwill impairments are related to debt covenants that rely on the goodwill balance and the CEO's protecting their reputation (agency theory rather than information signaling goals), which is not a desired situation for users of the financial statements.

While goodwill balances are certainly difficult to audit, recent research demonstrates that they represent an important issue for both auditors and users of financial statements. Ayres, Neal, Reid, and Shipman (2016) document that material goodwill impairments are significantly associated with subsequent auditor switches. Also, the auditor switch becomes more likely when the relative magnitude of the impairment charge is higher. These results highlight the importance of the goodwill impairment issue to both audit firms and public companies. It appears that auditing of goodwill balances is an area which generates a high level of business risk to the auditors and affects auditor-client relationship. Köhler, Ratzinger-Sakel, and Theis (2015) experimental results suggest that a discussion of goodwill impairment issues, such as the magnitude of assumptions changes leading to goodwill impairment, when included in key audit matters (KAM) paragraph in auditor's report, significantly influences users' decisions with regard to the company.

[3] This statistics is reported in the 2013 version of the study, while it is not included into the current 2015 version.

Despite the complexity of the task and the heavy demands it places on the professional judgment of the accountants and auditors, as well as the importance of goodwill reporting and auditing to the stakeholders, prior auditing research on goodwill is relatively undeveloped and predominantly limited to archival methodology papers. For example, the series of studies by Carlin et al. (2007 and 2008) and Carlin and Finch (2008) concentrate on public companies' compliance with the disclosure requirements of IAS 36 (IASB 2004a) related to goodwill impairment, and the ability of their auditors to enforce the compliance requirement. Shepardson (2013) finds that that the audit committee member (ACM) contextual experiences with goodwill impairment issues (proxied by interlocks with companies that likely went through the impairment testing process in the past) is associated with a higher likelihood of goodwill write-off, and the effect is the most pronounced when the experience is obtained in a manager's (vs. a monitor's) capacity. Stokes and Webster (2009) find that higher audit quality (measured by Big 4/non-Big 4, switches to Big 4, and other proxies) contributes to representational faithfulness of goodwill balances under IFRS. The result highlights a disparity in goodwill impairment audit outcomes between the Big 4 and non-Big 4 auditors, while it is not entirely clear whether the disparity is due to differences in the audit process, the audit effort, or both. Shipman, Carcello, and Neal (2016) investigate the impact of non-audit fees on auditor's independence in the context of goodwill impairment and find an inverse relationship of the non-audit fees to the likelihood of impairment in a situation where goodwill is likely to be impaired, meaning that non-audit services may compromise the independence.

Favere-Marchesi and Emby (2005) is one of the few experimental auditing studies on goodwill impairment, which establishes that a new concurring audit partner is more likely to recommend a write-down of purchased goodwill than a continuing concurring audit partner,

highlighting the issue of auditor's independence for this type of audit task. Recently, Griffith (2014) uses a goodwill impairment task (in the U.S. GAAP context) to investigate the interaction of audit-team specialists' caveats and client source credibility when auditing complex estimates and finds that auditor's review of evidence with regard to a biased complex estimate and related audit judgments incorporate a caveat if the estimate originates from a source which is perceived to have low credibility (if the preparer's source credibility is perceived as high, the caveat is disregarded). In a related study, the author investigates how relational ques in specialists' work interact with client source credibility when considered by auditors (Griffith 2016).

1.3 Summary of the Main Findings

The process study is a quasi-experiment with the objective of describing currently under-researched process of auditing complex FV estimates. The reliance on quasi-experimental methodology based on concurrent verbal protocols (Blocher and Cooper 1988, Biggs and Mock 1983, and Biggs et al. 1988) is justified by the fact that it produces much more detailed information on the FV auditing process than the extant interview-based research (Cannon and Bedard 2015, Glover et al. 2016, and Griffith et al. 2012 and 2015). This is achieved by providing a concrete context of the experimental case, which helps the participants to think about fine details of the FV auditing and FV estimation processes, leading to collection of rich process information which would not be possible to obtain in lacking specific context interview methodology studies. The use of the uniform experimental case also allows for valid process comparisons among different participant groups (experienced auditors, valuation specialists, and junior auditors). The experimental case used is CGU/goodwill impairment case under IFRS/IAS. The particular focus of the process study is obtaining qualitative information related to three

areas: 1) methodological aspects of the auditing and fair valuation processes, 2) interpretation, application, and interaction of reporting, auditing, and valuation standards, and 3) judgmental shortcuts arising within the auditing process, including those arising from uncertainties inherent in complex FVs.

In addition to qualitative results, the process study also provides some quantitative findings. The main such finding is related to the width of the participants' intervals, its relation to audit materiality, and its dependence on the participants' expertise (proxied by the work experience). Particularly, it is discovered that for all groups of the participants, the width of their auditors' intervals is multiple times the audit materiality. This result confirms concerns raised by Christensen et al. (2012) about auditors' ability to provide positive-level assurance on complex FV balances. The participants' intervals developed in the process study fall under Smieliauskas' (2012) "estimate nightmare" scenario, so that all points inside or outside of the participants' ranges have a significant risk. While the number of available observations does not permit to come to any conclusion for valuation specialists, a negative relationship is found between the auditors' expertise and the width of the auditors' intervals. Particularly, the width of the experienced auditors' intervals is narrower on average than the width of the junior auditors' intervals.

As mentioned, a set of results of the process study includes issues related to interpretation and application of relevant auditing and financial reporting guidance (primarily ISA 540 and IAS 36). One such finding is how the participants classify their audit approach under two mutually exclusive categories prescribed by ISA 540, testing management's estimate vs. developing auditor's own estimate or range. It appears that participants across all of the groups have difficulty with classifying their actions under the above categories. Additionally, a pluralism of

opinions exists on exactly what audit procedures are encompassed by each of the two categories. Some participants define developing auditor's own estimate or range as completely disregarding the management's work and creating a new valuation model along with its inputs from the scratch, while others suggest less radical interpretations such as altering the timing and amount of the management's cash flows, or performing a sensitivity analysis using the management's model. These findings provide a basis for reconciling conflicting results in prior interview-based studies of FV auditing process regarding the relative number of auditors choosing to test management's estimate vs. develop their own estimate or range (Cannon and Bedard 2015, Glover et al. 2016, and Griffith et al. 2012 and 2015).

The process study also sheds light on the participants' motives when classifying their actions as either testing the management's estimate or developing their own estimate or range. Particularly, senior-level participants suggest that since it is not possible to recognize the auditor's estimate on the face of financial statements due to independence considerations, developing auditor's own estimate or range represents an inefficient option. An efficient option is to guide/coach the management to correctly develop their own estimate, which can then be audited and reported on the balance sheet. The participants also suggest that this course of action benefits the audits in subsequent years, as the management acquires a skill to perform valuation tasks. At the same time, another reason for the majority of valuation specialists to classify their actions as testing the managements estimate may be grounded in the interaction between audit and valuation standards. The Canadian valuation standards place all of the valuation engagements into two exhaustive "buckets": a comprehensive valuation (assuming an extensive amount of work) and an estimate (assuming a limited amount of work). Since valuation specialists are likely to view a comprehensive valuation engagement as the only way to develop

a true independent estimate, and since valuation for financial reporting purposes falls into the estimate category, valuation specialists may tend to classify an audit engagement they participate in as testing management estimate under ISA 540.

The application of auditing standards is found to be affected by judgmental shortcuts employed by the participants. Some of these shortcuts have not been well researched in the FV audit task context in the extant literature. For example, many experienced and junior auditors use the midpoint of their auditor's range to arrive at a point estimate for the CGU RA. This approach to determining a FV point estimate is not recommended in the auditing standards and may be a manifestation of the availability heuristics. It also runs contrary to the results in Griffin (2014), who finds that auditors use the nearest bound of their FV interval to calculate the amount of suggested adjustment to the management's estimate. An additional problem discovered is that many participants do not recognize the necessity to narrow down their range given the audit materiality when arriving at a conclusion about the material misstatement in FV estimates, which represents a non-ISA 540 approach. At the same time, the participants who do recognize such necessity do not seem to offer a specific/systematic procedure(s) for narrowing down the range. They most frequently cite a general discussion with management as a way to reduce the range's width.

Another instance of the availability heuristics identified in the FV auditing process is the use of "+/-10% rule" by some valuation specialists in order to develop an auditor's range from a point estimate of the CGU RA, which is not suggested in either auditing or valuation standards. Moreover, since the "+/-10% rule" leads to auditor's ranges which are many times the amount of the audit materiality, its application by valuation specialists imply that this group of participants considers FV estimation uncertainty in isolation from the audit materiality. This approach may

be a consequence of valuation specialists acting primarily as business advisors in their professional practice, leading to a treatment of technical auditing concepts (i.e., audit materiality) different from that of auditors, who act primarily as assurance providers.

The process study also reveals methodological problems in the FV audit and valuation processes, including (but not limited to) insufficient understanding of valuation methodology by some of the experienced and junior auditors. A good illustration of such problem is that auditors do not always distinguish between two different approaches to discounted cash flow valuation – levered vs. unlevered (debt-free) methods. This may lead to application of an inappropriate discount rate in the analysis, which produces a highly material difference in the resulting CGU RA estimate.

As discussed, the process study demonstrates the difficulties that the participants experience with producing a reasonable range for the CGU RA. The issue encompasses several distinct problems, including: 1) Participants not recognizing the necessity to narrow down the range given the amount of audit materiality; 2) Participants relying on judgmental shortcuts to arrive at a point estimate (e.g., using a midpoint of the range as a point estimate); 3) Participants not having a systematic method of reducing the range given the audit materiality. One of the ways to alleviate the above problems is to introduce a decision aid to help the auditors and valuation specialists to produce a reasonable range for complex FV estimates.

The elicitation study tests probability distribution elicitation methods as a candidate for such a decision aid. More precisely, two elicitation methods – cumulative distribution function method (CDF) and credible interval method (CI) – are tested and compared between each other as well as to the unaided judgment in an experiment using the same CGU/goodwill impairment case and the same groups of participants as in the process study. The reason for choosing the

CDF and CI methods is that they are very often used to elicit individuals' probability distributions in business settings, as shown in the extant literature.

One of the results of the elicitation paper is calculating "implied confidence levels", which are levels of confidence exercised by the participants in their unaided intervals for the model input parameters, determined through comparisons to the assisted intervals developed with the help of elicitation methods. The averaged implied confidence levels for experienced auditors are in 55% – 62% range, while implied confidence levels for junior auditors are in 59% – 66% range.[4] Therefore, experienced auditors appear to require a lower level of confidence for the input parameter intervals for FV models, implying a negative relationship between the level of confidence and auditor's expertise (proxied by experience).

The investigation of effectiveness of probability distribution elicitation methods for improving unaided judgment indicates that the CDF method has such ability, while the CI method does not. Particularly, if a 50% percent confidence level is chosen for the valuation model input parameters, the use of the CDF method yields a smaller standard deviation of the interval widths (and thus more consistency among the participants) than unaided judgment.[5] The use of the CI method does not lead to a similar result.

A direct comparison of the CDF distribution elicitation method to the CI method also demonstrates a higher effectiveness of the CDF method. For both experienced and junior auditors, for the comparable intervals (25% to 75% cumulative distribution under the CDF and 50% confidence interval under the CI), the CDF method produces a set of intervals which 1) result in narrower (on average) intervals for the resulting FV, and 2) have a smaller standard deviation of the interval widths and lower and upper bounds for the resulting FV, than the CI

[4] The implied confidence levels for valuation specialists are difficult to estimate reliably due to the small number of observations.
[5] This finding is mostly due to the junior auditors.

method. In other words, the use of the CDF method leads to a better compliance with IAS 540 and to a higher consistency of judgment among auditors, compared to the CI method. For valuation specialists, however, interval widths for the resulting FV, as well as their standard deviations and the standard deviations of their lower and upper bounds are smaller for the CI method, compared to the CDF method. This may be explained either by a small sample size available for this group of participants, or alternatively by valuation specialists being more skillful than auditors with the use of probability distributions.

The results in the verbal protocols suggest that the CDF distribution elicitation method surpasses the CI method for the purposes of quantification of uncertainty inherent in complex FV estimates. For the group of words characteristic of the quantification of uncertainty process, the CDF method has higher frequencies of occurrence for a larger number of individual words, as well as has a higher composite index based on equal weighting of frequencies for all of the words in the group, compared to the CI method.

Finally, I hypothesize and find that the CDF distribution elicitation method, compared to the CI method, has smaller susceptibility to the anchoring heuristics. This prediction is based on the fact that the CI method routine operates in "interval" terms, while the CDF method routine operates in "value" (a distributional fractile) terms. Thus, the participants' prior-held beliefs about the parameter intervals may enter the elicitation process more easily when the CI method is used rather than when the CDF method is used.

The elicitation study thus contributes to the academic literature by bringing together auditing research and elicitation research in a FV auditing setting. From a practical perspective, the paper has the potential to improve current audit practices related to auditing of goodwill

impairment and possibly other complex FVs. This is accomplished by providing information valuable for the development of decision aids useful in FV audits.

1.4 Outline of the Study

This dissertation study consists of five chapters. The Introduction chapter (Chapter 1) provides general motivation for the study, discusses the reasons for choosing goodwill/CGU impairment as a basis for the experimental case, as well as outlines the main results of the two studies comprising the dissertation. Chapter 2 provides a comprehensive literature review which includes both FV reporting, auditing, and valuations standards and academic studies related to the FV auditing subject. The literature review focuses on the auditing research since the introduction of the new FV reporting standards (circa 2007). Archival and behavioral papers are addressed in separate sections. Chapter 3 is the first of the two studies comprising the dissertation. As mentioned above, it is called the "process study" because it relies on the process analysis methodology based on concurrent verbal protocols. Chapter 4 is the second dissertation study, called the "elicitation study" since it experimentally tests probability distribution elicitation methods as a means to assist auditors with constructing reasonable ranges for complex FVs. Chapter 5 concludes the dissertation study. It contains a discussion of the study's contributions to academic research, regulation and standard settings, as well as education. It also provides suggestions for future research arising from the dissertation's findings, and lists the limitations of both of the studies comprising the dissertation.

Chapter 2 - Literature Review

2.1 FV Financial Reporting and Auditing Standards

Table 1 summarizes current financial reporting and auditing rules on FVs both in the U.S. and IFRS-adopting countries. It demonstrates that under both of the regimes, the systems of relevant standards are complex and evolving. In IFRS jurisdictions, IFRS 13 "Fair Value Measurement" (IASB 2011) governs the use of FVs for financial and nonfinancial assets and sets up a three-level hierarchy based on the observability of inputs to the valuation, while International Accounting Standard (IAS) 36 and 39 (IASB 2004a and 2004b) prescribe rules for impairment of assets (including goodwill) and financial instruments, respectively.[6] Both IFRS 13 and SFAS 157 define the levels of as in a parallel way, whereby Level 1 inputs represent "quoted prices (unadjusted) in active markets for identical assets or liabilities that the entity can access at the measurement date", Level 2 inputs represent "inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly or indirectly", and Level 3 inputs represent "unobservable inputs for the asset or liability" (IASB 2009, pp. 23, 25, 26). With regard to goodwill, U.S. rules are different from IFRS because SFAS 142 permits reliance on management's reporting structure to define the business units used in the assessment of goodwill, whereas IAS 36 defines a cash generating unit (CGU) as the smallest possible subset of assets that produces independent cash inflows for the company.

International Standard on Auditing (ISA) 540 "Auditing Accounting Estimates, Including FV Accounting Estimates, and Related Disclosures" (IAASB 2008) guides the auditing of

[6] In the U.S., SFAS 142 (FASB 2001) changed the measurement of goodwill from amortization of acquisition cost to valuation based on periodic impairment testing, which entails fair value determination of business units. Subsequently, SFAS 157 (FASB 2007 and 2011) established a framework for measuring fair values (with three levels, as in IFRS 13) and expanded the disclosures.

estimates, including FVs, for IFRS adopters.[7] As discussed below, these auditing standards have been criticized for applying legacy methods used for auditing historical cost financial statements to FVs such as Level 2 and 3 FVs or the value of goodwill impairment, which are subject to a much higher level of uncertainty.

Canadian CICBV practice standards[8] include 18 valuations standards which are intended to encompass different valuations engagements such as valuations for issuing a fairness opinion, valuations for financial reporting (auditing), valuations for litigation support, etc. Valuation engagements for financial reporting purposes are governed by Practice Standard No. 110 "Valuation Report Standards and Recommendations" and Appendix B to Practice Standard No. 110 "Valuation for Financial Reporting".

2.2 Archival Studies on Auditability of FVs

Using financial statements of Wells Fargo and General Motors as examples, Christensen t al. (2012) demonstrate that a small change in one of the inputs to a Level 3 FV can produce a highly material "swing" in the reported FV. The authors question whether positive assurance on such balances can be obtained and suggest that negative review-level assurance or positive assurance on the ranges seem more realistic (Christensen et al. 2012, p. 140).

These concerns are echoed in Smieliauskas (2012), who introduces three scenarios: 1) "Accounting estimate nirvana" occurs when the width of the reasonable range of an estimate does not exceed the material misstatement, implying that any point in the reasonable range does

[7] For audits of U.S. issuers, AU Section 328 "Auditing Fair Value Measurements and Disclosures" (AICPA 2002) guides auditing fair values belonging to the hierarchy. The U.S. Public Company Accountability and Oversight Board (PCAOB) (2013) states that besides AU Section 328, three other relevant standards are AU Section 332 (AICPA 2001), AU Section 336 (AICPA 1998), and AU Section 342 (AICPA 1997), which relate to auditing derivatives, hedges, and investment securities, reliance on a specialist, and auditing accounting estimates, respectively.

[8] In Canada, valuation practitioners are member of Canadian Institute of Chartered Business Valuators (CICBV).

not have a significant estimation risk, as defined in ISA 540 (IAASB 2008); 2) "Estimate problem" exists when the width of the reasonable range is greater than the material misstatement but does not exceed twice the material misstatement, meaning there is at least one estimate with no significant risk. 3) "Estimate nightmare" takes place when twice the material misstatement is smaller than the width of the reasonable range, so that all points inside or outside of the reasonable range have significant risks (Smielauskas 2012, p. 279), under which a change to another financial reporting framework is necessary.

Ramanna and Watts (2012) comment that SFAS 142 (FASB 2001), in contrast with prior standards, derives the goodwill impairment amount from unverifiable management estimates of its current value. They find[9] that management's private information (measured by share repurchases, insider trading, 10-K tone, and one-year-ahead returns) does not bear on goodwill impairments, while agency-based predictions have some grounds (debt covenants that rely on the goodwill balance and the CEO's tenure are (weakly) linked to non-impairments).

Summarizing, some complex FV balances are very sensitive to small variations in input model parameters. This may lead to situations when it is not possible to provide positive assurance on a point estimate of a complex FV. Also, management appear to use subjectivity in complex FVs to meet debt covenants and/or protect their reputation rather than signal insider information. This increases the importance of auditing for such balances.

2.3 Behavioral Research on FV Auditing

While archival studies primarily deal with issues around the reporting outcomes of FV audits, the experimental and interview-based studies shed light on the underlying audit process.

[9] The sample consists of firms with strong market signs of goodwill impairment, specifically when a firm's book value exceeds its market value (BTM>1) for two years in a row in 2003-2006.

These studies are summarized in **Table 2**. They provide information about behavioral aspects related to FV audits such as biases and reliance on experts.

2.3.1 Biases in Auditors' Judgment When Evaluating FV Estimates

Montague (2010) shows that auditors are subjected to more confirmation bias (i.e., auditor seeks more confirming than disconfirming evidence) when they are asked to counter (vs. support) management's estimate or generate their own estimate, while this bias increases the professional skepticism.[10] Additionally, the confirmation bias is the highest in "counter/disconfirm" condition with high estimation uncertainty. Cohen et al. (2016) follow Monatgue (2010) in investigating the procedure frame[11] on the auditor's actions. In a single-factor experiment the authors find that a balanced frame (vs. a positive or negative ones) causes auditors to use more evidence countering, rather than supporting management's assertions, resulting in higher perceived RMM, and leading to lower FV balances, implying that revising current audit standards from positive to balanced frame leads to more conservative FV audits.

Maksymov et al. (2015) investigate how audit procedure positive vs. negative frame (defined as the need to ascertain whether management's assumptions are reasonable vs. not reasonable, respectively), efficiency pressure (high vs. low), and the extent posterior verifiability of audit quality (rated by the participants) bear on budgeted time for Level 3 FVs audit procedures. The authors find that the negative frame leads to planning for more audit hours, especially for procedures that are perceived as less verifiable. This implies that re-framing audit procedures from the (typical in practice) positive frame to a negative one is expected to increase audit effort.

[10] In Montague (2010), the professional skepticism is measured via skeptical judgment and action (the risk of material misstatement of the estimate and the quantum of recommended adjustment, respectively).
[11] Three levels of procedure frame are considered, where "support" represents a positive frame, "support and oppose" represents a balanced frame, and "oppose" represents a negative frame.

Griffin (2014) experimentally manipulates subjectivity (Level 2 vs. 3 FV), imprecision (narrow vs. wide estimate range), and footnote disclosure about estimate inputs (present vs. absent) and finds that the interaction between subjectivity and imprecision makes an adjustment more likely, while disclosure reduces the interaction. Griffin (2014) also discovers that auditors calculate the FV adjustment quantum by comparing management's FV estimate to the nearest bound (vs. the midpoint) of the auditors' range, implying a strict application of auditing standards.

Earley, Hoffman, and Joe (2014) experimentally investigate whether auditors experienced in the FV auditing task exercise skepticism about the management's SFAS 157 (FASB 2007) Level 2 vs. 3 classification judgments, because they may subconsciously gravitate towards the management's classification, as happens with Sarbanes-Oxley Section 404 internal control judgments (Earley et al. 2008). They find that auditors do exercise skepticism, especially when the management settles on the less conservative FV reporting alternative.

Summarizing, auditing complex FVs is a process which can be subjected to a number of biases. Estimation uncertainty/imprecision appears to be an important feature of FV balances, which influences both auditors' biases and the amount of adjustment suggested by the auditors.

2.3.2 The Use of Valuation Experts

Carpentier, Labelle, Laurent, and Suret (2008) observe that auditing FV assets with no liquid active market can be made easier by obtaining help from outside experts and by introducing valuation standards by practitioner bodies. Carpentier et al. (2008) ask a group of 43 Chartered Business Valuators (CBVs) to follow the Canadian Venture Capital Association's (CVCA's) recommendations to value a small, private, pre-IPO high tech firm and find that, despite the uniform guidance provided by the CVCA, the respondents rely on a variety of

methods and utilize different multiples in the valuation process. Carpentier et al. (2008) note that these differences in the valuation process translate into a very wide range of resulting FMVs, and that the post-IPO value verification reveals overstatement.

Jamal, Marshall, and Tan (2011) experimentally gauge the effectiveness of two means for reducing the bias of professional accountants (e.g., acting as auditors or business valuators) arising from the desire to please a fee-generating client, disclosure and certification, by asking 161 participants to value a business for issuing a fairness opinion. The participants are placed either into a "no conflict" control condition or into conditions created by manipulating the type of conflict (with the selling party, or with both the buying and the selling parties) and the bias reduction mechanism (no mechanism, disclosure, certification, or the combination of both). The authors discover that when only the selling party is present, conflict disclosure is dysfunctional as it produces bias. When both the buying and the selling parties are present, the biased is observed across all of the conditions. The authors conclude that the certification mechanism of bias reduction is ineffective, but the disclosure mechanism is dysfunctional.

Joe et al. (2015) conduct an experiment with 92 audit seniors employed with a "Big 4" firm, in which the evidence quantification level (low vs. high) and control environment risk (low vs. high) are manipulated with the proportional effort allocated to FV audit procedures serving as a dependent variable. The authors find that the auditors allocate less proportionate effort to testing the subjective inputs of management's FV estimate when both the quantification evidence level and control risk are high. In a supplemental experiment, an introduction of a regulatory practice alert (re: focus audit effort on FV inputs that are subject to management bias) is not resulting in a change of effort allocation documented in the first study.

Griffith (2015) analyzes interview data with 28 auditors who used valuation specialists and establishes that they apply auditing standards' guidance for external specialists to internal valuation specialists. Further, if there is no relevant guidance, the auditors lead the specialists to comply with the audit team's prevailing position. Griffith (2015) finds that main issues in the area are related to the complex FVs' inherent uncertainty, which causes the auditors to rely on reports of valuation specialists that they cannot competently review or even understand.

Griffith (2014) notes that audit-team valuation specialists often produce caveats to let the auditors know about reservations on certain assumptions (while the overall conclusion on the estimate is "clean"). The author, using an experiment with 78 experienced auditors, finds that their review of evidence with regard to a biased complex estimate and related audit judgments incorporate a caveat if the estimate originates from a source which is perceived to have low credibility (prepared by the client in-house). If the preparer's source credibility is perceived as high (prepared by a third party), the caveat is disregarded.

Summarizing, the body of research evidence regarding valuation specialists' performance in audit and/or valuation tasks is at present fairly limited. For the purpose of this study, the most important finding from the extant literature implies that current professional recommendations/standards for business valuators may not be effective in helping them to deal with uncertainty inherent in complex FVs, and that valuation processes used by the valuators are far from being uniform. A modification to the existing recommendations as well as their supplementation with relevant decision aids might be necessary to achieve an improvement.

2.3.3 Studies of FV Audit Process

Griffith et al (2012) expect that the audit process for complex estimates will not be similar to the one for historical cost numbers, since the two tasks have different goals and

structures, and call for a framework for understanding the process. The authors interview 24 auditors experienced with complex estimates, and conclude that the auditors rely less on their own models but rather prefer to test management's (or specialist-developed) models for complex estimates, which leads to underweighting of external evidence. Griffith et al. (2012) suggest that this underweighting can be corrected via modifications to the auditing standards, changes to their implementation, as well as staffing valuation tasks with auditors who have a suitable cognitive processing style. The authors also find that auditors' decision to verify management's estimate may be based on effort and efficiency consideration, given their investment in understanding management's model. Also, better communication with the valuation specialists and using more experienced auditors may decrease their excessive reliance on the specialists, because it likely stems from auditors not understanding the specialists' models.

Griffith et al. (2015), based on the same interview data, find that auditors most frequently elect to verify the management's estimate, rather than to develop an auditor's own estimate or review subsequent events, and that they examine separate elements of management's estimates in isolation without looking at the "big picture". Based on institutional theory, the authors name two root causes of this situation: excessive focus on verifying management's estimates in the standards and audit firms' current distribution of knowledge between auditors and specialists, whereby the auditors do not know enough about valuation.

Cannon and Bedard (2015) conduct a survey-based field investigation of auditing of complex FV estimates and find that uncertainty in the estimates is positively related to the assessed inherent risk, but in a number of cases the estimate's inherent risk is assessed below maximum even though the uncertainty leads to ranges that are larger than materiality. They find that use of a valuation specialist by the client triggers the reliance on a specialist by the auditors.

In their sample of engagements, the auditors most frequently (in 53% of the cases) choose to develop their own independent estimate or range for a FV, instead of testing managements estimate or evaluating subsequent realizations. Cannon and Bedard (2015) observe that obtaining positive assurance on complex FVs may not always be possible.

Griffith's et al. (2014) experiment shows that a deliberative mindset intervention helps auditors to detect unreasonable estimates because such intervention assists them in finding conflicting information from other audit areas and including it into the analysis. The authors suggest that the intervention forces the auditors think broader instead of working harder, thus improving audit quality of complex estimates.

Summarizing, while the above studies shed some light on the auditing process of complex FVs, they do not offer any structured decision aids that can help to overcome the process shortcomings. Additionally, there is not enough information on how and why the processes are different between the auditors and valuation specialists.

Chapter 3 - How Are FV Impairments Audited? A Study of Auditors and Valuation Specialists

3.1 Introduction

Recent changes in financial reporting regulation effected by the adoption of International Financial Reporting Standards (IFRS) in Europe, Australia, and Canada, as well as the introduction of Statement of Financial Accounting Standards (SFAS) 142 (FASB 2001) and SFAS 157 (FASB 2007 and 2011) in the U.S. significantly increased users' exposure to FVs and thus made the issue of FV auditing extremely important for the stakeholders. The new standards introduced a three-level hierarchy of FV types based on the observability of inputs, and moved from goodwill amortization to its impairment testing. These changes highlighted problems with auditing highly complex, judgment-dependent and inherently uncertain items such as FVs at the higher levels of the hierarchy and goodwill impairments. There is a concern that in some circumstances such FVs may not be auditable, and that requiring auditors to provide positive audit-level assurance on them may necessitate changes to the current financial reporting model, e.g. reporting ranges or confidence intervals, rather than point estimates (Christensen et al. 2012; Smieliauskas 2012). Current auditing standards have been criticized for applying legacy methods used for auditing historical cost balances to complex FVs, which are subject to a much higher level of uncertainty, and regulators point to numerous problems with FV audits in recent years (IFIAR 2014).

The complexity and novelty of FV auditing tasks to the auditors, the proliferation of problems with FV auditing discovered by the regulators, together with the importance of FV reporting and audit quality to capital markets, make the understanding of the underlying FV auditing process a promising avenue for research. This paper provides quasi-experimental

evidence about the process of FV auditing obtained based on verbal protocols methodology, which helps to better understand and improve the auditing of complex FVs (using goodwill impairment task as a specific example). Particularly, the study investigates the ways in which auditors deal with uncertainty inherent in the goodwill impairment audit task, and compares process differences between the auditors and valuation specialists.

The following section provides motivation and literature review that focuses on the auditing research since the introduction of the new FV reporting standards (circa 2007). It also looks at the suitability of goodwill impairment as an exemplar FV auditing task. It is followed by a discussion of relevant theory and the development of research questions. The next section outlines the research methodology, followed by a discussion of quasi-experimental results. The conclusion summarizes academic and practical contributions of the study.

3.2 Motivation and Literature Review

The literature review focuses on several unexplored areas that a quasi-experimental study of the FV auditing process can help to address. First, a discussion of the features of complex FV estimates which make them difficult to audit highlights a necessity to investigate how auditors deal with these problematic areas. Second, prior archival results establish a relationship between audit quality and the quality of reported FVs. These results suggest a need to understand differences in the auditing process among auditors of different quality, since these differences have a bearing on the resulting FVs' reliability and representational faithfulness. Third, there is evidence that the features of complex FVs that make them difficult to audit influence a number of auditors' biases as well as key audit judgments, e.g. the suggested adjustment. Since little is known about the mechanisms of such influence, a process study will be useful for uncovering

these mechanisms. Forth, extant interview based studies of the auditing process, while helpful with identifying the difficult areas, provide little information on how auditors deal with them when obtaining assurance. Finally, a review of the papers on valuation specialists' involvement with FV audits indicates a lack of direct evidence about the specialists' auditing process.

3.2.1 Characteristics of FVs Affecting Their Auditability

Prior archival papers shed light on the characteristics of FV reporting that contribute to the difficulty of providing assurance on such balances. For complex model-based FVs, a major problem appears to lie in very high sensitivity of resulting FVs to variations in the input parameters. Christensen et al. (2012) demonstrate this on the examples of Wells Fargo's mortgage-backed securities and General Motors' pension liabilities, whereby very small changes in interest and discount rates respectively cause material swings in the reported amounts. The authors question whether positive assurance on such balances can be obtained, as negative review-level assurance or positive assurance on the ranges may be more realistic. These concerns are echoed in an analytical paper by Smieliauskas (2012), who introduces three scenarios: 1) "Accounting estimate nirvana" occurs when the width of the reasonable range of an estimate does not exceed the material misstatement, implying that any point in the reasonable range does not have a significant estimation risk, as defined in ISA 540 (IAASB 2008); 2) "Estimate problem" exists when the width of the reasonable range is greater than the material misstatement but does not exceed twice the material misstatement, meaning there is at least one estimate with no significant risk. 3) "Estimate nightmare" takes place when twice the material misstatement is smaller than the width of the reasonable range, so that all points inside or outside of the reasonable range have significant risks (Smieliauskas 2012, p. 279), under which a change to another financial reporting framework is necessary.

This research points to the necessity to understand how auditors deal with such input parameter-sensitive models while providing assurance on complex FVs. Does the auditing process adequately address the underlying challenges?

3.2.2 The Impact of Audit Quality on Representational Faithfulness of FVs

Extant archival research demonstrates that audit quality (measured by different proxies) has a positive relationship with representational faithfulness of reported complex FVs, both perceived and actual. Stokes and Webster (2009) find that higher audit quality (measured by Big 4/non-Big 4, switches to Big 4, and other proxies) contributes to representational faithfulness of goodwill balances[12] under IFRS. Vergauwe, Gaeremynck, and Stokes (2011) document that during 2007-2009, for European real estate firms valuing investment property based on model estimates, the investors perceive that greater audit effort (measured via unexpected audit fees or audit delay) adds to the FVs reliability (measured using the bid-ask spread). Bratten, Caushiolli, and Myers (2012a), using a sample of U.S. bank holdings during 2000-2008, discover that the effect of auditor industry specialization[13] on the earnings management methods of such companies is influenced by their exposure to FV accounting. They find that specialist auditors reduce transaction-based earnings management through timing of the realization of gains and losses on sales of investments, because clients of such auditors make more conservative estimates (possibly due to the knowledge possessed by the industry specialist auditors).

These results pose a question of what drives the disparity in FV audit outcomes between the auditors of different quality: differences in the audit process, the audit effort, or both. If effort

[12] FASB and IASB Conceptual Frameworks define the representational faithfulness property in a similar way, e.g. SFAC 8 (FASB 2010) states that to be representationally faithful, financial information "must … represent the phenomena that it purports to represent" in "complete, neutral, and free from error" manner (p. 17). Economic goodwill is a part of the firms' investment opportunity set (IOS), where Chalmers, Godfrey, and Webster's (2009) IOS composite measure is based on factor analysis of market-to-book, price-to-earnings, and other ratios.
[13] The effect is weakened in the presence of a Big 4 auditor.

is the key to improving representational faithfulness of FVs, and the auditor's process is not a significant determinant of the audit quality for such audits, creating incentives for more hours spent on auditing FVs (such as raising penalties for audit firms) will solve the problem. If the process does matter, it is important to determine what aspects of it distinguish a high-quality auditor from a low quality one.

3.2.3 The Influence of Information Uncertainty/Imprecision of Complex FVs on Auditors' Judgment

While papers discussed above demonstrate that certain features inherent in complex FVs contribute to the difficulty of auditing of such balances, a number of experimental articles look at how these features affect the auditors' biases and judgments such as the amount of proposed adjustment. Montague (2010) shows that auditors are subjected to more confirmation bias (i.e., auditor seeks more confirming than disconfirming evidence) when they are asked to counter (vs. support) management's estimate or generate their own estimate, while this bias increases the professional skepticism. Additionally, the confirmation bias is the highest in "counter/disconfirm" condition with high estimation uncertainty.

Griffin (2014) experimentally manipulates subjectivity (Level 2 vs. 3 FV), imprecision (narrow vs. wide estimate range), and footnote disclosure about estimate inputs (present vs. absent) and finds that the interaction between subjectivity and imprecision makes an adjustment more likely, while disclosure reduces the interaction. Griffin (2014) also discovers that auditors calculate the FV adjustment quantum by comparing management's FV estimate to the nearest bound (vs. the midpoint) of the auditors' range, implying a strict application of auditing standards.

Maksymov et al. (2015) investigate how audit procedure frame (an auditor judges whether management's assumptions are reasonable vs. not reasonable), efficiency pressure (high vs. low), and the extent posterior verifiability of audit quality (rated by the participants) bear on budgeted time for Level 3 FVs audit procedures. The authors find that the negative frame leads to planning for more audit hours, especially for procedures that are perceived as less verifiable. This implies that re-framing audit procedures from the (typical in practice) positive frame to a negative one is expected to increase audit effort.

The above papers offer evidence that features of complex FVs such as estimation uncertainty/imprecision and difficult ex-post verifiability bear both on the auditors' biases and on the key audit judgments, e.g. on the amount of adjustment suggested by the auditors. However, they provide a limited insight into the mechanisms of such influence. A process study that sheds light on these mechanisms will produce information useful for assisting the auditors when they deal with uncertainty/imprecision and proposing any corrective actions, if necessary.

3.2.4 Studies of FV Audit Process

Griffith et al. (2012) interview 24 auditors experienced with complex estimates and identify the steps that the auditors follow in the process and the issues that are problematic in the auditors' view. They conclude that the auditors rely less on their own models but rather prefer to test management's (or specialist-developed) models, which leads to underweighting of external evidence. Griffith et al. (2012) suggest that this can be corrected via modifications to the auditing standards, changes to their implementation, staffing valuation tasks with auditors who have a suitable cognitive processing style, as well as better communication with the valuation specialists and using more experienced auditors. The authors also find that auditors' decision to verify

management's estimate may be based on effort and efficiency consideration, given their investment in understanding management's model.

Griffith et al. (2015), based on the same interview data, find that auditors most frequently elect to verify management's estimate, rather than to develop an auditor's own estimate or review subsequent events, and that they examine separate fragments of management's estimates in isolation without looking at the "big picture". Based on institutional theory, the authors suggest two root causes of this situation: excessive focus on verifying management's estimates in the standards and audit firms' current distribution of knowledge between auditors and specialists, whereby the auditors do not know enough about valuation.

Cannon and Bedard (2015) conduct a survey-based field investigation of auditing of complex FV estimates and find that uncertainty in the estimates is positively related to the assessed inherent risk, but in a number of cases the estimate's inherent risk is assessed below maximum even though the uncertainty leads to ranges that are larger than materiality. They find that use of a valuation specialist by the client triggers the reliance on a specialist by the auditors. In their sample of engagements, the auditors most frequently (in 53% of the cases) choose to develop their own independent estimate or range for a FV, instead of testing managements estimate or evaluating subsequent realizations. Cannon and Bedard (2015) observe that obtaining positive assurance on complex FVs may not always be possible.

Griffith et al. (2014) experiment shows that a deliberative mindset intervention helps auditors to detect unreasonable estimates because such intervention assists them in finding conflicting information from other audit areas and including it into the analysis. The authors suggest that the intervention forces the auditors to think broader instead of working harder, thus improving audit quality of complex estimates.

