Corporate Sustainability Reporting: Investigation of Assurance Process, Assurance Characteristics and Assurance Frameworks Used

By

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ABSTRACT

This dissertation is on assured sustainability reporting. It has three parts that are titled as follows: Part 1. Planning Assurance Services for Sustainability Reporting: An Analysis of Cost versus Assurance in Audit Evidence, Part 2. The Development of Worldwide Assured Sustainability reporting, and, Part 3. Assurance on Sustainability Reports: A Study of Factors Influencing the Selection of an Assurance Framework. Of the above, Part 1 is complete and ready for submission to a journal and Part 2 has been accepted for publication in Australian Accounting Review.

Part 1 investigates providing assurance on sustainability reporting and demonstrates how an evidential reasoning framework can enhance providing such a service. It develops a framework based on the Dempster-Shafer theory of belief functions for the purpose of audit program planning and cost analysis. A sensitivity analysis is used to demonstrate the value of the model based on seven scenarios. The cost to perform an audit procedure is assumed to increase exponentially with the increase in the targeted level of assurance and audit procedures are assumed to exhibit inherent limitations as to the maximum level of assurance they can be expected to provide. Results demonstrate as follows:

i. the importance of the assurance provider selecting audit procedures that directly relate to the highest level assertions,
ii. the effects of discovering during the audit that certain audit tests are less diagnostic than anticipated,
iii. the effects of obtaining mixed audit evidence,
iv. the effects of obtaining strong evidence that implies that certain assertions are not fairly stated and
v. the effects of planning to provide different levels of assurance across assertions

Each of these findings demonstrates the value of utilizing a formal evidential reasoning and cost minimization approach in providing assurance on sustainability reports.

Part 2 investigates the development of assured sustainability reports (SRs) during this century's first decade. More specifically, it presents basic descriptive data on a sample of 148 SRs published in 2006 and 2007 and contrasts this sample with the sample discussed in Mock, Strohm, and Swartz (MSS 2007). The prior study examined a sample of 130 assured SRs issued between 2002 and 2004.

Both samples provide information about the nature of sustainability reports, allowing us to investigate important questions such as which countries and industries are more likely to have an assurance statement, what levels of assurance are provided, and what factors affect the level of assurance provided.

In addition to providing descriptive data relative to the above questions, we run logistic regressions where the dependent variable is whether a Big4 firm provided the assurance, for both periods being considered. Some important differences are observed related to whether the

assurance provided applies to both the quantitative and qualitative assertions made in the report (significantly negatively associated with Big4 in the 2002-2004 period, but not significant in 2006-2007), whether the report uses symbols to identify assured statements (significantly positively associated with Big4 in the 2002- 2004 period, but not significant in 2006-2007), and whether the procedures used are disclosed (not significant in 2002-2004, but significantly positively associated with Big4 in 2006-2007).

Part 3 examines the factors that influence the assurance provider in the selection of an assurance framework for the purpose of assuring sustainability reports where assurance is voluntarily sought by the organization issuing the sustainability report. These frameworks are not generally accepted and no authority mandates these frameworks. Audit-firm specific, client-company specific and country level factors are considered as explanatory variables. Multi-level modeling is used for analysis since companies are nested within countries.

Analysis suggests that the following country levels factors have significant impact on the selection of the type of assurance frameworks (i.e. international frameworks or regional frameworks): level of disclosure, market capitalization and the level of carbon dioxide emissions. Further, analysis suggests that two client company characteristics also have a significant impact: whether a company has foreign operations, and, the level of growth opportunities.

One of the important ways of adding credibility to sustainability reports published by companies is obtaining assurance on them (Simnett, Vanstraelen and Chua 2009). Hence, the type of assurance framework used (International versus Regional) may indicate assurance provider preferences. Use of international frameworks (ISAE3000 and AA1000AS) may indicate a trend towards standardization of assurance frameworks and ease of comparison. On the other hand, use of regional assurance frameworks may indicate a possible country-of-origin effect.

Factors that influence the selection of assurance frameworks and the type of assurance framework selected are important because it offers insights into trends and opportunities that shape the growing assurance market in the sustainability area. This could aid companies, assurance providers, standard setting bodies and investors respond to a changing environment in a meaningful way.