The existing studies of the FV auditing process based on interview methodology provide important information about the steps that auditors follow while attending to FV auditing tasks and the elements of the process that they see as problematic. These studies also offer advice on how certain aspects of the auditors' behavior can be changed in a desired way. This includes encouraging auditors to purse the development of independent estimates rather than verifying management's estimates and getting them to take a broader perspective to incorporate evidence from other audit areas. However, the extant process studies of FV auditing leave out questions about how auditors handle FV features that make the FV balances difficult to audit, that is information uncertainty and imprecision.

3.2.5 The Use of Valuation Experts in FV Auditing

Recent PCAOB consultation papers (PCAOB 2014 and 2015) highlight the interest of regulators and standard setters in the use of specialists during the audit, witch a particular emphasis on the use of valuation specialists given the increasing importance of FV audits. However, one of the limitations of the existing studies of the FV auditing process is that they provide little direct evidence of how valuation specialists approach FV auditing tasks. The interview-based studies discussed above have very limited input from valuation specialists. For example, in Cannon and Bedard (2015), of 96 FV auditing experiences analyzed by the authors, only three are supplied by valuation experts. Both Griffith et al. (2012) and Griffith et al. (2015) are based solely on interviewing 24 experienced auditors with no feedback from valuation specialists. Similarly, Glover's et al. (2016) sample consists exclusively of auditor participants.

This concern is also applicable to Griffith (2015), where only auditors' perspective is taken into account, even though the study concerns the use of valuation experts. Griffith (2015) analyzes interview data with 28 auditors who used valuation specialists and establishes that they

apply auditing standards' guidance for external specialists to internal valuation specialists. Further, if there is no relevant guidance, the auditors lead the specialists to comply with the audit team's prevailing position. Griffith (2015) finds that main issues in the area are related to the complex FVs' inherent uncertainty, which causes the auditors to rely on reports of valuation specialists that they cannot competently review or even understand.

One of the few studies directly addressing valuation specialists' involvement in FV auditing is Carpentier, Labelle, Laurent, and Suret (2008). The authors observe that auditing FV assets with no liquid active market can be made easier by obtaining help from outside experts and by introducing valuation standards by practitioner bodies. Carpentier et al. (2008) ask a group of 43 Chartered Business Valuators (CBVs) to follow the Canadian Venture Capital Association's (CVCA's) recommendations to value a small, private, pre-IPO high tech firm and find that, despite the uniform guidance provided by the CVCA, the respondents rely on a variety of methods and utilize different multiples in the valuation process. Carpentier et al. (2008) note that these differences in the valuation process translate into a very wide range of resulting FMVs, and that the post-IPO value verification reveals overstatement.

Griffith (2014) investigates some aspects of reliance of auditors on valuation specialists when auditing complex FVs. She notes that audit-team valuation specialists often produce caveats to let the auditors know about reservations on certain assumptions (while the overall conclusion on the estimate is "clean"). The author, using an experiment with 78 experienced auditors, finds that their review of evidence with regard to a biased complex estimate and related audit judgments incorporate a caveat if the estimate originates from a source which is perceived to have low credibility (prepared by the client in-house). If the preparer's source credibility is perceived as high (prepared by a third party), the caveat is disregarded.

Thus, extant research on valuation specialists' involvement in FV auditing provides limited information on how the specialists handle such tasks. It appears that current professional recommendations/standards for business valuators are not effective in helping them to deal with uncertainty inherent in complex FVs, and that valuation processes used by the valuators are far from being uniform. These results call for obtaining direct evidence on how valuation experts perform FV auditing tasks, analysis of which can lead to a modification to the existing recommendations as well as their supplementation with relevant decision aids to achieve an improvement.

3.3 Development of Research Questions

3.3.1 FV Audit Process Map and Development of Research Questions

While Cannon and Bedard (2015) and Griffith et al. (2012 and 2015) provide important evidence about the FV auditing process using field study and interview methodologies, an quasi-experimental study in this area using a uniform task across all of the participant (which include both auditors and valuation specialists) is useful for a more precise description of the process, as well as for uncovering the differences between the auditors and the specialists. The specific focus of the process study is on investigating how the participants deal with estimation uncertainty and imprecision in FVs, given the audit materiality. Smieliauskas (2012) notes that the main difficulty with auditing FVs is related to the possibility of judgmental misstatements[14], which can arise either from inaccuracies in forecasting of future events (e.g., estimating growth and discount rates, timing and amount of future cash flows, etc.), or from other judgmental

[14] ISA 540 (IAASB 2008) defines judgmental misstatements as "differences arising from management's judgments concerning accounting estimates that the auditor considers unreasonable, or the selection or application of accounting policies that the auditor considers inappropriate".

inaccuracies related mostly to present events (subjective determinations such as adjusting the price of an asset with an active market to find the price of the original asset without an active market, or establishing CGUs for the purpose of goodwill impairment). From the audit theory standpoint, a unique problem specific to future event uncertainties is that the ranges associated with future events are dependent on the possible states of the economic environment, and obtaining more evidence on those possible states may increase the expected volatility and therefore widen the associated range rather than narrow it (Smieliauskas 2012, p. 266). The presence of this estimation uncertainty (what Smieliauskas (2012) calls "accounting risk") is the principal factor distinguishing the audit of FVs from the audit of other accounting transactions or balances based on historical cost, because of the necessity for the auditors to obtain assurance on future or hypothetical present economic transactions rather than past transactions (Smieliauskas 2012; IAASB 2008). The analytical argument in Smieliauskas (2012) is supported by field data in Cannon and Bedard (2015), who discover that the primary factors that make FVs challenging to audit[15] are all directly related to estimation uncertainty. In a similar vein, Menzefricke and Smieliauskas (2012a), using their simple model of a pension fund, demonstrate that disregarding the uncertainty in the return rate can lead to a material misstatement of the funding status. They also warn that the uncertainty around the funding status is multifaceted, and includes the uncertainty around mortality assumptions and outcomes of the future management-employee negotiations. Thus, of particular interest in a FV auditing process study is how the auditors deal with the uncertainty inherent in FV estimates.

[15] The three most frequently mentioned factors are "number of significant and/or complex assumptions associated with the process"," high degree of subjectivity associated with these assumptions and factors used in the process", and "high degree of uncertainty associated with the future occurrence or outcome of events underlying the assumptions" (mentioned by 64.6, 63.6, and 42.4% of the respondents, respectively).

Bratten, Gaynor, McDaniel, Montague, and Sierra (2013) note that adequate inclusion of the fundamental uncertainty underlying complex FVs into auditing judgments is hampered by individual information processing limitations. They cite extant judgment and decision making research to suggest that individuals tend to lower their cognitive load when faced with difficult and/or uncertain tasks, producing simplified strategies (heuristics) that often lead to ignoring or misusing relevant information. At the same time, prior psychology literature on quantitative estimation, which lies at the heart of auditing complex FVs, suggests that the process of such estimation is influenced by information cues based on cognitive biases/heuristics and/or the use of domain-specific knowledge, as well as on intuitive statistical knowledge (Brown and Siegler 1993; von Helversen and Rieskam 2008).

The study's research questions are formulated around the most important audit judgments and decisions identified in a process analysis of the FV accounting and auditing processes, with a particular focus on the audit of goodwill (the analysis is available from the author upon request). There are several reasons for choosing goodwill impairment as the accounting and auditing task to focus on this study. First, goodwill impairment is a multi-step process requiring extensive use of professional judgment by both the client's management and the auditors, which creates a potential for judgmental misstatements, including those arising from estimation uncertainty. Second, goodwill impairment appears to be the issue most common to the general population of publicly listed firms, both worldwide and in Canada, when compared to other valuation tasks. Third, goodwill impairments appear to be an issue of importance[16] to both audit firms and public companies.

[16] E.g., Ayres, Neal, Reid, and Shipman (2016) document that material goodwill impairments have a significant association with subsequent auditor switches. Also, the auditor switch becomes more likely when the relative magnitude of the impairment charge is higher. This finding points to the fact that auditing of goodwill balances is an area which generates a high level of business risk to the auditors.

The process analysis, presented in **Table 3, Panel A**, is prepared based on the current international accounting and auditing standards governing goodwill impairments (IAS 36; ISA 540), as well as extant interview-based papers on FV auditing process (Cannon and Bedard 2015; Griffith et al. 2012 and 2015). The study's research questions are therefore formulated around the most important audit judgments and decisions identified in the process analysis, with a particular focus on those judgments and decisions which involve uncertain information and which are the most likely to give rise to certain cognitive biases. For the reader's convenience, all of the research questions are listed in **Table 3, Panel B**.

According to the process analysis, the initial step in the process of a CGU/goodwill impairment audit is identifying assets that may be impaired. While ISA 540 does not provide explicit guidance related to this step, IAS 36 suggests that the participants should identify the necessity to test goodwill for impairment every year (whether or not any indicators of impairment are present), leading to RQ 1. The participants should as well as verify the source of goodwill (as self-developed goodwill is not be recognized on the balance sheet). This leads to RQ 2, which investigates whether the participants perform the above action.

The second step the participant is expected to perform is to verify the identification of CGU(s) to make sure that the CGU(s) identified by management are in accordance with the IAS 36 definition. RQ 3 investigates whether the participants acknowledge the issue of CGU determination as a part of the auditing task and comes to the appropriate conclusion based on the case facts. This question is very important because under IFRS, compared to U.S. GAAP, the CGU determination is generally much more challenging and cannot be based on management's internal reporting structure. It is based purely on objective economic considerations such as identifying the smallest part of the company producing independent cash flows.

The next step in the process of auditing of FV estimates is assessing the risk of material misstatement (RMM) for the estimate, which entails understanding of the audit client and its environment, including its internal controls (ISA 540, 8), as well as of the underlying assumptions (ISA 540.A31). The risk assessment also involves evaluating the degree of estimation uncertainty associated with the accounting estimate (ISA 540, 10). This stage is critical because it is the information uncertainty surrounding the assumptions which makes FV estimates difficult to audit (Christensen et al. 2012; Smieliauskas 2012). Therefore, the research questions which provide for the understanding of the risk assessment stage ask how the participants assess the RMM related to the CGU impairment amount, including the inherent and control risk (RQ 4), and whether the participants determine whether the impairment amount is a source of high estimation uncertainty (RQ 5).

The next step in the auditing process is audit testing undertaken in response to the assessed RMM. Prior auditing literature does not come to a definitive conclusion about two major auditor decisions relevant to the audit testing step, which are 1) selecting between a pure substantive and combined approach and 2) selecting between testing the management's estimate and developing the auditor's own estimate or range (Cannon and Bedard 2015; Griffith et al. 2012 and 2015). Therefore, obtaining process information about both of them is important.[17] This is accomplished by answering RQ 6 and RQ 7 which ask, respectively, whether the participants elect to use a combined or fully substantive approach, and whether they choose to test the management's estimate for the goodwill/CGU impairment amount as opposed to developing their own estimate or range, and investigate the factors influencing both of those

[17] Verification against the actual outcome or other subsequent-event-type verification is only possible for simple accounting estimates such as provisions for bad debts or warranties. Therefore, the participants are unlikely to place significant weight on ISA 540, 13(a), which is based on determining whether events occurring up to the date of the auditor's report provide audit evidence regarding the fair value estimate.

decisions. The next set of research questions investigate what alternatives to the management's assumptions and/or valuation model the participants consider when either testing the management's estimate or developing their own estimate or range for the goodwill/CGU impairment amount. RQ 8 inquires whether the participants' elect to either consider alternative set of assumptions, or an alternative valuation model, or to do both. RQ 9 investigates the participants' reasoning for the development of alternative assumptions and/or model, while RQ 10 looks at the sources of information used by the participants when developing such assumptions and/or models.

Additionally, the development of a participant's own range involves narrowing the range if it is not considered reasonable. RQ 11 investigates whether and based on what audit evidence the range is narrowed down, as well as how the participants factor in materiality when narrowing the range down and making the conclusion about its reasonableness.

Further, IAS 36 defines an asset's recoverable amount (RA) as the maximum of FV less costs to sell (FVLCS) and value in use (VIU). RQ 12 investigates whether the participants recognize the need to calculate FVLCS of the envelope business CGU in addition to VIU, to determine the RA.

ISA 540.21 requires the auditor to consider indicators of possible management bias. RQ 13 investigates whether the participants factor in any indicators of management's bias that in their view are present when drawing their conclusion about the reasonableness of management's estimate or developing their own estimate or range. RQ 14 enquires whether the participant reviews management's compensation information when considering indicators of possible management bias.[18]

[18] ISA 540.A125does not explicitly discuss management compensation in relation to possible management's bias, but rather speaks in more general terms of "management objectives" that may result in a bias.

While recognizing the possibility of management bias being present in reported FV estimates due to various incentives, ISA 540 is silent with regard to possible auditor's biases which may arise in the process of auditing such estimates. The auditor's biases may include unconscious cognitive biases which result from short-cut heuristics in the auditor's judgment (Bratten et al. 2013) as well as deliberate biases arising from the desire to produce a valuation that would please a fee-generating client (Jamal, Marshall, and Tan 2011), compared to deliberate management's biases discussed in ISA 540. Also, prior psychology literature on quantitative estimation (Brown and Siegler 1993; von Helversen and Rieskam 2008) suggests that the process of such estimation is influenced by information cues based on cognitive biases/heuristics. Therefore, RQ 15 helps to gauge the susceptibility of the participants' process to the use of such cues when considering alternative assumptions and/or valuation model, while RQ 16 investigates the same issue in the participants' process when narrowing down their own range. For example, a participant may develop the alternative assumptions (model) by "adjusting away" from the initial assumptions (model) suggested by management (serving as a cognitive anchor). A different manifestation of anchoring may arise when a participant decides to use an alternative valuation model which is typical of their usual practice (but is not necessarily a model more appropriate in the circumstances than management's model), or when a participant develops alternative assumptions for management's model based on the features of a typical model reflective of their usual practice, rather than the model actually used by management. RQ 17 and 18 investigates the possibility of deliberate participants' bias when developing an alternative model and/or assumptions, and when narrowing down their own range, respectively.

An additional research question (RQ 19) refer to the auditors' use of internal valuation specialists (including the division of responsibilities between assurance and valuations groups) and the auditors' and valuation specialists' use of third party (external) specialists in the process of FV auditing. This research question is warranted due to the lack of current research on the topic and due to interest to this issue from the regulators and standard setter (PCAOB 2014 and 2015).

In general, in a process analysis study (whether or not based on concurrent verbal protocols methodology) the expected participants' process map plays the role of the theoretical framework around which the research questions and/or hypotheses are developed and formulated and against which the participants' actual process is compared and analyzed. Therefore, the FV audit process map developed above serves as the primary theoretical framework for this part of the study.

3.3.2 Expected Process Differences Between Auditors and Valuation Specialists

It is expected, based on the extant literature, that valuation specialists' process while performing the task will be different from that of regular auditors. Particularly, it appears that valuation specialist are more likely than auditors to elect developing an independent estimate or range (rather than verifying the management's estimate), and they tend to test model assumptions and the model itself rather than verify the underlying data (Cannon and Bedard 2015; Griffith et al. 2012 and 2015). Developing an independent estimate or range for a model-based FV may involve either creating alternative point estimates or ranges of the input parameters or building a new model altogether, or even a set of models integrated with a system of weights (Bratten et al. 2013). As DCF (discounted cash flow) models are generally accepted for business valuation purposes, the valuation specialists are unlikely to switch to a different class of models, but may

elect to develop an alternative model within the class (e.g., using debt-free model as opposed to the management's levered model). The choice between the two methods may depend on the size of the audit firms, where non-Big 4 firms' specialists may gravitate towards the use of the unlevered method as they tend to deal with smaller clients with little or no debt financing in their capital structure. The case materials also allow for application of other types of DCF valuation methods, such as earnings capitalization technique (which may rely either on levered or unlevered approaches). It is difficult to predict when the valuation specialists may elect to use such alternative techniques as there is no prior auditing literature on this issue.

Additionally, since dealing with FVs is likely viewed as a less difficult task by valuation specialists (when compared to auditors) due to their extensive training and knowledge in the area, the specialists are less likely than auditors to rely on simplified strategies. Therefore, it is predicted that the valuation specialists are less likely than the auditors to suffer from unconscious biases in their audit process.

3.4 Research Design

3.4.1 Research Methodology

The study is a quasi-experiment, since a random assignment is difficult to accomplish due to the nature of the participants recruitment process. An expertise manipulation (with three conditions, "junior auditors", "experienced auditors" and "valuation experts") can be viewed as an experimental manipulation. The methodology is the verbal protocol analysis, a method that has been used in the extant auditing literature to obtain detailed evidence about and understanding of the processes that auditors follow when performing various types of tasks. Particularly, the verbal protocol analysis has been employed for studying the analytical review

process (Blocher and Cooper 1988; Biggs et al. 1988) and internal control evaluation process and audit scope determinations (Biggs and Mock 1983). The method requires subjects to "think aloud" when performing the task, and their thinking is captured using voice and potentially other recording equipment (e.g., tracking information searches, etc.)[19]. The process information is then coded and analyzed by the researcher(s) conducting the study.

The concurrent verbal protocols are a good methodology fit for a process analysis study because they provide behavioral information about the underlying process, and render rich data especially valuable for analyzing complex tasks (Biggs and Mock 1983, p. 237), such as the FV auditing task. Biggs and Mock's (1983) methodological note discusses potential validity threats inherent in the method as well as relevant safeguards. The note implies that the validity threats can be effectively countered by the respective safeguards, and therefore the concurrent verbal protocols are expected to generate an accurate description of the underlying process. The validity threats as well as relevant safeguards and their implementation in the study are summarized in **Table 3B**.

This quasi-experimental study based on the concurrent verbal protocols method is different from the semi-structured, open-ended type interviews as well as questionnaires used in prior studies of FV auditing (Griffith et al. (2012 and 2015), Cannon and Bedard (2015)) in several respects. First, the reliance on a specific experimental case provides a context which allows for a more precise and detailed description of the process. Second, using a uniform task across all of the groups of participants (which include both experienced and junior auditors and valuation specialists) is more suitable for uncovering similarities and differences among these groups. Third, behavioral information about the process obtained based on the verbal protocols is helpful for studying judgmental shortcuts and behavioral biases arising in the process. As

[19] I use Camtasia software to record the screen activity during the study.

outlined above, the task for the verbal protocol analysis is a CGU impairment auditing task for a publicly listed company which reports under IFRS. The company is in the paper products industry and audited by a Big 4 audit firm. A comprehensive description of the instrument is given in the following section.

Analysis techniques theorized in Newell and Simon (1972) and applied in auditing settings in Biggs and Mock (1983) are used, whereby the analysis is done at two levels, microlevel[20] and macrolevel. This study is mainly at the macrolevel.[21]. Process analysis prepared as a result of the quasi-experiment are compared to the process analysis formed based on the current accounting and auditing standards (IAS 36; ISA 540)[22] as well as extant interview-based studies of the FV auditing process (Cannon and Bedard 2015; Griffith et al. 2012 and 2015). Through this comparison, issues with the participants' processes are identified and analyzed.

3.4.2 Participants

This study is based on a sample of 21 experienced auditors, 9 valuation specialists, and 11 junior auditors. The experienced auditors and valuations specialists are from three Big 4 (referred to as "Big 4 firm #1", "Big 4 firm #2", and "Big 4 firm #3") and one Big 6 (referred to

[20] Theory of data analysis introduced by Newell and Simon (1972) states that the substance of microlevel data analysis is to reveal evidence of "problem space", which is represented by goals, operators, and states of knowledge, in the participants' behavior reflected in verbal protocols. Once the process data has been collected, the coding rules are developed and the operators are coded accordingly.

[21] The macrolevel analysis, which consists of higher-level aggregate descriptions of the subjects' task behavior, is conducted in two forms, following Biggs and Mock (1983): (1) episode abstracts and (2) process tables. Biggs and Mock (1983) use flowcharts instead of process tables.

[22] In IFRS jurisdictions, International Accounting Standard (IAS) 36 (IASB 2004a) prescribe rules for impairment of assets (including goodwill). U.S. rules differ from IFRS is several respects, e.g. SFAS 142 (FASB 2001) permits reliance on management's reporting structure to define the business units used in the assessment of goodwill, whereas IAS 36 defines a cash generating unit (CGU) as the smallest possible subset of assets that produces independent cash inflows for the company. International Standard on Auditing (ISA) 540 "Auditing Accounting Estimates, Including Fair Value Accounting Estimates, and Related Disclosures" (IAASB 2008) guides the auditing of estimates, including fair values, for IFRS adopters. In the U.S., AU Section 328 "Auditing Fair Value Measurements and Disclosures" (AICPA 2002) is relevant.

as "Big 6 firm #1") public accounting firms,[23] while the group of 11 junior auditors consists of MAcc students from a medium-size university possessing public accounting experience and particularly, experience with auditing goodwill or intangible assets. The study obtained ethics approval from the office of research ethics at the author's university. The experienced auditors and valuation specialists were recruited using personal networking, while junior auditors were recruited by advertising the study in class. The junior auditors were remunerated at the rate of $30CAD an hour, while the rest of the participants were not remunerated. **Table 4** presents selected demographic information of the current group of participants. The table suggests that the experienced auditors, the valuations specialists, and the junior auditors on average performed 4.3, 9.3, and 2.5 impairment analyses in the last two years, respectively.[24]

While efforts wwere made to obtain an equal number of participants in the junior auditors, experienced auditors, and valuation specialists groups of participants, it was not possible to achieve this objective with regard to the study's sample. The number of valuation specialist participants is smaller than the number experienced auditor participants since the general population of valuation specialists in North American public accounting firms (the number of employees in the firms' valuations practice) is smaller than the general population of experienced auditors (the number of employees in the firms' assurance practice), so that the number of volunteers in the two groups would vary given approximately the same participant response rate. The number of junior auditor participants is smaller than the number experienced auditor participants since the recruitment of junior auditors was restricted to one medium-size university, and since of the requirement that they possess prior experience with auditing FV

[23] All of Big 4 and Big 6 participants are employed in central Canadian offices of their public accounting firms.
[24] The two experienced auditors and one valuation specialist who report no impairment analyses performed in the last two years performed impairment analyses in previous years.

estimates narrowed the pool of potential participants significantly, compared to the number of potential participants with general audit experience.

3.4.3 Quasi-Experimental Instrument

As discussed above, the principal component of the quasi-experimental instrument is a CGU (goodwill) impairment case. The case was developed by the researcher and is not adapted from any prior academic or professional publication or any other source. It involves a public company in the paper products sector. A concise summary of the experimental instrument is provided in **Table 5**, whereas the case selection criteria are discussed in **Appendix 1**. The case instructions are shown in **Figure 1**. The case instructions were designed to make the participants follow their normal auditing process.

FIGURE 1

Case Instruction (Process Study)

INSTRUCTIONS FOR THE PARTICIPANTS

Please read the following scenario and perform the required task. During your participation you will be requested to think out loud. If you fall silent, I will prompt you to "please think out loud" or "please say what you are thinking now".

Introduction

You are a part of the engagement team assigned to audit the financial statements of Supremex, Inc. ("the Company" or "Supremex") for the year ended December 31, 2012 (Fiscal 2012). Supremex, Inc. is a continuing audit client and its financial statements have been audited by your firm for several previous years. Supremex was incorporated on March 31, 2006 under the Canadian Business Corporations Act. The common shares of the Company are listed on the Toronto Stock Exchange ("TSX") under the symbol SXP.

Supremex is Canada's leading manufacturer and marketer of a broad range of stock and custom envelopes and related products. Supremex employs approximately 550 people and is the only national envelope manufacturer in Canada, with seven manufacturing facilities across six provinces. This national presence allows Supremex to meet the manufacturing needs of large national customers, such as large Canadian corporations, nationwide resellers and government bodies, as well as paper merchants and solution and process providers.

Supremex's management has determined that there is one cash generating unit (CGU) – the envelope business. The Company has completed a detailed impairment analysis of the CGU as at December 31, 2012. As a result, an impairment charge of $29,880,165 was recorded for the CGU. Assume for the purposes of this case you concur with management's identification of the CGUs.

Your Task

It is now February 2013. Your team is conducting fieldwork on the financial statements of Supremex for Fiscal 2012.

The Task:
You are asked to perform an audit of the CGU recoverable amount (and the resulting goodwill impairment charge) suggested by the management. Based on the materials provided on the next page of the survey:

1) Please decide whether you will:
- test the management's estimate for the CGU recoverable amount
or

- develop your own auditor's estimate or range for the CGU recoverable amount (as defined in ISA 540 "Auditing Accounting Estimates, Including Fair Value Accounting Estimates, and Related Disclosures").

2) According to your decision in 1), please either:
- test the management's estimate for the CGU recoverable amount
or
- develop your own auditor's estimate or range for the CGU recoverable amount.

Supplemental information will be provided to you to develop your own estimate or range. Also, the DCF spreadsheet which is a part of management's impairment analysis contains additional fields to facilitate calculation of your own estimate or range for the CGU recoverable amount.

Note: Materiality for the audit is set at 5% of Supremex's 2012 pre-tax income before extraordinary items, i. e. at $600,000 (the same materiality is obtained when it is calculated as 0.5% of Supremex's 2012 revenue).

The materials are provided on the next page of the survey. **The source of all of the materials (except External Information on Significant Assumptions) is the audit working papers. External Information on Significant Assumptions comes from outside sources (industry publications, etc).**

ISA 540 "Auditing Accounting Estimates, Including Fair Value Accounting Estimates, and Related Disclosures" and IAS 36 "Impairment of Assets" are also provided for your reference.

Please start the task now. Click the button in the bottom right corner to go to the next page.

The case was developed with the help of partner-level practitioners experienced with FV impairment issues. The process study was pilot tested with an MAcc student at the University of Waterloo possessing some experience with FV audits, an Audit Senior from a Big 4 audit firm, and a Senior Valuations Manager and a former Valuations Partner from a Big 6 audit firm, both of whom are also Canadian Chartered Business Valuators (CBVs).

The case is based on a company in the manufacturing (paper products) industry, Supremex Inc., which is a producer of envelopes. The industry is chosen in order not to narrow the participant pool as might happen if the selected company required specialized expertise from auditors and valuation specialists (e.g., such specialized expertise would be needed for a company in the resources sector, or in financial services industry). Supremex, Inc. is an actual Canadian public company. The information related to Supremex as well as the supplemental information referenced in the case is a combination of real information[25] and information generated by the researcher. The real information includes the overview of the business, the comparative financial statements, notes to the financial statements, comparison of current financial information to the prior year, description of the risk factors, internal controls, management compensation, and corporate governance. The information generated by the researcher includes the management memo, external information on significant assumptions (industry benchmarking information), as well as the valuation model for goodwill impairment.

The goodwill originated from acquisitions of subsidiaries by Supremex, Inc. in a number of preceding years. The management decided that evidence of goodwill impairment existed because during the fourth quarter of the year under audit, several new indicators have shown that the volume decrease in North America's envelope industry was higher than expected and that

[25] All of the real information is obtained exclusively from publicly available sources. The researchers have no access to private/confidential information about Supremex and none of it is used in this study.

this decline was expected to continue in the upcoming years. The management's estimate of goodwill impairment is $29,268,763, representing 39% of the total goodwill carrying value of $75,751,125 (with the audit materiality of $600,000). The case is intentionally developed so that the post-impairment goodwill balance is material. This is needed to trigger the generation of participants' own estimates/ranges, since an immaterial remaining balance would mean that the entire goodwill would be written off.

The case facts indicate that the management is reasonably competent to estimate a goodwill impairment for a public company of the given size and complexity. The case does not suggest that the management's estimate of goodwill impairment is biased in any way.

As indicated in Table 5, the total length of the case materials is 35 pages in 10 PDF files, not counting the two PDF files with relevant financial reporting (IAS 36) and auditing (ISA 540) standards, which are included as a reference for the participants' convenience. The volume of the case materials is thus reasonable for the expected duration of the quasi-experimental session of about one hour.

Readers of this dissertation are expected to understand the findings presented herein without reading the full set of the experimental case materials. However, they need to carefully study the information presented in the current section as well as in **Table 5** and **Appendix 1**.

3.4.4 Administration of the Quasi-Experiment – Quasi-Experimental Session

For all of the junior auditor participants, the experimental session was administered in the School of Accounting and Finance behavioral laboratory at the University of Waterloo. For all of the experienced auditor and valuation specialist participants the experimental session was administered at their firms' offices. The sessions took place either in one of the office boardrooms or in one of the practice offices. In all cases, the participants were isolated from their

colleagues or other persons who could distract them from working on the task. In the researcher's opinion, the openness and other characteristics of participants' responses did not vary in any noticeable way depending on where the study was administered.

A number of steps were taken to make participants feel comfortable and be willing to openly discuss their judgment and decision making process with regard to the goodwill impairment auditing task. Before attending to the experimental task, all of the participants were presented with a consent/information form, which clearly stated that if they grant permission to use their quasi-experimental session data for research purposes, all quotations they make and information they provide would not be associated with their name and/or their employer information in any future presentation, report, and publication. They were provided complete assurance of confidentiality with regards to their responses. All of the quasi-experimental sessions were administered by the researcher personally. No research assistants were used to help with the administration of the quasi-experimental sessions.[26]

In the researcher's opinion, there was a slight difference among the participants groups with regard to how openly the participants were willing to discuss their judgment and decision making process surrounding the goodwill impairment audit. Specifically, some manager and senior-manager level auditor and valuation specialist participants appeared to be slightly less open than other participants. The reasons for this phenomenon are not known. Overall, the participants seemed sufficiently open to providing detailed insights into their judgment and decision making process.

[26] One of the participants enquired whether the quasi-experimental session data could be used for promotional purposes within their audit firm. The participant's attention was drawn to the consent/information form, which clearly indicated that the consent was given for the use of the data exclusively for research purposes.

There were no significant unanticipated problems encountered during the quasi-experimental sessions. A small number of minor interruptions occurred due to issues related to stability of the Internet connection.[27]

3.5 Results

The discussion in this section is organized around the research questions. Some of the related research questions are grouped together for a more concise discussion. The results are based on the coding of verbal protocols[28] obtained from the participants during the quasi-experimental session. Tables in this paper supporting the frequency analysis for the research questions are excerpts from the verbal protocols coding, while the complete coding table is available upon request.

Both the author and a research assistant (who is an accounting faculty holding a CPA and possessing several years of auditing experience) independently coded responses for a randomly selected subsample of nine participants (three experienced auditors, three valuation specialists, and three junior auditors). Inter-rater agreement for the subsample was 85.11 percent (Cohen's Kappa of 0.54).[29]

3.5.1 Annual Impairment Testing and the Source of Goodwill (RQ 1 and 2)

Thirteen (62%), seven (78%), and seven (64%) experienced auditors, valuation specialists, and junior auditors, respectively, devoted attention to considering goodwill impairment indicators. Industry- and company-level revenue decline due to a technology change

[27] The stability of the Internet connection is important for the conduct of the quasi-experimental sessions due to the instrument being implemented on the Internet-based Qualtrics platform.
[28] Provalis Research QDA Miner software was used to do the coding.
[29] Cohen's Kappa of 0.54 may be described as "moderate" based on the authoritative literature (Landis and Koch 1977). Further, a rule of thumb is that Kappa measures between 0.40 and 0.70 are acceptable (Neuendorf 2002).

is the most frequently noted indicator of impairment. Among the related factors raised are interconnections between goodwill and intangible assets impairment indicators, and the necessity to pay close attention to impairments of intangibles as a result of that. Other factors considered include implications for impairment of specific long-lived assets belonging to the envelope business CGU, consistency of the indicators of goodwill impairment with certain economic facts presented elsewhere in the case materials, consistency of the current indicators with those used in prior periods impairment testing, disclosure quality of the impairment indicators, and others. Only one experienced auditor, one valuation specialist, and two junior auditors mention the necessity for annual testing of goodwill, suggesting that the issue may be considered implicitly by the participants.[30]

Four (19%), one (11%), and two (18%) of experienced auditors, valuation specialists, and junior auditors respectively attempt to verify the source of goodwill, i.e. that it arose from past business combinations. The small number of participants paying attention to the issue may be explained by Supremex being a continuing client, so that most of the participants implicitly assume that they can rely on prior audits regarding the source of recorded goodwill.

3.5.2 The Determination of CGUs (RQ 3)

The necessity to obtain assurance on management's CGU determination is expressed by 11 (52%) of the experienced auditors, two (22%) of the valuation specialists, and one (9%) of the junior auditors.[31] The fact that experienced auditors pay more attention to CGU determination when compared to valuation specialists may be explained by another finding of this study,

[30] One additional experienced auditor, however, suggests the need to consult with IAS 36 re: annual impairment testing of goodwill.

[31] 27 remaining participants ignored the CGU determination issue, which may be due to the instructions where the participants are asked to accept the management's CGU choice, and therefore is not necessarily a problem with their audit process.

whereby the division of labor between auditors and valuation specialists assumes that the former are primarily responsible for the issue. Why junior auditors do not consider CGU determination remains to be investigated. The participants pointed out that the CGU determination is a suspect because the company has many subsidiaries, many products/lines of business, as well as geographic locations, which may have different risk profiles.

Only two senior-level participants (an experienced auditor and a valuation specialist) draw attention to the need to verify the level at which the management tests/monitors goodwill. Specifically, one of the participants mention that management may choose to monitor goodwill for impairment through a group of CGUs up to the level of an operating segment, before the application of aggregation criteria under IFRS 8 implementation guidance.

3.5.3 Assessment of the Risk of Material Misstatement and Estimation Uncertainty (RQ 4 and 5)

The factors related to RMM are considered almost exclusively by auditors and include primarily internal control considerations, which is somewhat surprising given that the same participants suggest that pure substantive approach is most frequently used to test goodwill impairments and is also applicable in the case of Supremex. 12 (57%) of experienced auditors, two (22%) of valuation specialists, and five (45%) of junior auditors, respectively consider control risk (with the specific controls around the estimate preparation, such as review and documentation controls, most frequently cited as relevant to an impairment audit).[32] Only three (14%) of experienced auditors, one (11%) of valuation specialists, and three (27%) of junior auditors, respectively consider inherent risk.

[32] One experienced auditor and one valuation specialists suggest that controls are irrelevant to an impairment audit.

Three (14%) of experienced auditors and one (11%) of valuation specialists elaborate on the issue of estimation uncertainty, which is unexpected given that the case is an audit of a complex accounting estimate.[33] The most frequent consideration is that high estimation uncertainty requires developing a range.

3.5.4 Choice Between Fully Substantive vs. Combined Approach (RQ 6)

The choice between a combined and a fully substantive approach to CGU impairment audit is discussed by 6 (29%) senior auditors, one (11%) valuation specialist, and one (9%) junior auditor. Of those, three participants propose to use a fully substantive approach in this case. Three[34] of the participants also mention that a vast majority of impairment audits are substantive, while none of the eight propose taking a combined approach in Supremex's case. Five of the eight participants observe that testing certain controls, in principle, may lead to a reduction of substantive work (review controls over the impairment are most frequently mentioned as a specific examples).

3.5.5 Choice Between Testing Management's vs. Developing Auditor's Estimate (RQ 7)

Eight (38%) of the experienced auditors, one (11%) of the valuation specialists, and five (45%) of the junior auditors report they decided to develop their own estimate or range for the CGU RA. Nine (43%) of the experienced auditors, seven (78%) of the valuations specialists, and six (55%) of the junior auditors said that they tested the management's estimate. The remaining participants, four (19%) of the experience auditors, one (11%) of the valuation specialist, and

[33] Some of the participants note/investigate the sensitivity of the CGU RA to certain input parameters of the DCF model (which, according to ISA 540, A45 is an indicator that the estimate possesses a high degree of estimation uncertainty). These facts are not included in the above frequency analysis.
[34] One of them recalled the only company (a SEC registrant) which had goodwill impairment audited using a combined approach.

none (0%) of the junior auditors suggest that they performed a combination of the two approaches (two of the experienced auditors emphasize that this approach is typical in their practice). At the same time, one experienced auditor and three valuations specialists expressed some uncertainty when classifying the actions that they performed into the two mutually exclusive categories prescribed by IAS 540, "test management's estimate" vs. "develop auditor's estimate or range".[35] In addition to that, a significant difference in opinions emerged when the participants elaborated on what exactly they understood to fall into the category "developing an auditor's own estimate". The spectrum of descriptions ranged from completely disregarding the management calculation and developing a new model and its inputs from scratch, to altering the timing and amount of management's projected cash flows, to doing sensitivity on the management's model. These findings reveal that ISA 540 is interpreted quite differently by different auditors and valuation specialists, even if they are employed within the same office of a Big 4 or Big 6 public accounting firm. They also demonstrate that auditors and valuation specialists do not always develop and implement their FV impairment audit procedures in conformance with the guidance suggested by ISA 540.

There is evidence in the verbal protocols suggesting that the decision to test the management's estimate is dictated by independence/efficiency factors (for four (19%) of the experienced auditors and four (44%) of the valuation specialists). The underlying logic is that in audit (vs. independent valuation) settings an auditor's-developed estimate cannot be reported in the financial statements due to independence considerations, and thus the management needs to

[35] When answering a direct question about what type of audit procedures they have actually performed working on the task, some of the participants gave uncertain answers: "it is hard to say…", "we are probably more like verifying or getting ourselves comfortable…", or "if I had to pick one, I guess I'd say..." Some of the valuation specialists suggest that they actually do a third approach called an "alternate calculation", which is based in part on the elements of the management's model.

come up with their own correct estimate even if an auditor's estimate is developed.[36] Therefore, the participants argue it is much more efficient to test the management's estimate and provide the management some guidance on how to perform correct valuation along the way, because such process leads to a reported estimate which is management's and not auditor's.

Another possible reason why the vast majority of valuation specialists classify they actions as testing the management estimate as opposed to developing their own estimate or range may be rooted in the interrelationship between ISA and Canadian Institute of Chartered Business Valuators (CICBV) guidance. One of the valuation specialists suggests that CICBV guidance offers two approaches to fair valuation, an "estimate" (performed for M&A, tax, and financial reporting (audit) purposes and assuming a limited amount of work) and a "comprehensive valuation" (performed for litigation support and fairness opinions and assuming an extensive amount of work). In the opinion of the valuation specialists, only the comprehensive valuation, which is never done for audit purposes, represents a "true development" of an independent FV estimate.