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CHAPTER 1: INTRODUCTION

1.1 Motivation for the Study

This study was motivated by an increasing number of organizations reporting on their sustainability performance and getting these reports assured (Simnett, Vanstraelen and Chua 2009; Perego 2009). Sustainability reporting can be said to be a structured way to report on the environmental, social and economic performance of a company (Rao, Mock and Srivastava 2009). Such reporting gives companies a means to demonstrate how non-financial factors affect financial figures and how these factors ultimately help drive a company's value (Mock, Strohm and Swartz 2007). While some institutions like stock exchanges require companies listed on them to issue sustainability reports (for example, the French stock exchange; KPMG 2002), seeking assurance on sustainability reports is a voluntary activity. As yet, there is no law in any part of the world that makes assurance on sustainability reports mandatory.

Organizations report on their sustainability performance for a variety of reasons. These include moral and ethical reasons, competitive advantage, being a party to setting of voluntary standards or mandatory standards, peer and industry pressure, image management, public relations, corporate reporting awards, social pressures, social license to operate, existing regulation and financial benefits from investor reactions (Buhr 2007, p. 64-65). Hodge, Subramaniam and Stewart (2009) find that provision of assurance on a sustainability report improves perceived reliability of the environmental and social information. Simnett, Vanstraelen and Chua (2009) conclude that companies seeking to enhance the credibility of their reports and build their corporate reputation are more likely to have their sustainability reports assured.

Ballou, Heitger, Landes and Adams (2006) argue that assurance is needed on sustainability reports because such reports present a fertile area to perpetrate fraud.

Tilt (2010) points out that professional and academic accountants can contribute significantly to the debate surrounding corporate social responsibility (CSR) as they have the ability to provide a mechanism for holding corporations responsible for what they do. She asserts that when CSR is considered from the point of view of the accounting profession, it linked with social and environmental reporting, and, more recently, the terms 'sustainability reporting' and 'sustainability accounting' have become common. Further, the involvement of accountants entails adoption and promotion of social and environmental responsibility and audit of social and environmental reports.

1.2 Objectives and Organization of the Dissertation

This dissertation examines assured sustainability reports from various perspectives and is divided into three parts. The first part is an investigation of the assurance process; the second part is an examination of the characteristics of assured sustainability reporting, and, the third part is an examination of factors influencing the assurance frameworks used.

Part I is titled *Planning Assurance Services for Sustainability Reporting: An Analysis of Cost versus Assurance in Audit Evidence*. It has two objectives: (1) how the process of assurance can be enhanced, in terms of audit program planning and cost analysis, by using the evidential reasoning approach related to the Dempster-Shafer (DS) theory of belief functions (Shafer 1976.), and (2) to develop a cost minimization model which helps the auditor obtain a desired level of assurance pertaining to each assertion being investigated.

Part II is titled *The Development of Worldwide Assured Sustainability Reporting*. It compares two samples related to the periods 2003-2004 and 2006-2007. First, it presents basic

descriptive data for both periods which allowing us to investigate important questions such as which countries and industries are more likely to have an assurance statement, what levels of assurance are provided, and what characteristics of assured sustainability reports affect the selection of a Big4 auditor. The contrast is performed by comparing similar logistic regressions, suggesting reasons for the observed changes.

Part III is titled *Assurance on Sustainability Reports: A Study of Factors Influencing the Selection of Assurance Framework*. In this study, I examine the factors influencing the selection of assurance frameworks related to assurance on sustainability reporting. An assurance framework is a critical aspect of assurance on sustainability reports because it furnishes guidelines to auditors to enable them to provide a competent and independent opinion about the inner workings and soundness of companies in terms of sustainability performance. I identify variables that could affect the selection of an assurance framework and plan to use multi-level logistic regression to investigate the effects of industry and country. Data for this study has been collected from CorporateRegister.com, Factiva and the websites of the companies in the sample.

1.3 Background of sustainability reporting

The concept of sustainable development was brought in the public eye with the publication of *Our Common Future* by the United Nations World Commission on Economic Development (UNWCED) (Bansal 2005). According to UNWCED (1987), sustainable development is 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' Rondinelli and Berry (2000) claim that the concept of sustainable development has developed to include the concurrent consideration of economic growth, environmental protection and social equity in business decision making.

Ballou, Heitger, Landes and Adams (2006) state that providing and measuring social and environmental information will provide an opportunity for certified public accountants to provide assurance on such information. Further, they emphasize that the guidelines most often used for reporting environmental and social information are those issued by Global Reporting Initiative (GRI.) Hedberg and von Malmborg (2003) find that the main reasons for use of the GRI guidelines is an expectation of increasing credibility of the CSR and that it provides a template for designing a sustainability report. The latest guidelines from GRI are named G3.1, and these were launched in March 2011. Other guidelines that can be used for sustainability reporting purposes are AA1000 Accounting Principles Standard (AA1000 APS), AA1000 Stakeholder Engagement Standard and the Dutch Accounting Standards Board (DASB) sustainability standard.

Sustainability reporting is also known as triple-bottom-line (TBL) reporting, corporate sustainability reporting (CSR), corporate social reporting (CSR), corporate social responsibility (CSR), corporate responsibility reporting. Reporting on social and environmental performance is required in some parts of the world. For example, from 2002, listed French companies have been required to report on their environmental and social performance (KPMG 2002, p. 5). However, there are no requirements regarding the choice of reporting framework. Some governments have encouraged sustainability reporting. For instance, the KPMG (2002, p.15) report points out that Japanese companies were encouraged to adopt environmental reporting guidelines issued by the Japanese government in 2001.

1.4 Background of assurance on sustainability reporting

While Gray, Bebbington and Walters (1993) are widely credited with the conceptual development of sustainability accounting, assurance on sustainability reports was a later

development. Gray (2001) states that the standard for social audits was first set by an organization called Social Audit Ltd. in the 1970s. To my knowledge, two of the earliest studies which involved assurance on sustainability reporting are Nitkin and Brooks (1998) and Wallage (2000). Currently, assurance on sustainability reports is not a requirement in any part of the world. Hence, organizations are not legally obliged to seek assurance on sustainability reports under any regime.

Manetti and Becatti (2009) report that the first assurance guidelines for assurance on sustainability reports was issued in 2003 by a British non-profit organization called the Institute of Social and Ethical Accountability (ISEA). The guidelines themselves were named AA1000AS, which stand for AccountAbility 1000 Assurance Standard. Further, they report that the International Auditing and Assurance Standards Board (IAASB), the international arm of the International Federation of Accountants (IFAC), also issued sustainability assurance guidelines, which became effective from January 1, 2005. These guidelines were named International Standard on Assurance Engagements (ISAE) 3000. Both of the above guidelines are international and are being used by auditors all over the world. Some assurance standards are regional in nature. Manetti and Beccatti (2009) document a few of these:

Australia: Standards Australia, Standard AS/NZS 5911: General Guidelines on the Verification, Validation and Assurance of Environmental and Sustainability Reports.

Sweden: FAR SRS, The Swedish association of auditors: Proposed Recommendation on Independent Review of Voluntary Separate Sustainability Report.

Germany: Institut derWirtschaftsprufer in Deutschland (IDW): German Generally Accepted Assurance Principles for Audit or Review of Sustainability Reports

The Netherlands: Nederlands Instituut van Registeraccountants (NIVRA): The Netherlands: Practitioners Working with Subject Matter Experts from other Disciplines on Non-Financial Assurance Engagements and Assurance Engagements Relating to Sustainability Reports

France: Compagnie Nationale des Commissaires aux Comptes (CNCC)

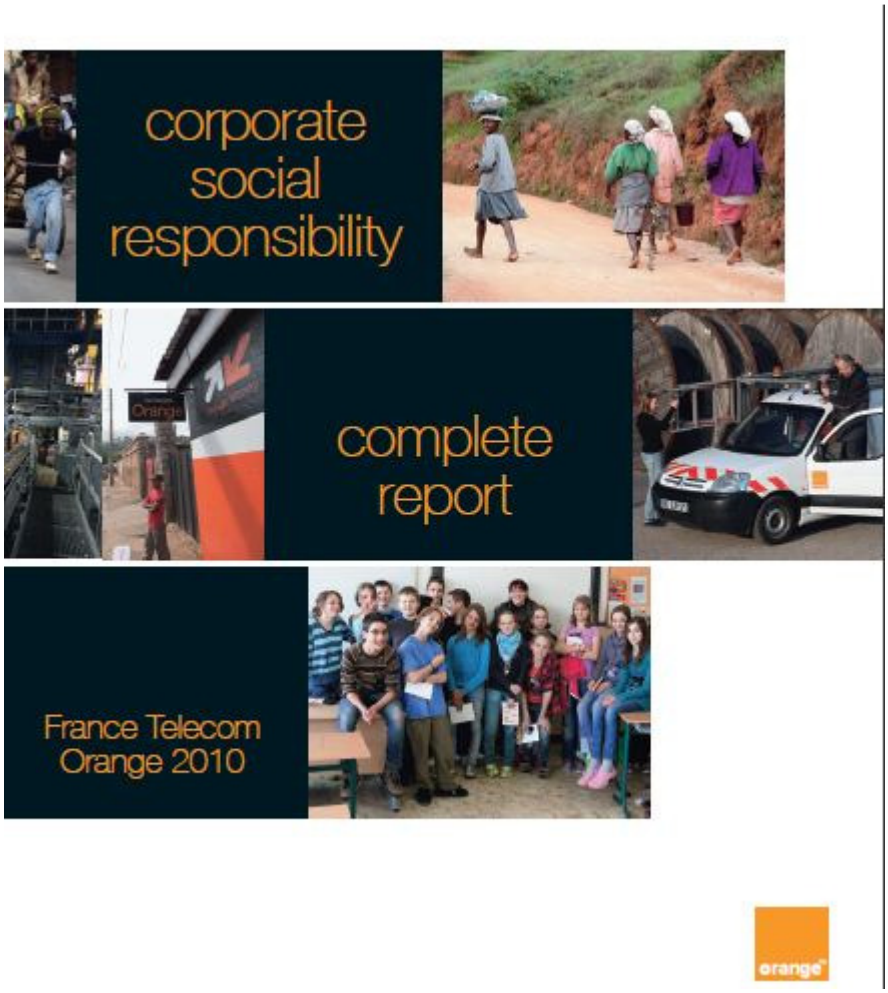
Italy: Consiglio Nazionale dei Dottori Commercialisti (CNDC)