Additional insights provided by the above findings are related to interpretation of results of the extant interview-based studies of FV auditing process. First, as discussed above, Cannon and Bedard (2015) and Glover et al. (2016) on one hand, and Griffith et al. (2012 and 2015) on the other, report conflicting findings with regard to auditors electing to verify management's estimate vs. developing their own estimate of reported complex FVs. The above results demonstrate that there is a need to clarify how the interviewed auditors understand the two approaches before making any further conclusions and/or comparisons. Second, there appears to be an alternative option of a combination of testing management's estimate and developing

[36] This creates inefficiencies because two estimates (an auditor's and a correct management's) need to be developed for the same audit.

auditor's own estimate or range, which is neither described in the prior studies nor mentioned in ISA 540. Third, for the senior-level participants (including both auditors and especially valuation specialists), the decision to test management's estimate as opposed to develop auditor's own estimate appears to be driven by considerations of auditor's independence as well as efficiency, rather than the difficulty of developing own independent estimate or range, investment of time/effort in understanding the management's estimate, or excessive focus of the current auditing guidance on the testing option, as suggested in some of the extant studies.

Factors influencing testing management's vs. developing own estimate or range choice are reported in **Table 6**. **Table 6** should be interpreted considering that there is a considerable variation in how the participants understand what constitutes the two approaches prescribed in ISA 540. Nonetheless, the results in the table indicate that there is little consistency among the participants on what influences the test vs. develop choice, as well as reveal some of the factors which are applied in different directions (e.g., materiality of the estimate), or applied in the same direction but using different underlying logic (e.g., internal client's risk rating).

3.5.6 Use of Alternative Assumptions vs. Use of Alternative Model (RQ 8)

The results demonstrate that the valuation specialists overwhelmingly elect to make modifications to the management's model. On the other hand, auditors are less critical of the management's model. They tend to develop alternative assumptions or verify the management-suggested assumptions, while leaving the management-suggested model either largely intact or with less significant modifications than those proposed by the valuation specialists.

3.5.7 Reasoning for the Application of the Alternative Assumptions and/or Model (RQ 9)

Table 7, Panel A lists the most frequent reasons for the suggested modifications of the management's model: the use of alternative types of discounting methods, the need to include certain items omitted from the forecast such as capital expenditure cash outlays, CCA tax shield/tax amortization benefits, and working capital changes, and the application of debt-free (vs. levered) valuation approach.

The participants' reasons for developing an alternative set of assumptions are provided in **Table 7, Panel B**. The reasons vary depending on the input parameter, e.g. for the discount rate the most frequently cited reasons for modification include insufficient support for the equity risk premium calculation, the use of CAPM (vs. build-up) method, the need to recalculate the discount rate, the need to include company specific (projection, forecast) risk into the discount rate, and others. **Table 7, Panel B** shows that the valuation specialists are most involved with the discount and growth rate input parameters, whereas the rest of the parameters are attended primarily by the experienced and junior auditors.

3.5.8 Sources of Information for and Issues Considered When Developing Alternative Assumptions/Model (RQ 10)

The main source of information for all of the participants who develop an alternative model appears to be their general valuation knowledge. The valuation specialists' sources choice is wider compared to the auditors, as they draw on the firm's pool of valuation methods and techniques, such as pre-set valuation model templates.

With regard to the assumptions, both auditors and valuation specialists use multiple sources of information, including but not limited to external information not originating from the company (industry information), long time-series of the company-specific comparatives

(historical information), and internal sources such as management's memo or management's analysis of risk factors. The most frequently mentioned sources are reported in **Table 8, Panel A.**[37]

An interesting pattern emerged during the analysis of how the participants use industry sources when developing alternative assumptions for their own auditor's range. As **Table 8, Panel B** demonstrates, only six (24%) of 25 participants who developed a range for the CGU RA did not use any provided industry information for the lower or upper bound of the respective input parameters' ranges. The industry ranges related to short- and long-term variable operating expenses, discount rate, tax rate, and short-term growth rate were most often applied as lower and upper bounds of the auditors' ranges. At the same time, the following factors were frequently discussed by the participants when deciding whether/how to apply the industry information: the company "fit" into the industry benchmarking, industry information not being current, as well as credibility of the industry information (**Table 8, Panel B**).

3.5.9 Participants' Range and its Relation to Materiality (RQ 11)

For all of the participants who developed a range (with no exceptions), the width of the range is many times the audit materiality of $600,000, consistent with concerns raised in Christensen et al. (2012) about the auditability of complex FVs (see **Table 9**). The average width of the interval is $42M, $45M, and $52M (69, 76, and 86 times the audit materiality) for experienced auditors, valuation specialists, and junior auditors respectively. Since there is only one interval available for the valuation specialists, a reliable comparison of this group of

[37] The discount rate stands apart from other input parameters in the sense that multiple outside sources are cited as relevant for this input parameter (even though the citations are not frequent and are limited to one or two participants). Those include Capital IQ, S&P 500, Bloomberg, Bank of Canada data, etc. For the growth rate, fixed operating expenses, and SG&A expenses, an important outside source in addition to the industry information appears to be macroeconomic data such as inflation and GDP parameters.

participants to the other two groups is problematic. However, data in **Table 9** suggests that auditor's intervals for the experienced auditors are narrower on average than those for junior auditors, both when all observations are included ($42M vs. $52M) and when the sample for each group is winsorized by excluding the two extreme observations ($35M vs. $46M).[38] These appear to indicate that increase in auditor's expertise leads to narrowing of the auditor's range. Overall, the results are best characterized by the "Estimate nightmare" scenario, which takes place when twice the materiality is smaller than the width of the reasonable range, meaning that all points inside or outside of the reasonable range have a significant risk (Smieliauskas 2012, p. 279).

3.5.10 Participants' Consideration of FVLCS vs. VIU of the CGU (RQ 12)

Six, five, and three (29%, 56%, and 27%, respectively) of experienced auditors, valuation specialists, and junior auditors recognize the necessity to calculate VFLCS of the CGU in addition to its VIU calculation, as prescribed by IAS 36. The limited attention to this issue from the auditors may possibly be explained by the majority of case facts pertaining to calculation of VIU, indicating that the auditors may be anchoring on management's method of calculation of the RA. The valuation specialists, on the other hand, are less likely to anchor since they are more familiar with the different ways to calculate FVs. A competing explanation would be that the auditors are generally less concerned with a possible overstatement of the impairment, compared to its understatement, thus creating a leeway for the management to take a "big bath" or to implement an income smoothing strategy.

[38] This result is not significant at conventional levels. However, when the data is winsorized by excluding two extreme observations in each category, to remove the effect of outliers, it is significant at a 10% level.

One experienced auditor and three valuation specialists suggest "market cap reconciliation" as an alternative procedure to calculating FVLCS, whereby the CGU's VIU is compared to the company's market capitalization, which strictly speaking represents a non-IFRS approach. Furthermore, one experienced auditor and two valuation specialists imply that there is a choice between VIU and FVLCS calculation, depending on the circumstances (e.g., the volume of trading and the number of CGUs).

3.5.11 Participants' Consideration of Management's Bias (RQ 13 and 14)

Participants across all of the groups appear to factor-in, to some degree, information about management's compensation when considering possible management's bias (this is the case for 18 (86%) of experienced auditors, five (56%) of valuation specialists, and six (55%) of junior auditors, respectively). Only one participant (an experienced auditor) states that the compensation is irrelevant. However, a significant proportion of the auditors do not appear to fully recognize how the goodwill impairment impacts certain drivers of management compensation. Particularly, there is not always a clear understanding that the impairment does not affect earnings before income taxes, depreciation and amortization (EBITDA), while it increases return on capital employed (ROCE) both in the short and long terms, so that a larger impairment increases the management's bonuses based on the EBITDA/ROCE ratio. The effect is equally pronounced for the experienced and junior auditors, whereby about 1/3 of the participants in each of the two categories incorrectly suggest that the management is incentivized to understate the impairment because of its effect on the compensation. Overall, the auditors seem to over-focus on the impairment impact on one compensation component, the net income,

which might be an indication of availability heuristics as pro-forma accounting measures such as EBITDA and ROCE are less readily available when compared to the profit measure.[39]

Seven (33%) experienced auditors, three (33%) valuation specialists, and four (36%) junior auditors consider possible management's bias due to factors other than management's compensation (making the company look better due to a possible acquisition from Clarke is a most frequently cited reason). One of the valuation specialists also suggests a possibility of the Board's bias due to Clarke's presence on the Board of Supremex (subject to the Board's involvement into goodwill valuation process).

3.5.12 Participants' Heuristics When Selecting Alternative Model and/or Assumptions (RQ 15)

The results reveal that both the experienced auditors and the valuation specialists tend to gravitate toward their firm's commonly used methodology. One example of availability heuristics (as well as of an apparent deficiency in the current valuation methodology application in audit settings) is the use of "+/- 10%" interval when determining the valuation specialists' range for a FV, which is developed based on their point estimate for that FV. This method of calculating the range is mentioned by three (33%) of the valuation specialists, all of them employed by the same Big 4 audit firm.[40] In addition to being a possible example of availability, the application of the "+/-10% rule" demonstrates that some of the valuation specialists consider uncertainty inherent in FVs as a concept separate from that of audit materiality, as the rule's application typically leads to FV ranges wider than the materiality. The above finding may be a manifestation of a larger problem arising from the fact that valuation specialist are a part of

[39] This is supported by the fact that two experienced auditors and one junior auditor observe that the management's motivation to overstate the impairment appears unusual to them.
[40] It is also mentioned by one experienced auditor from the same firm in relation to the current valuation specialists practice.

business advisory (vs. assurance) practices of international as well as national audit firms, with the financial reporting (audit) work representing only a fraction of their engagements (e.g., as discussed above, an "estimate" engagement may be performed for M&A, tax, and financial reporting purposes). This may lead to differences in the application of certain technical auditing concepts by the members of assurance and valuation (advisory) groups. On the other hand, higher-level auditing concepts such as auditor's independence appear to be well-taken by the valuation specialists, possibly because they serve as main distinguishing factors between assurance and advisory engagements.

The other instance of the availability heuristics is related to the auditors/valuation specialists adhering to their firm's practice of including/excluding the forecast risk in/from the discount rate.[41] While one experienced auditor and four valuation specialists suggest that the forecast risk is to be included in the discount rate (see **Table 7, Panel B**), an experienced auditor from another firm suggest that it should be included in the CF forecast. Two experienced auditors and three valuation specialists mention that the inter-firm differences with regard to forecast risk treatment result in incomparable discount rates among different audit firms. Thus, in this case availability may lead to decreased comparability.

The use of after-tax discount rate applied to after-tax cash flows, in contrast with the management's before-tax treatment of both the discount rate and the cash flows, suggested by one experienced auditor and seven valuation specialists (see **Table 7, Panel A**) is based on the availability of economic data (since "market input for equity", which is a major element of the equity discount rate determination, is usually available on the after-tax basis). This leads to the

[41] The risk of changes in revenues/operating costs (projection or forecast risk) should be included either in the CF forecast or into the discount rate to avoid double counting.

IFRS-consistent management's approach being replaced with a non-IFRS approach with a subsequent reconciliation to IFRS rules.

Yet another example of availability may be related to the switch from the management's end-of-year CF discounting method to the mid-period discounting,[42] suggested by six (67%) of the valuation specialists (see **Table 7, Panel A**). While the proposed change to the mid-period discounting does not necessarily represent a problem (as mentioned by four valuation specialists, it is applied in order to better approximate the timing of the projected CFs), what may represent a problem is that the they implement it without investigating the management's assumptions underlying the timing of the CFs.

In addition, some of the auditors appear to have limited knowledge of valuation methodology, compared to the valuation specialists, who possess a uniformly adequate grasp of the methodology. The distinction is clearly revealed by the participants' understanding of differences between the levered and unlevered (debt-free) approaches to business valuation[43]. While the case facts assume that management applied the levered method when calculating the RA of the CGU, under which the cash flows are discounted using an equity discount rate, the case content also includes some information about the parameters which would have been used if the unlevered method was chosen to do the valuation (see **Figure 2** for a schematic outline of the two approaches and their similarities and distinctions). Among these parameters is the company's WACC, which is used to discount cash flows under the unlevered method. The verbal protocol analysis reveals that some of the auditors (6 (29%) of the experienced and 4 (36%) of

[42] The switch produces a highly material difference with the management's estimate, of which the valuation specialists are fully aware when they are performing the audit. Specifically, it results in a difference between the revised estimate and the management's estimate of nearly $15 million, given the audit materiality of $600 thousand.
[43] On the difference between the two methods, see Larrabee and Voss (2013). Equity discount rate used under the levered approach is also sometimes called unlevered WACC, while the WACC used under debt-free approach is the levered WACC (Larrabee and Voss 2013, p.267).

the junior auditors, respectively) do not understand the difference and either attempt to apply the WACC to discount the CFs under the levered approach, or suggest a treatment of debt/financing costs inconsistent with the definition of the levered approach, which represents a misapplication of the methodology. The valuation specialists understand the distinction. [44]

[44] While a similar facts pattern was observed in the pilot study, the difference with the main sample study is that one of the two valuation specialists involved in the pilots also overlooked the distinction between the levered and debt-free valuation methods (which caused a significant difficulty to that participant when verifying the DCF model's input parameters). This may be explained by the fact that the valuation specialists involved in the pilots were employed at smaller offices of Big 6 (non-Big 4) public accounting firms. Since such offices deal with smaller private companies' valuations which typically rely on variations of the debt-free method, the valuation specialist could have fallen victim to the availability bias with regard to their most frequently use methodology. With the main sample drawn from the population of auditors and valuation specialists employed at large offices of Big 4 and Big 6 firms, the observed misapplication of the levered vs. unlevered method cannot be explained by availability, and is more likely attributable to a superficial knowledge of valuation methodology by some of the auditors.

FIGURE 2

Levered vs Debt Free Valuation Approaches

CAPITALIZED EARNINGS METHOD
LEVERED vs DEBT FREE APPROACHES

Levered Approach	***Debt Free Approach***
Maintainable Earnings from Operations Before Tax (net of interest on LTD)	Maintainable Earnings from Operations Before Tax
	+
	Interest
	=
	Maintainable EBIT
–	–
Taxes	Taxes
=	=
Maintainable After–Tax Earnings	Maintainable After–Tax Earnings
X	X
Multiplier (cap rate based on ROE)	Multiplier (cap rate based on WACC)
=	=
	Enterprise Value
	–
	Long Term Interest Bearing Debt
	=
Going Concern Value of Operations	Going Concern Value of Operations
+	+
Redundant Assets (include leverage adjust'ts)	Redundant Assets (exclude leverage adjust'ts)
=	=
Fair Market Value	Fair Market Value

3.5.13 Participants' Heuristics When Narrowing Participants Own Range (RQ 16)

One of the heuristics that arises in the process of arriving from the auditor's range to a point estimate of the CGU RA is taking the average of the range as a point estimate. This is reported by six experienced auditors and five junior auditors, i.e. by almost half of the 25 participants who developed a range for the CGU RA.[45] This strategy appears to be based on availability and is not suggested in auditing or accounting standards, except for IAS 36 allowing the use of averages as a simplified strategy in certain situations.[46] Four experienced auditors and five junior auditors of the 25 participants who developed a range do not mention that the auditor's range should be narrowed down to be within the AM, and use a range which is many times the size of the materiality to arrive at their conclusion about the management's estimate, which is not aligned with the approach suggested in ISA540.A94 and .A95. Additionally, even those participants who recognized that the range should be narrowed down given the AM do not identify any specific or systematic procedure for doing so (the most frequent suggestion mentioned by seven participants is an inquiry/discussion with the management).

3.5.14 Use of Internal Specialists (RQ 19)

Seven (33%) and two (22%) of the experienced auditors and valuation specialists, respectively report that they will involve tax specialists to examine the tax rate.[47] A smaller number of participants suggest they will use tax specialists for other tax-related parameters such

[45] One more junior auditor suggest taking an average of three numbers (lower and upper bounds of the auditor's estimate and the management's estimate), while one valuation specialist suggest using averages for all of the input parameters intervals except for the discount rate.

[46] The only reference to computing the averages is in ISA 36.23, stating that "In some cases, estimates, averages and computational short cuts may provide reasonable approximations of the detailed computations illustrated in this Standard for determining fair value less costs to sell or value in use."

[47] One of the issues uncovered when investigating the use of internal and external specialists during a CGU impairment audit is a very low level of understanding of the role of such specialists by the junior auditors. This is illustrated by the issues surrounding the specialists' use discussed almost exclusively by the experienced auditors and valuation specialists.

as CCA groups and R&D tax credit relevant to the CF forecast. One (5%) of the experienced auditor and two (22%) of the valuation specialists propose to involve their actuarial specialists to examine the pension liability, while one (5%) of the experienced auditor and one (11%) of the valuation specialists suggest to use their complex securities specialists to deal with the financial liability. The use of internal valuation specialists is discussed in more detail in the following section.

3.5.15 Division of Labor Between Auditors and Valuation Specialists (RQ 19)

Three (14%) and three (33%) of the experienced auditors and valuation specialists, respectively report that examining the management's CF forecast is auditors' responsibility. Another most frequently mentioned responsibility of the auditors is examining the expenses, which is reported by four (44%) of the valuation specialists. Some of the participants suggest that auditors are better equipped to examine the CF forecast and expenses since they know the company and/or the industry better than valuation specialists. On the other hand, the primary responsibility of valuation specialists appear to be examining (reported by 10 (48%) of the experienced auditors and one (11%) of the valuation specialist) or developing (reported by 3 (14%) of the experienced auditors) the discount rate. The second most frequently cited responsibility of the valuation specialists is examining the valuation model, as suggested by 7 (33%) of the experienced auditors, one (11%) of the valuation specialists, and one (9%) of the junior auditors.

3.5.16 Use of 3rd Party Valuation Specialists (RQ 19)

The involvement of 3rd party (external) valuation specialists is primarily discussed by the valuation specialists. Three (33%) of the valuation specialists report that they will ask the client

to hire an external valuator if the management lacks qualifications to do their own valuation. Some of the valuation specialists suggest that this request will be communicated to the management/audit committee and that they will have a conversation with the 3rd party specialists regarding the shortcomings of the management's analysis.[48]

Three (33%) of the valuation specialists suggest that a report from a 3rd party valuator would add credibility but is not automatically relied upon. The reliance is influenced by factors such as the identity of the 3rd party valuator (e.g., Big 4 vs. non-Big 4), as well as by the personal acquaintance with the external valuator.

Table 9B provides, in a summary form, the findings of the study for each of the 19 research questions formulated around the expected FV audit process map.

3.6 Discussion and Conclusion

This study describes the currently under-researched process of auditing complex FV estimates, using CGU/goodwill impairment as an example of the auditing task. This is approached by using the verbal protocols analysis methodology, with a particular focus on researching the methodological aspects of the auditing and fair valuation processes, investigating how FV reporting, auditing, and valuation standards are interpreted and applied, determining relevant judgmental shortcuts arising within the auditing process, and understanding how the auditors and valuation specialists deal with uncertainties (i.e., unobservable judgmental inputs) inherent in the task. The unobservable inputs that have been considered include discount rates, growth rates, cost structure trends, etc.

[48] These results are aligned with the finding that the valuations specialists (particularly, senior valuation specialists) insist on testing the management's estimate instead of developing their own estimate or range for the public clients, primarily due to the independence considerations. If the management is incapable of developing their own estimate, the valuation specialists would propose hiring a third party valuator to help the management to come up with their own estimate which can subsequently be tested.

As expected, the quasi-experimental study of the FV auditing process appears to supply much more detailed process information when compared to the extant interview-based research. One of the main reasons for this is that a concrete context of the impairment case provides the participants an opportunity to think about fine details of the auditing and FV estimation processes, resulting in obtaining rich process information which is not possible to collect in interview studies which are lacking specific context.

For all of the participants who developed a range, the width of the range is many times the audit materiality. Auditor's intervals for the experienced auditors are narrower on average than those for junior auditors, indicating that increase in auditor's expertise leads to narrowing of the auditor's range. Overall, the results are consistent with concerns raised in Christensen et al. (2012) about the auditability of complex FVs, and are best characterized by the Smieliauskas' (2012) "Estimate nightmare" scenario, meaning that all points inside or outside of the reasonable range have a significant risk.

There are signs of possible issues with interpretation and application of FV auditing and accounting standards across all groups of the participants. One characteristic example is the difficulty many of the participants experience with classifying their approach within the two categories prescribed by ISA 540 (testing management's vs. developing auditor's own estimate or range), as well as the wide variation in interpreting these categories. Some of the participants report performing a combination of the two approaches or a different approach (developing an "alternate estimate") which do not appear to fall neatly into any of the ISA 540-prescribed categories. These findings help to interpret conflicting results in the prior interview-based studies (Cannon and Bedard (2015), Glover et al. (2016), and Griffith et al. (2012 and 2015)) regarding auditors' choice to verify the management's estimate vs. develop their own estimate for complex

FVs. They also reveal that for the senior-level participants (including both auditors and especially valuation specialists), the decision to test management's estimate as opposed to develop auditor's own estimate is driven by considerations of auditor's independence as well as efficiency of the current and subsequent audits,[49] rather than the difficulty of developing own independent estimate or range, investment of time/effort in understanding the management's estimate, or excessive focus of the current auditing guidance on the testing option, as suggested in some of the extant studies. The interplay between the ISA and CICBV guidance, which assumes the use of an "estimate" (vs. "comprehensive valuation") technique for audit purposes, may also have a bearing on how valuation specialists classify their approach under ISA 540.

Some of the issues with application of the auditing standards appear to be related to judgmental shortcuts (heuristics) of the participants which have not been researched in a valuation task context in prior auditing literature. A significant proportion of both experienced and junior auditors are subject to a heuristic in the process of arriving from the auditor's range to a point estimate of the CGU RA, whereby the median of the range is assigned as a point estimate. The above strategy appears to be based on availability and is not suggested in auditing or accounting standards, as well as is not aligned with the findings in Griffin (2014), who suggests that auditors calculate the FV adjustment quantum by comparing management's FV estimate to the nearest bound (vs. the midpoint). This is combined with the fact that many of the auditors use a range which is many times the size of the materiality to arrive at their conclusion about the management's estimate (without an attempt to narrow the range), which is not aligned to the approach suggested in ISA540. Additionally, those participants who recognized that the

[49] The efficiency here is understood as a possibility not to do the same work on the auditors' side and on the management's side. Performing independent valuation by the auditors does not relieve the management from doing their own valuation. Guiding the management to do a correct valuation in the current fiscal year may allow them to do the valuation in the following years without guidance from the auditors.

range should be narrowed down given the AM do not identify any specific or systematic procedure for doing so.

The tendency of some of the valuation specialist to develop their auditor's range from a point estimate using the "+/- 10% approach" , which may lead to ranges far in excess of the audit materiality, appear to demonstrate that valuation specialists apply the concepts of estimation uncertainty and audit materiality in isolation. One possible cause for this phenomenon is valuation specialists' involvement in business advisory practice, which may affect the way they apply technical auditing concepts such as materiality when performing assurance engagements.

The results of the study show that inter-firm differences in accounting for the forecast (projection) risk in projected CFs lead to difficulties in comparing discount rates used in fair valuation models by different audit firms. It appears that the practice may benefit from introducing a degree of standardization in the treatment of the forecast risk, to increase comparability among firms. Another area where the standards may be revisited is the IFRS requirement to apply a pre-tax discount rate in VIU models. The practice appear to demonstrate that using a post-tax discounting may represent a more natural choice, given the availability of observable economic inputs into the valuation process.

The majority of both of the experienced and junior auditors does not elaborate on the requirement of IAS 36 with regard to determining the RA as a maximum of VIU and FVLCS, and omit FVLCS calculation, potentially resulting in an understatement of the RA. This may be due to 1) anchoring on management's method of calculation of the RA, whereby auditors are more likely to anchor than valuation specialists, since valuation specialists are better familiar with the different ways to calculate FVs or 2) auditors (vs. valuation specialists) being generally

less concerned with a possible overstatement of the impairment, compared to its understatement (creating a leeway for the management to take a "big bath" or implement income smoothing).

When addressing the possible management's bias from the compensation perspective, some of the auditors fail to understand how FV impairments affect pro-forma measures such as EBITDA/ROCE (the effect is equally pronounced for the experienced and junior auditors). This may be a manifestation of the availability heuristics (whereby the pro-forma accounting measures are less readily available when compared to the more mainstream profit measure) and leads to incorrect assessment of the impairment impact on the compensation drivers and eventually the amount of compensation. The reason why valuation specialists are not susceptible to this heuristics is a topic to the future research.

Applying potentially inappropriate firm guidance to the case setting of this study is characterized as participants relying on the availability heuristic. However, it can be argued that following firm guidance is not a heuristic. If that is the case, then some of the findings in this section relating to the participants' reliance on the availability heuristic would need to be reinterpreted. At least some of the experienced and junior auditors do not appear to have a complete grasp of the applicable valuation methodology and do not attempt to gain an in-depth understanding of management's model, which might lead to misunderstanding of management's valuation approach and misinterpreting the model's assumptions and input parameters. It appears that this pattern may be corrected by either introducing decision aids or by educating auditors on the valuation issues. To give an example, the decision aid response may entail developing a checklist asking the auditors to explicitly identify the specifics of the management's valuation approach.

Finally, the results suggest that the division of responsibilities between assurance and valuation groups when auditing FV impairments entails the valuation specialists working on the model and certain model input parameters such as the discount rate and, to a lesser extent, the growth rate. The auditors are involved with the CF forecast and the rest of the input parameters, mainly related to expenses of the business, due to their better familiarity with both the industry and the particular company. Also, the valuation specialists request an audit client to retain a third party valuator if in their opinion the management is not capable to produce a correct valuation. This is done in order to preserve the independence, given the valuation specialists preference to test the management's estimate rather than develop their own.

The study contributes to the academic literature by obtaining direct quasi-experimental evidence on auditors' and valuation specialists' process when they perform a FV auditing task, and investigating the process differences between the auditors and experts. The paper highlights several issues which may warrant future research. One such issue is how to assist auditors with narrowing their range for complex FV estimates to meet ISA 540 requirements. The other issue is searching for the ways to alleviate dysfunctional behavioral shortcuts revealed in the auditing process. The findings in the paper may also be of interest to policy makers, regulators, and standard setters. Particularly, they point out to the components of ISA 540 and IAS 36 which may require clarification. This includes, but is not limited, to the part of the standard which describes options available to assurance provider when auditing complex FVs (testing management's vs. developing auditor's estimate or range). The results also demonstrate that CICA and CICBV standards may interact in an unexpected way in the course of FV audits involving experts. Furthermore, some findings in the paper indicate that valuation specialists' involvement in business advisory services have a possible bearing on how they approach the

assurance engagements. Finally, the paper may be helpful for auditing and valuation educators as it identifies difficult areas of FV audits which may be addressed in the classroom. One such area is the application of valuation methodology in audit settings, while another is educating accounting students about the role of valuation and other specialists.

A limitation of the study is that its results may not fully generalize to FV auditing tasks involving types of valuation models different from DCF models, such as valuation models for complex financial instruments. Additionally, since the study uses a single case, it produces idiosyncratic inferences about how auditors and valuation specialists attend to auditing of FV estimates, which depend on the particulars of the case used. This is not a concern regarding the results based on the manipulation (differences among the expertise conditions). However, the results regarding the detail about what auditors and valuation specialists did in response to case details (i.e., levels) are affected by the particulars of the case.

Chapter 4 - Can Probability Distribution Elicitation Methods Increase the Precision of FV Estimates?

4.1 Introduction

Recent changes in financial reporting regulation effected by the adoption of International Financial Reporting Standards (IFRS) in Europe, Australia, and Canada, as well as the introduction of Statement of Financial Accounting Standards (SFAS) 142 (FASB 2001) and SFAS 157 (FASB 2007 and 2011) in the U.S. significantly increased users' exposure to FVs and thus made the issue of FV auditing extremely important for the stakeholders. The new standards introduced a three-level hierarchy of FV types based on the observability of inputs, and moved from goodwill amortization to its impairment testing. These changes highlighted problems with auditing highly complex, judgment-dependent and inherently uncertain items such as FVs at the higher levels of the hierarchy and goodwill impairments. There is a concern that in some circumstances such FVs may not be auditable, and that requiring auditors to provide positive audit-level assurance on them may necessitate changes to the current financial reporting model, e.g. reporting ranges or confidence intervals, rather than point estimates (Christensen et al. 2012; Smieliauskas 2012). Current auditing standards have been criticized for applying legacy methods used for auditing historical cost balances to complex FVs, which are subject to a much higher level of uncertainty, and regulators point to numerous problems with FV audits in recent years (IFIAR 2014). At the same time, extant archival research documents that audit quality affects earnings management involving FVs, their reliability as well as representation faithfulness, both actual and perceived by market participants (Stokes and Webster 2009; Vergauwe, Gaeremynck, and Stokes 2011; Bratten et al. 2012a).

The complexity and novelty of FV auditing tasks to the auditors, the proliferation of problems with FV auditing discovered by the regulators, together with the importance of FV reporting and audit quality to capital markets, make the understanding of possible improvements to the underlying FV auditing process a promising avenue for research. This study follows the process study, which provides quasi-experimental evidence about the process of FV auditing obtained based on verbal protocols methodology (using a goodwill impairment task as a specific example). It investigates the ways in which auditors and valuation specialists can be assisted when dealing with estimation uncertainty inherent in the goodwill impairment audit task and constructing their own auditor's ranges for the impairment amount.

Smieliauskas (2012) suggests that the high estimation uncertainty (accounting risk) inherent in complex FVs leads to consideration of ranges of their possible outcomes by the auditors, rather than dealing with their point estimates. Prior research, as well as the process study, demonstrates that the quantitative impact of the problem is highly material for many categories of FVs (Christensen et al. 2012; Menzefricke and Smieliauskas 2012a and 2012b). This raises a question on how to assist auditors with constructing a reasonable range for a complex FV estimate. Smieliauskas (2012) calls for a search for systematic methods which would help with quantifying accounting risk and improve the FV estimates ranges calibration (p. 282). This study uses probability distribution elicitation techniques for this purpose, which are defined in the literature as methods helpful for constructing a probability distribution of a random variable(s) that "properly represents the expert's [individual's] knowledge/uncertainty"[50]

[50] While O'Hagan et al. (2006) refers to eliciting probability distribution information from "experts", eliciting probability distribution information from "individuals" may be a more appropriate choice of words. Indeed, the extant elicitation literature suggests that probability distribution information may be elicited from individuals with varying degrees of expertise. In this study, valuation specialists may be classified as individuals possessing an expert-level knowledge in the field of valuation (i.e., the "experts"), while experienced and junior auditors may be classified as individuals with some level of knowledge in the field of valuation (i.e., non-expert knowledgeable individuals).

about the variable(s) (O'Hagan , Buck, Daneshkhah, and others 2006, p. 9). Two probability distribution elicitation methods (cumulative distribution function method (CDF) and credible interval method (CI)) are experimentally tested and compared in goodwill impairment audit settings using experienced and junior auditors and valuation specialists as participants. These methods are chosen because they are most frequently used in prior literature to elicit individuals' probability distributions in business settings such as accounting (auditing), economics, and finance (e.g., Crosby 1980 and 1981; Dominitz 1998; Laws and O'Hagan 2002; Budescu and Du 2007). The other family of elicitation methods representatives of which may have been considered as potential candidates for the study are elicitation methods for which elicited probabilities are influenced by individuals' utility functions, such as procedures-lotteries, scoring rules, and promissory note (Kadane and Winkler 1988). However, since such methods involve real or hypothetical payoffs, and are subject to utility-related effects, they are not the best choice for the valuation task in audit settings. Finally, elicitation methods dealing with judgmental point forecasting (Lawrence et al. 2006) are not suitable since they disregard to the consideration of ranges of possible outcomes.

A search of the academic literature did not find criteria for judging the effectiveness of elicitation methods as means of quantifying accounting risk and improving the calibration of FV estimates ranges. Therefore, this study introduces three sets of criteria against which the effectiveness of elicitation methods can be compared and evaluated. These criteria are based on an econometric method, an expert panel method, and a content analysis method based on the analysis of verbal protocols.

The criteria based on the econometric method compare the participant's interval widths as well as the standard deviations of their widths and standard deviations of their upper and

lower bounds for either aided or unaided FV interval judgments. They establish whether a particular elicitation method improves the consistency of FV interval judgment among the participants. The criteria based on the expert panel method are concerned with whether the use of a particular elicitation method brings the participant's FV interval judgment closer to that of a certain reference group; e.g., that of valuation specialists. Finally, the criteria based on the content analysis of verbal protocols consider how the relative frequencies of words indicative of quantification of uncertainty compare between different elicitation methods.

The CDF elicitation method proves to be superior to the CI elicitation method for both experienced and junior auditors based on the econometric method of comparison (for intervals with the same confidence level, the CDF method provides for a smaller average interval width as well as for smaller standard deviation of interval widths and their upper and lower bounds). However, the opposite result is established for valuation specialists. A comparison of aided auditor's intervals developed with the help of elicitation methods to participants' unaided auditor's intervals developed in the process study reveals a significant variation in confidence levels placed by the participants on their unaided intervals, indicating lack of consistency. This comparison also indicates that when all groups of the participants are considered together, the CDF method provides for an improvement over unaided judgment (a smaller standard deviation of the interval widths for the aided intervals vs. the unaided intervals). On the other hand, the CI method is not helpful for improving the consistency of the participants' judgments. The results concerning the effectiveness of both the CDF and the CI methods are primarily driven by the junior auditors. The analysis of verbal protocols and screen recordings obtained in the study indicates that the CDF elicitation method has an advantage over the CI method with regard to its susceptibility to the anchoring bias. The data in the verbal protocols also points out the fact that

both experienced and junior auditors as well as valuation specialists do not have a clear idea of what the required level of confidence for the input parameters for model-based FVs should be in audit settings. Also, it appears that none of the currently used in practice decision aids for the fair valuation models input parameters explicitly quantify the parameters confidence levels, while some of them do take into consideration probabilistic characteristics of those parameters. Finally, the participants' subjective opinion about the usefulness of the two elicitation methods indicates a generally positive attitude. The study has a potential to improve the practice of auditing of goodwill and possibly other complex FVs, by providing information for the development of relevant decision aids. The main contribution of the study to the academic literature is in combining auditing and elicitation research in FV auditing settings, while in prior auditing research, elicitation methods application have been limited to historical cost balances and audits of internal controls (Crosby 1980 and 1981, Solomon 1982, Tomassini et al. 1982, Solomon et al. 1985).

The following section provides motivation and literature review that focuses on the auditing research since the introduction of the new FV reporting standards (circa 2007). It is followed by a discussion of relevant theory and the development of research questions. The next section outlines the research methodology, followed by a discussion of experimental results. The conclusion summarizes academic and practical contributions of the study.

4.2 Motivation and Literature Review

The literature review demonstrates a necessity to develop a decision aid for helping auditors and valuation specialists with FV audits. A discussion of the features of complex FV estimates which make them difficult to audit when compared to historical cost balances

(information uncertainty and imprecision) highlights the problematic area which requires attention. A review of extant research on how the uncertainty and imprecision affect auditors' and valuation specialists' judgment provides understanding of which aspects of these judgments may require correction or assistance to provide for a higher quality audit.

4.2.1 Characteristics of FVs Affecting Their Auditability

Prior archival papers shed light on the characteristics of FV reporting that contribute to the difficulty of providing assurance on such balances. For complex model-based FVs, a major problem appears to lie in very high sensitivity of resulting FVs to variations in the input parameters. Christensen et al. (2012) demonstrate this on the examples of Wells Fargo's mortgage-backed securities and General Motors' pension liabilities, whereby very small changes in interest and discount rates respectively cause material swings in the reported amounts. The authors question whether positive assurance on such balances can be obtained, as negative review-level assurance, or positive assurance on the ranges may be more realistic. Similar results are obtained by Menzefricke and Smieliauskas (2012a and 2012b) for input parameters into pension liability valuation models such as return rates. These concerns are echoed in an analytical paper by Smieliauskas (2012), who introduces three scenarios: 1) "Accounting estimate nirvana" occurs when the width of the reasonable range of an estimate does not exceed the material misstatement, implying that any point in the reasonable range does not have a significant estimation risk, as defined in ISA 540 (IAASB 2008); 2) "Estimate problem" exists when the width of the reasonable range is greater than the material misstatement but does not exceed twice the material misstatement, meaning there is at least one estimate with no significant risk; 3) "Estimate nightmare" takes place when twice the material misstatement is smaller than the width of the reasonable range, so that all points inside or outside of the reasonable range have

significant risks (Smieliauskas 2012, p. 279), under which a change to another financial reporting framework is necessary. This research demonstrates that sensitivity to uncertain input parameters to valuation models makes complex FV balances more difficult to audit compared to historical cost balances.

4.2.2 The Influence of Information Uncertainty/Imprecision of Complex FVs on Auditors' Judgment

While papers discussed above demonstrate that certain features inherent in complex FVs contribute to the difficulty of auditing of such balances, a number of experimental articles look at how these features affect the auditors' biases and judgments such as the amount of proposed adjustment. Montague (2010) shows that auditors are subjected to more confirmation bias (i.e., auditor seeks more confirming than disconfirming evidence) when they are asked to counter (vs. support) management's estimate or generate their own estimate, while this bias increases the professional skepticism. Additionally, the confirmation bias is the highest in "counter/disconfirm" condition with high estimation uncertainty.

Griffin (2014) experimentally manipulates subjectivity (Level 2 vs. 3 FV), imprecision (narrow vs. wide estimate range), and footnote disclosure about estimate inputs (present vs. absent) and finds that the interaction between subjectivity and imprecision makes an adjustment more likely, while disclosure reduces the interaction. Griffin (2014) also discovers that auditors calculate the adjustment quantum by comparing management's FV estimate to the nearest bound (vs. the midpoint) of the auditors' range, implying a strict application of auditing standards.

Maksymov et al. (2015) investigate how audit procedure frame (an auditor judges whether management's assumptions are reasonable vs. not reasonable), efficiency pressure (high vs. low), and the extent posterior verifiability of audit quality (rated by the participants) bear on

budgeted time for Level 3 FVs audit procedures. The authors find that the negative frame leads to planning for more audit hours, especially for procedures that are perceived as less verifiable. This implies that re-framing audit procedures from the (typical in practice) positive frame to a negative one is expected to increase audit effort.

Cannon and Bedard (2015) conduct a survey-based field investigation of auditing of complex FV estimates and find that uncertainty in the estimates is positively related to the assessed inherent risk, but in a number of cases the estimate's inherent risk is assessed below maximum even though the uncertainty leads to ranges that are larger than materiality. They find that use of a valuation specialist by the client triggers the reliance on a specialist by the auditors. In their sample of engagements, the auditors most frequently (in 53% of the cases) choose to develop their own independent estimate or range for a FV, instead of testing managements estimate or evaluating subsequent realizations. Cannon and Bedard (2015) observe that obtaining positive assurance on complex FVs may not always be possible.

Griffith (2015) analyzes interview data with 28 auditors who used valuation specialists and finds that main issues in the area are related to the complex FVs' inherent uncertainty, which causes the auditors to rely on reports of valuation specialists that they cannot competently review or even understand. The author identifies the following problems arising from the uncertainty in complex FVs: inadequate transfer of information from audit clients to auditors and valuation specialists, uncertainty on the part of the auditors about the amount of audit evidence required from the specialists, and subjectivity in the valuation field that can lead to alternative valuation outcomes.

Carpentier, Labelle, Laurent, and Suret (2008) observe that auditing FV assets with no liquid active market can be made easier by obtaining help from outside experts and by

introducing valuation standards by practitioner bodies. The authors ask a group of 43 Chartered Business Valuators (CBVs) to follow the Canadian Venture Capital Association's (CVCA's) recommendations to value a small, private, pre-IPO high tech firm and find that, despite the uniform guidance provided by the CVCA, the respondents rely on a variety of methods and utilize different multiples in the valuation process. Carpentier et al. (2008) note that these differences in the valuation process translate into a very wide range of resulting FMVs, and that the post-IPO value verification reveals overstatement.

Finally, the process analysis study (Chapter 3) based on concurrent verbal protocols method reports details of the FV auditing process of auditors and valuation specialists related to auditing and accounting standards, audit and valuation methodology, and behavioral aspects such as judgmental shortcuts. It discovers that auditor's ranges developed by both the participating auditors and valuation specialists exceed the audit materiality by multiple times, primarily due to wide intervals for the input parameters entering the valuation model. The study finds that while specialists are more proficient with technicalities of the underlying valuation models, they share similar difficulties with auditors when estimating the input model parameters. The process study also finds that auditors do not always attempt to narrow their auditor's interval when developing a point estimate for the FV.

The above studies offer evidence that features of complex FVs such as estimation uncertainty/imprecision and difficult ex-post verifiability bear both on auditors' and valuation specialists' biases and on their key audit judgments, e.g. on the suggested amount of adjustment. They also indicate that certain audit judgments in FV settings require an improvement. However, these papers provide a limited insight into how to produce information useful for assisting auditors' and valuation specialists' judgment when dealing with the uncertainty/imprecision.

4.2.3 Eliciting Probability Distribution Information from Individuals

The above studies of complex FVs indicate a necessity to develop structured decision aids capable of assisting auditors and valuation specialists to deal with the estimation uncertainty inherent in such FVs, and especially with constructing auditor's intervals. One candidate is a decision aid (or a family of decision aids) based on elicitation methods which may help auditors and valuation specialists build distributions of input parameters for fair valuation models. This section reviews literature on elicitation of distributions from experts both in general settings and in financial statements audit settings.

Probability distribution elicitation methods are defined in the literature as methods helpful for constructing a probability distribution of a random variable(s) that "properly represents the expert's [individual's] knowledge/uncertainty" about the variable(s) (O'Hagan et al. 2006, p. 9). They include a wide spectrum of techniques which vary along a number of dimensions, including the type of questions that the experts are asked, the number of experts participating in the process (a single expert vs. a panel), the number of iterations (single step vs. iterative process), etc.

This literature is based on findings from psychology and statistical sciences and pertains to several fields such as psychology, business and economics, medicine, agriculture, weather forecasting, nuclear power generation, and others and deals with the theories, mechanisms and best practices of obtaining probability distribution information from the experts in the field (O'Hagan et al. 2006; Lawrence, Goodwin, Connor, and Onkal 2006). According to the review studies cited above, prior elicitation papers provide results on the methods useful for eliciting probability distributions and for their calibration, the factors contributing to biases such as

overconfidence, the ways to reduce the biases, the effect of expertise level and other factors on distribution elicitation, and related topics.

Probability distribution elicitation has been researched in the auditing context using experimental methodology. Crosby (1980) investigates the impact of two alternative elicitation techniques on the choice of an attribute sample size, while Crosby (1981) evaluates the two techniques from the perspective of consistency of the elicited priors. Solomon (1982) compares distributions elicited from individual auditors with those elicited from audit teams, in terms of their verification against the actual outcome. Tomassini et al. (1982) measure the calibration of the auditors' prior probability distributions of account balances, while Solomon et al. (1985) research how contextual factors bear on the calibration of probabilistic judgments by the auditors. All of above studies apply elicitation methods in relation to historical cost, rather than FV accounts. This study tests probability distribution elicitation methods in FV audit settings.

4.3 Development of Research Questions and Hypotheses

Smieliauskas (2012) notes that the main difficulty with auditing FVs is related to the possibility of judgmental misstatements[51], which can arise either from inaccuracies in forecasting of future events (e.g., estimating growth and discount rates, timing and amount of future cash flows, etc.), or from other judgmental inaccuracies related mostly to present events (subjective determinations such as adjusting the price of an asset with an active market to find the price of the original asset without an active market, or establishing CGUs for the purpose of goodwill impairment). From the audit theory standpoint, a unique problem specific to future event uncertainties is that the ranges associated with future events are dependent on the possible states

[51] ISA 540 (IAASB 2008) defines judgmental misstatements as "differences arising from management's judgments concerning accounting estimates that the auditor considers unreasonable, or the selection or application of accounting policies that the auditor considers inappropriate".

of the economic environment, and obtaining more evidence on those possible states may increase the expected volatility and therefore widen the associated range rather than narrow it (Smieliauskas 2012, p. 266). The presence of this estimation uncertainty (what Smieliauskas (2012) calls "accounting risk") is the principal factor distinguishing the audit of FVs from the audit of other accounting transactions or balances based on historical cost, because of the necessity for the auditors to obtain assurance on future or hypothetical present economic transactions rather than past transactions (Smieliauskas 2012; IAASB 2008).

According to the analysis in Smieliauskas (2012), the high estimation uncertainty (accounting risk) inherent in complex FVs leads to consideration of ranges of their possible outcomes by the auditors, rather than dealing with their point estimates. As mentioned, these ranges differ from the ranges (confidence intervals) arising from sampling risk in the statistical sampling procedures applied to historical cost accounts, in that obtaining more evidence does not automatically yields a narrower range. Prior archival auditing research (discussed above) demonstrates the quantitative magnitude of the problem: even very small changes to the assumptions and input parameters of model-based FVs produce a very wide variation in the resulting FV estimates for many categories of FVs starting from financial instruments and ending with retirement benefits obligations (Christensen et al. 2012; Menzefricke and Smieliauskas 2012a and 2012b). While there is no "generally accepted terminology" in this relatively new auditing area, Griffin (2014) refers to the fact that estimated FVs are picked from a possible range as "imprecision". Accordingly, for the purpose of making a materiality assessment, the auditors need to consider reasonable ranges of estimated FVs rather than their point estimates (Smieliauskas 2012). This is also reflected, to a certain extent, in the auditing standards in both IFRS and U.S. GAAP jurisdictions. ISA 540 (IAASB 2008) suggests that developing an

auditor's range is one of the alternatives to audit FV estimates, while AU Section 328 (AICPA 2002) mentions management's range of "significantly different FV measurements". However, the standards provide little guidance on developing or auditing the ranges, e.g. on how to deal with situations when a scenario realizes that the reasonable range width exceeds twice the material misstatement (what Smieliauskas (2012) calls "an accounting estimate nightmare").[52]

A question thus arises on how to assist auditors with constructing a reasonable range for a complex FV estimate. Smieliauskas (2012) calls for a search for systematic methods which would help with quantifying accounting risk in a way similar to sampling risk, and improve the FV estimates ranges calibration (p. 282). I attempt to use probability distribution elicitation techniques for this purpose. Specifically, FV estimates require uncertain inputs (e.g., growth rates, discount rates, future cost structure), and uncertainty in these inputs leads to consideration of ranges for the resulting estimates (Christensen et al. 2012; Menzefricke and Smieliauskas 2012a and 2012b). As each such input represents a random variable, elicitation of individuals' probability distributions of random variables becomes relevant to the task at hand. Bratten et al. (2013) note that adequate inclusion of the fundamental uncertainty underlying complex FVs into auditing judgments is hampered by individual information processing limitations. They cite extant judgment and decision making research to suggest that individuals tend to lower their cognitive load when faced with difficult and/or uncertain tasks, producing simplified strategies that often lead to ignoring or misusing relevant information. Thus, as elicitation methods are intended quantify the uncertainty, they have a potential to produce higher quality audit evidence for complex FV balances.

[52] Under this scenario, the reasonable range also becomes relevant to financial reporting, meaning that a point estimate for the fair value may not be auditable according to the current auditing standards.

A brief summary of various probability distribution elicitation methods described in prior literature can be found in **Table 10**. The table demonstrates that there are several classes of elicitation methods tested in auditing context (in relation to historical cost, rather than FV accounts) as well as in other fields such as economics and finance, which may be considered as candidates to be used in this study. Of the methods listed in **Table 10**, two probability distribution elicitation methods (cumulative distribution function method (CDF) and credible interval method (CI)) are most frequently used in prior literature to elicit individuals' expert probability distributions in business settings such as accounting (auditing), economics, and finance (e.g., Crosby 1980 and 1981; Dominitz 1998; Laws and O' Hagan 2002; Budescu and Du 2007). The other family of elicitation methods is the methods for which the elicited probabilities depend on the individuals' utility functions, e.g. lotteries, scoring rules, and promissory notes (Kadane and Winkler 1988). Judgmental point forecasting methods (Lawrence et al. 2006) are also included in **Table 10**. For the parameters entering fair valuation process such as discount and growth rates and future cost structure, the branch of elicitation literature dealing with interval elicitation/forecasting has the highest relevance. Lawrence et al. (2006) provides a literature review on point forecasting vs. interval forecasts (prediction intervals), which they define as "prediction bounds that specify upper and lower forecast limits within which the future value of the predicted variable is expected to lie with a specified probability" (p. 505). The authors observe that point forecasting may create "false assumptions of precision", while elicitation formats such as prediction intervals and probability forecasts make the uncertainties explicit (Lawrence et al. 2006, p. 501). Thus, the judgmental point forecasting is not likely to be suitable for the FV auditing task. Also, since lotteries, scoring rules, and promissory notes methods involve real or hypothetical payoffs, and are subject to utility-related effects, they are

not the best candidate for a decision aid for a valuation task in audit settings. Therefore, of the methods listed in **Table 10**, the CDF and CI methods are chosen to be tested. As the effectiveness of the two selected methods in FV audits is unknown, the following research question may be formulated:

RQ 1. Are the CDF and CI elicitation methods useful (effective) for obtaining information about uncertain inputs into the calculation of FV estimates from the auditors and valuation specialists, particularly those helping to construct the reasonable ranges?

As extant elicitation literature describes a variety of elicitation techniques which prove to lead to different outcomes in terms of resulting distributions (e.g., Shapir, Shavit, and Benzion 2015), it is reasonable to expect that some of the elicitation methods will be more effective for the purposes of building distributions for complex FV estimates than the others. This argument leads to the following research question:

RQ 2. Which of the CDF and CI elicitation methods is more useful (effective) for obtaining information about uncertain inputs into the calculation of FV estimates from the auditors and valuation specialists?

Probability distribution elicitation methods also provide a way to estimate the degree of confidence placed by the auditors and valuation specialists on the fair valuation model input parameters, if the information about unaided intervals is available in addition to the information about assisted intervals (developed with the help of elicitation methods). Obtaining such information is important since no current reporting, auditing, or valuation standards provide any guidance on either the required degree of confidence for the parameters entering valuation models, or its relationship to other parameters such as audit materiality. This motivates the following research question:

RQ 3. What is the degree of confidence placed by the auditors and valuation specialists on the model input parameters for fair valuation models?

Prior literature on elicitation of probability distributions suggests that the elicitation process may suffer from certain behavioral biases such as overconfidence, anchoring, and others (O'Hagan et al. 2006; Lawrence et al. 2006). In the context of FV auditing task, the anchoring heuristics can be argued to have high importance since auditors and valuation specialists may have prior-held beliefs on the ranges of parameters entering the fair valuation model before attending to the elicitation task.

Since the CI method questions operate in "interval" terms, making it easier for the participants prior-held beliefs about the parameters intervals to enter the elicitation process, while the CDF method questions wording is based on a "value" (a distributional fractile) concept instead of the "interval" concept, making it more difficult to incorporate such beliefs, the CDF method is expected to be less susceptible to the anchoring heuristics than the CI method. In other words, the use of the CDF method provides more certainty that any prior-held beliefs will not influence the elicited parameters distributions. This leads to the following hypothesis:

H 1. The CDF (E1) probability distribution elicitation method is less susceptible to the anchoring effect than the CI (E2) probability distribution elicitation method.

According to Griffin (2011), complex FVs have a quality of imprecision, which means that there is a range of possible future outcomes, with wider (more imprecise) ranges resulting from higher variability of the outcomes. As discussed above, addressing imprecision is critically important for auditors, because under current reporting standards financial statements must contain point estimates of complex FVs, subject to audit materiality (Smieliauskas 2012). Probability distribution elicitation methods help the auditors and valuation specialists to build

distributions of the uncertain input parameters for FV estimates, thus facilitating the quantification of uncertainty in the input parameters. However, different elicitation method may have differential impact on the quantification of uncertainty. Therefore, the following research question can be formulated:

RQ 4. Which elicitation methods better facilitates the quantification of uncertainty in the input parameters for complex model-based FV estimates?

4.4 Research Design

4.4.1 Research Methodology

In this study I expose the participants to elicitation methods which will help them to construct distributions of the input parameters used in the DCF model based on the external and internal information provided in the experimental case. One of the methods I use is cumulative distribution function (CDF) method (see **Table 1**), also called "variable interval method" (O'Hagan et al. 2006, p. 133). A brief illustration of the method is presented in **Table 11, Panel A**. Under this method, participants are asked to specify selected fractiles of the cumulative distribution function for an elicited parameter, such that the .X fractile represents the value X such that there is a X% chance that the true value of the parameter is actually lower than the value and a (1-X)% chance that it is actually higher (e.g., Tomassini et al. 1982). The selection of the CDF method is in part dictated by its relative simplicity, which is important given the limited time available to the participants to perform the task. Additionally, the method has been successfully tested in prior auditing studies (Crosby 1980; Crosby 1981; Solomon 1982; Tomassini et al. 1982; Solomon et al. 1985), even though in the context of less complex tasks such as building auditors' prior distributions of account balances.

I also use another elicitation method to evaluate the differences among elicitation techniques that can potentially be used to assist with FV audits. One candidate is the credible interval (CI) elicitation method (see **Table 10**), which has been applied in management, psychology, and economics, but to my knowledge has never been tested in auditing settings. Under this method, participants are asked to specify a "low value" and a "high value" for an elicited parameter, such that they are X% confident the true value is inside the resulting interval (e.g., McKenzie, Liersch, and Yaniv 2008). A brief illustration of the credible interval elicitation method is presented in **Table 11, Panel B**. Subjects are assigned to the two elicitation methods to provide for a sufficient number of observations for each method to perform a comparison.

This study is implemented during the same experimental session with the process study with the same participants. This is necessitated by three important factors. First, there is a limited number of valuation specialists involved with FVs employed by Canadian audit firms, making it problematic to extend the sample. Second, it is important to utilize advantages arising from the fact that the researcher is present during the study. Extant auditing studies on elicitation suggest that the researchers should preferably be present during the experimental sessions for consulting the subjects and for reviewing the assessed probability distributions with them to ensure the correct calibration (e.g., Tomassini et al. 1982, p.395)[53][54]. Third, the proposed study features a much more involving and time consuming task than prior elicitation papers, making it difficult to achieve similar recruitment of the participants.

[53] Generally, in-person elicitation interviews provide for a much higher quality of responses than questionnaires delivered in the absence of the researcher (O'Hagan et al. 2006, pp. 25, 26).

[54] In the elicitation study, the review with participants of the assessed probability distributions to ensure correct calibration was performed after the completion of the session. It was made to ensure that the distributions produced by the participants conform to the general rules of probability theory. For example, a 75%/25% distributional fractile value is supposed to be always larger or equal to the median value. If a problem with the calibration was discovered, a correction was made by the participants themselves.

As the process study, the study is a quasi-experiment, since a random assignment is difficult to accomplish due to the nature of the participants recruitment process, which is described below. The use of the two elicitation methods can be considered a between-subjects experimental manipulation. The experimental case is identical to the one used in the process study, with the task being a CGU impairment auditing task for a publicly listed company which reports under IFRS. The company is a manufacturing company in the paper products industry. However, the elicitation study adds an elicitation aid implemented in Excel intended to help the participants to develop intervals for the input parameters to the DCF valuation model used to determine the recoverable amount of the CGU. A more comprehensive description of the instrument is given in one of the following sections.

The verbal protocol analysis methodology is used to understand the details of the participants' elicitation process. The verbal protocols method have been used in the extant auditing literature to obtain detailed evidence about and understanding of the processes that auditors follow when performing various types of tasks. Particularly, the verbal protocol analysis has been employed for studying the analytical review process (Biggs, Mock, and Watkins 1988; Blocher and Cooper 1988) and internal control evaluation process and audit scope determinations (Biggs and Mock 1983). The method requires subjects to "think aloud" when performing the task, and their thinking is captured using voice and potentially other recording equipment (e.g., tracking information searches, etc.)[55]. The process information is then coded and analyzed by the researcher(s) conducting the study. The concurrent verbal protocols are a good methodology fit for a process analysis because they provide behavioral information about the underlying process, and render rich data especially valuable for analyzing complex tasks (Biggs and Mock 1983, p. 237), such as the FV auditing task. The main purpose of verbal

[55] I use Camtasia software to record the screen activity during the study.

protocol analysis in this study is to understand whether elicitation methods help to quantify uncertainty inherent in model input parameters for fair valuation models.

To the best of my knowledge, prior literature does not provide any definitive guidance on how to establishing the quality of auditors' judgments related to ranges for complex FVs. In other word, there is no previously tested way to gauge the effectiveness of elicitation methods in FV auditing settings. Therefore, three new methods for establishing their effectiveness are suggested in this paper: an econometric method, an expert panel method, and a method based on the analysis of verbal protocols. These methods are discussed in detail below. Unfortunately, in a typical CGU impairment scenario (like the one considered in this study), verification of the recoverable amount against the actual outcome is problematic because this outcome is unknown, in the sense that each year the CGU impairment judgment incorporates a considerable amount of uncertainty.[56] As a consequence, the method based on comparison to the actual outcome is not feasible in complex FV audit settings.

The econometric method is based on the use of econometric analysis to examine distribution properties of the participants' intervals. Such distribution properties include (but are not limited to) the average width of the intervals and the variance/standard deviation of widths of the intervals, their upper and lower bounds, or their midpoints.

The econometric method can be used both in the context of comparison between the two elicitation methods and in the context of comparison of participants' unaided judgment intervals to their assisted judgment intervals.[57] For the purpose of comparison between the CDF and CI

[56] This is also generally applicable to other complex fair value estimates. Verification against the actual outcome is only possible for simple accounting estimates such as provisions for bad debts or warranties. Complex fair values are difficult to verify against their outcomes due to significant time lags and possible intervening events (e.g., IAASB 2011).

[57] The set of auditors' intervals for the CGU recoverable amount produced by the participants using unaided judgment in the process study, can be called "unaided judgment intervals", while the set of auditors' intervals

elicitation methods, econometric analysis can be used to examine similarities/differences of the distribution properties of intervals produced under each of the methods. One elicitation method is deemed more effective than the other method if participants' aided judgment intervals produced under the first method are on average narrower and have smaller variance/standard deviation of their widths, upper and lower bounds, etc. than equivalent[58] participants' intervals produced under the second method. A smaller average width of equivalent participants' intervals for one of the elicitation methods indicates a higher effectiveness of that method since ISA 540.A94 requires that "ordinarily, a range that has been narrowed to be equal to or less than performance materiality is adequate for the purposes of evaluating the reasonableness of management's point estimate." A smaller variance/standard deviation of the interval widths and upper and lower bounds indicates a higher effectiveness since it reflects more consistency among the participants using the elicitation method, compared to the other method.[59]

For the purpose of comparing participants' unaided judgment intervals to their assisted judgment intervals, econometric analysis can be used to compare variance/standard deviation of the interval widths and upper and lower bounds for a given level of confidence. As is the case with the comparison of different elicitation methods, when comparing aided interval judgments to unaided interval judgments, a smaller variance/standard deviation of the interval widths and upper and lower bounds when relying on elicitation means more consistency among the participants' aided judgments, compared to their unaided judgments. On the other hand, if the

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produced by the participants using the suggested elicitation techniques in this study can be called "assisted judgment intervals".

[58] The intervals in question should be equivalent to produce meaningful results. For example, in the context of this study, an interval between .25 and .75 fractiles under the CDF method is equivalent to 50% confidence interval under the CI method, as both intervals provide for the same confidence level (50%).

[59] It remains to be investigated whether the increase in consistency (which is a key point of the econometric method-based comparison criteria for the distribution elicitation methods) move the participants' FV interval judgment in the correct direction (meaning that the more problematic FV interval judgments rest with the outliers). This is a topic for future research.

above parameters are smaller for the unaided judgments, the elicitation method does not provide any advantage over such judgments in terms of increasing consistency among the participants.

The expert panel method is based on the postulate that valuation specialists represent a type of expert panel whose judgments regarding intervals for the valuation model input parameters can be used as a benchmark of outcome quality. Thus, the valuation specialists' judgments represent a benchmark against which experienced auditors' and novices' judgments can be evaluated. According to this logic, elicitation methods that bring auditors' (non-specialists') judgments closer to valuation specialists' judgments can be considered effective, whereas elicitation methods that have no impact or exacerbate the differences between specialists' and non-specialists' judgments can be considered ineffective. However, it is also possible that the experimental results will provide evidence consistent with valuation specialists' judgments and estimates not representing a defensible set of judgment outcomes for the purpose of evaluating non-specialists' judgment outcomes.

Under the method based on the analysis of verbal protocols, an elicitation method is considered effective if evidence can be obtained that it facilitates quantification of uncertainties involved in the goodwill impairment auditing task. As discussed above, these uncertainties are related to unobservable input parameters to the valuation model such as growth rates, discount rates, and future cost structure. The evidence is obtained directly from the verbal protocols and visual data collected during this study (the elicitation study) and the process study. The data collected during the elicitation study can be analyzed either separately on its own, or in comparison with that obtained during the process study.[60] The method based on verbal protocols can be used in conjunction with either the first (the econometric analysis) or the second (the expert panel) suggested methods.

[60] Provalis Research QDA Miner software was used to do the coding.

The specifics of the verbal protocol method include analyzing the frequencies of words and/or phrases which are indicative of the quantification of uncertainty process. One probability distribution elicitation method is considered to be more effective than the other elicitation method for the purpose of quantification of uncertainty if the related verbal protocols for the first method are characterized by a higher relative frequency of such words, compared to the second method. These relative frequencies can be calculated for each specific word. Alternatively, composite frequency measures can be used with a system of weights assigned to the words according to their importance in the quantification of uncertainty process.

The verbal protocols method operates under the assumption that the frequency of words/phrases related to a certain topic in the verbal protocols reflects the frequency with which the participants think about this topic in the process of performing the task. Therefore, a higher relative frequency of words indicative of quantification of uncertainty under a particular elicitation points to the participants thinking to a greater extent about how to quantify uncertainty under that elicitation method.

4.4.2 Participants

This study is based on a sample of 18 experienced auditors[61], 6 valuation specialists, and 11 junior auditors, providing for a total sample size of 35 participants.[62] This is comparable with other elicitation studies performed in audit settings which used about 30 to 40 participants (e.g. Crosby 1980, Tomassini et al. 1982).The sample involves experienced auditors and valuations

[61] One of the 18 experienced auditors who performed elicitation did not fill up some of the elicitation cells for the widest aided interval. Therefore, this participant is excluded from the analysis related to the widest aided interval.
[62] Even though the process and elicitation studies were run in a single experimental session, the sample size for the elicitation study is slightly smaller than the one for the process study, as some of the participants were not able to complete the elicitation part due to a time constraint. The total sample size for the process study is 41 (21 experienced auditors, 9 valuation specialists, and 11 junior auditors), meaning that 3 experienced auditors and 3 valuation specialists did not complete the elicitation part.

specialists from three Big 4 (referred to as "Big 4 firm #1", "Big 4 firm #2", and "Big 4 firm #3") and one Big 6 (referred to as "Big 6 firm #1") public accounting firms,[63] while the group of 11 junior auditors consists of MAcc students from a medium sized university possessing public accounting experience and particularly, experience with auditing goodwill or intangible assets. The study obtained ethics approval from the office of research ethics at the author's university. The experienced auditors and valuation specialists were recruited using personal networking, while junior auditors were recruited by advertising the study in class. The junior auditors were remunerated at the rate of $30CAD an hour, while the rest of the participants were not remunerated. **Table 12** presents selected demographic information of the participants. The table suggests that the experienced auditors, the valuations specialists, and the junior auditors on average performed 4.3, 9, and 2.5 impairment analyses in the last two years, respectively.[64] As discussed above, the involvement of valuation specialists is warranted because, at this time, there is little direct evidence on how they approach FV auditing tasks, because existing interview-based studies of the FV auditing process have had very limited input from valuation specialists.

4.4.3 Experimental Instrument

As discussed above, the principal component of the experimental instrument is a CGU (goodwill) impairment case. It involves a public company in the paper products sector. A concise summary of the experimental instrument is provided in **Table 5**, whereas the case selection criteria are discussed in **Appendix 1**.

As discussed in the previous section, this study ("elicitation study") attempts to find a systematic way to elicit information from auditors (experienced as well as junior) and valuation

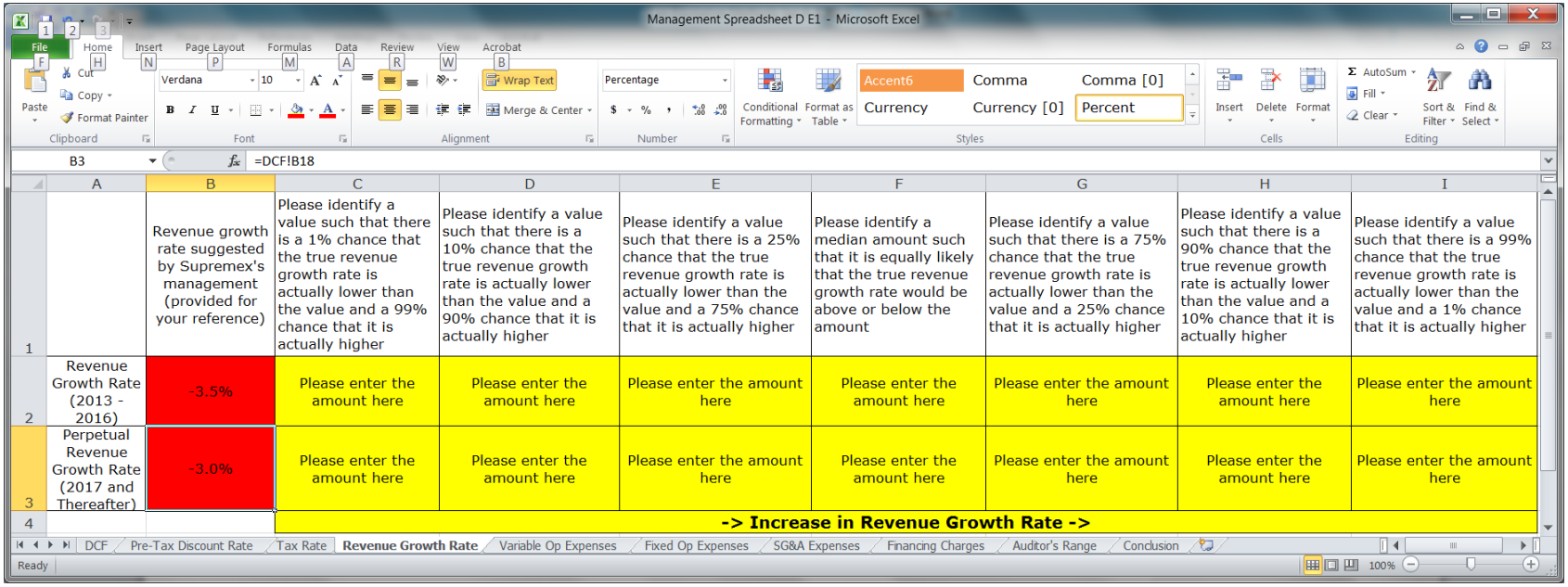
[63] All of Big 4 and Big 6 participants are employed in central Canadian offices of their public accounting firms.
[64] The two experienced auditors and one valuations specialist who report no impairment analyses performed in the last two years performed impairment analyses in previous years.

specialists when they audit complex FV estimates. Therefore, the case is supplemented with a set of instructions intended to test the two different elicitation methods described above, cumulative distribution function (CDF) method (also referred to as "E1" in this study) and credible interval (CI) elicitation method (also referred to as "E2"), for helping auditors to come up with an auditor's range for the CGU recoverable amount. More precisely, the participants are provided with an instructions page on how to use their elicitation method and with an additional Excel spreadsheet which facilitates the process of entering the parameters of the probability distributions of the DCF valuation model input variables. An illustration of the elicitation template is presented in **Figure 3**.

The case was developed with a help of partner-level practitioners experienced with FV impairment issues. The study was pilot tested with a pilot sample of one auditor (an Assurance Senior Staff Accountant employed by a Big 4 public accounting firm, possessing prior experience with auditing FV impairments), two valuation specialists (a Senior Valuations Manager and a former Valuations Partner employed by a national (Big 6) public accounting firm), who are also Canadian Chartered Business Valuators (CBVs), and a junior auditor (a Masters student possessing some experience with FV audits).

FIGURE 3

Example of the Elicitation Method Template (CDF Elicitation Method)



	A	B	C	D	E	F	G	H	I
1		Revenue growth rate suggested by Supremex's management (provided for your reference)	Please identify a value such that there is a 1% chance that the true revenue growth rate is actually lower than the value and a 99% chance that it is actually higher	Please identify a value such that there is a 10% chance that the true revenue growth rate is actually lower than the value and a 90% chance that it is actually higher	Please identify a value such that there is a 25% chance that the true revenue growth rate is actually lower than the value and a 75% chance that it is actually higher	Please identify a median amount such that it is equally likely that the true revenue growth rate would be above or below the amount	Please identify a value such that there is a 75% chance that the true revenue growth rate is actually lower than the value and a 25% chance that it is actually higher	Please identify a value such that there is a 90% chance that the true revenue growth rate is actually lower than the value and a 10% chance that it is actually higher	Please identify a value such that there is a 99% chance that the true revenue growth rate is actually lower than the value and a 1% chance that it is actually higher
2	Revenue Growth Rate (2013 - 2016)	-3.5%	Please enter the amount here	Please enter the amount here	Please enter the amount here	Please enter the amount here	Please enter the amount here	Please enter the amount here	Please enter the amount here
3	Perpetual Revenue Growth Rate (2017 and Thereafter)	-3.0%	Please enter the amount here	Please enter the amount here	Please enter the amount here	Please enter the amount here	Please enter the amount here	Please enter the amount here	Please enter the amount here
4			**-> Increase in Revenue Growth Rate ->**						

4.5 Results

4.5.1 Implied Confidence Levels for the Unaided Intervals (RQ 3)

Table 13 contains a comparison of assisted auditor's intervals for the CGU recoverable amount developed with a help of an elicitation method applied to the DCF model input parameters, to the unaided auditor's intervals produced without application of an elicitation method. As discussed above, the unaided interval is produced in the course of the process analysis study, which is run before the elicitation study during the same experimental session. **Panels A and B in Table 13** present the comparison of the unaided intervals to the assisted auditor's intervals for the CDF (E1) and CI (E2) elicitation methods, respectively.

One of the insights provided by data in **Table 13** is estimating the degree of confidence placed by the participants on the model input parameters when developing their unaided intervals. The estimation can be performed via a comparison of the widths of aided intervals developed with the use of elicitation methods (for which the confidence levels are known[65]) to the widths of unaided intervals (for which the confidence levels need to be estimated). The results of the comparison are reported in **Table 14**.[66] As can be seen from the table, there is a wide variation in the estimated degree of confidence placed by the experienced and junior auditors[67] on the model input parameters when developing their unaided intervals. There seem to be no clear preference among the auditors towards any single degree of confidence. This result

[65] While under the CI (E2) elicitation method the confidence levels are explicit at 90%, 50%, and 25% for the widest, middle, and narrowest intervals respectively, under the CDF (E1) method they can be calculated using the general probability rules at 98%, 80%, and 50% for the widest, middle, and narrowest intervals respectively.
[66] **Table 14** contains four panels. Panels A and B report implied confidence levels using unadjusted assisted ranges, while Panels C and D report confidence levels using adjusted assisted ranges. The adjusted assisted range differs from the unadjusted assisted range in such a way that it includes ranges for those and only for those input parameters for which ranges where developed when developing the unassisted range for the CGU recoverable amount.
[67] The number of observation for the valuation specialists is too small to estimate the variation.

demonstrates a general lack of consistency regarding the confidence level placed on the model input parameters by the auditors when developing their unaided intervals. **Table 14** also reports imputed levels of confidence for the unaided intervals calculated using OLS imputation method based on the three known observations corresponding to the elicited intervals.[68] The average imputed levels of confidence for the unaided intervals for experienced and junior auditors using the CDF (E1) elicitation method are 49% and 54% (55% and 59% for the adjusted assisted intervals), respectively, while the average imputed levels of confidence for the same participant groups using the CI (E2) method are 50% and 57% (62% and 66% for the adjusted assisted intervals), respectively. The similarity in the two pairs of numbers between the participants using E1 and E2 is expected given that the confidence level for the unaided interval should not depend on the elicitation method used by a participant. When the participants using the CDF (E1) and CI (E2) methods are considered together, the average imputed levels of confidence for the unaided intervals for experienced and junior auditors are 49% and 56% (60% and 64% for the adjusted assisted intervals), respectively (not shown in **Table 14**).

4.5.2 Comparison of the Unaided Judgment to Assisted Judgment with the Elicitation Methods (RQ 1)

Implied confidence analysis given above indicates that, with the data available, the comparison of the aided to the unaided judgments can be accomplished for the confidence level of 50% (which is approximately the implied confidence for the unaided intervals). This confidence level corresponds to the narrowest interval under the CDF (E1) elicitation method (the interval formed with the 25% and 75% CDF fractiles), and the middle interval under the CI

[68] The imputation is performed using STATA 13 software. Out of 23 observations to be imputed, the procedure produces correct imputations (i.e., imputations falling in the correct confidence intervals) for 20 observations (for 19 observations when adjusted assisted intervals are considered). For the three (four) remaining observations (marked with * in **Table 14**), the imputed number is replaced with the closest interval bound.

(E2) elicitation method. The comparison indicates that when all groups of the participants are considered together (not tabulated), the CDF method provides for an improvement over unaided judgment with the standard deviation of the interval widths of 41.90 for the aided intervals vs. the standard deviation of the interval widths of 45.52 for the unaided intervals. On the other hand, the CI (E2) method is not helpful for improving the consistency of the participants' judgments (the standard deviation of the interval widths is 191.15 vs. 55.69, for the aided vs. unaided intervals respectively). Further analysis of the above findings performed via a breakdown of the participants into the three groups (experienced and junior auditors and valuation specialists) indicates that the results concerning the effectiveness of both the CDF (E1) and the CI (E2) method are primarily driven by the junior auditors' group (see **Table 13, Panels A and B**). For example, **Table 13, Panel A** demonstrates that for a 50% confidence level, the CDF method provides for smaller standard deviation of the interval's widths (as well as their upper and lower bounds) for junior auditors when aided judgment is compared to the unaided one, while the result does not hold for the experienced auditors.[69] This analysis suggests that the CDF method appears to have a potential for improving unaided judgment regarding FV intervals, while the CI method appears not to have such a potential, answering **RQ 1**.

The discussion above also indicates that the use of both of the elicitation methods encourages the participants to develop distributions for the valuation model input parameters for which no ranges were developed for the unaided auditor's interval, thus providing for a better quantification of uncertainty. **Table 15** reports the input parameters for which elicited distributions were developed but point estimates were used for the unaided auditor's intervals.

[69] The results are not significant at conventional significance levels due to the small number of available observations.