In 2004, the International Register of Certificated Auditors (IRCA) launched a new auditor training program in the social reporting area called the *Social Systems Auditor Program*. This program is designed to help businesses in the domain of ethical sourcing (IRCA 2004a). In addition, AccountAbility (AA) and IRCA launched the world's first individual certification scheme in the field of sustainability assurance called *The Certified Sustainability Assurance Practitioner Program* (IRCA 2004b). The creation of such programs indicates that there is a growing demand for auditors in the field of sustainability reporting.

The KPMG (2008, p.55) report calls attention to the fact that assurance on sustainability reports grew from 30% to 40% in the Global Fortune 250 (G250) companies and that major accountancy organizations are leading the sustainability assurance field. In the context of sustainability assurance, audit opinion in the sustainability assurance arena can be positive or negative. For example, to indicate positive assurance, phrases such as *fair and balanced representation*, *provides a fair account*, *accurately portrays the performance* are used in both samples. To indicate negative assurance, phrases such as *report contained no inaccuracies or misleading statements*, *nothing has come to our attention* are used. Usually, positive phrases are associated with reasonable assurance and negative assurance phrases (both illustrated above) are associated with limited or moderate assurance. The KPMG 2008 report also states that the Global Fortune 250 (G250) companies are less likely to ask for reasonable (positive) assurance than the 100 largest companies in the world.

Recently, unlike financial statement audits which currently provide assurance at one level ('reasonable assurance'), but for public clients at several levels for assurance on internal control over financial reporting, sustainability assurance providers are issuing reports with varying

degrees of assurance on various assertions. For example, in the 2010 assurance report for France Telecom Orange (FTO 2010), Deloitte provides reasonable assurance on performance indicators relating to *CSR priorities*, *Social dialogue*, *HR Governance and Diversity* and moderate assurance on other performance indicators[1]. The pictures below are from the assurance report of France Telecom Orange. They illustrate the cover page, the title of the assurance report provided by Deloitte, and the conclusion of the assurance and the signature on the report.



[1] See pages 107, 108, 111, 115, and 120 of the report. For more examples see the 2010 reports of Cathay Pacific and Vancity.

external opinion

Deloitte.

report by one of the statutory auditors on the Corporate Social Responsibility process

(This is a free translation into English of the original report issued in the French language and is provided solely for the convenience of English speaking readers)

conclusion

Reasonable assurance

(1) Description of the Principles

In our opinion, the description given by the Group on pages 11 and 12 of the Report concerning respect for the Principles of inclusion, materiality and reactivity as described in the AA1000 APS (2008) Standard for the process of compiling the Report is truthful in all significant matters.

(2) Selected Achievements

In our opinion, the description of the Achievements given on page 111 of the Report and identified by the symbol  is truthful in all significant matters.

(3) Selected Performance Indicators 

In our opinion, the data identified by the symbol  have been established, in all significant matters, in conformity with the reference document referred to.

Moderate assurance

(3) Selected Performance Indicators ☑

On the basis of our verifications, we have come across no anomalies that might provide grounds to challenge the fact that the data identified by the symbol ☑ have been, in all significant matters, established in conformity with the reference document referred to.