4.5.3 Comparison of the Effectiveness of CDF (E1) and CI (E2) Elicitation Methods (RQ 2)

Table 16 presents the comparison of results achieved with the use of CDF and CI elicitation methods, for each of the participants groups. Specifically, the narrowest (25% to 75% cumulative distribution) interval developed using the CDF method is directly comparable to the middle (50% confidence) interval developed using the CI method. A comparison of the appropriate cells in **Panel A, Table 16** which reports the CDF method results, to the corresponding cells in **Panel B, Table 16** which reports the CDF method results, leads to the following findings. For both experienced and junior auditors, the CDF method provides for narrower intervals for the resulting FV (on average) than the CI method. The standard deviation of the interval widths is smaller for the intervals obtained using the CDF method when compared to the standard deviation of the intervals obtained using the CI method, for both experienced and junior auditors. Additionally, the standard deviation of lower and upper bounds of the intervals for the resulting FV is smaller for the CDF method compared to the CI method, for both experienced and junior auditors (not reported in **Table 16**). On the contrary, for valuation specialists, interval widths for the resulting FV, as well as their standard deviations and the standard deviations of their lower and upper bounds are smaller for the CI method, compared to the CDF method (the results for lower and upper interval bounds is not tabulated). These findings indicate that the CDF method appears to be more effective for both experienced and junior auditors (as it produces narrower intervals with smaller standard deviations of their widths and upper and lower bounds), while the CI method is more effective for valuation specialists (using the same criteria), providing an answer to **RQ 2** formulated above.[70] Additional research

[70] Due to the small sample size employed in the study some of the results reported in Table 16 are not statistically significant at conventional levels. Results for standard deviations of upper interval bounds and standard deviations of interval widths for junior and experienced auditors, however, are statistically significant. For the experienced auditors group, the differences in standard deviations of upper interval bounds and standard deviations of interval

is needed to understand why the CDF method is more useful for auditors, but the CI method is more useful for valuation specialists. One of the possible reasons is that valuation specialists are much more proficient in the use of probability distributions than auditors (as discussed in the verbal protocols analysis part), which may reflect on the difference in effectiveness between the CDF and CI methods for auditors and valuation specialists.

4.5.4 Comparison of the CDF (E1) and CI (E2) Elicitation Methods with Regard to Their Susceptibility to the Anchoring Heuristics (H 1)

To test **H 1**, it is necessary to have an estimate of the participants' prior-held beliefs to determine the extent of the anchoring effect, if any. Since the process study and the elicitation study are run in one experimental session, one after the other, the point estimate or range for the input parameters entering the valuation model for the CGU RA developed by a participant in the process study can serve as an approximation of the participant's prior-held beliefs about the model input parameters before attending to the elicitation routine. If this proxy for the prior-held beliefs is used, the analysis of verbal protocols and screen recordings indicates that the anchoring does take place, but as predicted, the two elicitation methods have a different level of susceptibility to it. Particularly, the analysis shows that for the discount rate distribution, two participants out of 14 (or 14%) who did the CDF method used their unaided interval for the range formed by either 1/99 or 25/75 fractiles, whereas nine participants out of 21 (or 43%) who did the CI method used their unaided interval for either 90% or 50% confidence intervals in the elicitation study. For the tax rate distribution, two participant out of 14 (or 14%) relying on the CDF method used their unaided interval for the range formed by either 1/99 or 10/90 fractiles,

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widths between CDF and CI methods are significant at 10% and 1%, respectively. For the junior auditors group, the differences in standard deviations of upper interval bounds and standard deviations of interval widths between CDF and CI methods are significant at 1% and 5%, respectively.

whereas six participants out of 21 (or 29%) relying on the CI method used their unaided interval for the 90% confidence intervals in the elicitation study. A similar result is observed for other DCF model input parameters including the revenue growth rate, variable operating expenses, fixed operating expenses, and financing charges.[71]

Thus, as predicted in H 1, the CDF (E1) elicitation method is less susceptible to the anchoring effect than the CI (E2) method. This conclusion has high practical significance in real-life audit settings since auditors or valuation specialists can have an opinion on the ranges of parameters entering the fair valuation model prior to performing the elicitation routine. The use of the CDF method provides more certainty that any prior-held beliefs will not influence the elicited parameters distributions. While the "interval" concept vs. the "value" concept theoretical argument used to support the development of H 1 appears to be plausible, future research is needed to determine any possible alternative explanations of the observed phenomenon.

4.5.5 Comparison of the CDF (E1) and CI (E2) Elicitation Methods with Regard to Their Ability to Assist With Quantification of Uncertainty (RQ 4)

Table 17 provides results of the frequency analysis of the words indicative of quantification of uncertainty in concurrent verbal protocols for the two probability elicitation methods. The procedure for identifying such words includes two steps. At the first step, all of the words containing in the verbal protocols are identified and their frequency of occurrence in the protocols is determined. At the second step, the words which are not indicative of quantification of uncertainty (neutral words) are removed from the analysis.[72] The two elicitation methods are then compared using the frequencies of the resulting set of non-neutral words.

[71] The relationship is the least pronounced for the fixed operating expenses.
[72] The full set of non-neutral words is presented in **Table 17**. One group of neutral words include pronouns (such as "we", "they", "them", etc.), articles ("a", "the", etc.), auxiliary verbs ("will", "would", etc.), and other words of this

The results in reported in **Table 17** suggest that CDF (E1) elicitation method appears to be more effective for assisting the participants in quantification of uncertainty, when compared to CI (E2) elicitation method, in the context of fair value impairment audit task. Particularly, out of 35 words identified as pointing to quantification of uncertainty, 23 are more frequent under the CDF (E1) method, while 12 are more frequent under the CI (E2) method. Thus, CDF (E1) method is more effective for quantification of uncertainty than CI (E2) method based on the frequencies of individual words per participant. If a composite index based on equal weighting of the frequencies of non-neutral words is used to proxy for effectiveness, CDF (E1) methods have the index of 85.4, while CI (E2) have the index of 54.1, again pointing to a higher effectiveness of CDF (E1) method compared to CI (E2) method.

4.5.6 Between-Participants Comparison of the Elicited Distributions

Visual inspection of the data in **Table 16** also indicates significant differences in how participants view the distributions of the input parameters for the DCF model for the CGU recoverable amount. The inspection of the 35 participants who performed the elicitation routine indicates the presence of five outliers with distributions which are much more extreme (and with the respective auditor's intervals which are much wider) than the remaining 30 participants. The outliers belong to all three of the participants groups (one junior auditor, three valuation specialists, and two experienced auditors). This result highlights a high degree of subjectivity currently present in model-based complex FV auditing practices. The outliers may be due to individual information processing features, insufficient understanding of the elicitation

type. I use Provalis Research QDA Miner and WordStat for my analysis and rely on its functionality to identify such words and place them in an automatically generated exclusion list. The other group of neutral words encompasses regular nouns, adjectives, and verbs which are unlikely to be used in the quantification of uncertainty process. I use my own judgment to separate such words from non-neutral words which are indicative of the quantification of uncertainty. Some examples would include nouns like "audit", "thing", "work", "management", adjectives such as "good", "pretty", etc.

instrument, or other possible factors. However, the fact that two participants from this outliers group who developed an auditor's range in the process analysis study also feature abnormally wide unassisted auditor's ranges, compared to other participants who developed unassisted auditor's ranges, suggests that incorrect understanding of the elicitation methods is unlikely to be a contributing factor to the observed extreme distributions.

4.5.7 Analysis of the Unaided and Aided Intervals from the Perspective of Audit Materiality

The data in **Table 16**, analyzed from the perspective of three scenarios introduced in Smieliauskas (2012), indicate that assisted ranges developed by the participants do not fit into the two acceptable scenarios, "Accounting estimate nirvana" (whereby the reasonable range of an estimate does not exceed the materiality), and "Estimate problem" (whereby the width of the reasonable range is greater than the materiality, but does not exceed twice the materiality). The results are best characterized by the "Estimate nightmare" scenario, which takes place when twice the materiality is smaller than the width of the reasonable range, meaning that all points inside or outside of the reasonable range have significant risks (Smieliauskas 2012, p. 279). Indeed, **Table 16, Panel A** demonstrates that even for the narrowest interval developed with the help of the CDF elicitation method (the interval formed by .25 and .75 CDF fractiles, corresponding to 50% confidence level), the average interval width is 88.33, 129.69, and 78.55 times the audit materiality for experienced auditors, valuation specialists, and junior auditors, respectively. **Table 16, Panel B** shows that for the narrowest interval developed with the help of the CI elicitation method (25% confidence level interval), the average interval width is 58.80, 39.39, and 63.13 times the audit materiality for experienced auditors, valuation specialists, and junior auditors, respectively.

For the unaided intervals, the average width is 69.40, 75.50, and 85.99 times the audit materiality for experienced auditors, valuation specialists, and junior auditors, respectively (not tabulated). None of the participants produced either unaided or assisted interval which is smaller than twice the audit materiality.

4.5.8 Other Findings Resulting From Concurrent Verbal Protocols Analysis

An important finding of the elicitation methods study is that currently both junior and experienced auditors and valuation specialists do not have a clear understanding of what a required level of confidence for the model input parameter for FVs should be. Even though at the final stage of the study all of the participants are notified that the auditor's interval for the CGU recoverable amount based on the elicited parameters distributions corresponds to intervals formed by 25%/75% distributional fractiles (25% confidence intervals) for the input parameters for the CDF method (the CI method), only a very small number of participants contests or otherwise discusses the suggested confidence level for the input parameters. Specifically, only one experienced and one junior auditor indicate that a 25% confidence for the input parameters would be insufficient for obtaining assurance on a model-based fir value estimate, and state that the required confidence level should approach 90%. One of the valuation specialists reports that in practice the numerical values of confidence levels for the model input parameters are not considered, while simultaneously admitting that different levels of confidence would be appropriate in different circumstances. [73]

Two of the participants provide comments on the decision aids which are used in current audit practice to deal with the input parameters for model-based FVs. One experienced auditor

[73] E.g., more confidence for the discount rate input parameter is required if the auditee does not fit into the existing WACC industry studies, if the company is not in a mature/stable industry, or if it is close to the impairment/no impairment threshold in the current year audit.

suggests that their group uses a Microsoft Excel-based decision aid which is intended to calculate point estimates for the input parameters using weighted-average probabilities method. [74][75] This decision aid is a relatively close analogy for the suggested elicitation decision aid, as it also takes into consideration probabilities when calculating point estimates of the input parameters. However, the elicitation procedures provide for more information as they explicitly quantify the levels of confidence attributable to the specified ranges of input parameters, while the weighted-average method does not. This distinction may be important as the verbal protocols show that the majority of participants have difficulty with specifying a required level of confidence for the input parameters. One valuation specialist suggests that their group utilizes an Excel-based decision aid which calculates the sensitivity of fair valuation model to the input parameters, without considering their probability distributions. This is a remote analogy of the suggested decision aid as the sensitivity aid does not take into account probabilities of the parameters values.

The participants' subjective opinion with regard to the usefulness of the two elicitation methods reveals that the majority of those who expressed their opinion see the methods as being useful for estimating the parameters distributions. Specifically, for the CDF (CI) method, one (seven) participants indicate that the method is useful, while one (one) participant indicates that the method is useful for judgmental parameters (such as discount and revenue growth rate) only, none (one) of the participants indicate that the method is probably useful, and none (one) of the participants say that they need to use the method for some time to ascertain its usefulness, respectively. None of the participants suggest that either of the method is not useful.

[74] The participant refers to IAS 36 requirement to calculate weighted average probabilities when determining VIU as a justification for this decision aid. However, IAS 36 refers to weighted average calculation applied to future cash flows, as opposed to model input parameters such as discount rate, etc.

[75] The experienced auditor also suggests that the aid use should be delegated to the auditee's management, if the management's qualifications so permit, to preserve the auditor's independence.

4.6 Discussion and Conclusion

Quantitative analysis of the assisted and unassisted auditor's ranges from the perspective of audit materiality indicates that currently auditor's intervals for complex model-based FVs are excessively wide and fall into "Accounting estimate nightmare" category defined in Smieliauskas (2012), meaning that any point in the reasonable range have a significant estimation risk, as defined in ISA 540 (IAASB 2008). This result confirms that concerns raised in Christensen et al. (2012) and Menzefricke and Smieliauskas (2012a and 2012b) based on the analysis of certain fair valuation models translate into a practical problem encountered during audits of complex model-based FVs. Moreover, this study discovers that the problem of excessively wide auditor's ranges persists across all of the main constituencies in FV audits, including both experienced and junior auditors and valuation specialists.

A within-participant comparison of assisted and unassisted intervals reveals a significant inconsistency in the degree of confidence that they place on the input parameters' intervals when developing their unassisted auditor's ranges. The study reports a so called "implied level of confidence" for the participants' unaided intervals which is calculated based on "fitting" the unaided intervals developed by the participants in the process study to the elicited distributions of the respective input parameters produced in the elicitation study. The data obtained on implied confidence demonstrates that experienced auditors generally require a lower level of confidence for the input parameters when compared to junior auditors (60% vs. 64% imputed levels of confidence, respectively). This result indicates that auditors' expertise (proxied by experience) might have an effect on the auditors' levels of confidence when auditing model-based FVs. Investigating the mechanism(s) and the magnitude of this effect is a topic for future research. The inconsistency of confidence levels among auditors also pose a question about what the

desired level of confidence for fair valuations model input parameters in audit engagement settings should be. As this level of confidence is not specified in current financial reporting, auditing, or valuation standards, the answer might be of significant interest to the regulators and standard setters. Further, the use of elicitation methods, coupled with the specified desired level of confidence, can introduce a necessary degree of standardization in the FV auditing process. Since elicitation methods enable auditors to produce probability distributions for the input parameters, auditors or valuation specialists can then use the prescribed level of confidence to determine the parts of the parameters distributions that should be entering the valuation model.

The data obtained in this study indicates that if a 50% confidence level is considered for the valuation model input parameters, the CDF method produces results superior to the unaided judgment because it provides for more consistency among the participants (that is, for a smaller standard deviation of the interval widths) when compared to the unaided judgment. This finding appears to be driven by the junior auditors group. On the other hand, the CI method does not seem to produce an improvement over the unaided judgment similar to the CDF method.

A comparison of the CDF and CI elicitation methods indicates that the CDF method proves to be superior relative to the CI method for both experienced and junior auditors, whereas the opposite is true for valuation specialists. Specifically, for the comparable interval (25% to 75% cumulative distribution under the CDF and 50% confidence interval under the CI), the CDF method provides for narrower intervals for the resulting FV (on average) than the CI method, as well as for a smaller standard deviation of the interval widths and lower and upper bounds, thus leading to a better compliance with IAS 540 and to a higher consistency of judgment among auditors. On the contrary, for valuation specialists, interval widths for the resulting FV, as well as their standard deviations and the standard deviations of their lower and upper bounds are

smaller for the CI method, compared to the CDF method. Why the CDF method is more useful for auditors, while the CI method is more useful for valuation specialists is a topic for future research. This study suggest one potential explanation: a higher proficiency of valuation specialists with the use of probability distributions, compared to auditors. As the comparison of the CDF and CI methods reveals different levels of effectiveness, future studies should continue the search for elicitation methods which might be more effective in FV audit settings than the methods investigated in this paper. This includes both fine-tuning the CDF and CI methods (such as using alternative distribution fractiles or confidence intervals, using different numbers of distribution fractiles/intervals, etc.) and testing other types of elicitation methods. Additionally, alternative interfaces for the practical implementation of elicitation methods may be designed and tested as a part of future research, in addition to Excel-based template implementations suggested in this study. Future research may also involve investigating elicitation biases such as overconfidence in FV audit settings.

In summary, the quantitative analysis performed in this study indicates that the CDF elicitation method has a potential to improve the participants' judgment regarding FV intervals, at least for junior auditors, while the CI method does not yield similar improvement. Also, when the two methods are compared to each other, the CDF method proves to be more effective for experienced and junior auditors, while the opposite is true for valuation specialists.

The qualitative analysis relying on verbal protocols methodology suggest that the CDF method is more effective than the CI method for helping auditors and valuation specialists with quantification of estimation uncertainty inherent in complex FVs such as goodwill impairments. The results are based on calculating the frequency of occurrence of words indicative of quantification of uncertainty. Specifically, the verbal protocols analysis finds that for the set of

35 words pointing to the quantification of uncertainty process, the CDF method is characterized by higher frequencies of 23 of such words, while the CI method has higher frequencies for the remaining 12 words. A composite measure constructed through equal weighting of the frequencies of occurrence of the 35 words is also higher for the CDF method when compared to the CI method (85.4 vs. 54.10).

The CDF probability distribution elicitation method is found to be less susceptible to the anchoring heuristic when compared to the CI method. The most likely explanation is related to the fact that the CI method questions operate in "interval" terms, making it easier for the participants prior-held beliefs about the parameters intervals to enter the elicitation process, while the CDF method questions wording is based on a "value" (a distributional fractile) concept instead of the "interval" concept, making it more difficult to incorporate such beliefs. Future research is needed to determine other possible reasons for this finding, if any.

The suggested elicitation methods provide an advantage over the currently used decision aids[76] for the fair valuation models input parameters (including those which take into consideration probabilistic characteristics of the parameters, such as the weighted-average probability-based decision aid) in that they explicitly quantify the parameters confidence levels. This is important because neither auditors nor valuation specialists appear to have a clear understanding of what the required level of confidence for the input parameters for model-based FVs should be in an audit. Finally, the majority of the participants indicate that, in their opinion, elicitation methods are helpful for a better understanding of the distributions of model input parameters for complex FVs, and for developing more precise auditor's ranges for such FVs. This holds for both experienced and junior groups of participants.

[76] As discussed above, the use of such methods is not widespread.

Overall, the study finds that certain probability distribution elicitation techniques have a potential to serve as a decision aid for auditors and valuation specialists verifying complex, forward-looking FV estimates. FV auditing appears to be a natural area for applying elicitation-based decision aids because such aids directly address uncertainties inherent in the task. Both quantitative and qualitative analyses performed in the study suggest that generally, the CDF method surpasses the CI method as a FV auditing decision aid.

The study contributes to the academic literature by bringing together auditing research and elicitation research in a FV auditing setting. From a practical perspective, the paper has the potential to improve current audit practices related to auditing of goodwill impairment and possibly other complex FVs. This is accomplished by providing information valuable for the development of decision aids useful in FV audits.

A limitation of the study is that its results may not fully generalize to FV auditing tasks involving types of valuation models different from DCF models, such as valuation models for complex financial instruments. Other potential limitations may arise from the fact that the process study and the elicitation study are run in one experimental session, one after the other. This includes the possibility of anchoring on the point estimate or range for the CGU recoverable amount developed by the same participant in the process study. Data in the verbal protocols suggests that some of the participants use their unaided parameters intervals as a starting point for constructing their respective elicited distributions.[77] Finally, since both studies are limited to an experimental session which would not typically exceed a two hour period, the limitation on time available to perform the task may impact the results.

[77] However, as discussed above, this research design also helps to investigate the susceptibility of different elicitation methods to the anchoring bias.

Chapter 5 - Discussion and Conclusion

5.1 Contribution

5.1.1 Contribution to Academic Literature

The process study contributes to the academic literature by obtaining direct experimental evidence on auditors' and valuation specialists' process when they perform a FV auditing task, and investigating the process differences between auditors and experts, as well as between auditors of different levels of expertise. The experimental study supplies much more detailed process information when compared to the extant interview-based research, which provides a "bigger picture" view on FV auditing. One of the main reasons for this is that a concrete context of the impairment case provides the participants an opportunity to think about fine details of the auditing and FV estimation processes, resulting in obtaining rich process information which is not possible to collect in interview studies which are lacking specific context.

The process study is also the first to apply the verbal protocols methodology in FV audit settings, a method that has been used in the extant auditing literature to obtain detailed evidence about and understanding of the processes that auditors follow when performing various types of tasks, and which is particularly suitable for analyzing complex tasks. It thus supplements and provides a valuable addition to prior verbal protocol studies of the audit analytical review, internal control evaluation, and audit scope determinations.

Another process study contribution is in overcoming one of the limitations of the existing studies of the FV auditing process, in that the extant studies provide little direct evidence of how valuation specialists approach the FV auditing tasks. The interview-based studies discussed

above have either a very limited input from valuation specialists, or are based solely on interviewing auditors, with no feedback from valuation specialists. On the other hand, 22% of the process study's sample is comprised of valuation specialists. As a result, it provides a significant amount of incremental evidence about the valuation specialists' involvement in FV audits, including the factors influencing such involvement as well as the interplay between valuation and audit standards/guidance.

The elicitation study contributes to the academic literature by bringing together auditing research and elicitation research in a FV audit setting. Distribution elicitation has been researched in the auditing context using experimental methodology with regard to the choice of an attribute sample size, the consistency of elicited priors, the comparison of distributions elicited from individual auditors vs. those elicited from audit teams, the calibration of the auditors' prior probability distributions of account balances, and the impact of contextual factors on the calibration of probabilistic judgments by the auditors. However, all of the above studies apply elicitation methods in relation to auditing of historical cost, rather than FV accounts.

The elicitation study also offers three new methods for establishing the effectiveness of the elicitation methods in FV audit settings: an econometric method, an expert panel method, and a method based on the analysis of verbal protocols. This represents an important contribution since there is no previously tested way to gauge the effectiveness of elicitation methods in FV audits. Moreover, prior literature does not provide any definitive guidance on how to establish the quality of auditors' judgments related to ranges for complex FVs, with or without a reference to elicitation methods.

5.1.2 Contribution to Audit Practice

From a practical perspective, both the process and elicitation studies have a potential to improve current audit practices related to auditing of goodwill impairment and possibly other complex FVs. The process study's main contribution is in identifying problematic areas of the

current practice along several dimensions: 1) audit and fair valuation methodology, 2) financial reporting, auditing, and fair valuation standards, 3) judgmental shortcuts arising in the course of the auditing process, and 4) estimation uncertainties inherent in the task. The identification of such problematic practice areas may help to develop appropriate corrective actions.

The main practical contribution of the elicitation study is in providing information on a class of techniques (probability distribution elicitation methods) which may serve as a basis for developing decision aids for dealing with FV estimation uncertainty (one of the problematic areas identified in the process study). Two elicitation methods – CDF method and CI method – are experimentally tested and compared in goodwill impairment audit settings. The practical need to develop decision aids useful for dealing with FV estimation uncertainty is highlighted by some of the participants mentioning ad-hoc decision aids which are used in current audit practice to deal with the input parameters for model-based FVs. One example is a Microsoft Excel-based decision aid which is intended to calculate point estimates for the input parameters using weighted-average probabilities method, which provides a relatively close analogy for the suggested elicitation decision aid, as it also takes into consideration probabilities when calculating point estimates of the input parameters. However, the elicitation procedures provide for more information as they explicitly quantify the levels of confidence attributable to the specified ranges of input parameters, while the weighted-average method does not. Another example is an Excel-based decision aid which calculates the sensitivity of FV model to the input parameters, without considering their probability distributions. This is a remote analogy of the suggested decision aid as the sensitivity aid does not take into account probabilities of the parameters values.

5.1.3 Contribution to Regulation and Standard Setting

From the point of view of standard setters, both the process and elicitation studies provide several useful insights. The results of the process study show that inter-firm differences in accounting for the forecast (projection) risk in projected CFs lead to difficulties in comparing discount rates used in fair valuation models by different audit firms. Therefore, valuation and FV auditing practice may benefit from introducing a degree of standardization in the treatment of the forecast risk, to increase comparability among firms. Possibly, CAS 540 may be expanded to reflect what appears to be the preferred treatment for the majority of public accounting firms, whereby the forecast risk is included as a component of the discount rate. Another area where the standards may be revisited is the IFRS requirement to apply a pre-tax discount rate in VIU models, as specified in IAS 36. The practice appears to demonstrate that using a post-tax discounting may represent a more natural choice, given the availability of observable economic inputs into the valuation process.

The process study also draws attention to the interplay between the ISA and CICBV guidance. The CICBV guidance offers two approaches to fair valuation, an "estimate" (performed for M&A, tax, and financial reporting (audit) engagements and assuming a limited amount of work) and a "comprehensive valuation" (performed for litigation support and fairness opinion engagements and assuming an extensive amount of work). This classification of the approaches to business valuation give rise to a possible problem whereby in audit engagements, which are supposed to provide the highest level of assurance to the financial statements users, a less stringent approach is applied when compared to several other types of valuation engagements. This finding suggests that the quality of FV estimates on the audited financial statements, which has been subject to much criticism and discussion in recent years, may in

principle be increased by applying a more stringent approach to valuation by the valuation specialists involved in FV audits, which is ultimately a question of audit cost efficiency.

The results of the process study also indicate that certain aspects of application of ISA 540 by the valuation specialists, such as the choice between testing management's estimate and developing auditor's own estimate or range, may be affected by the interaction between ISA 540 and CICBV guidance. Specifically, the finding that valuation specialists have a preference to classify their actions as "testing management's estimate" may be explained not only by the choice factors specified in ISA 540 and the auditor's independence considerations, but also by the fact that in the opinion of valuation specialists, only the comprehensive valuation, which is never done for audit purposes, represents a "true development" of an independent FV estimate.

Finally, the elicitation study reports a so called "implied level of confidence" for the participants' unaided intervals which is calculated based on "fitting" the unaided intervals developed by the participants in the process study to the elicited distributions of the respective input parameters produced in the elicitation study. The study demonstrates that experienced (vs. junior) auditors generally require a lower level of confidence for the input parameters, as well as general inconsistency of confidence levels among auditors belonging to the same expertise group. Given that this level of confidence is not specified in the current financial reporting or auditing standards, these results point to a need to develop guidance within the auditing standards regarding the required level of confidence for input parameters for complex FVs, which may possibly be linked to the existing guidance on audit risk or AM, or both.

5.1.4 Contribution to Education

The results of the process study reveal that auditors are generally not well-versed in the valuations methodology. The most prominent example where many auditors have difficulty is

the classification and application of different valuations methods, such as levered vs. debt-free method, which is very important since it has a direct bearing on the understanding of cash flow components which should be included into the valuation model. Other issues which cause difficulties include the necessity of circular calculation of the value of equity and the difference between pre-tax and post-tax discounting methods. This situation represents a problem since ISA 620, which governs the use of the work of an auditor's expert, prescribes that the auditor should be able to understand the field of expertise of the expert (e.g., business valuation) in order to both determine the nature, scope and objectives of that expert's work for the auditor's purposes, and evaluate the adequacy of that work (ISA 620.10). While the suggested decision-aid-related response to this problem is described in the audit practice contribution discussion above, a possible educational response would include strengthening of the valuations component of the auditors' education, with a particular emphasis on the problematic areas which are identified in the paper.

The other process study result which has educational implications is general unfamiliarity of the junior auditors with the role that valuation specialists play in audit engagements involving valuations issues. This is illustrated by the junior auditors not providing any comments regarding either the involvement of internal valuation specialists in the audit or the division of responsibilities between the specialists and the auditors in the course of the audit. This result points to a need to better educate auditing students with regard to the role of valuation and other specialists in audit engagements.

5.2 Suggestions for Future Research

The process and elicitation studies suggest several issues which may warrant future research. One such issue is how to assist auditors with narrowing their range for complex FV estimates to meet ISA 540 requirements. While one of the means to address this issue

(probability distribution elicitation methods) is suggested and tested to some extent in the elicitation study, the other possible ways may also be identified and investigated.

The other issue is searching for the ways to alleviate dysfunctional behavioral shortcuts revealed in the auditing process. Those include, but are not limited to, the tendency of some of the valuation specialist to apply the concepts of estimation uncertainty and audit materiality in isolation, the tendency of the auditors to rely on mainstream accounting performance measure rather than on pro-forma performance measures when addressing the possible management's bias from the compensation perspective, etc.

Several future research questions are related to a so called "implied level of confidence" for the participants' unaided intervals which is calculated based on "fitting" the unaided intervals developed by the participants in the process study to the elicited distributions of the respective input parameters produced in the elicitation study. The data obtained on implied confidences demonstrates that expertise (proxied by experience) might have an effect on the auditors' levels of confidence when auditing model-based FVs. Investigating the mechanism(s) and the magnitude of this effect is a topic for future research. The inconsistency of confidence levels among auditors poses an additional question about what the desired level of confidence for fair valuations model input parameters in audit engagement settings should be, given that it is not specified or even discussed in current financial reporting or auditing standards.

A comparison of the CDF and CI elicitation methods indicates that the CDF method proves to be superior relative to the CI method for both experienced and junior auditors, whereas the opposite is true for valuation specialists. Why the CDF method is more useful for auditors, while the CI method is more useful for valuation specialists is a topic for future research. The

elicitation study suggest one potential explanation: a higher proficiency of valuation specialists with the use of probability distributions, compared to auditors.

As the comparison of the CDF and CI methods reveals different levels of effectiveness, future studies should continue the search for elicitation methods which might be more effective in FV audit settings than the methods investigated in this paper. This includes both fine-tuning the CDF and CI methods (such as using alternative distribution fractiles or confidence intervals, using different numbers of distribution fractiles/intervals, etc.) and testing other types of elicitation methods. Additionally, alternative interfaces for the practical implementation of elicitation methods may be designed and tested as a part of future research, in addition to Excel-based template implementations suggested in this study. Future research may also involve investigating elicitation biases such as overconfidence in FV audit settings.

Additional research is also needed to address the issue of why the CDF elicitation method is less susceptible to the anchoring heuristic when compared to the CI method. The elicitation paper suggests a possible explanation, which may be related to the CI method operating in "interval" terms, making it easier for the participants prior-held beliefs about the parameters intervals to enter the elicitation process, compared to the CDF method operating in "value" terms, making it more difficult to incorporate such beliefs. Future research is needed to find the actual reasons of the observed phenomenon.

Finally, additional research is needed on how to gauge the quality of auditors' judgments related to ranges for complex FVs, with or without a reference to elicitation methods. While the elicitation study offers three new methods for establishing the effectiveness of the elicitation methods in FV audit settings, other methods for evaluating auditors' FV interval judgment can be designed and tested.

5.3 Limitations

A limitation of both studies is that their results may not fully generalize to FV auditing tasks involving types of valuation models different from DCF models used for goodwill valuation, such as valuation models for complex financial instruments and actuarial (pension) liabilities. Another limitation relevant for both studies is the time constraint: since both studies are limited to an experimental session which would not typically exceed a two hour period, the limitation on time available to perform the task may impact the results.

Some of the limitations of the process study originate from the use of concurrent verbal protocols methodology, which include possible side effects of verbalizing requirement on the cognitive process under examination, concerns about completeness of the resulting report, and issues with coding procedure subjectivity. As discussed, prior research on the verbal protocols demonstrated that these limitations can be effectively countered with the appropriate safeguards.

One limitation of the elicitation study arises from the fact that the process study and the elicitation study are run in a single experimental session, one after the other. This entails the possibility of anchoring on the point estimate or range for the CGU recoverable amount developed by the same participant in the process study. Data in the verbal protocols suggests that some of the participants use their unaided parameters intervals as a starting point for constructing their respective elicited distributions. However, this limitation also serves as an advantage in the sense that it helps to gauge the susceptibility of the tested elicitation methods to the anchoring heuristics.

TABLE 1 Current Financial Reporting and Auditing Regulation on Fair Values

Jurisdiction	Governing Body	Type of Standard	Standard/Document	Title	Effective Date	Comments
USA	FASB	Financial Reporting	SFAS No. 157	FV Measurements	For financial statements issued for fiscal years beginning after November 15, 2007, and interim periods within those fiscal years	
USA	FASB	Financial Reporting	Staff Position No. FAS 157-3	Determining the FV of a Financial Asset When the Market for That Asset Is Not Active	Same with Statement of Financial Accounting Standards No. 157	This FASB Staff Position (FSP) clarifies the application of FASB Statement No. 157, Fair Value Measurements, in a market that is not active
USA	PCAOB (SEC)	Auditing (issuers)	SAS No. 101 / AU Section 328	Auditing FV Measurements and Disclosures	For audits of financial statements for periods beginning on or after June 15, 2003	
USA	PCAOB (SEC)	Auditing (issuers)	SAS No. 92 / AU Section 332	Auditing Derivative Instruments, Hedging Activities, and Investments in Securities	For audits of financial statements for fiscal years ending on or after June 30, 2001. Early application is permitted	
USA	PCAOB (SEC)	Auditing (issuers)	SAS No. 73 / AU Section 336	Using the Work of a Specialist	For audits of periods ending on or after December 15, 1994	

USA	PCAOB (SEC)	Auditing (issuers)	SAS No. 57 / AU Section 342	Auditing Accounting Estimates	For audits of financial statements for periods beginning on or after January 1, 1989, unless otherwise indicated	
USA	ASB (AICPA)	Auditing (non-issuers)	AU 540	Auditing Accounting Estimates, Including FV Accounting Estimates and Related Disclosures	For audits of financial statements for periods ending on or after December 15, 2012	Replaced SAS No. 101 / AU Section 328
EU / Canada / Australia	IASB	Financial Reporting	IFRS 13	FV Measurement	January 1, 2013. Earlier application is permitted	
EU / Canada / Australia	IASB	Financial Reporting	IAS 36	Impairment of Assets	March 31, 2004	Amended in 2008 and 2009 for "Annual Improvements to IFRSs 2007 and 2008." Initially released in June 1998
EU / Canada / Australia	IASB	Financial Reporting	IAS 39	Financial Instruments: Recognition and Measurement	January 1, 2005. Earlier application is permitted	
EU / Canada / Australia	IAASB (IAASB)	Auditing	ISA 540	Auditing Accounting Estimates, Including FV Accounting Estimates, and Related Disclosures	Audits of financial statements for periods beginning on or after December 15, 2009	

Canada	CICBV	Valuation	Standard No. 110	Valuation Report Standards and Recommendations.	June 17, 2009	
Canada	CICBV	Valuation	Appendix B to Standard No. 110	Valuation for Financial Reporting	February 26, 2010	

TABLE 2 Behavioral Studies on Fair Value Auditing

Broad Topic	Study	Variables	Research Design	Results
Biases in Auditors' Judgment When Evaluating Fair Value Estimates	Montague (2010) "The effects of directional audit guidance on auditor confirmation bias and professional skepticism when evaluating fair value estimates"	Independent variables: Audit guidance (support management's estimate, generate own estimate, disconfirm management's estimate), uncertainty (low, high) Dependent variables: Confirmation bias, conservative bias, professional skepticism	3 x 2 between-participants experimental design in which professional auditors and undergraduate auditing students acted as participants	Auditors are subjected to more confirmation bias (i.e., auditor seeks more confirming than disconfirming evidence) when they are asked to counter (vs. support) management's estimate or generate their own estimate, while this bias increases the professional skepticism. Confirmation bias is the highest in "counter/disconfirm" condition with high estimation uncertainty.
	Cohen et al. (2016) " The Effect of Framing on Information Search and Information Evaluation in Auditors' Fair Value Judgments"	Independent variables: three levels of guidance frame - "support" (positive frame), "support and oppose" (balanced frame), or "oppose" (negative frame) management's assertions Dependent variables: auditors' recommended fair value estimate (FVE)	A single-factor experimental design, using experienced auditors as participants	A balanced frame (vs. a positive or negative ones) causes auditors to use more evidence countering, rather than supporting management's assertions, resulting in higher perceived RMM, and leading to lower fair value balances, implying that revising audit standards from positive to balanced frame leads to more conservative fair value audits.