(4) GRI Self-assessment

On the basis of our verifications, we have come across no significant anomalies that might provide grounds to challenge the Self-assessment in the Report compiled by France Telecom on the basis of the GRI G3 guidelines and giving rise to a rating of A+.

Neuilly-sur-Seine, 15 April 2011.

One of the Auditors,
Deloitte & Associés
Frédéric Moulin

Owen (2007) claims that the essential purpose of assurance on sustainability reports is to enhance the status of sustainability reporting and to increase the confidence of report users in the reliability of the reported information. In a report commissioned by the Association of Chartered Certified Accountants (ACCA research report no. 86), Zadek, Raynard, Forstater and Oelschlaegel (2004, p.16) claim that the benefits of sustainability assurance for organizations include improved overall management of performance in relation to existing policies and commitments, improved risk management and better understanding of emerging issues. The above piece on assurance on sustainability reporting provides a context for the description of the dissertation, which follows immediately.

1.5 Introductions to Three parts of the Dissertation

Before starting with the introductions to each part of the dissertation, the following should be kept in mind. Sustainability reporting is required by some stock exchanges (for example, the French Stock Exchange) and encouraged by some governments (for example, the Japanese government) (KPMG 2008). However, there no requirements or restrictions on the use of guidelines related to sustainability reporting. Some of the guidelines for sustainability reporting are those provided by Global Reporting Initiative version 3 (GRI G3), AccountAbility 1000 Accountability Principles Standard (AA1000APS), and, the Dutch Accounting Standards Board (DASB) sustainability standard and are used by managements of companies to prepare and issue their sustainability reports.

Assurance on sustainability reporting is not required under any law in any part of the world. The guidelines related to assurance on sustainability reporting are used by auditors to verify, validate, assure or review the sustainability reports issued by companies. Some sustainability assurance guidelines are international in nature. Examples of this are the International Standard on Assurance (ISAE) 3000 and AccountAbility 1000 Assurance Standard (AA1000AS). Others are regional in nature. Examples of regional sustainability assurance guidelines are NIVRA 3410N (the Dutch sustainability assurance guidelines) and AS/NZS 5911 (the Australian sustainability assurance guidelines.) Assurance providers can use one or more guidelines of their choosing to verify, validate, assure or review sustainability reports.

In addition, the following characteristics need to be emphasized: Assurance on sustainability reports can be either negative or positive. As mentioned earlier, negative assurance is usually associated with a lower level of assurance, or limited or moderate assurance. Positive assurance usually is associated with a higher level of assurance or reasonable assurance. Secondly, sustainability assurance providers currently provide different levels of assurance on

different assertions. Thirdly, a sustainability report contains information on the non-financial performance of a firm. This includes aspects that can be judged only qualitatively (e.g., whether equal opportunity is being provided to both sexes), and, aspects that are quantifiable (e.g., tons of carbon dioxide emitted). Additionally, a firm may seek assurance only on some parts of the sustainability report. This means that there may be parts of a sustainability report that are not assured. Lastly, most sustainability assurance statements provide a list of procedures undertaken by the auditors.

1.5.1 Introduction to Part I: Planning Assurance Services for Sustainability Reporting: An Analysis of Cost versus Assurance in Audit Evidence

Part I of this dissertation has two primary objectives: The first is to demonstrate the use of an evidential reasoning framework under the Dempster-Shafer theory of belief functions (hereafter referred to as DS theory, Shafer 1976) for planning, performing and evaluating evidence for assurance services in sustainability reporting at a desired level of assurance (e.g. reasonable for some assertions and moderate for others) on a given assertion. To demonstrate the application of this framework we consider assertions, sub-assertions and audit evidence relevant to sustainability reporting.

The second objective is to develop a cost minimization model which helps the auditor obtain a desired level of assurance pertaining to each assertion being investigated. The model incorporates a realistic cost function which increases exponentially as the desired level of assurance from the evidence increases. In addition to cost, the model incorporates the reliability of evidence gathered in the assurance process where reliability may vary across assertions.

To illustrate the model we analyze several realistic scenarios and perform sensitivity

analysis to demonstrate the impact of cost and reliability of evidence on the planned and achieved levels of assurance. Importantly, the cost minimization approach may be applied to any assurance service including the traditional financial statement audit.

Research on sustainability is important because an increasing number of entities are preparing sustainability reports (SRs) which attempt to measure their environmental, social and economic performance (Labuschagne, Brent and van Erck 2005; Vanclay 2002; Brudge 2002). We focus on SR assurance because of two reasons. First, a growing number of companies are issuing SRs and obtaining assurance on these reports (Wallage 2000, Mock, Strohm and Swartz 2007, Mock, Rao, Srivastava and Swartz 2011). However, there is no formal approach to assist the assurance provider in their complex risk analysis and planning activities.

Second, unlike financial statement audits which currently provide assurance at one level ('reasonable assurance'), but, for public companies at several levels for assurance on internal control over financial reporting, sustainability assurance providers are issuing reports with varying degrees of assurance on various assertions. For example in the 2010 assurance report for Vancouver City Savings Credit Union (Vancity 2010), Ernst & Young provides reasonable assurance on implemented processes and disclosures that adhere with AccountAbility's AA1000 Accountability Principles Standard (2008) (AA1000APS (2008)) principles of Inclusivity, Materiality and Responsiveness and on the fair presentation of Vancity's 2010 greenhouse gas assertions. Ernst & Young provides a limited level of assurance on key performance indicators such as overall member loyalty score and employee engagement score and net growth of community investment loan portfolio among others. Parts of the assurance report on Vancity's sustainability report have been provided below:

ERNST & YOUNG LLP'S INDEPENDENT ASSURANCE STATEMENT

Scope of our Engagement

We have carried out a 'reasonable' assurance engagement[1] over Vancouver City Savings Credit Union and its subsidiaries' ("Vancity's") adherence to AA1000 Principles and a limited assurance engagement over certain specified performance information appearing in Vancity's 2010 Annual Report (the "Report") for the period January 1, 2010 to December 31, 2010 prepared by Vancity management. The scope of our engagement, as agreed with management, is as follows:

- Subject Matter 1: to obtain a reasonable level of assurance that Vancity has implemented processes and disclosures that adhere with AccountAbility's AA1000 Principles Standard (2008) ("AA1000APS (2008)") principles of Inclusivity, Materiality and Responsiveness and to express an opinion thereon;
- Subject Matter 2: to obtain a limited level of assurance on the fair presentation of the following specified performance information presented in the Key Performance Indicator Table and within the summarized and complete accountability Statements:
  - Overall member loyalty score
  - Percentage of branches with an overall service experience score > 8.69 out of 10
  - Employee engagement score
  - Net growth of community investment loan portfolio (together, the "specified performance information"); and
- Subject Matter 3: to obtain a reasonable level of assurance on the fair presentation of Vancity's 2010 greenhouse gas assertions as presented within the Report including in the summarized and complete accountability statements and to express an opinion thereon.

Ernst + Young LLP

Vancouver, Canada
06 April 2011

The evidential reasoning approach described here will help auditors control risk and develop cost-effective plans in providing varying levels of assurance on different assertions

within the sustainability reports. Consideration of varying levels of assurance is a topic of discussion by the International Federation of Accountants (IFAC 2002) and by the PCAOB in their recent concept release on possible revisions to standards related to audit reports (PCAOB, 2011). Both IFAC and the PCAOB are working on developing audit standards to deal with varying levels of assurance of various components of an audit engagement.

Sustainability reporting which is also known as corporate sustainability reporting (CSR), and triple bottom line (TBL) reporting, provides data on financial and non-financial factors related to environmental, social and economic performance. The February 2007 issue of *Business Finance* reports that two-thirds of the 250 largest companies have adopted sustainability reporting.

Currently most companies providing SRs follow the guidelines developed by the Global Reporting Initiative (GRI). GRI issued its G3 Reporting framework in October 2006 after a three-year development period that engaged more than three thousand individuals from a diverse set of backgrounds. The G3 Reporting framework consists of reporting principles, reporting guidance, and standard disclosures including performance indicators.

In many jurisdictions, there are no professional bodies which regulate the provision of assurance services for sustainability reporting. Thus, assurance providers may use a variety of standards including the international standards (e.g. IAASB 2005), local standards (e.g. Dutch standards (DASB 2009)) or even ad-hoc approaches (Mock, Strohm and Swartz 2007, Mock, Rao, Srivastava and Swartz 2011).

There are three important issues the assurance provider needs to consider in judging whether a SR has been prepared in accordance with G3 or other guidelines. The first deals with

the principles and criteria to be adhered to by the reporting company in preparing the SR. The second deals with the evidence gathered by the assurance provider to make judgments about whether these principles and criteria have been met. The third deals with representing and managing uncertainties and risks involved in the audit evidence gathered.