	Maksymov et al. (2015) "Planning Audits of Fair Values: Effects of Procedure Frame and Perceived Procedure Verifiability"	Independent variables: Audit procedure frame (positive/negative), efficiency pressure (low/high) Dependent variables: The number of audit hours that they budget for each of audit procedures, achieved audit risk	In the experiment audit procedure frame is manipulated between participants and efficiency pressure is manipulated within participants	The negative frame leads to planning for more audit hours, especially for procedures that are perceived as less verifiable. This implies that re-framing audit procedures from the (typical in practice) positive frame to a negative one would increase audit effort.
Effect of Subjectivity/Management Bias in Fair Value Estimates on Auditors' Judgment	Griffin (2014) " The Effects of Uncertainty and Disclosure on Auditors' Fair Value Materiality Decisions"	Independent variables: Subjectivity (Level 2, less subjective or Level 3, more subjective), imprecision (narrow, precise $250k range or wide, imprecise $1M range), and disclosure (whether or not additional supplemental information, e.g. key assumptions and range of possible outcomes, accompanies a standard footnote) Dependent variables: Likelihood of required adjustment	Three independent variables are manipulated in 2 × 2 × 2 between-participants design with 106 practicing auditors as participants	When fair values are more subjective and imprecise in outcomes, auditors are more likely to recommend adjustments, but the effect is weakened when fair values are accompanied by additional disclosure. Auditors calculate the adjustment quantum by comparing management's FV estimate to the nearest bound (vs. the midpoint) of the auditors' range, implying a strict application of auditing standards.
	Earley et al. (2014) "Auditors' Role in Level 2 versus Level 3 Fair-Value Classification Judgments"	Independent variables: security type (mortgage backed security, or MBS) and an auction rate security, or ARS) and management's preference (Level 2 and Level3) Dependent variables: Auditor's skepticism	2 x 2 x 2 mixed design, with two between-participants independent variables, security type and management's preference	For fair value auditing, the auditors are generally skeptical of the classification that the management's chooses. This is especially pronounced when the management settles on the more aggressive reporting option, suggesting that auditors incorporate

				regulators' warnings not to be lenient in such situations.
The Use of Valuation Experts	Carpentier et al. (2008) "Does Fair Value Measurement Provide Satisfactory Evidence for Audit? The Case of High Tech Valuation"	Dispersion of FV estimates, methods used to value the investment, consistency of the valuation model input, relevance of the standards	In a survey, Chartered Business Valuators (CBVs) are asked to value a high tech firm in the process of making an IPO, in accordance with the Canadian Venture Capital Association's (CVCA's) recommendations	Methods and multiples used by valuation experts are highly heterogeneous, and the resulting FVMs for the same investment exhibit very significant variability. Post-IPO verification reveals overstatement
	Jamal et al. (2011) "Do Disclosure and Certification Exacerbate Bias From Conflict of Interest?"	Independent variables: Type of conflict (with one agent vs. two agents), bias control (none, disclosure, certification) Dependent variables: Valuation bias	161 professional accountants as participants in a 2x3+1 between subject's design experiment that varies (1) the type of conflict of interest and (2) the bias control	When only the selling party is present, conflict disclosure is dysfunctional as it produces bias. When both the buying and the selling parties are present, the bias is observed across all of the conditions.
	Griffith (2014) "Auditing Complex Estimates: The Interaction of Audit-Team Specialists' Caveats and Client Source Credibility"	Independent variables: Presence or absence of a caveat in the audit-team specialist's memo, perceptions of the source credibility of the preparer of the estimate Dependent variables: auditors' elaboration on the evidence related to the estimate, auditors' concerns about the estimate, and the procedures they would perform to address them	Experiment with 78 senior auditors from three Big 4 firms as participants	Auditors incorporate a caveat into evidence evaluation for a biased FV estimate when they perceive the preparer of an estimate to have relatively low source credibility. Auditors do not incorporate the caveat if they perceive the initial preparer to have relatively high source credibility.
	Griffith (2015) "How Do Auditors Use Valuation Specialists when Auditing	N/A	Interviews with 28 audit partners and managers with experience using valuation	Auditors apply auditing standards' guidance for external specialists to internal

	Fair Values?"		specialists	valuation specialists. If there is no relevant guidance, the auditors lead the specialists to comply with the audit team's prevailing position. Main issues in the area are related to the complex fair values' inherent uncertainty, which causes the auditors to rely on reports of valuation specialists that they cannot competently review or even understand.
	Griffith (2016) "When Do Auditors Use Specialists' Work to Develop Richer Problem Representations of Complex Estimates?"	Independent variables: Presence or absence of a relational cue (manipulated) and auditors' views of source credibility (measured) Dependent variables: Richness of auditors' problem representations, auditors' identification of potential issues in FV estimate	Experiment with 78 senior auditors from three Big 4 firms as participants	A relational cue in a specialist's work leads to improvement in auditors' problem representations and estimate-related judgments. The improvement occurs only if client source credibility is low, meaning that auditors do not always respond to cues in specialists' work.
	Joe et al. (2015) "Use of Third Party Specialists' Reports When Auditing Fair Value Measurements: Do Auditors Stay in Their Comfort Zone?"	Independent variables: quantification level (low vs. high) and control environment risk (low vs. high) Dependent variables: time a participant allocates to a procedure scaled by the total hours allocated	2 x 2, between-subjects design, on the sample of 92 "Big 4" audit seniors	Auditors allocate less proportionate effort to testing the subjective inputs of management's FV estimate when both the quantification evidence level and control risk are high.
Other Studies on Fair Value	Griffith et al. (2012)	N/A	Interviews of 24 experienced	Auditors elect not to create

Audit	"Auditing Complex Estimates: Understanding the Process Used and Problems Encountered"		auditors who regularly deal with complex estimates, content analysis of recent PCAOB inspection reports to corroborate understanding of the most critical difficulties in auditing estimates	an independent estimate or to rely on verification via subsequent events, but rather prefer to audit the management's estimate details. Auditors' decision to verify management's estimate may be based on effort and efficiency consideration, given their investment in understanding management's model.
	Griffith et al. (2015) "Audits of Complex Estimates as Verification of Management Numbers: How Institutional Pressures Shape Practice"	N/A	Interviews of 24 experienced auditors who regularly deal with complex estimates, content analysis of recent PCAOB inspection reports to corroborate understanding of the most critical difficulties in auditing estimates	Auditors overwhelmingly elect testing management's FV estimates rather than developing independent expectations or reviewing subsequent events. There are two root causes of this situation: excessive focus on verifying management's estimates in the standards and audit firms' current distribution of knowledge between auditors and specialists, whereby the auditors do not know enough about valuation.
	Cannon and Bedard (2015) "Auditing Challenging Fair Value Measurements: Evidence from the Field"	Independent variables: Levels 3 FV, estimation uncertainty, inherent risk, control risk, etc. for different tests Dependent variables: inherent risk, auditors use of specialist, etc. for different tests	Field study based on a questionnaire of a sample of 115 FVs, described by high-level engagement team members from multiple audit firms (comprised mostly of Level 3 fair values such as financial instruments, asset impairments, etc.)	Uncertainty in the estimates is positively related to the assessed inherent risk, but in a number of cases the estimate's inherent risk is assessed below maximum even though the uncertainty leads to ranges that are larger than materiality. The use of a

				valuation specialist by the client triggers the reliance on a specialist by the auditors. Thee auditors most frequently (in 53% of the cases) choose to develop their own independent estimate or range.
	Glover et al. (2016) "Current Practices and Challenges in Auditing Fair Value Measurements and Complex Estimates: Implications for Auditing Standards and the Academy"	N/A	Survey of 32 audit partners	The auditors more frequently choose to develop own estimates for financial instruments, compared to other FVs. Both management's and audit team's assumptions may be used when developing an independent estimate, while the use of audit team's assumptions is more common.

TABLE 3 Detailed Audit Process Information for Impairment Testing of Goodwill and Related Research Questions

Panel A: Expected Process Map

Relevant Financial Reporting Guidance – Excerpts from IFRS IAS 36 "Impairment of Assets" (IASB 2004a)	Relevant Audit Guidance – Excerpts from ISA 540 "Auditing Accounting Estimates, Including Fair Value Accounting Estimates, and Related Disclosures" (IAASB 2008)	Predicted Audit Process for Impairment Testing of Goodwill (Audit of Supremex, Inc. for Fiscal 2012)	Research Questions About Audit Process Prepared Based on Prior Auditing and Psychology Literature
Identifying an asset that may be impaired 8 An asset is impaired when its carrying amount exceeds its recoverable amount. Paragraphs 12–14 describe some indications that an impairment loss may have occurred. If any of those indications is present, an entity is required to make a formal estimate of recoverable amount. Except as described in paragraph 10, this Standard does not require an entity to make a formal estimate of recoverable amount if no indication of an impairment loss is present. **9 An entity shall assess at the end of each reporting period whether there is any indication that an asset may be impaired. If any such indication exists, the entity shall estimate the recoverable amount of the asset.** **12 In assessing whether there is any indication that an asset may be impaired, an entity shall consider, as a minimum, the following**		The "Management Memo" mentions that Supremex's management established at the end of the reporting period that there are indications that goodwill may be impaired. Specifically, the "Management Memo" states that "During the fourth quarter of 2012, several new indicators have shown that the volume decrease in North America's envelope industry was higher than expected and that this decline was expected to continue in the upcoming years." The auditor will likely point out that according to Paragraph 10 of IAS 36 "Impairment of Assets", irrespective of whether there is any indication of impairment, an entity must test any goodwill acquired in a business combination for impairment annually, in accordance with paragraphs 80–99 of the same IAS. Next, the auditor will observe that Supremex has a material goodwill balance on its balance sheet. Materiality for the audit is set at	RQ 1. Do the participants recognize the necessity to test goodwill for impairment annually as prescribed in IAS 36, irrespective of the existence of indicators of impairment? Do the participants recognize that indicators of impairment are present/consider indicators of impairment? RQ 2. Do the participants attempt to verify the sources of goodwill, specifically that the goodwill arose from past business combinations?

indications: **External sources of information** **(a) during the period, an asset's market value has declined significantly more than would be expected as a result of the passage of time or normal use.** **(b) significant changes with an adverse effect on the entity have taken place during the period, or will take place in the near future, in the technological, market, economic or legal environment in which the entity operates or in the market to which an asset is dedicated.** **(c) market interest rates or other market rates of return on investments have increased during the period, and those increases are likely to affect the discount rate used in calculating an asset's value in use and decrease the asset's recoverable amount materially.** **(d) the carrying amount of the net assets of the entity is more than its market capitalization.** **Internal sources of information** **(e) evidence is available of obsolescence or physical damage of an asset.** **(f) significant changes with an adverse effect on the entity have taken place during the period, or are expected to take place in the near future, in the extent to which, or manner in which, an asset is**		$600,000 according to the Case Instructions, while the balance of the goodwill is $75,751,125, a highly material amount. Therefore, the auditor will need to make sure that Supremex's management performed annual goodwill impairment testing in according with IAS 36, and verify management's conclusion about the impairment.	

used or is expected to be used. These changes include the asset becoming idle, plans to discontinue or restructure the operation to which an asset belongs, plans to dispose of an asset before the previously expected date, and reassessing the useful life of an asset as finite rather than indefinite. **(g) evidence is available from internal reporting that indicates that the economic performance of an asset is, or will be, worse than expected.** 13 The list in paragraph 12 is not exhaustive. An entity may identify other indications that an asset may be impaired and these would also require the entity to determine the asset's recoverable amount or, in the case of goodwill, perform an impairment test in accordance with paragraphs 80–99. 14 Evidence from internal reporting that indicates that an asset may be impaired includes the existence of: (a) cash flows for acquiring the asset, or subsequent cash needs for operating or maintaining it, that are significantly higher than those originally budgeted; (b) actual net cash flows or operating profit or loss flowing from the asset that are significantly worse than those budgeted; (c) a significant decline in budgeted net cash flows or operating profit, or a significant increase in budgeted loss,			

flowing from the asset; or (d) operating losses or net cash outflows for the asset, when current period amounts are aggregated with budgeted amounts for the future.			
Identifying the cash-generating unit to which an asset belongs 66 If there is any indication that an asset may be impaired, recoverable amount shall be estimated for the individual asset. If it is not possible to estimate the recoverable amount of the individual asset, an entity shall determine the recoverable amount of the cash-generating unit to which the asset belongs (the asset's cash-generating unit).		The Case Instructions state that Supremex's management has determined that there is only one cash generating unit (CGU) – the envelope business. Further, the auditor is asked to assume, for the purposes of this case, that he or she concurs with the management's identification of the CGUs. Therefore, the auditor will consider one CGU for the purposes of impairment testing – the envelope business and will not perform further investigation into whether smaller CGUs exist within Supremex (as the existence of smaller CGUs will normally imply a larger amount of impairment and smaller total assets and net income). Otherwise, the issue of CGU determination is not trivial in this CGU impairment case, as "Overview of the Business" states that Supremex has multiple geographic locations in six provinces. Each of these locations can potentially be considered as a candidate for a separate CGU.	RQ 3. Do the participants recognize the need to obtain assurance on the CGU determination as a part of the auditing task and explain that further investigation is not necessary because of the instructions to concur with the management CGU determination? Do the participants recognize the need to understand at what level goodwill is tested (CGU or other)?
	Risk Assessment Procedures and Related Activities 8. When performing risk assessment	As a part of risk assessment activities, in accordance with ISA 540.8, the auditor will likely obtain an understanding of how management	RQ 4. Do the participants assess the RMM (risk of material misstatement) related to the CGU/goodwill impairment, including inherent risk

	procedures and related activities to obtain an understanding of the entity and its environment, including the entity's internal control, as required by ISA 315,4 the auditor shall obtain an understanding of the following in order to provide a basis for the identification and assessment of the risks of material misstatement for accounting estimates: (Ref: Para. A12) (a) The requirements of the applicable financial reporting framework relevant to accounting estimates, including related disclosures. (Ref: Para. A13–A15) (b) How management identifies those transactions, events and conditions that may give rise to the need for accounting estimates to be recognized or disclosed in the financial statements. In obtaining this understanding, the auditor shall make inquiries of management about changes in circumstances that may give rise to new, or the need to revise existing, accounting estimates. (Ref: Para. A16–A21) (c) How management makes the accounting estimates, and an understanding of the data on which they are based, including: (Ref: Para. A22–A23) (i) The method, including where applicable the model, used in making the accounting estimate; (Ref: Para. A24–A26) (ii) Relevant controls; (Ref: Para. A27–A28)	makes the CGU impairment estimate, and an understanding of the data on which the CGU impairment estimate is based. This will include understanding the details of the DCF model used to calculate the recoverable amount of the CGU, which is given in the Management Spreadsheet". Further, the auditor will gain an understanding of the relevant control system surrounding the preparation of the CGU impairment estimate, by studying the "Corporate Governance" and "Internal Controls" documents included in the case. The auditor will likely observe that the relevant internal controls have a weakness related to segregation of duties among the top management personnel, namely that the Supremex's CEO and CFO are the same person. The auditor will likely conclude that corporate governance is strong because there is a majority of independent directors on the Board, the Board's Audit Committee is in place, and financial expertise of the Audit Committee/Board members is reasonably advanced. The auditor will also obtain an understanding of the assumptions underlying the CGU impairment estimate surrounding the input parameters of management's DCF model and are discussed in the "Management Memo". The auditor may note that Supremexe's managements did not use a valuation specialist.	and control risk? RQ 5. Do the participants assess the degree of estimation uncertainty related to the CGU/goodwill impairment?

	(iii) Whether management has used an expert; (Ref: Para. A29vA30) (iv) The assumptions underlying the accounting estimates; (Ref: Para. A31–A36) (v) Whether there has been or ought to have been a change from the prior period in the methods for making the accounting estimates, and if so, why; and (Ref: Para. A37) (vi) Whether and, if so, how management has assessed the effect of estimation uncertainty. (Ref: Para. A38) 9. The auditor shall review the outcome of accounting estimates included in the prior period financial statements, or, where applicable, their subsequent reestimation for the purpose of the current period. The nature and extent of the auditor's review takes account of the nature of the accounting estimates, and whether the information obtained from the review would be relevant to identifying and assessing risks of material misstatement of accounting estimates made in the current period financial statements. However, the review is not intended to call into question the judgments made in the prior periods that were based on information available at the time. (Ref: Para. A39–A44)	With regard to the degree of information uncertainty and significant risk related to the CGU impairment amount, the case specifics are such that the CGU impairment amount is determined using a company-developed model (the DCF model), for which some of the inputs are unobservable (e.g., the discount rate and the timing and amount of future cash flows). It is open to interpretation whether a DCF-type model can be characterized as a "highly specialized" model, as referred to in ISA 540.A47. However, according to ISA 540.A47, the CGU impairment amount is highly dependent upon judgment, because the amount and timing of future cash flows is conditional on uncertain events that may or may not occur many years in the future. Therefore, since a number of conditions specified in ISA 540.A47 are met, the participant is likely to point out that the CGU impairment amount contains high estimation uncertainty, and therefore can give rise to significant risks. Based on the above considerations, the auditor is likely come to a conclusion that the control risk around the goodwill impairment estimate is low-to-medium, while the inherent risk is medium-to-high.	
	Identifying and Assessing the Risks of Material Misstatement		

	10. In identifying and assessing the risks of material misstatement, as required by ISA 315,5 the auditor shall evaluate the degree of estimation uncertainty associated with an accounting estimate. (Ref: Para. A45–A46) 11. The auditor shall determine whether, in the auditor's judgment, any of those accounting estimates that have been identified as having high estimation uncertainty give rise to significant risks. (Ref: Para. A47vA51) **Application and Other Explanatory Material** **Risk Assessment Procedures and Related Activities (Ref: Para. 8)** Assumptions (Ref: Para. 8(c)(iv)) A31. Assumptions are integral components of accounting estimates. Matters that the auditor may consider in obtaining an understanding of the assumptions underlying the accounting estimates include, for example: • The nature of the assumptions, including which of the assumptions are likely to be significant assumptions. • How management assesses whether the assumptions are relevant and complete (that is, that all relevant		

	variables have been taken into account). • Where applicable, how management determines that the assumptions used are internally consistent. • Whether the assumptions relate to matters within the control of management (for example, assumptions about the maintenance programs that may affect the estimation of an asset's useful life), and how they conform to the entity's business plans and the external environment, or to matters that are outside its control (for example, assumptions about interest rates, mortality rates, potential judicial or regulatory actions, or the variability and the timing of future cash flows). • The nature and extent of documentation, if any, supporting the assumptions. Assumptions may be made or identified by an expert to assist management in making the accounting estimates. Such assumptions, when used by management, become management's assumptions. **Identifying and Assessing the Risks of Material Misstatement** *High Estimation Uncertainty and Significant Risks (Ref: Para. 11)* A47. Examples of accounting estimates that may have high		

	estimation uncertainty include the following: • Accounting estimates that are highly dependent upon judgment, for example, judgments about the outcome of pending litigation or the amount and timing of future cash flows dependent on uncertain events many years in the future. • Accounting estimates that are not calculated using recognized measurement techniques. • Accounting estimates where the results of the auditor's review of similar accounting estimates made in the prior period financial statements indicate a substantial difference between the original accounting estimate and the actual outcome. • Fair value accounting estimates for which a highly specialized entity developed model is used or for which there are no observable inputs.		
Fair value less costs to sell 25 The best evidence of an asset's fair value less costs to sell is a price in a binding sale agreement in an arm's length transaction, adjusted for incremental costs that would be directly attributable to the disposal of the asset. 26 If there is no binding sale agreement but an asset is traded in an active market, fair value less costs to sell is the asset's market price less the costs of disposal. The appropriate	**Responses to the Assessed Risks of Material Misstatement** 12. Based on the assessed risks of material misstatement, the auditor shall determine: (Ref: Para. A52) (a) Whether management has appropriately applied the requirements of the applicable financial reporting framework relevant to the accounting estimate; and (Ref: Para. A53–A56) (b) Whether the methods for making the accounting estimates are	According to ISA 540.13, the auditor will need to decide either to test how management produced the accounting estimate and the data on which it is based (ISA 540.13b), or develop a point estimate or a range to evaluate management's point estimate (ISA 540.13d). In addition, the auditor will need to choose between fully substantive approach and combined approach to testing of accounting estimates (ISA 540.13c). ISA 540.A84 suggests that testing the operating effectiveness of the controls	RQ 6. Do the participants use combined or pure substantive audit

market price is usually the current bid price. When current bid prices are unavailable, the price of the most recent transaction may provide a basis from which to estimate fair value less costs to sell, provided that there has not been a significant change in economic circumstances between the transaction date and the date as at which the estimate is made. 27 If there is no binding sale agreement or active market for an asset, fair value less costs to sell is based on the best information available to reflect the amount that an entity could obtain, at the end of the reporting period, from the disposal of the asset in an arm's length transaction between knowledgeable, willing parties, after deducting the costs of disposal. In determining this amount, an entity considers the outcome of recent transactions for similar assets within the same industry. Fair value less costs to sell does not reflect a forced sale, unless management is compelled to sell immediately. **Value in use** **30 The following elements shall be reflected in the calculation of an asset's value in use:** **(a) an estimate of the future cash flows the entity expects to derive from the asset;** **(b) expectations about possible**	appropriate and have been applied consistently, and whether changes, if any, in accounting estimates or in the method for making them from the prior period are appropriate in the circumstances. (Ref: Para. A57–A58) 13. In responding to the assessed risks of material misstatement, as required by ISA 330,6 the auditor shall undertake one or more of the following, taking account of the nature of the accounting estimate: (Ref: Para. A59–A61) (a) Determine whether events occurring up to the date of the auditor's report provide audit evidence regarding the accounting estimate. (Ref: Para. A62–A67) (b) Test how management made the accounting estimate and the data on which it is based. In doing so, the auditor shall evaluate whether: (Ref: Para. A68–A70) (i) The method of measurement used is appropriate in the circumstances; and (Ref: Para. A71–A76) (ii) The assumptions used by management are reasonable in light of the measurement objectives of the applicable financial reporting framework. (Ref: Para. A77–A83) (c) Test the operating effectiveness of the controls over how management made the accounting estimate, together with appropriate substantive procedures. (Ref: Para. A84–A86) (d) Develop a point estimate or a range to evaluate management's point	over how Supremex's management makes the estimate of the CGU impairment amount is appropriate when there are strong controls in place and functioning, e.g. when the CGU impairment estimate is reviewed and approved by appropriate levels of management and/or those charged with governance, or when the estimate is derived from the routine data processing by the accounting system. The case materials provide information on the strength of Supremex's internal controls over financial reporting in the "Internal Controls" document, as well as information on Supremex's corporate governance details in the "Corporate Governance" document. As indicated in the discussion of the predicted risk assessment process, the auditor is likely to come to a conclusion that the control risk is low-to-medium, which makes it possible to use the combined approach and reduce the substantive testing by relying on the internal controls. On the other hand, the nature of the CGU impairment estimate is such that it is not derived from routine data processing by the accounting system of Supremex (e.g., discounted cash flow analysis for calculating VIU of the envelope business CGU, as described in Supremex's "Management Memo" on impairment of the CGU). Therefore, the auditor is may choose to assume a fully substantive approach to auditing of impairment of the envelope business CGU.	approach when auditing the CGU/goodwill impairment?

variations in the amount or timing of those future cash flows; **(c) the time value of money, represented by the current market risk-free rate of interest;** **(d) the price for bearing the uncertainty inherent in the asset; and** **(e) other factors, such as illiquidity, that market participants would reflect in pricing the future cash flows the entity expects to derive from the asset.** 31 Estimating the value in use of an asset involves the following steps: (a) estimating the future cash inflows and outflows to be derived from continuing use of the asset and from its ultimate disposal; and (b) applying the appropriate discount rate to those future cash flows. **Basis for estimates of future cash flows** **33 In measuring value in use an entity shall:** **(a) base cash flow projections on reasonable and supportable assumptions that represent management's best estimate of the range of economic conditions that will exist over the remaining useful life of the asset. Greater weight shall be given to external evidence.** **(b) base cash flow projections on the most recent financial**	estimate. For this purpose: (Ref: Para. A87–A91) (i) If the auditor uses assumptions or methods that differ from management's, the auditor shall obtain an understanding of management's assumptions or methods sufficient to establish that the auditor's point estimate or range takes into account relevant variables and to evaluate any significant differences from management's point estimate. (Ref: Para. A92) (ii) If the auditor concludes that it is appropriate to use a range, the auditor shall narrow the range, based on audit evidence available, until all outcomes within the range are considered reasonable. (Ref: Para. A93–A95) 14. In determining the matters identified in paragraph 12 or in responding to the assessed risks of material misstatement in accordance with paragraph 13, the auditor shall consider whether specialized skills or knowledge in relation to one or more aspects of the accounting estimates are required in order to obtain sufficient appropriate audit evidence. (Ref: Para. A96–A101) **Application and Other Explanatory Material** **Responses to the Assessed Risks of Material Misstatement** (Ref: Para. 12) *Application of the Requirements of*	ISA 540.13 permits two approaches to auditing accounting estimates. As described in ISA 540.13.b, the auditor can test how management made the accounting estimate and the data on which it is based. Alternatively, as described in ISA 540.13.d, the auditor can develop a point estimate or a range to evaluate management's point estimate. When auditing the impairment of the envelope business CGU, the auditor may choose to follow the approach suggested in ISA 540.13.d, which is developing the auditor's own estimate or range. The case contains a number of factors mentioned in ISA 540. A87 which can lead the auditor to develop their own estimate or range. First, the accounting estimate is not derived from the routine processing of data by the Supremex's accounting system. It is based on the management's future cash flow forecast, and the management's estimate of the applicable discount, growth, and tax rates as well as a projection of the future Supremex's cost structure, as described in the "Management Memo" on impairment of the CGU. Second, there are alternative outside sources of relevant data available to the auditor that can be used in developing their own point estimate or range. These sources are described in "External Information on Significant Assumptions section" and include external data from the	RQ 7. Do the participants elect to test management's estimate or to develop their own estimate or range when auditing the CGU/goodwill impairment? What factors influence the participants' choice re: testing vs. developing the impairment estimate? RQ 8. Do the participants elect to use assumptions (model) alternative to management's assumptions (model), or both? RQ 9. If a participant elects to use assumptions (model) alternative to management's assumptions (model), what reasoning does the participant provide that in their view necessitates the application of the alternative assumptions (model), if any? RQ 10. If a participant elects to use assumptions (model) alternative to management's assumptions (model), what source(s) of information does the participant use to support the alternative assumptions (model), if any? RQ 11. Do the participants' who developed a range attempt to narrow it down? Based on what audit evidence the participants' range is narrowed? Do the participants factor in materiality when narrowing the range and making the conclusion about its reasonableness?

budgets/forecasts approved by management, but shall exclude any estimated future cash inflows or outflows expected to arise from future restructurings or from improving or enhancing the asset's performance. Projections based on these budgets/forecasts shall cover a maximum period of five years, unless a longer period can be justified. **(c) estimate cash flow projections beyond the period covered by the most recent budgets/forecasts by extrapolating the projections based on the budgets/forecasts using a steady or declining growth rate for subsequent years, unless an increasing rate can be justified. This growth rate shall not exceed the long-term average growth rate for the products, industries, or country or countries in which the entity operates, or for the market in which the asset is used, unless a higher rate can be justified.** **39 Estimates of future cash flows shall include:** **(a) projections of cash inflows from the continuing use of the asset;** **(b) projections of cash outflows that are necessarily incurred to generate the cash inflows from continuing use of the asset (including cash outflows to prepare the asset for use) and can be directly attributed, or allocated on a reasonable and consistent basis, to the asset; and**	*the Applicable Financial Reporting Framework* (Ref: Para. 12(a)) A56. The application of the requirements of the applicable financial reporting framework requires management to consider changes in the environment or circumstances that affect the entity. For example, the introduction of an active market for a particular class of asset or liability may indicate that the use of discounted cash flows to estimate the fair value of such asset or liability is no longer appropriate. Testing the Operating Effectiveness of Controls (Ref: Para. 13(c)) A84. Testing the operating effectiveness of the controls over how management made the accounting estimate may be an appropriate response when management's process has been well-designed, implemented and maintained, for example: • Controls exist for the review and approval of the accounting estimates by appropriate levels of management and, where appropriate, by those charged with governance. • The accounting estimate is derived from the routine processing of data by the entity's accounting system. A85. Testing the operating effectiveness of the controls is required when:	Envelope Manufacturers Association Foundation (the EMA Foundation) and the Envelope Manufacturers Association (EMA). According to ISA 540.A87, those are factors indicating that development of the auditor's own estimate or a range to evaluate management's point estimate may be an appropriate approach. If the auditor elects to develop their own point estimate or range to evaluate management's point estimate, ISA 540.13.d suggests that the auditor then proceeds with obtaining an understanding of management's assumptions or methods, in order to take into account all of the relevant variables and to evaluate any significant differences from management's point estimate (this happens if the auditor uses assumptions or methods that differ from the management's). In Supremex's case, since DCF analysis is a generally accepted technique for determining the value of a CGU, the auditor is likely to preserve the DCF technique in his or her own analysis, but use assumptions that are different from the management's, especially in the light of availability of external data on some of the assumptions from the industry associations. The auditor, nonetheless, may elect to develop an alternative model within the class of DCF model generally accepted for business valuation purposes. While the management's	

(c) net cash flows, if any, to be received (or paid) for the disposal of the asset at the end of its useful life. **44 Future cash flows shall be estimated for the asset in its current condition. Estimates of future cash flows shall not include estimated future cash inflows or outflows that are expected to arise from:** **(a) a future restructuring to which an entity is not yet committed; or** **(b) improving or enhancing the asset's performance.** **50 Estimates of future cash flows shall not include:** **(a) cash inflows or outflows from financing activities; or** **(b) income tax receipts or payments.** **55 The discount rate (rates) shall be a pre-tax rate (rates) that reflect(s) current market assessments of:** **(a) the time value of money; and** **(b) the risks specific to the asset for which the future cash flow estimates have not been adjusted.**	(a) The auditor's assessment of risks of material misstatement at the assertion level includes an expectation that controls over the process are operating effectively; or (b) Substantive procedures alone do not provide sufficient appropriate audit evidence at the assertion level. Developing a Point Estimate or Range (Ref: Para. 13(d)) A87. Developing a point estimate or a range to evaluate management's point estimate may be an appropriate response where, for example: • An accounting estimate is not derived from the routine processing of data by the accounting system. • The auditor's review of similar accounting estimates made in the prior period financial statements suggests that management's current period process is unlikely to be effective. • The entity's controls within and over management's processes for determining accounting estimates are not well designed or properly implemented. • Events or transactions between the period end and the date of the auditor's report contradict management's point estimate. • There are alternative sources of relevant data available to the auditor which can be used in developing a point estimate or a range.	DCF method represents levered approach when the cash flows include the debt service costs and are discounted using equity risk-adjusted discount rate (capitalization rate based on ROE), the case supplies sufficient information for the auditor to use an alternative unlevered or debt-free approach, whereby the cash flows exclude the interest costs and are discounted using WACC (i.e., the capitalization rate is based on WACC), with subsequent subtraction of long-term debt value The auditor's choice between the two methods my depend on the size of the audit firms, where non-Big 4 firms auditors may gravitate towards the use of unlevered method as they tend to deal with smaller clients with little or no debt financing in their capital structure. Further, the auditor may point out that the application of the levered DCF approach currently use by the management is imperfect due to the management not making a leverage adjustment for imperfect capital structure. The case materials also allow for application of other types of DCF valuation methods. One of the examples is the use of earnings capitalization technique, under which the short-term cash flow forecast is unnecessary (the technique may rely either on levered or unlevered approaches). It is difficult to predict when the auditor may elect to use	

	Narrowing a Range (Ref: Para. 13(d)(ii)) A93. When the auditor concludes that it is appropriate to use a range to evaluate the reasonableness of management's point estimate (the auditor's range), paragraph 13(d)(ii) requires that range to encompass all "reasonable outcomes" rather than all possible outcomes. The range cannot be one that comprises all possible outcomes if it is to be useful, as such a range would be too wide to be effective for purposes of the audit. The auditor's range is useful and effective when it is sufficiently narrow to enable the auditor to conclude whether the accounting estimate is misstated. A94. Ordinarily, a range that has been narrowed to be equal to or less than performance materiality is adequate for the purposes of evaluating the reasonableness of management's point estimate. However, particularly in certain industries, it may not be possible to narrow the range to below such an amount. This does not necessarily preclude recognition of the accounting estimate. It may indicate, however, that the estimation uncertainty associated with the accounting estimate is such that it gives rise to a significant risk. Additional responses to significant risks are described in paragraphs A102–A115.	such alternative techniques as there is no prior auditing literature on this issue. Further, if the auditor decides to use a range, the auditor will narrow the range until all outcomes within the range are reasonable. According to ISA 540.A93–A95, the auditor will first separate the reasonable outcomes range from the possible outcomes range, since the latter is not useful for purposes of the audit due to it width. The narrowing of the range will be accomplished by removing those outcomes at the sides of the range judged by the auditor to be unlikely to occur based on audit evidence available. If the auditor is able to narrow the reasonable range to be equal to or less than performance materiality, the auditor then evaluates the reasonableness of management's point estimate. If the auditor is not able to narrow the reasonable range to be equal to or less than performance materiality, the standard gives little guidance, except that this situation does not necessarily preclude recognition of the accounting estimate and that such estimate has the estimation uncertainty that gives rise to a significant risk. The auditor may respond to this significant risk by attempting to understand whether the management has assessed how estimation uncertainty may affect the accounting estimate (ISA 540.A102–A115).	RQ 12. Do the participants recognize the need to calculate FVLCS of the CGU in addition to its VIU, to determine the recoverable amount?

	A95. Narrowing the range to a position where all outcomes within the range are considered reasonable may be achieved by: (a) Eliminating from the range those outcomes at the extremities of the range judged by the auditor to be unlikely to occur; and (b) Continuing to narrow the range, based on audit evidence available, until the auditor concludes that all outcomes within the range are considered reasonable. In some rare cases, the auditor may be able to narrow the range until the audit evidence indicates a point estimate.	If the auditor elects to test how management made the accounting estimate and the data on which it is based, ISA 540.13.b suggests that the auditor will evaluate whether the method of measurement used is appropriate in the circumstances and whether the assumptions used by management are reasonable in light of the measurement objectives of the applicable financial reporting framework. In Supremex's case, since DCF analysis is a generally accepted technique for determining the value of a CGU, the auditor is likely not to question reasonableness of this method, while reasonableness of the management's assumptions is likely to become the main subject of the auditor's scrutiny. Extant auditing literature does not provide a definitive answer on whether the auditor will prefer to verify the management's estimate or to develop their own estimate or rage for the CGU impairment amount. Griffith et al. (2012 and 2015) found that the auditors would overwhelmingly select to verify the management's estimate, whereas Cannon and Bedard (2015) come to a different conclusion. Supremex's management does not calculate fair value less costs to sell (FVLCS) of the envelope business CGU. The "Management Memo" on impairment of the CGU contains calculation of the value in use (VIU)	

		of the CGU. However, IAS 36 defines an asset's recoverable amount (RA) as the maximum of FVLCS and VIU. The auditor may decide not to challenge the management's decision to only calculate VIU on the grounds that ISA 540 implies that the use of discounted cash flows to estimate the fair value of an asset or liability or a CGU is not appropriate only if an active market exist for such class of assets or liabilities (ISA 540.A56). On the other hand, the auditors may decide to use prior transactions from the industry and earnings multiples to calculate the FVLCS of the CGU. When assessing FVLCS, the auditor may also refer to the acquisition offer from Clarke, a majority (45%) shareholder of Supremex, to acquire the rest of the outstanding shares of Supremex, as the evidence supporting determination of FVLCS. Particularly, the acquisition which features a price of $1.20 per share (close to the current stock exchange share price), which would translate in a total business value of about $35million (vs. $94.5M supplied by the valuation model).	
	Further Substantive Procedures to Respond to Significant Risks *Estimation Uncertainty* 15. For accounting estimates that give rise to significant risks, in addition to	Following ISA 540.15, the auditor may observe that the management performed sensitivity analysis of the CGU impairment amount with regard to several key inputs, indicating a high sensitivity of the impairment amount to these assumptions (this	

	other substantive procedures performed to meet the requirements of ISA 330,7 the auditor shall evaluate the following: (Ref: Para. A102) (a) How management has considered alternative assumptions or outcomes, and why it has rejected them, or how management has otherwise addressed estimation uncertainty in making the accounting estimate. (Ref: Para. A103–A106) (b) Whether the significant assumptions used by management are reasonable. (Ref: Para. A107–A109) (c) Where relevant to the reasonableness of the significant assumptions used by management or the appropriate application of the applicable financial reporting framework, management's intent to carry out specific courses of action and its ability to do so. (Ref: Para. A110) 16. If, in the auditor's judgment, management has not adequately addressed the effects of estimation uncertainty on the accounting estimates that give rise to significant risks, the auditor shall, if considered necessary, develop a range with which to evaluate the reasonableness of the accounting estimate. (Ref: Para. A111–A112) **Application and Other Explanatory Material**	analysis is contained in "Results of Operations - Notes to Financial Statements" document). The auditor may also observe that the management does not provide any discussion of how the sensitivity to the assumptions impacts the management's judgment about the impairment amount. The auditor may therefore decide that the management has not adequately addressed the effects of estimation uncertainty on the CGU impairment amount estimate, and elect to develop a range with which to evaluate the reasonableness of the accounting estimate according to ISA 540.16.	

	Further Substantive Procedures to Respond to Significant Risks (Ref: Para. 15) A102. In auditing accounting estimates that give rise to significant risks, the auditor's further substantive procedures are focused on the evaluation of: (a) How management has assessed the effect of estimation uncertainty on the accounting estimate, and the effect such uncertainty may have on the appropriateness of the recognition of the accounting estimate in the financial statements; and (b) The adequacy of related disclosures. *Estimation Uncertainty* Management's Consideration of Estimation Uncertainty (Ref: Para. 15(a)) A103. Management may evaluate alternative assumptions or outcomes of the accounting estimates through a number of methods, depending on the circumstances. One possible method used by management is to undertake a sensitivity analysis. This might involve determining how the monetary amount of an accounting estimate varies with different assumptions. Even for accounting estimates measured at fair value there can be variation because different market participants will use different		

	assumptions. A sensitivity analysis could lead to the development of a number of outcome scenarios, sometimes characterized as a range of outcomes by management, such as "pessimistic" and "optimistic" scenarios. A104. A sensitivity analysis may demonstrate that an accounting estimate is not sensitive to changes in particular assumptions. Alternatively, it may demonstrate that the accounting estimate is sensitive to one or more assumptions that then become the focus of the auditor's attention. A105. This is not intended to suggest that one particular method of addressing estimation uncertainty (such as sensitivity analysis) is more suitable than another, or that management's consideration of alternative assumptions or outcomes needs to be conducted through a detailed process supported by extensive documentation. Rather, it is whether management has assessed how estimation uncertainty may affect the accounting estimate that is important, not the specific manner in which it is done. Accordingly, where management has not considered alternative assumptions or outcomes, it may be necessary for the auditor to discuss with management, and request support for, how it has addressed the effects of estimation uncertainty on the accounting estimate.		

	Indicators of Possible Management Bias 21. The auditor shall review the judgments and decisions made by management in the making of accounting estimates to identify whether there are indicators of possible management bias. Indicators of possible management bias do not themselves constitute misstatements for the purposes of drawing conclusions on the reasonableness of individual accounting estimates. (Ref: Para. A124–A125) **Indicators of Possible Management Bias (Ref: Para. 21)** A124. During the audit, the auditor may become aware of judgments and decisions made by management which give rise to indicators of possible management bias. Such indicators may affect the auditor's conclusion as to whether the auditor's risk assessment and related responses remain appropriate, and the auditor may need to consider the implications for the rest of the audit. Further, they may affect the auditor's evaluation of whether the financial statements as a whole are free from material misstatement, as discussed in ISA 700.26 A125. Examples of indicators of possible management bias with respect to accounting estimates	Since impairment of the envelope business CGU is a fair value estimate based on a DCF model, two issues described in the auditing standards become particularly relevant to the auditor's consideration of the possible management bias in the accounting estimate. These issues are selection or construction of significant assumptions that yield a point estimate favorable for management objectives, and use of an entity's own assumptions for fair value accounting estimates when they are inconsistent with observable marketplace assumptions (ISA 540.A125). Since proposing a highly material goodwill impairment charge may serve as an indicator suggesting to the auditor that Supremex's management has "big bath" plans for fiscal 2012, the auditor may consider what assumptions in the DCF model potentially lead to an artificially depressed carrying value of the envelope business CGU, with a resulting higher amount of CGU impairment. In this case, the "big bath" intention makes a higher CGU impairment amount the point estimate favorable for management objectives. The auditor may challenge unobservable inputs into the DCF model such as the discount rate and other inputs such as the perpetual decline rate, as an elevated discount rate as well as the perpetual decline assumption contribute to a lower	RQ 13. How do the participants factor in any indicators of management's bias that in their view are present when drawing their conclusion about the reasonableness of the management's estimate or developing their own estimate or range, if at all? RQ 14. Do the participants review management's compensation information when considering indicators of possible management bias, if at all? If yes, do they consider different components of management's compensation and the impact of CGU/goodwill impairment on these components in the short- and long-terms? RQ 15. What judgmental heuristics (such as anchoring-and-adjustment, availability, or representativeness) influence the participants' selection of the alternative assumptions (model), if any? RQ 16. What judgmental heuristics influence the participant's judgment in the process of narrowing their own range? RQ 17. Are there indications of any deliberate biases in the participant's process of selecting the alternative assumptions (model)?

	include: • Changes in an accounting estimate, or the method for making it, where management has made a subjective assessment that there has been a change in circumstances. • Use of an entity's own assumptions for fair value accounting estimates when they are inconsistent with observable marketplace assumptions. • Selection or construction of significant assumptions that yield a point estimate favorable for management objectives. • Selection of a point estimate that may indicate a pattern of optimism or pessimism.	value of the carrying amount of the CGU and a higher amount of impairment. When considering indicators of the possible management's bias of Supremex's management when auditing the CGU impairment amount, the auditor is likely to review the management compensation information available in the "Management Compensation" document. The auditor will likely consider different components of the management compensation, such as base salary, bonus and management profit sharing plan. The auditor may point out that the bonus and the management profit plan are based on return on capital employed (ROCE), which nominator is derived from EBITDA and which denominator includes goodwill carrying value. Therefore, the management may have an incentive to take a "big bath" because of the long-term increasing effect of goodwill impairment on the ROCE. The auditor may also observe that the incentive to take a "big bath" in 2012 becomes more likely because the management's bonus and profit sharing in that year has already been reduced by 20% upon a special agreement with the management because of the declining sales. In addition to the possibility of the management's bias which is addressed in the auditing standards, there is a possibility of the auditor's	

		bias which the auditing standards are silent about. When auditing complex fair value estimates, particularly the impairment of Supremex's envelope business CGU, the auditor is likely to be subjected to a number of judgmental shortcuts/biases because of the individual information processing limitations (Bratten et al. 2013). For the Supremex's CGU impairment scenario, the auditor is likely to anchor on the management's provided model/assumptions if the auditor chooses to verify the management's model/assumptions. The anchoring on the management's model/assumptions is also likely to happen when the auditor chooses to develop their own alternative model/assumptions. Other auditor's biases may also be relevant such as availability and representativeness.	
Recognizing and measuring an impairment loss **59 If, and only if, the recoverable amount of an asset is less than its carrying amount, the carrying amount of the asset shall be reduced to its recoverable amount. That reduction is an impairment loss.** **104 An impairment loss shall be recognized for a cash-generating unit (the smallest group of cash-generating units to which goodwill or a corporate asset has been allocated) if, and only if, the**	**Evaluating the Reasonableness of the Accounting Estimates, and Determining Misstatements** 18. The auditor shall evaluate, based on the audit evidence, whether the accounting estimates in the financial statements are either reasonable in the context of the applicable financial reporting framework, or are misstated. (Ref: Para. A116–A119)	Supremex's "Management Memo" on impairment of the CGU provides the management's calculation of the impairment amount of the envelope business CGU. The auditor will likely re-perform the management's calculation of the impairment amount of the envelope business CGU. Since Supremex's management determined that there is only one CGU, and the auditor is asked to concur with the management's determination, the auditor is likely to observe that calculation of the impairment amount of the envelope business CGU is	

recoverable amount of the unit (group of units) is less than the carrying amount of the unit (group of units). The impairment loss shall be allocated to reduce the carrying amount of the assets of the unit (group of units) in the following order: **(a) first, to reduce the carrying amount of any goodwill allocated to the cash-generating unit (group of units); and** **(b) then, to the other assets of the unit (group of units) pro rata on the basis of the carrying amount of each asset in the unit (group of units).** **These reductions in carrying amounts shall be treated as impairment losses on individual assets and recognized in accordance with paragraph 60.**		straightforward and does not involve any judgment calls such as allocation of the corporate assets. Therefore, the re-performance becomes a trivial task. The auditor will likely mention that in accordance with IAS 36.104, the impairment amount of the CGU needs to be allocated to reduce the carrying value of goodwill, and then to other assets in the unit if the impairment amount exceeds the carrying value of goodwill.	

TABLE 3 Continued

Panel B: Process Study – Research Questions

	Research Question
RQ 1	Do the participants recognize the necessity to test goodwill for impairment annually as prescribed in IAS 36, irrespective of the existence of indicators of impairment? Do the participants recognize that indicators of impairment are present/consider indicators of impairment?
RQ 2	Do the participants consider the sources of goodwill, specifically that the goodwill arose from past business combinations?
RQ 3	Do the participants recognize the need to obtain assurance on the CGU determination as a part of the auditing task and explain that further investigation is not necessary because of the instructions to concur with the management CGU determination? Do the participants recognize the need to understand at what level goodwill is tested (CGU or other)?
RQ 4	Do the participants assess the RMM (risk of material misstatement) related to the CGU/goodwill impairment, including inherent risk and control risk?
RQ 5	Do the participants assess the degree of estimation uncertainty related to the CGU/goodwill impairment?
RQ 6	Do the participants use combined or pure substantive audit approach when auditing the CGU/goodwill impairment?
RQ 7	Do the participants elect to test management's estimate or to develop their own estimate or range when auditing the CGU/goodwill impairment? What factors influence the participants' choice re: testing vs. developing the impairment estimate?
RQ 8	Do the participants elect to use assumptions (model) alternative to management's assumptions (model), or both?
RQ 9	If a participant elects to use assumptions (model) alternative to management's assumptions (model), what reasoning does the participant provide that in their view necessitates the application of the alternative assumptions (model), if any?
RQ 10	If a participant elects to use assumptions (model) alternative to management's assumptions (model), what source(s) of information does the participant use to support the alternative assumptions (model), if any?
RQ 11	Do the participants' who developed a range attempt to narrow it down? Based on what audit evidence the participants' range is narrowed? Do the participants factor in materiality when narrowing the range and making the conclusion about its reasonableness?
RQ 12	Do the participants recognize the need to calculate FVLCS of the CGU in addition to its VIU, to determine the recoverable amount?
RQ 13	How do the participants factor in any indicators of management's bias that in their view are present when drawing their conclusion about the reasonableness of the management's estimate or developing their own estimate or range, if at all?
RQ 14	Do the participants review management's compensation information when considering indicators of possible management bias, if at all? If yes, do they consider different components of management's compensation and the impact of CGU/goodwill impairment on these components in the short- and long-terms?

RQ 15	What judgmental heuristics (such as anchoring-and-adjustment, availability, or representativeness) influence the participants' selection of the alternative assumptions (model), if any?
RQ 16	What judgmental heuristics influence the participant's judgment in the process of narrowing their own range?
RQ 17	Are there indications of any deliberate biases in the participants' process of selecting the alternative assumptions (model)?
RQ 18	Are there indications of any deliberate biases in the participants' process of narrowing their own range?
RQ 19	How are various specialists involved in the CGU/goodwill impairment audit?

Table 3B Threats to Validity and Possible Safeguards of the Verbal Protocol Analysis Methodology (per Biggs and Mock's (1983) Methodological Note)

Validity Threats	Possible Safeguards	Implementation of the Safeguards in the Study
Possible side effects of verbalizing requirement on the cognitive process under examination	Biggs and Mock (1983) cite research evidence that concurrent (as opposed to retrospective) verbalizing does not affect the process	The study uses concurrent verbal protocols, which are shown not to affect the participants' process
Completeness of the resulting report	Biggs and Mock (1983) note that the possible incompleteness of the report does not invalidate the information that is reported The incompleteness can be battled by the researcher being present during the session and urging the subject to "think aloud" after he or she falls silent for certain period of time (Blocher and Cooper 1988, p. 4)	To counter incompleteness, if the participants fall silent for a period of time over about one minute, they are prompted to speak by the researcher with the phrases "please tell me what you are thinking" or "please speak more about what you are doing"
Coding procedure subjectivity	Biggs and Mock (1983) suggest that safeguards against the subjectivity of the coding procedure include: 1) Defining coding rules for the behavioral operators before the coding, 2) Employing more than one coder and measuring reliability via the consensus, 3) Making the coding rules accessible to the readers, and 4) Using customized computer software to perform the coding However, Biggs and Mock (1983) note that the computer program option may not be suitable for complex tasks (which is the case with the fair value auditing task)	Since the fair value auditing task represents a complex type of task, the computer program coding method is not applicable in the study's settings Both the author and a research assistant (who is an accounting faculty holding a CPA and possessing several years of auditing experience) independently coded responses for a randomly selected subsample of nine participants (three experienced auditors, three valuation specialists, and three junior auditors). The independent coding is restricted to a subsample of the full sample due to the volume of the verbal protocols and the time consuming nature of the coding process. Inter-rater agreement for the subsample was 85.11 percent, with Cohen's Kappa of 0.54. Cohen's Kappa of 0.54 may be described as "moderate" based on the authoritative literature (Landis and Koch 1977). Further, a rule of thumb is that Kappa measures between 0.40 and 0.70 are acceptable (Neuendorf 2002)

TABLE 4 Selected Demographic Information for the Participants – Process Study

Participant	Audit Firm	Group	Rank	Accounting Designation	Other Designations / Credentials	# of Impairment Analyses Performed in the Last Two Years
EA Big 4 #1.1	Big 4 #1	Assurance	Senior Staff Accountant	CPA, CA		4
EA Big 4 #1.2	Big 4 #1	Assurance	Manager	CPA, CA		11
EA Big 4 #1.3	Big 4 #1	Assurance	Senior Manager	CPA		2
EA Big 4 #1.4	Big 4 #1	Assurance	Senior Manager	CPA, CA		*[78]
EA Big 4 #2.1	Big 4 #2	Assurance	Senior Manager	CPA, CA	MBA	4
EA Big 4 #2.2	Big 4 #2	Assurance	Manager	CPA, CA		2
EA Big 4 #3.1	Big 4 #3	Assurance	Senior manager	CPA, CA		3
EA Big 4 #3.2	Big 4 #3	Assurance	Manager	CPA, CA		2
EA Big 4 #3.3	Big 4 #3	Assurance	Senior Manager	CPA, CA		5
EA Big 4 #3.4	Big 4 #3	Assurance	Experienced Manager	CPA, CA		5
EA Big 4 #3.5	Big 4 #3	Assurance	Senior Manager	CPA, CA		1
EA Big 4 #3.6	Big 4 #3	Assurance	Senior Manager	CPA		2
EA Big 4 #3.7	Big 4 #3	Assurance	Manager	CPA, CA		*
EA Big 6 #1.1	Big 6 #1	Assurance - National Assurance Standards Group	Senior Manager	CPA, CA		11
EA Big 6 #1.2	Big 6 #1	Assurance	Senior Manager	CPA, CA		5
EA Big 6 #1.3	Big 6 #1	Assurance	Manager	CPA, CA		1
EA Big 6 #1.4	Big 6 #1	Assurance	Manager	CPA, CA		2
EA Big 6 #1.5	Big 6 #1	Assurance	Senior Manager	CPA, CA		6
EA Big 4 #2.3	Big 4 #2	Advisory - Complex Accounting & Transaction Expertise Group	Partner	CPA,CA	CFA	5
EA Big 4 #1.5	Big 4 #1	Assurance	Manager	CPA, CA		8
EA Big 4 #1.6	Big 4 #1	Assurance - Professional Practice	Partner	FCPA, FCA	Lawyer	11
Total Number, EA	**21**				**Average #, EA**	**4.3**
VS Big 4 #1.1	Big 4 #1	Valuation Specialist	Senior Manager	CPA, CA	CBV	10
VS Big 4 #1.2	Big 4 #1	Valuation Specialist	Vice President Valuations	CPA, CA	CBV	11
VS Big 4 #1.3	Big 4 #1	Valuation Specialist	Vice President Valuations	CPA, CA	CBV	8

[78] "*" denotes that the participant performed impairment analyses in the period before the most recent 2-year period.

VS Big 4 #1.4	Big 4 #1	Valuation Specialist	Senior Manager		MBA, CBV, Accredited Senior Appraiser	11
VS Big 4 #2.1	Big 4 #2	Valuation Specialist	Director Valuations	CPA, CA	CBV	11
VS Big 4 #2.2	Big 4 #2	Valuation Specialist	Senior Manager	CA, CPA	CBV	11
VS Big 6 #1.1	Big 6 #1	Valuation Specialist	Manager	CA,CPA	CBV	11
VS Big 6 #1.2	Big 6 #1	Valuation Specialist	Senior Manager	CPA	CBV, CFA	11
VS Big 4 #2.3	Big 4 #2	Valuation Specialist	Senior Manager	CPA, CA	CBV, CFA	*
Total Number, VS	**9**				**Average #, VS**	**9.3**
JA #1	MAcc Student	N/A	Associate			0
JA #2	MAcc Student	N/A	Intermediate Staff Accountant			2
JA #3	MAcc Student	N/A	Intermediate Staff Accountant			2
JA #4	MAcc Student	N/A	Staff Accountant			1
JA #5	MAcc Student	N/A	Staff Accountant			2
JA #6	MAcc Student	N/A	Associate			11
JA #7	MAcc Student	N/A	Senior Staff Accountant			3
JA #8	MAcc Student	N/A	Intermediate Associate, Returning as Senior Associate			0
JA #9	MAcc Student	N/A	Experienced Associate			2
JA #10	MAcc Student	N/A	Second Year Staff Accountant			3
JA #11	MAcc Student	N/A	Intermediate Staff Accountant			1
Total Number, JA	**11**				**Average #, JA**	**2.5**
Total Number	**41**				**Average #**	**4.9**

TABLE 5 Outline of the Experimental Case Content

Case Component	Process Study and Elicitation Study	Length of the Document
Instructions	Instructions for the first part of the study include three-paragraph introduction briefly outlining the case scenario. The introduction part also contains a request to the participants, for the purposes of the study, to concur with the management's identification of the CGUs. The next part of the instructions outlines the task. The participants are asked to perform an audit of the CGU recoverable amount (and the resulting goodwill impairment charge) suggested by the management. Based on the materials provided on the next page of the survey, the participants are asked to decide whether they will: - test the management's estimate for the CGU recoverable amount or - develop your own auditor's estimate or range for the CGU recoverable amount (as defined in ISA 540 "Auditing Accounting Estimates, Including Fair Value Accounting Estimates, and Related Disclosures"). According to their decision, the participants are then asked to either: - test the management's estimate for the CGU recoverable amount or - develop your own auditor's estimate or range for the CGU recoverable amount. Note: In order to reduce unnecessary variability not directly related to the fair value auditing process, the participants are supplied with the materiality number that they should use in their analysis. The materiality is set at 5% of pre-tax income before extraordinary items (the same materiality is obtained when it is calculated as 0.5% of revenue) in the year under audit, consistent with Big 4 materiality practices.	1 page in Qualtrics interface
Management spreadsheet	The management Excel spreadsheet contains the DCF analysis that supports the management's CGU impairment amount. In addition, I introduced several data entry fields for alternative values of the model's input parameters (pre-tax discount rate, tax rate, and six other inputs) in order to facilitate the participants' calculation of their own independent estimate or range. This is needed because of the limited time (about an hour for each part of the study) that will be available for the participants to do the task. The practitioners who reviewed the study confirmed the validity of this approach – particularly, it is not expected to distort the participants' thinking process compared to the actual audit settings.[79]	2 tabs in an Excel spreadsheet
Management memo	Description of how the management came up with the impairment amount.	3 pages in a PDF file
External Info on Significant Assumptions	Information on the industry cost structure, revenue trends, etc. from external sources.	2 pages in a PDF file
Results of Operations - Financial Statements	Consolidated financial statements of the company for the last five years, including the year under audit.	7 pages in a PDF file

[79] A set of tabs for entering elicited probability distribution information for each of the model input parameters is added. Also, a tab with the resulting range for the CGU recoverable amount is provided for the participants' review.

Results of Operations - Notes to Financial Statements	Notes to consolidate financial statements of the company for the year under audit.	9 pages in a PDF file
Results of Operations - Comparison to Prior Year	Twelve-month period under audit compared with the previous twelve-month period.	2 pages in a PDF file
Overview of the business	Overview, overall performance, and key factors affecting the business.	2 pages in a PDF file
Risk Factors	Discussion of the company's risk factors.	5 pages in a PDF file
Corporate Governance	Description of the company's corporate governance.	2 pages in a PDF file
Internal Controls	Description of the company's internal controls.	1 pages in a PDF file
Management Compensation	Description of the company's management compensation	2 pages in a PDF file
International Accounting Standard 36	IAS 36 (IASB 2004a) "Impairment of Assets" is included for reference purposes.	30 pages in a PDF file
International Standard on Auditing 540	ISA 540 (IAASB 2008) "Auditing Accounting Estimates, Including Fair Value Accounting Estimates, and Related Disclosures." Is included for reference purposes.	45 pages in a PDF file

TABLE 6 Factors Influencing Test Management's Estimate vs. Develop Auditor's Estimate or Range Choice

Factors Influencing Test vs. Develop Choice	Total Participants	Participants by Group
Develop if disagree to some degree with the management's valuation	6	2 EA, 3 VS, 1JA
Develop if management is not competent	3	1 EA, 2 VS[80]
Develop if internal controls around the estimate are weak or absent	3	2 EA, 1JA
Develop if company not using services of external valuation specialists	2	1VS, 1 JA
Develop if highly material amount	2	1 EA, 1 JA
Test if client documentation supporting assumptions is good	1	1 EA
Test if client is public	1	1 VS
Test if client internal risk rating is high risk (because of independence considerations)	1	1 VS
Test if internal client risk rating is high risk (as testing gives a more specific estimate, while developing a range creates latitude)	1	1 EA
Develop if estimation uncertainty is high	1	1 EA
Develop if estimate is highly sensitive to input parameters	1	1 EA
Test if company is unique (not enough comparable entities) to develop own independent cash flows	1	1 EA
Test if company has unique circumstances (e.g., postal strike) making it difficult to develop own independent cash flow	1	1 EA
Test if there is no recent market transactions	1	1 EA
Develop if inherent risk is high	1	1 JA
Test if highly material amount	1	1 EA

[80] "A" stands for "experienced auditor", VS stands for "valuation specialist", and "JA" stands for "junior auditor".

TABLE 7 Reasons for Developing an Alternative Model and Assumptions

Panel A: Reasons for Developing an Alternative Model[81]

Reason for Developing Alternative Model	Total Participants	Participants by Group
Use after-tax equity discount rate under levered approach, then report pre-tax to comply with IFRS	8	7 VS, 1 EA
Use mid-period discounting instead of end of year discounting	6	6 VS
Include CapEx in the model	6	3 EA, 3 VS
Include working capital changes in the model	4	1 EA, 3 VS
Account for CCA tax shield/tax amortization benefits	4	3 EA, 1 VS
Use debt-free instead of levered approach	3	3 VS
Use finite number of year CF forecast instead of perpetual forecast	2	1 EA, 1 VS
Include cash taxes based on CCA groups/pools rather than book base taxes based on depreciation	2	1 EA, 1 VS
Incorporate cyclical patterns in the model	2	1 EA, 1 VS
Include exchange rate factors in the model	2	1 EA, 1 VS
Exclude anything not relating to current state of company (e.g., planned reduction in pension costs, expansion plans)	2	2 EA

[81] Only frequencies >= 2 are reported in the Panel.

TABLE 7 Continued

Panel B: Reasons for Developing Alternative Assumptions[82]

Reason for Developing Alternative Assumptions	Total Participants	Participants by Group
Discount Rate		
Insufficient support for equity risk premium calculation	8	6 EA, 2 VS
Use CAPM to calculate discount rate rather than build-up	7	1 EA, 6 VS
Recalculate discount rate	6	2 EA, 2 VS, 2 JA
Confirm BBB is a good approximation of company borrowing rate	5	1 EA, 4 VS
Include company specific (projection, forecast) risk into discount rate	4	4 VS
Use longer than 10-year horizon for risk-free rate since VIU	4	3 EA, 1 VS
Risk of changes in revenues/operating costs (projection, forecast risk) should be included in discount rate, to avoid double counting	4	1 EA, 3 VS
Tax Rate		
Tax rate influenced by US sales/countries where company operates	5	2 EA, 3 JA
Use tax rate which is closer to historical effective tax rates	4	1 EA, 1 VS, 2 JA
Growth Rate		
Historical revenue decrease larger than forecasted decrease	12	6 EA, 5 VS, 1 JA
Industry forecast indicates management is optimistic	10	4 EA, 1 VS, 5 JA
Terminal (l/t) growth rate of -3 percent seem too high/optimistic	5	4 EA, 1 JA
Historical revenue decrease larger than industry forecasted decrease	4	1 EA, 1 VS, 2 JA
Variable Operating Expenses		
Breakdown of variable and fixed op expenses on financial statements is unknown	9	6 EA, 1 VS, 2 JA
Fixed Operating Expenses		
Decline in fixed operating expenses larger than revenue decline	7	5 EA, 1 VS, 1 JA
Investigate/correct for forecasted decline	6	4 EA, 2 JA
SG&A Expenses		
Historical SGA larger than forecasted SGA	6	2 EA, 4 JA
Investigate/correct for forecasted decline	5	4 EA, 1 JA
Financing Charges		
Recalculate financing charges as a percentage of revenue against actual debt interest in contracts/financials	5	4 EA, 1 JA
Determine/quantify how derivatives influence fin charges	5	1 EA, 4 JA
Financing charges may be overstated	5	1 EA, 4 JA

[82] Only frequencies >= 4 are reported in the Panel.

TABLE 8 Information Used to Evaluate/Develop Alternative Model Assumptions

Panel A: Sources of Information Used for Model Assumptions[83]

Sources of Information Used for Model Assumptions	Total Participants
Discount Rate	
Use industry information	24
Use management memo	7
Use management discussion of risk factors information	5
Use company-specific information on risks to determine which side of industry range it is at	3
Tax Rate	
Use industry information	17
Use management memo	11
Use historical information	4
Growth Rate	
Use industry information	32
Use historical information	14
Use management discussion of risk factors information	10
Use comparison to prior year information	4
Use management memo	4
Use economic information (inflation, etc.)	3
Variable Operating Expenses	
Use industry information	30
Use historical information	15
Use management memo	8
Use management discussion of risk factors information	3
Fixed Operating Expenses	
Use industry information	16
Use historical information	10
Use management memo	9
Use discussion (inquiry) with management	4
Use economic information (inflation, etc.)	3
Use management memo - specifically pension costs	3
SG&A Expenses	
Use industry information	18
Use historical information	16
Use management memo	6
Use economic information (inflation, etc.)	4
Financing Charges	
Use historical information	11
Use management memo	8
Use management discussion of risk factors information	6

[83] Only frequencies >= 3 are reported in the Panel.

Use F/S (current vs. historical)	4
Use CFS	3
Use notes to the F/S	3

TABLE 8 Continued

Panel B: Use of Industry Sources When Developing Alternative Model Assumptions[84]

Industry Information Used to Develop Alternative Model Assumptions	Total Participants
Use 55/53 percent (industry range) for terminal (l/t) variable operating expenses	12
Use 16.9/13.4 percent (industry range) for discount rate	10
Use 55/53 percent (industry range) for s/t variable operating expenses	10
Use 27/24 percent (industry range) for tax rate	9
Use -4.25/-3.25 percent (widest range based on 2 industry sources) for s/t growth rate	7
Do not use any industry ranges for unaided ranges	6
Use -4.25/-3.25 percent (widest range based on 2 industry sources) for terminal (l/t) growth rate	4
Use 16.9/15.6 percent (industry/management) for discount rate	2
Use -4.3/-3.3 percent (approximately widest range based on 2 industry sources) for s/t growth rate	2
Use -4/-3.25 percent (EMAF range) for s/t growth rate	2

[84] Only frequencies >= 2 are reported in the Panel.

TABLE 9 Width of the Participants' Range and Its Relation to Audit Materiality

	Participant	Developed Range	Lower Bound	Upper Bound	Range Width	Times Materiality
	Experienced Auditors					
1	EA Big 4 #1.1	No	$114,175,376	$130,654,367	$16,478,991	27.46
2	EA Big 4 #1.2	No	N/A	N/A	N/A	N/A
3	EA Big 4 #1.3	No	N/A	N/A	N/A	N/A
4	EA Big 4 #1.4	No	N/A	N/A	N/A	N/A
5	EA Big 4 #1.5	Yes	$27,424,062	$91,662,352	$64,238,290	107.06
6	EA Big 4 #1.6	Yes	$74,890,708	$107,669,111	$32,778,403	54.63
7	EA Big 4 #2.1	Yes	$44,101,297	$90,439,036	$ 46,337,739	77.23
8	EA Big 4 #2.2	Yes	$60,192,229	$95,784,291	$ 35,592,062	59.32
9	EA Big 4 #2.3	No	N/A	N/A	N/A	N/A
10	EA Big 4 #3.1	Yes	$71,733,533	$108,463,465	$36,729,932	61.22
11	EA Big 4 #3.2	Yes	$86,034,255	$94,699,081	$8,664,826	14.44
12	EA Big 4 #3.3	No	N/A	N/A	N/A	N/A
13	EA Big 4 #3.4	Yes	$18,862,614	$182,778,352	$163,915,738	273.19
14	EA Big 4 #3.5	Yes	$68,185,926	$106,520,592	$38,334,666	63.89
15	EA Big 4 #3.6	Yes	$70,212,350	$82,861,102	$12,648,752	21.08
16	EA Big 4 #3.7	Yes	$74,518,521	$95,784,291	$21,265,770	35.44
17	EA Big 6 #1.1	Yes	$68,920,551	$107,563,414	$38,642,863	64.40
18	EA Big 6 #1.2	Yes	$65,704,355	$102,703,602	$36,999,247	61.67
19	EA Big 6 #1.3	Yes	$71,918,051	$111,268,881	$39,350,830	65.58
20	EA Big 6 #1.4	Yes	$66,998,990	$108,307,020	$41,308,030	68.85
21	EA Big 6 #1.5	No	N/A	N/A	N/A	N/A
				Average:	**$41,641,446**	**69.40**
				Average excluding two extreme observations:	**$34,772,395**	**57.95**
	Valuation Specialists					
1	VS Big 4 #1.1	No	N/A	N/A	N/A	N/A
2	VS Big 4 #1.2	No	N/A	N/A	N/A	N/A
3	VS Big 4 #1.3	No	N/A	N/A	N/A	N/A
4	VS Big 4 #1.4	No	N/A	N/A	N/A	N/A
5	VS Big 4 #2.1	No	N/A	N/A	N/A	N/A
6	VS Big 4 #2.2	No	N/A	N/A	N/A	N/A
7	VS Big 4 #2.3	No	N/A	N/A	N/A	N/A
8	VS Big 6 #1.1	Yes	$67,282,680	$112,705,129	$45,422,449	75.70
9	VS Big 6 #1.2	No	N/A	N/A	N/A	N/A
				Average:	**$45,422,449**	**75.70**
				Average excluding two extreme observations:	**N/A**	**N/A**

	Junior Auditors					
1	JA #1	Yes	$79,018,288	$110,793,129	$31,774,841	52.96
2	JA #2	No	N/A	N/A	N/A	N/A
3	JA #3	Yes	$33,012,846	$142,294,142	$109,281,296	182.14
4	JA #4	Yes	$58,958,360	$89,766,676	$30,808,316	51.35
5	JA #5	Yes	$2,902,469	$62,773,942	$59,871,473	99.79
6	JA #6	Yes	$61,252,380	$93,430,985	$32,178,605	53.63
7	JA #7	Yes	$69,731,968	$103,205,438	$33,473,471	55.79
8	JA #8	Yes	$73,406,947	$114,895,935	$41,488,988	69.15
9	JA #9	Yes	$63,896,931	$103,188,208	$39,291,277	65.49
10	JA #10	Yes	$43,887,514	$130,067,730	$86,180,216	143.63
11	JA #11	No	N/A	N/A	N/A	N/A
				Average:	**$51,594,276**	**85.99**
				Average excluding two extreme observations:	**$46,322,696**	**77.20**

TABLE 9B Summary of the Finding for Each of the Research Questions

	Research Question	Findings in Summarized Form
RQ 1	Do the participants recognize the necessity to test goodwill for impairment annually as prescribed in IAS 36, irrespective of the existence of indicators of impairment? Do the participants recognize that indicators of impairment are present/consider indicators of impairment?	A large proportion of participants across all of the groups consider goodwill impairment indicators. Industry- and company-level revenue decline due to a technology change is the most frequently noted indicator of impairment. Among the related factors raised are interconnections between goodwill and intangible assets impairment indicators, and the necessity to pay close attention to impairments of intangibles as a result of that. Other factors considered include implications for impairment of specific long-lived assets belonging to the envelope business CGU, consistency of the indicators of goodwill impairment with certain economic facts presented elsewhere in the case materials, consistency of the current indicators with those used in prior periods impairment testing, disclosure quality of the impairment indicators, and others.
RQ 2	Do the participants consider the sources of goodwill, specifically that the goodwill arose from past business combinations?	A small proportion of participants across all of the groups consider verifying the source of goodwill (i.e. that it arose from past business combinations). This may be explained by Supremex being a continuing client, so that most of the participants implicitly assume that they can rely on prior audits regarding the source of recorded goodwill.
RQ 3	Do the participants recognize the need to obtain assurance on the CGU determination as a part of the auditing task and explain that further investigation is not necessary because of the instructions to concur with the management CGU determination? Do the participants recognize the need to understand at what level goodwill is tested (CGU or other)?	The experienced auditors pay more attention to CGU determination when compared to valuation specialists, which may be explained by another finding of this study, whereby the division of labor between auditors and valuation specialists assumes that the former are primarily responsible for the issue. Junior auditors do not consider CGU determination, and the reasons for that remain to be investigated.
RQ 4	Do the participants assess the RMM (risk of material misstatement) related to the CGU/goodwill impairment, including inherent risk and control risk?	The factors related to RMM are considered almost exclusively by auditors and include primarily internal control considerations, which is somewhat surprising given that the same participants suggest that pure substantive approach is most frequently used to test goodwill impairments and that this approach is also applicable in the case of Supremex.
RQ 5	Do the participants assess the degree of estimation uncertainty related to the CGU/goodwill impairment?	Only a small proportion of experienced auditors and valuation specialists elaborate on the issue of estimation uncertainty, which is unexpected given that the case is an audit of a complex accounting estimate (the most frequent consideration is that high estimation uncertainty requires developing a range).
RQ 6	Do the participants use combined or pure	The choice between a combined and a fully

	substantive audit approach when auditing the CGU/goodwill impairment?	substantive approach to CGU impairment audit is primarily discussed by senior auditors. Of those, some propose to use a fully substantive approach for Supremex, while also suggesting that in general a vast majority of impairment audits are substantive. No one proposes taking a combined approach in Supremex's case. Some participants say that testing certain controls, in principle, may lead to a reduction of substantive work (review controls over the impairment are most frequently mentioned as a specific example).
RQ 7	Do the participants elect to test management's estimate or to develop their own estimate or range when auditing the CGU/goodwill impairment? What factors influence the participants' choice re: testing vs. developing the impairment estimate?	The choice across the three groups split among developing an auditor's own estimate or range, testing the management's estimate, and a combination of the two approaches. Some of the experienced auditors and valuation specialists appear to have difficulty when classifying their actions into the two mutually exclusive categories prescribed by the standards.
RQ 8	Do the participants elect to use assumptions (model) alternative to management's assumptions (model), or both?	The valuation specialists overwhelmingly elect to make modifications to the management's model. On the other hand, auditors are less critical of the management's model. They tend to develop alternative assumptions or verify the management-suggested assumptions, while leaving the management-suggested model either largely intact or with less significant modifications than those proposed by the valuation specialists.
RQ 9	If a participant elects to use assumptions (model) alternative to management's assumptions (model), what reasoning does the participant provide that in their view necessitates the application of the alternative assumptions (model), if any?	The most frequent reasons for changing the model include the use of alternative types of discounting methods, the need to include certain items omitted from the forecast such as capital expenditure cash outlays, CCA tax shield/tax amortization benefits, and working capital changes, and the application of debt-free (vs. levered) valuation approach. The reasons for developing an alternative set of assumptions vary depending on the input parameter, e.g. for the discount rate the most frequently cited reasons for modification include insufficient support for the equity risk premium calculation, the use of CAPM (vs. build-up) method, the need to recalculate the discount rate, the need to include company specific (projection, forecast) risk into the discount rate, and others.
RQ 10	If a participant elects to use assumptions (model) alternative to management's assumptions (model), what source(s) of information does the participant use to support the alternative assumptions (model), if any?	The main source of information for all of the participants who develop an alternative model appears to be their general valuation knowledge. The valuation specialists' sources choice is wider compared to the auditors, as they draw on the firm's pool of valuation methods and techniques, such as

		pre-set valuation model templates. With regard to the assumptions, both auditors and valuation specialists use multiple sources of information, including but not limited to external information not originating from the company (industry information), long time-series of the company-specific comparatives (historical information), and internal sources such as management's memo or management's analysis of risk factors.
RQ 11	Do the participants' who developed a range attempt to narrow it down? Based on what audit evidence the participants' range is narrowed? Do the participants factor in materiality when narrowing the range and making the conclusion about its reasonableness?	For all of the participants who developed a range (with no exceptions), the width of the range is many times the audit materiality, consistent with concerns raised in Christensen et al. (2012) about the auditability of complex FVs. Since there is only one interval available for the valuation specialists, a reliable comparison of this group of participants to the other two groups is problematic. However, the data suggests that auditors' intervals for the experienced auditors are narrower on average than those for junior auditors. These may indicate that increase in auditor's expertise leads to narrowing of the auditor's range. Overall, the results are best characterized by Smieliauskas' (2012) "Estimate nightmare" scenario, which takes place when twice the materiality is smaller than the width of the reasonable range, meaning that all points inside or outside of the reasonable range have a significant risk.
RQ 12	Do the participants recognize the need to calculate FVLCS of the CGU in addition to its VIU, to determine the recoverable amount?	Relatively more valuation specialists, compared to auditors, recognize the necessity to calculate VFLCS of the CGU in addition to its VIU calculation. The limited attention to this issue from the auditors may be explained by the majority of case facts pertaining to calculation of VIU, indicating that the auditors may be anchoring on management's method of calculation of the RA. The valuation specialists, on the other hand, are less likely to anchor since they are more familiar with the different ways to calculate FVs. An alternative explanation would be that the auditors are generally less concerned with a possible overstatement of the impairment, compared to its understatement, thus creating an opportunity for the management to take a "big bath" or to implement an income smoothing strategy.
RQ 13	How do the participants factor in any indicators of management's bias that in their view are present when drawing their conclusion about the reasonableness of the management's estimate or developing their own estimate or range, if at all?	Some of experienced auditors, valuation specialists, and junior auditors consider possible management's bias due to factors other than management's compensation (making the company look better for a possible acquisition is the most frequently cited reason). One valuation specialist also considers the possibility of the Board's bias due to the potential acquirer presence on the Board of Supremex (subject

		to the Board's involvement in the goodwill valuation process).
RQ 14	Do the participants review management's compensation information when considering indicators of possible management bias, if at all? If yes, do they consider different components of management's compensation and the impact of CGU/goodwill impairment on these components in the short- and long-terms?	Participants across all of the groups appear to factor-in, to some degree, information about management's compensation when considering possible management's bias. However, a significant proportion of the auditors do not appear to fully recognize how the goodwill impairment impacts certain drivers of management compensation.
RQ 15	What judgmental heuristics (such as anchoring-and-adjustment, availability, or representativeness) influence the participants' selection of the alternative assumptions (model), if any?	The results reveal that both the experienced auditors and the valuation specialists tend to gravitate toward their firm's commonly used methodology. One example of availability heuristics (as well as of an apparent deficiency in the current valuation methodology application in audit settings) is the use of "+/- 10%" interval when determining the valuation specialists' range for a FV, which is developed based on their point estimate for that FV. In addition to being a possible example of availability, the application of the "+/-10% rule" demonstrates that some of the valuation specialists consider uncertainty inherent in FVs as a concept separate from that of audit materiality, as the rule's application typically leads to FV ranges wider than the materiality.
RQ 16	What judgmental heuristics influence the participant's judgment in the process of narrowing their own range?	One heuristic that arises in the process of arriving from the auditor's range to a point estimate of the CGU RA is taking the average of the range as a point estimate, exhibited by almost half of the auditors who developed a range for the CGU RA. This approach appears to be based on availability and is not suggested in auditing or accounting standards, except as a simplified strategy in certain situations. Many auditors who developed a range do not mention that the auditor's range should be narrowed down to be within the AM, and use a range which is many times the size of the materiality to arrive at their conclusion about the management's estimate.
RQ 17	Are there indications of any deliberate biases in the participants' process of selecting the alternative assumptions (model)?	No indication of such deliberate biases
RQ 18	Are there indications of any deliberate biases in the participants' process of narrowing their own range?	No indication of such deliberate biases
RQ 19	How are various specialists involved in the CGU/goodwill impairment audit?	The experienced auditors and valuation specialists involve tax specialists to examine the tax rate and for other tax-related parameters such as CCA groups and R&D tax credit relevant to the CF forecast; involve their actuarial specialists to examine the pension liability; and involve their complex securities

		specialists to deal with the financial liability. Most frequently mentioned responsibility of the auditors are examining the management's CF forecast and examining the expenses. Some of the participants say that auditors are better equipped to examine the CF forecast and expenses since they know the company and/or the industry better than valuation specialists. On the other hand, the primary responsibility of valuation specialists appears to be examining or developing the discount rate. The second most frequently cited responsibility of the valuation specialists is examining the valuation model. The involvement of 3rd party (external) valuation specialists is primarily discussed by the valuation specialists, who will ask the client to hire an external valuator if the management lacks qualifications to do their own valuation. Some of the valuation specialists suggest that this request will be communicated to the management/audit committee and that they will have a conversation with the 3rd party specialists regarding the shortcomings of the management's analysis.