The evidential reasoning framework discussed deals with all three issues mentioned above in a structured way. To identify the relevant assertions and sub-assertions, we use GRI's G3 guidelines for reporting principles and criteria. To determine the relevant items of evidence to consider, we refer to G3 guidelines. To deal with the issue of representing and managing uncertainties in the evidence, we use DS theory as used in other domains such as information security assurance (Sun, Srivastava, and Mock 2006) and information quality assurance (Bovee, Srivastava and Mak 2003).

Under an evidential reasoning approach, one develops an evidential diagram consisting of variables the assurance provider needs to consider, interrelationships among the variables, and items of evidence pertaining to these variables. The variables that need to be considered consist primarily of the assertions that assurance is provided on and the evidence that is collected and evaluated. The evidential network development is elaborated in further chapters of this dissertation.

We use DS theory because it provides an appropriate framework for capturing uncertainties in any assurance services setting (Shafer and Srivastava 1990; Srivastava and Mock 2005). Moreover, there is empirical evidence in psychology (Curley and Golden 1994) and in auditing (Harrison, Srivastava and Plumlee 2002; Fukukawa and Mock 2011) that show the advantages of using DS theory in decision-making settings.

This study contributes to assurance literature in three significant ways. Most notably, it is the first research that looks at sustainability reporting assurance using a formal evidential reasoning approach. Second, it is one of the first studies in the audit and assurance literature that introduces the concepts and methods for making decisions using a cost analysis approach (see also, Srivastava and Mock 1999-2000). This study adds to this literature by introducing an audit program planning and cost analysis approach to determine the audit procedures which are expected to provide the needed level of assurance at the minimum cost. Since the cost in providing an assurance service depends on the cost associated with obtaining evidence, it makes economic sense to minimize audit procedure cost given the desired level of assurance. In addition, it introduces the concept of providing varying levels of assurance on different assertions of interest at a minimum cost. This approach is different from prior approaches (e.g., see Srivastava and Shafer 1992, Srivastava and Mock 1999-2000 and Sun, Srivastava and Mock 2006) where audit evidence is combined without explicit consideration of expected cost.

Finally, this is the first study to demonstrate analytically the importance of focusing on items of evidence at a higher level of assertion in the evidential diagram. This finding is consistent with and supports audit practice (Bell, Marrs, Solomon, and Thomas 1997).

The findings of this study demonstrate the value of utilizing a formal evidential reasoning and cost minimization approach for the purpose of providing assurance on sustainability reports. The findings are as follows:

i. the importance of the assurance provider selecting audit procedures that directly relate to the highest level assertions,

ii. the effects of discovering during the audit that certain audit tests are less diagnostic than anticipated,

iii. the effects of obtaining mixed audit evidence,

iv. the effects of obtaining strong evidence that implies that certain assertions are not fairly stated and

v. the effects of planning to provide different levels of assurance across assertions

1.5.2 Introduction to Part II: The Development of Worldwide Assured Sustainability Reporting

The main objective of this study is to present basic descriptive data on a sample of 148 sustainability assurance reports issued in 2006 and 2007 and contrast this sample with Mock, Stohm and Swartz's (2007) (MSS 2007) sample, which was based on a sample of sustainability assurance reports issued in 2002 and 2003[2]. Both samples include companies from a multitude of different countries. In addition to providing descriptive data relative to the above questions, I run logistic regressions where the dependent variable is whether a Big4 firm provided the assurance, for both periods being considered.

Such a study is needed because an increasing number of companies are viewing sustainability reporting as a critical business issue which is associated with financial gains, innovation and learning (KPMG 2011, p.18.) Further, companies want to increase the credibility of their sustainability data by seeking assurance on it (Simnett, Vanstraelen and Chua 2009), as investors currently consider this data relevant for investment purposes. Sustainability reporting and assurance on it gives stakeholders a more transparent view of the company's performance, potentially enabling them to make more informed decisions (Coram, Monroe and Woodliff 2009).

[2] Given that some of the companies in the original sample did not report on a calendar basis, some of the reports related partly to 2004. Thus we label this sample as 2002-2004.

In terms of important descriptive findings we discover that the percentage of positive assurance statements has undergone a large decrease from 74% to 43% and correspondingly the percentage of negative assurance statements has increased from 17% to 42%. But the majority of positive statements are still being issued by non-Big4 assurance providers.