TABLE 10 Probability Distribution Elicitation Methods

Elicitation Method	Abbreviated name	Examples of Studies
Judgmental point estimate elicitation/forecasting		Lawrence et al. (2006) (Economics/Management)
Cumulative distribution function (CDF) elicitation technique or "variable interval method"	CDF technique	Crosby (1980) (Auditing) Crosby (1981) (Auditing) Solomon (1982) (Auditing) Tomassini et al. (1982) (Auditing) Solomon et al. (1985) (Auditing) Shephard and Kirkwood (1994) (Management) Dominitz (1998) (Economics) Laws and O' Hagan (2002) (Auditing) Berg (2006) (Economics) Budescu and Du (2007) (Finance)
Credible interval elicitation	CI technique	Teigen and Jorgensen (2005) (Psychology) McKenzie et al. (2008) (Management) Hansson et al. (2008) (Psychology) Lambert et al. (2012) (Psychology/Economics)
Elicitation methods involving real or hypothetical payoffs (influenced by individuals' utility functions), such as lotteries, scoring rules, and promissory notes		Kadane and Winkler (1988) (Economics/Management)

TABLE 11 Illustration of the Elicitation Methods Used in the Study

Panel A: CDF Elicitation Method Illustration (Fractiles Chosen as in Tomassini et al. 1982)

Questions Asked to Experts	Resulting CDF
Please identify a median amount (in appropriate units of measurement) such that it is equally likely that the true population value (i.e., account balance, interest rate, growth rate, etc.) would be above or below the amount	This amount would represent the expert's .50 fractile
Please identify a value such that there is a 25% chance that the true value is actually lower than the value and a 75% chance that it is actually higher	This amount would represent the expert's .25 fractile
Please identify a value such that there is a 75% chance that the true value is actually lower than the value and a 25% chance that it is actually higher	This amount would represent the expert's .75 fractile
Please identify a value such that there is a 10% chance that the true value is actually lower than the value and a 90% chance that it is actually higher	This amount would represent the expert's .10 fractile
Please identify a value such that there is a 90% chance that the true value is actually lower than the value and a 10% chance that it is actually higher	This amount would represent the expert's .90 fractile
Please identify a value such that there is a 1% chance that the true value is actually lower than the value and a 99% chance that it is actually higher	This amount would represent the expert's .01 fractile
Please identify a value such that there is a 99% chance that the true value is actually lower than the value and a 1% chance that it is actually higher	This amount would represent the expert's .99 fractile

TABLE 11 Continued

Panel B: Credible Interval Elicitation Method Illustration

Questions Asked to Experts	Resulting Credible (Confidence) Interval
Please identify a lower bound for the 90% confidence interval for the true population value (in appropriate units of measurement)	This amount would represent the lower bound for the expert's 90% confidence interval
Please identify a lower bound for the 50% confidence interval for the true population value	This amount would represent the lower bound for the expert's 50% confidence interval
Please identify a lower bound for the 25% confidence interval for the true population value	This amount would represent the lower bound for the expert's 25% confidence interval
Please identify a median amount such that it is equally likely that the true population value would be above or below the amount	This amount would represent the expert's median
Please identify an upper bound for the 25% confidence interval for the true population value	This amount would represent the upper bound for the expert's 25% confidence interval
Please identify an upper bound for the 50% confidence interval for the true population value	This amount would represent the upper bound for the expert's 50% confidence interval
Please identify an upper bound for the 90% confidence interval for the true population value	This amount would represent the upper bound for the expert's 90% confidence interval

TABLE 12 Selected Demographic Information for the Participants – Elicitation Study

Participant	Audit Firm	Group	Rank	Accounting Designation	Other Designations / Credentials	# of Impairment Analyses Performed in the Last Two Years
EA, Method E1						
EA Big 4 #1.2	Big 4 #1	Assurance	Manager	CPA, CA		11
EA Big 4 #3.3	Big 4 #3	Assurance	Senior Manager	CPA, CA		5
EA Big 6 #1.3	Big 6 #1	Assurance	Manager	CPA, CA		1
EA Big 6 #1.4	Big 6 #1	Assurance	Manager	CPA, CA		2
EA Big 4 #2.3	Big 4 #2	Advisory - Complex Accounting & Transaction Expertise Group	Partner	CPA,CA	CFA	5
EA Big 4 #1.5	Big 4 #1	Assurance	Manager	CPA, CA		8
EA Big 4 #1.6	Big 4 #1	Assurance - Professional Practice	Partner	FCPA, FCA	Lawyer	11
Total Number, EA E1	**7**				**Average #, EA E1**	**6.1**
VS, Method E1						
VS Big 4 #1.1	Big 4 #1	Valuation Specialist	Senior Manager	CPA, CA	CBV	10
VS Big 4 #1.2	Big 4 #1	Valuation Specialist	Vice President Valuations	CPA, CA	CBV	11
VS Big 6 #1.2	Big 6 #1	Valuation Specialist	Senior Manager	CPA	CBV, CFA	11
VS Big 4 #2.3	Big 4 #2	Valuation Specialist	Senior Manager	CPA, CA	CBV, CFA	*[85]
Total Number, VS E1	**4**				**Average #, VS E1**	**8.0**
JA, Method E1						
JA #1	MAcc Student	N/A	Associate			0
JA #2	MAcc Student	N/A	Intermediate Staff Accountant			2
JA #3	MAcc Student	N/A	Intermediate Staff Accountant			2
Total Number, JA E1	**3**				**Average #, JA E1**	**1.3**
Total Number,	**14**				**Average #,**	**5.6**

[85] "*" denotes that the participant performed impairment analyses in the period before the most recent 2-year period.

E1					**E1**	
EA, Method E2						
EA Big 4 #1.3	Big 4 #1	Assurance	Senior Manager	CPA		2
EA Big 4 #1.4	Big 4 #1	Assurance	Senior Manager	CPA, CA		*
EA Big 4 #2.1	Big 4 #2	Assurance	Senior Manager	CPA, CA	MBA	4
EA Big 4 #2.2	Big 4 #2	Assurance	Manager	CPA, CA		2
EA Big 6 #1.1	Big 6 #1	Assurance - National Assurance Standards Group	Senior Manager	CPA, CA		11
EA Big 6 #1.2	Big 6 #1	Assurance	Senior Manager	CPA, CA		5
EA Big 4 #3.1	Big 4 #3	Assurance	Senior manager	CPA, CA		3
EA Big 4 #3.2	Big 4 #3	Assurance	Manager	CPA, CA		2
EA Big 4 #3.4	Big 4 #3	Assurance	Experienced Manager	CPA, CA		5
EA Big 4 #3.5	Big 4 #3	Assurance	Senior Manager	CPA, CA		1
EA Big 4 #3.7	Big 4 #3	Assurance	Manager	CPA, CA		*
Total Number, EA E2	**11**				**Average #, EA E2**	**3.2**
VS, Method E2						
VS Big 6 #1.1	Big 6 #1	Valuation Specialist	Manager	CA,CPA	CBV	11
VS Big 4 #2.2	Big 4 #2	Valuation Specialist	Senior Manager	CA, CPA	CBV	11
Total Number, VS E2	**2**				**Average #, VS E2**	**11.0**
JA, Method E2						
JA #4	MAcc Student	N/A	Staff Accountant			1
JA #5	MAcc Student	N/A	Staff Accountant			2
JA #6	MAcc Student	N/A	Associate			11
JA #7	MAcc Student	N/A	Senior Staff Accountant			3
JA #8	MAcc Student	N/A	Intermediate Associate, Returning as Senior Associate			0
JA #9	MAcc Student	N/A	Experienced Associate			2
JA #10	MAcc Student	N/A	Second Year Staff Accountant			3
JA #11	MAcc Student	N/A	Intermediate Staff Accountant			1
Total Number, JA E2	**8**				**Average #, JA E2**	**2.9**

Total Number, E2	**21**				**Average #, E2**	**3.8**
Total Number, EA E1 and E2	**18**				**Average #, EA E1 and E2**	**4.3**
Total Number, VS E1 and E2	**6**				**Average #, VS E1 and E2**	**9**
Total Number, JA E1 and E2	**11**				**Average #, JA E1 and E2**	**2.5**
Total Number, E1 and E2	**35**				**Average #, E1 and E2**	**4.5**

TABLE 13 Comparison of Elicited Intervals to Unaided Intervals for Each Group of Participants

Panel A: Results by Group, Elicitation Method E1 (CDF) – Comparison of Elicited to Unaided Intervals

		Unassisted			Widest			Middle			Narrowest	
	Participant	**Range Width**	**Times AM**		**Range Width**	**Times AM**		**Range Width**	**Times AM**		**Range Width**	**Times AM**
	EA, Method E1											
1	EA Big 4 #1.2	Did not develop										
2	EA Big 4 #3.3	Did not develop										
3	EA Big 6 #1.3	$ 39,350,830	65.58		$ 76,420,688	127.37		$ 55,981,112	93.30		$ 33,707,115	56.18
4	EA Big 6 #1.4	$ 41,308,030	68.85		$ 348,015,637	580.03		$ 183,884,424	306.47		$ 85,360,459	142.27
5	EA Big 4 #2.3	Did not develop										
6	EA Big 4 #1.5	$ 64,238,290	107.06		$ 257,676,398	429.46		$ 165,376,493	275.63		$ 93,552,888	155.92
7	EA Big 4 #1.6	$ 32,778,403	54.63		$ 164,265,547	273.78		$ 101,238,300	168.73		$ 53,200,008	88.67
	Average:	**$ 44,418,888**	**74.03**		**$ 211,594,567**	**352.66**		**$ 126,620,082**	**211.03**		**$ 66,455,117**	**110.76**
	St. Dev.:	**$ 11,870,891**	**19.78**		**$ 101,545,873**	**169.24**		**$ 51,027,843**	**85.05**		**$ 24,185,898**	**40.31**
	VS, Method E1											
1	VS Big 4 #1.1	Did not develop										
2	VS Big 4 #1.2	Did not develop										
3	VS Big 6 #1.2	Did not develop										
4	VS Big 4 #2.3	Did not develop										
	Average:	**N/A**	**N/A**		**N/A**	**N/A**		**N/A**	**N/A**		**N/A**	**N/A**
	St. Dev.:	**N/A**	**N/A**		**N/A**	**N/A**		**N/A**	**N/A**		**N/A**	**N/A**
	JA, Method E1											
1	JA #1	$ 31,774,841	52.96		$ 179,326,164	298.88		$ 86,651,635	144.42		$ 33,639,067	56.07
2	JA #2	Did not develop										
3	JA #3	$ 109,281,296	182.14		$ 242,812,619	404.69		$ 161,901,331	269.84		$ 86,499,440	144.17
	Average:	**$ 70,528,069**	**117.55**		**$ 211,069,391**	**351.78**		**$ 124,276,483**	**207.13**		**$ 60,069,254**	**100.12**
	St. Dev.:	**$ 38,753,227**	**64.59**		**$ 31,743,228**	**52.91**		**$ 37,624,848**	**62.71**		**$ 26,430,186**	**44.05**

TABLE 13 Continued

Panel B: Results by Group, Elicitation Method E2 (CI) – Comparison of Elicited to Unaided Intervals

		Unassisted			Widest			Middle			Narrowest		
	Participant	**Range Width**	**Times AM**		**Range Width**	**Times AM**		**Range Width**	**Times AM**		**Range Width**	**Times AM**	
	EA, Method E2												
1	EA Big 4 #1.3	Did not develop											
2	EA Big 4 #1.4	Did not develop											
3	EA Big 4 #2.1	$ 46,337,739	77.23		$ 135,739,770	226.23		$ 75,561,037	125.94		$ 36,469,209	60.78	
4	EA Big 4 #2.2	$ 35,592,062	59.32		$ 47,927,767	79.88		$ 31,418,582	52.36		$ 14,516,894	24.19	
5	EA Big 6 #1.1	$ 38,642,863	64.40		$ 34,411,985	57.35		$ 22,347,030	37.25		$ 7,076,150	11.79	
6	EA Big 6 #1.2	$28,334,802	47.22		$ 92,279,641	153.80		$ 69,852,067	116.42		$ 36,428,593	60.71	
7	EA Big 4 #3.1	$ 36,729,932	61.22		$ 25,692,483	42.82		$ 12,753,489	21.26		$ 3,240,419	5.40	
8	EA Big 4 #3.2	$ 8,664,826	14.44		$ 29,695,817	49.49		$ 17,469,075	29.12		$ 6,956,804	11.59	
9	EA Big 4 #3.4	$ 163,915,738	273.19		$ 383,428,946	639.05		$ 216,135,545	360.23		$ 110,635,404	184.39	
10	EA Big 4 #3.5	$ 38,334,666	63.89		$ 51,146,268	85.24		$ 26,470,207	44.12		$ 13,058,433	21.76	
11	EA Big 4 #3.7	$ 21,265,770	35.44		$ 105,915,090	176.53		$ 65,649,070	109.42		$ 34,546,891	57.58	
	Average:	**$46,424,266**	**77.37**		**$ 100,693,085**	**167.82**		**$ 59,739,567**	**99.57**		**$ 29,214,311**	**48.69**	
	StDev:	**$42,853,129**	**71.42**		**$ 106,230,277**	**177.05**		**$ 59,766,975**	**99.61**		**$ 31,446,029**	**52.41**	
	VS, Method E2												
1	VS Big 6 #1.1	$ 45,422,449	75.70		$ 41,402,435	69.00		$ 27,440,148	45.73		$ 13,474,044	22.46	
2	VS Big 4 #2.2	Did not develop											
	Average:	**N/A**	**N/A**		**N/A**	**N/A**		**N/A**	**N/A**		**N/A**	**N/A**	
	StDev:	**N/A**	**N/A**		**N/A**	**N/A**		**N/A**	**N/A**		**N/A**	**N/A**	
	JA, Method E2												
1	JA #4	$ 30,808,316	51.35		$ 30,984,204	51.64		$ 21,562,740	35.94		$ 10,432,211	17.39	
2	JA #5	$ 59,871,473	99.79		$ 170,942,240	284.90		$ 87,477,297	145.80		$ 34,875,629	58.13	
3	JA #6	$ 32,178,605	53.63		$ 36,722,125	61.20		$ 19,387,004	32.31		$	16.14	

											9,683,512		
4	JA #7	$ 33,473,471	55.79		$ 33,197,785	55.33		$ 21,176,552	35.29		$ 9,879,031	16.47	
5	JA #8	$ 41,488,988	69.15		$ 87,087,947	145.15		$ 50,285,510	83.81		$ 25,349,048	42.25	
6	JA #9	$ 39,291,277	65.49		$ 83,734,182	139.56		$ 51,174,760	85.29		$ 23,733,944	39.56	
7	JA #10	$ 86,180,216	143.63		$ 1,189,006,473	1981.68		$ 495,731,421	826.22		$ 170,155,130	283.59	
8	JA #11	Did not develop											
	Average:	**$ 46,184,621**	**76.97**		**$ 233,096,422**	**388.49**		**$ 106,685,041**	**177.81**		**$ 40,586,929**	**67.64**	
	StDev:	**$ 18,711,025**	**31.19**		**$ 392,906,096**	**654.84**		**$ 160,431,016**	**267.39**		**$ 53,644,407**	**89.41**	

TABLE 14 Implied Confidence Levels for the Unaided Auditor's Intervals for the CGU Recoverable Amount Computed via Comparison to the Assisted Auditor's Intervals

Panel A: Implied Confidence Levels by Group, Elicitation Method E1 (CDF) – Unadjusted Assisted Intervals

		Unassisted	Widest	Middle	Narrowest			
	Participant	**Times AM**	**Times AM**	**Times AM**	**Times AM**	**Relation of Unaided Interval to Elicited Intervals**	**Implied Confidence Level (Interval Form) for Unaided Interval**	**Imputed Confidence Level (Point Form) for Unaided Interval**
	EA, Method E1		**98% Confidence**	**80% Confidence**	**50% Confidence**			
1	EA Big 4 #1.2	Did not develop						
2	EA Big 4 #3.3	Did not develop						
3	EA Big 6 #1.3	65.58	127.37	93.30	56.18	Between narrowest and middle	50% < Confidence level < 80%	58%
4	EA Big 6 #1.4	68.85	580.03	306.47	142.27	Smaller than narrowest	Confidence level<50%	47%
5	EA Big 4 #2.3	Did not develop						
6	EA Big 4 #1.5	107.06	429.46	275.63	155.92	Smaller than narrowest	Confidence level<50%	45%
7	EA Big 4 #1.6	54.63	273.78	168.73	88.67	Smaller than narrowest	Confidence level<50%	45%
	Average:	**74.03**	**352.66**	**211.03**	**110.76**			**49%**
	St. Dev.:	**19.78**	**169.24**	**85.05**	**40.31**			**5%**
	VS, Method E1							
1	VS Big 4 #1.1	Did not develop						
2	VS Big 4 #1.2	Did not develop						
3	VS Big 6 #1.2	Did not develop						
4	VS Big 4 #2.3	Did not develop						
	Average:	**N/A**	**N/A**	**N/A**	**N/A**			**N/A**
	St. Dev.:	**N/A**	**N/A**	**N/A**	**N/A**			**N/A**
	JA, Method E1							
1	JA #1	52.96	298.88	144.42	56.07	Smaller than narrowest	Confidence level<50%	49%* (55%)

2	JA #2	Did not develop						
3	JA #3	182.14	404.69	269.84	144.17	Between narrowest and middle	50% < Confidence level < 80%	59%
	Average:	**117.55**	**351.78**	**207.13**	**100.12**			**54%**
	St. Dev.:	**64.59**	**52.91**	**62.71**	**44.05**			**5%**

TABLE 14 Continued

Panel B: Implied Confidence Levels by Group, Elicitation Method E2 (CI) – Unadjusted Assisted Intervals

		Unassisted	Widest	Middle	Narrowest			
	Participant	**Times AM**	**Times AM**	**Times AM**	**Times AM**	**Relation of Unaided Interval to Elicited Intervals**	**Implied Confidence Level (Interval Form) for Unaided Interval**	**Imputed Confidence Level (Point Form) for Unaided Interval**
	EA, Method E2		**90% Confidence**	**50% Confidence**	**25% Confidence**			
1	EA Big 4 #1.3	Did not develop						
2	EA Big 4 #1.4	Did not develop						
3	EA Big 4 #2.1	77.23	226.23	125.94	60.78	Between narrowest and middle	25% < Confidence level < 50%	31%
4	EA Big 4 #2.2	59.32	79.88	52.36	24.19	Between middle and widest	50% < Confidence level < 90%	63%
5	EA Big 6 #1.1	64.40	57.35	37.25	11.79	Larger than widest	90% < Confidence level	96%
6	EA Big 6 #1.2	47.22	153.80	116.42	60.71	Smaller than narrowest	Confidence level < 25%	12%
7	EA Big 4 #3.1	61.22	42.82	21.26	5.40	Larger than widest	90% < Confidence level	99%* (121%)
8	EA Big 4 #3.2	14.44	49.49	29.12	11.59	Between narrowest and middle	25% < Confidence level < 50%	28%
9	EA Big 4 #3.4	273.19	639.05	360.23	184.39	Between narrowest and middle	25% < Confidence level < 50%	38%
10	EA Big 4 #3.5	63.89	85.24	44.12	21.76	Between middle and widest	50% < Confidence level < 90%	69%
11	EA Big 4 #3.7	35.44	176.53	109.42	57.58	Smaller than narrowest	Confidence level < 25%	12%
	Average:	**78.98**	**167.82**	**99.57**	**48.69**			**50%**
	StDev:	**70.89**	**177.05**	**99.61**	**52.41**			**31%**

	VS, Method E2							
1	VS Big 6 #1.1	75.70	69.00	45.73	22.46	Larger than widest	90% < Confidence level	97%
2	VS Big 4 #2.2	Did not develop						
	Average:	**N/A**	**N/A**	**N/A**	**N/A**			**N/A**
	StDev:	**N/A**	**N/A**	**N/A**	**N/A**			**N/A**
	JA, Method E2							
1	JA #4	51.35	51.64	35.94	17.39	Between middle and widest (approximately equal to widest)	50% < Confidence level < 90% (approximately = 90%)	86%
2	JA #5	99.79	284.90	145.80	58.13	Between narrowest and middle	25% < Confidence level < 50%	37%
3	JA #6	53.63	61.20	32.31	16.14	Between middle and widest	50% < Confidence level < 90%	80%
4	JA #7	55.79	55.33	35.29	16.47	Larger than widest (approximately equal to widest)	90% < Confidence level (approximately = 90%)	91%* (89%)
5	JA #8	69.15	145.15	83.81	42.25	Between narrowest and middle	25% < Confidence level < 50%	42%
6	JA #9	65.49	139.56	85.29	39.56	Between narrowest and middle	25% < Confidence level < 50%	40%
7	JA #10	143.63	1981.68	826.22	283.59	Smaller than narrowest	Confidence level < 25%	22%
8	JA #11	Did not develop						
	Average:	**76.97**	**388.49**	**177.81**	**67.64**			**57%**
	StDev:	**31.19**	**654.84**	**267.39**	**89.41**			**26%**

TABLE 14 Continued

Panel C: Implied Confidence Levels by Group, Elicitation Method E1 (CDF) – Adjusted Assisted Intervals

		Unassisted	Widest	Middle	Narrowest			
	Participant	**Times AM**	**Times AM**	**Times AM**	**Times AM**	**Relation of Unaided Interval to Elicited Intervals**	**Implied Confidence Level (Interval Form) for Unaided Interval**	**Imputed Confidence Level (Point Form) for Unaided Interval**
	EA, Method E1		**98% Confidence**	**80% Confidence**	**50% Confidence**			
1	EA Big 4 #1.2	Did not develop						
2	EA Big 4 #3.3	Did not develop						
3	EA Big 6 #1.3	65.58	107.93	79.37	48.56	Between narrowest and middle	50% < Confidence level < 80%	65%
4	EA Big 6 #1.4	68.85	500.52	263.74	122.34	Smaller than narrowest	Confidence level<50%	48%
5	EA Big 4 #2.3	Did not develop						
6	EA Big 4 #1.5	107.06	345.08	215.40	125.24	Smaller than narrowest	Confidence level<50%	49%* (50%)
7	EA Big 4 #1.6	54.63	150.50	93.79	38.64	Between narrowest and middle	50% < Confidence level < 80%	59%
	Average:	**74.03**	**276.01**	**163.08**	**83.69**			**55%**
	St. Dev.:	**19.78**	**157.46**	**78.55**	**40.26**			**7%**
	VS, Method E1							
1	VS Big 4 #1.1	Did not develop						
2	VS Big 4 #1.2	Did not develop						
3	VS Big 6 #1.2	Did not develop						
4	VS Big 4 #2.3	Did not develop						
	Average:	**N/A**	**N/A**	**N/A**	**N/A**			**N/A**
	St. Dev.:	**N/A**	**N/A**	**N/A**	**N/A**			**N/A**
	JA, Method E1							
1	JA #1	52.96	219.79	107.35	43.21	Between narrowest and middle	50% < Confidence level < 80%	58%
2	JA #2	Did not develop						
3	JA #3	182.14	385.92	256.06	138.21	Between narrowest and middle	50% < Confidence level < 80%	61%

	Average:	**117.55**	**302.85**	**181.70**	**90.71**			**59%**
	St. Dev.:	**64.59**	**83.07**	**74.35**	**47.50**			**2%**

TABLE 14 Continued

Panel D: Implied Confidence Levels by Group, Elicitation Method E2 (CI) – Adjusted Assisted Intervals

		Unassisted	**Widest**	**Middle**	**Narrowest**			
	Participant	**Times AM**	**Times AM**	**Times AM**	**Times AM**	**Relation of Unaided Interval to Elicited Intervals**	**Implied Confidence Level (Interval Form) for Unaided Interval**	**Imputed Confidence Level (Point Form) for Unaided Interval**
	EA, Method E2		**90% Confidence**	**50% Confidence**	**25% Confidence**			
1	EA Big 4 #1.3	Did not develop						
2	EA Big 4 #1.4	Did not develop						
3	EA Big 4 #2.1	77.23	214.36	118.67	58.36	Between narrowest and middle	25% < Confidence level < 50%	33%
4	EA Big 4 #2.2	59.32	79.88	52.36	24.19	Between middle and widest	50% < Confidence level < 90%	63%
5	EA Big 6 #1.1	64.40	57.35	37.25	11.79	Larger than widest	90% < Confidence level	96%
6	EA Big 6 #1.2	47.22	143.49	109.78	57.48	Smaller than narrowest	Confidence level < 25%	14%
7	EA Big 4 #3.1	61.22	42.82	21.26	5.40	Larger than widest	90% < Confidence level	99%* (121%)
8	EA Big 4 #3.2	14.44	14.44	8.70	2.93	Between middle and widest (approximately equal to widest)	50% < Confidence level < 90% (approximately = 90%)	90%* (87%)
9	EA Big 4 #3.4	273.19	378.12	243.88	110.06	Between middle and widest	50% < Confidence level < 90%	62%
10	EA Big 4 #3.5	63.89	64.27	34.30	17.55	Between middle and widest	50% < Confidence level < 90%	89%* (90%)
11	EA Big 4 #3.7	35.44	176.53	109.42	57.58	Smaller than narrowest	Confidence level < 25%	12%
	Average:	**78.98**	**130.14**	**81.74**	**38.37**			**62%**

	St. Dev.:	**70.89**	**107.54**	**69.36**	**33.26**			**33%**
	VS, Method E2							
1	VS Big 6 #1.1	75.70	69.00	45.73	22.46	Larger than widest	90% < Confidence level	97%
2	VS Big 4 #2.2	Did not develop						
	Average:	**N/A**	**N/A**	**N/A**	**N/A**			**N/A**
	St. Dev.:	**N/A**	**N/A**	**N/A**	**N/A**			**N/A**
	JA, Method E2							
1	JA #4	51.35	51.64	35.94	17.39	Between middle and widest (approximately equal to widest)	50% < Confidence level < 90% (approximately = 90%)	90%* (86%)
2	JA #5	99.79	132.98	68.09	25.87	Between middle and widest	50% < Confidence level < 90%	70%
3	JA #6	53.63	53.83	28.23	14.10	Between middle and widest (approximately equal to widest)	50% < Confidence level < 90% (approximately = 90%)	90%
4	JA #7	55.79	55.33	35.29	16.47	Larger than widest (approximately equal to widest)	90% < Confidence level (approximately = 90%)	90%* (89%)
5	JA #8	69.15	115.83	64.28	32.63	Between middle and widest	50% < Confidence level < 90%	54%
6	JA #9	65.49	119.09	73.03	33.53	Between narrowest and middle	25% < Confidence level < 50%	48%
7	JA #10	143.63	1028.94	516.97	199.87	Smaller than narrowest	Confidence level < 25%	21%
8	JA #11	Did not develop						
	Average:	**76.97**	**222.52**	**117.40**	**48.55**			**66%**
	St. Dev.:	**31.19**	**330.81**	**163.97**	**62.20**			**25%**

TABLE 15 Valuation Model Input Parameters for Which Elicited Distributions Were Developed While Point Estimates Were Used for the Unaided Auditor's Interval

	Participant	Model Input Parameters
		CDF Elicitation Method (E1)
E1	EA Big 6 #1.3	Variable operating expenses (short term); SG&A (short term)
E1	EA Big 6 #1.4	SG&A (both short term and terminal value); financing charges (both short term and terminal value)
E1	EA Big 4 #1.5	Fixed operating expenses (both short term and terminal value); financing charges (both short term and terminal value)
E1	EA Big 4 #1.6	Growth rate (both short term and terminal value); fixed operating expenses (both short term and terminal value); SG&A (both short term and terminal value)
E1	JA	Growth rate (short term); variable operating expenses (short term); fixed operating expenses (short term); SG&A (both short term and terminal value); financing charges (both short term and terminal value)
E1	JA	Fixed operating expenses (both short term and terminal value)
		CI Elicitation Method (E2)
E2	EA Big 4 #2.1	Perpetual growth rate
E2	EA Big 4 #2.2	Same[86]
E2	EA Big 6 #1.1	Same
E2	EA Big 6 #1.2	Variable operating expenses (short term)
E2	EA Big 4 #3.1	Same
E2	EA Big 4 #3.2	Disc rate; SG&A (both short term and terminal value)
E2	EA Big 4 #3.4	Tax rate; perpetual growth rate; variable operating (terminal value)
E2	EA Big 4 #3.5	Tax rate; fixed op expenses (both short term and terminal value); SG&A (terminal value)
E2	EA Big 4 #3.7	Same
E2	VS Big 6 #1.1	Same
E2	JA	Same
E2	JA	Disc rate; tax rate; variable operating expenses (terminal value); fixed op expenses (terminal value); SG&A term; financing charges (both short term and terminal value)
E2	JA	Fixed operating expenses both periods; financing charges (terminal value)
E2	JA	Same
E2	JA	Perpetual growth rate
E2	JA	Perpetual growth rate; fixed op expenses (terminal value); SG&A (both short term and terminal value)

[86] Intervals developed for the same input parameters in the process and elicitation studies

E2	JA	Tax rate; variable operating expenses (terminal value); fixed operating expenses (both short term and terminal value); SG&A (terminal value); financing charges (terminal value)

TABLE 16 Comparison of Elicitation Methods for Each Group of Participants

Panel A: Results by Group, Elicitation Method E1 (CDF)

	Widest			Middle			Narrowest		
Participant	**Range Width**	**Times AM**	**Label**	**Range Width**	**Times AM**	**Label**	**Range Width**	**Times AM**	**Label**
EA, Method E1									
EA Big 4 #1.2	$ 236,913,973	394.86		$ 116,891,783	194.82		$ 47,619,567	79.37	
EA Big 4 #3.3	$ 54,155,928	90.26		$ 38,711,000	64.52		$ 22,992,549	38.32	
EA Big 6 #1.3	$ 76,420,688	127.37		$ 55,981,112	93.30		$ 33,707,115	56.18	
EA Big 6 #1.4	$ 348,015,637	580.03		$ 183,884,424	306.47		$ 85,360,459	142.27	
EA Big 4 #2.3	$ 105,240,853	175.40		$ 66,388,758	110.65		$ 34,547,953	57.58	
EA Big 4 #1.5	$ 257,676,398	429.46		$ 165,376,493	275.63		$ 93,552,888	155.92	
EA Big 4 #1.6	$ 164,265,547	273.78		$ 101,238,300	168.73		$ 53,200,008	88.67	
Mean	**$ 177,527,003**	**295.88**		**$ 104,067,410**	**173.45**		**$ 52,997,220**	**88.33**	**A**
Standard Deviation	**$ 99,900,790**	**166.50**		**$ 51,137,715**	**85.23**		**$ 24,882,196**	**41.47**	**B**
VS, Method E1									
VS Big 4 #1.1	$ 2,733,908,341	4556.51		$ 466,174,133	776.96		$ 156,828,684	261.38	
VS Big 4 #1.2	$ 89,182,432	148.64		$ 57,865,479	96.44		$ 28,474,132	47.46	
VS Big 6 #1.2	$ 698,337,614	1,163.90		$ 220,751,052	367.92		$ 74,881,036	124.80	
VS Big 4 #2.3	$ 560,823,555	934.71		$ 162,277,644	270.46		$ 51,067,240	85.11	
Mean	**$ 1,020,562,985**	**1700.94**		**$ 226,767,077**	**377.95**		**$ 77,812,773**	**129.69**	**C**
Standard Deviation	**$ 1,014,668,860**	**1691.11**		**$ 150,032,137**	**250.05**		**$ 48,481,270**	**80.80**	**D**
JA, Method E1									
JA	$ 179,326,164	298.88		$ 86,651,635	144.42		$ 33,639,067	56.07	
JA	$ 100,812,571	168.02		$ 45,455,934	75.76		$ 21,259,030	35.43	
JA	$ 242,812,619	404.69		$ 161,901,331	269.84		$ 86,499,440	144.17	
Mean	**$ 174,317,118**	**290.53**		**$ 98,002,967**	**163.34**		**$ 47,132,512**	**78.55**	**E**
Standard Deviation	**$ 58,079,378**	**96.80**		**$ 48,211,493**	**80.35**		**$ 28,291,725**	**47.15**	**F**

TABLE 16 Continued

Panel B: Results by Group, Elicitation Method E2 (CI)

	Widest			Middle			Narrowest		
Participant	**Range Width**	**Times AM**	**Label**	**Range Width**	**Times AM**	**Label**	**Range Width**	**Times AM**	**Label**
EA, Method E2									
EA Big 4 #1.3	N/A	N/A		$ 56,987,639	94.98		$ 13,876,912	23.13	
EA Big 4 #1.4	$ 317,892,864	529.82		$ 197,185,414	328.64		$ 111,280,484	185.47	
EA Big 4 #2.1	$ 135,739,770	226.23		$ 75,561,037	125.94		$ 36,469,209	60.78	
EA Big 4 #2.2	$ 47,927,767	79.88		$ 31,418,582	52.36		$ 14,516,894	24.19	
EA Big 6 #1.1	$ 34,411,985	57.35		$ 22,347,030	37.25		$ 7,076,150	11.79	
EA Big 6 #1.2	$ 92,279,641	153.80		$ 69,852,067	116.42		$ 36,428,593	60.71	
EA Big 4 #3.1	$ 25,692,483	42.82		$ 12,753,489	21.26		$ 3,240,419	5.40	
EA Big 4 #3.2	$ 29,695,817	49.49		$ 17,469,075	29.12		$ 6,956,804	11.59	
EA Big 4 #3.4	$ 383,428,946	639.05		$ 216,135,545	360.23		$ 110,635,404	184.39	
EA Big 4 #3.5	$ 51,146,268	85.24		$ 26,470,207	44.12		$ 13,058,433	21.76	
EA Big 4 #3.7	$ 105,915,090	176.53		$ 65,649,070	109.42		$ 34,546,891	57.58	
Mean	**$ 122,413,063**	**204.02**		**$ 71,984,469**	**119.97**	**A**	**$ 35,280,563**	**58.80**	
Standard Deviation	**$ 120,009,172**	**200.02**		**$ 67,013,189**	**111.69**	**B**	**$ 37,495,422**	**62.49**	
VS, Method E2									
VS Big 6 #1.1	$ 41,402,435	69.00		$ 27,440,148	45.73		$ 13,474,044	22.46	
VS Big 4 #2.2	$ 102,949,447	171.58		$ 55,978,209	93.30		$ 33,791,369	56.32	
Mean	**$ 72,175,941**	**120.29**		**$ 41,709,178**	**69.52**	**C**	**$ 23,632,707**	**39.39**	
Standard Deviation	**$ 30,773,506**	**51.29**		**$ 14,269,030**	**23.78**	**D**	**$ 10,158,663**	**16.93**	
JA, Method E2									
JA	$ 30,984,204	51.64		$ 21,562,740	35.94		$ 10,432,211	17.39	
JA	$ 170,942,240	284.90		$ 87,477,297	145.80		$ 34,875,629	58.13	
JA	$ 36,722,125	61.20		$ 19,387,004	32.31		$ 9,683,512	16.14	
JA	$ 33,197,785	55.33		$ 21,176,552	35.29		$ 9,879,031	16.47	
JA	$ 87,087,947	145.15		$ 50,285,510	83.81		$ 25,349,048	42.25	

JA	$ 83,734,182	139.56		$ 51,174,760	85.29		$ 23,733,944	39.56	
JA	$ 1,189,006,473	1981.68		$ 495,731,421	826.22		$ 170,155,130	283.59	
JA	$ 58,998,545	98.33		$ 39,839,394	66.40		$ 18,897,818	31.50	
Mean	**$ 211,334,188**	**352.22**		**$ 98,329,335**	**163.88**	**E**	**$ 37,875,790**	**63.13**	
Standard Deviation	**$ 372,012,720**	**620.02**		**$ 151,689,063**	**252.82**	**F**	**$ 50,689,832**	**84.48**	

TABLE 17 Comparison of Frequency of Words Pointing to Quantification of Uncertainty

	Word	Absolute Frequency – CDF (E1) Method	Frequency per Participant – CDF (E1) Method	Absolute Frequency – CI (E2) Method	Frequency per Participant – CI (E2) Method	Difference
1	Percent	340	24.29	246	11.71	12.57
2	Rate	117	8.36	90	4.29	4.07
3	Range	91	6.50	114	5.43	1.07
4	Chance	90	6.43	0	0.00	6.43
5	Lower	87	6.21	73	3.48	2.74
6	Median	59	4.21	31	1.48	2.74
7	Estimate	49	3.50	46	2.19	1.31
8	Higher	41	2.93	22	1.05	1.88
9	Probability	32	2.29	0	0.00	2.29
10	Long	30	2.14	17	0.81	1.33
11	Reasonable	26	1.86	20	0.95	0.90
12	Iincrease	26	1.86	0	0.00	1.86
13	Point	24	1.71	33	1.57	0.14
14	Amount	20	1.43	17	0.81	0.62
15	Change	20	1.43	24	1.14	0.29
16	Negative	19	1.36	12	0.57	0.79
17	Average	18	1.29	12	0.57	0.71
18	Declining	18	1.29	0	0.00	1.29
19	Highest	13	0.93	0	0.00	0.93
20	Significant	12	0.86	0	0.00	0.86
21	Narrow	11	0.79	0	0.00	0.79
22	Rates	11	0.79	11	0.52	0.26
23	Risk	10	0.71	12	0.57	0.14
1	Bound	0	0.00	72	3.43	-3.43
2	Upper	16	1.14	54	2.57	-1.43
3	Interval	0	0.00	50	2.38	-2.38
4	Confidence	0	0.00	50	2.38	-2.38
5	Numbers	15	1.07	30	1.43	-0.36
6	Minus	0	0.00	22	1.05	-1.05
7	Difference	0	0.00	16	0.76	-0.76
8	Ranges	0	0.00	16	0.76	-0.76
9	Distribution	0	0.00	12	0.57	-0.57
10	Equals	0	0.00	12	0.57	-0.57
11	Level	0	0.00	12	0.57	-0.57
12	Materiality	0	0.00	10	0.48	-0.48

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Appendices

Appendix A Experimental Case Selection Criteria

The case is selected based on several criteria:

1) Since the case is used in process analysis and information elicitation studies, it is important that it should be highly realistic and typical of current practices, so as to induce representative behavior from the participants during the studies. The realism is achieved by developing the case materials from an actual company's financial statements, annual report, proxy circular, and other relevant documents.

2) The company should not be in an industry requiring highly specialized industry expertise from the auditors and valuation specialists (such as mining), in order not to unduly narrow the participants pool.

3) There preferably should be a single CGU. Given the limited time (about two hours for both studies combined) that busy professionals can devote to the task, it seems reasonable to limit the amount of uncertain judgment inherent in the case. Since the unique challenge with auditing fair values is in future event uncertainties (e.g., growth rates, discount rates, future cost structure), the issues with CGUs selection and related matters (e.g., allocation of the corporate assets), can naturally be omitted if only one CGU is present.

4) The post-impairment goodwill balance should be material. This is needed to trigger the generation of participants' own estimates/ranges, since immaterial remaining balance means that the entire goodwill is written off. The case was developed with the help of partner-level practitioners experienced with fair value impairment issues.