The launch of assurance guidelines by AA and IAASB; assurance training programs jointly by AA and IRCA; and new types of auditing services related to emissions provides motivation for examining associations between the characteristics of 26 sustainability reports. For this purpose, we compare logistic regressions with the dependent variable *Big4* in the two periods. First, consistent with the descriptive findings, we learn that Big 4 audit firms are less likely to provide positive assurance in both sets of data. Unlike the 2002-2004 sample, however, the logistic results show that the Big4 firms are now more likely to disclose procedures used in providing SR assurance. Also, compared to the 2002-2004 period, the Big4 firms are increasingly using standards (AA1000 and ISAE3000) that recommend the disclosure of procedures (KPMG 2008).

1.5.3 Introduction to Part III: Assurance on Sustainability Reports: A Study of Factors Influencing the Selection of an assurance Framework

In Part III, I examine the factors influencing the selection by the assurance provider of an assurance framework related to assurance on sustainability reporting. This study contributes by examining the factors influencing a critical aspect of assurance on sustainability reports. According to Simnett and Nugent (2007), an assurance framework is a basic structure which consists of suitable criteria by which a particular subject matter is measured and evaluated, and an assurance framework provides the basis by which assurance on a broad range of subject

matter can be offered by members of the auditing profession. The International Auditing and Assurance Standards Board (IAASB 2012 a, p. 25) defines (suitable) criteria as follows:

"*Criteria are benchmarks used to evaluate or measure the subject matter including, where relevant, benchmarks for presentation and disclosure. Criteria can be formal or less formal. There can be different criteria for the same subject matter. Suitable criteria are required for reasonably consistent evaluation or measurement of a subject matter within the context of professional judgment. Further, suitable criteria should exhibit the following characteristics:*
(a) Relevance: relevant criteria contribute to conclusions that assist decision making by the intended users.
(b) Completeness: criteria are sufficiently complete when relevant factors that could affect the conclusions in the context of the engagement circumstances are not omitted. Complete criteria include, where relevant, benchmarks for presentation and disclosure.
(c) Reliability: reliable criteria allow reasonably consistent evaluation or measurement of the subject matter including, where relevant, presentation and disclosure, when used in similar circumstances by similarly qualified practitioners.
(d) Neutrality: neutral criteria contribute to conclusions that are free from bias.
(e) Understandability: understandable criteria contribute to conclusions that are clear, comprehensive, and not subject to significantly different interpretations."

An assurance framework is important because it furnishes guidelines to auditors to enable them to provide a competent and independent opinion about the inner workings and soundness of companies in terms of sustainability performance assertions. Hasan, Maijoor, Mock, Roebuck, Simnett, and Vanstraelen (2005) define assurance services as those engagements that involve the 'evaluation or measurement of a subject matter that is the responsibility of another party against identified suitable criteria, in order to express a conclusion that provides the intended user with a level of assurance about the subject matter.' Assurance frameworks provide the suitable criteria and guidance related to engagement acceptance, using the work of an expert, obtaining evidence, documentation, and, preparing the assurance report among other things in the context of sustainability reporting.

Assurance on sustainability reports is useful for various parties, such as investors, creditors, corporate issuers, analysts and regulators including stock exchanges and governments (KPMG 2002, p. 5). It is likely that choice of assurance framework affects the quality of assurance on sustainability reports, which in turn affects debt markets (Mansi, Maxwell and Miller 2004) and equity markets (Khurana and Raman 2004; Teoh and Wong 1993) and, hence, influences market integrity and capital formation. KPMG (2002) argues that the socially responsible investment sector has experienced dramatic growth in the past few years, particularly in USA and Europe, and, sustainability may become a major deciding factor for future access to equity capital and investments (p. 8).

Examination of factors that affect the choice of assurance framework might provide an insight into various factors that influence the sustainability performance of companies, such as the desire for legitimacy or the eagerness to implement a policy before it becomes mandatory. This in turn may aid standard setters such as the International Auditing and Assurance Standards Board (IAASB) to construct new standards and guidance to assure sustainability performance of companies. For example, if it is found that companies want to issue sustainability reports and get them assured so as to match other companies in their industry, then the IAASB can develop assurance frameworks tailored to the needs of different industries. It will help organizations which issue frameworks for assurance on sustainability reporting in providing improved frameworks for assurance practitioners. It will help investors in evaluating companies as they might now have more relevant information.

This study contributes by augmenting prior research in the following ways: First, it uses a sample of 71 companies from 27 countries, all of which are traded in the US (further details about the sample selection are given in the section titled 6. Sample Selection). Second, it presents a list of

assurance frameworks related to sustainability reporting that have been used in different countries. Further, it suggests that country level factors (level of disclosure, market capitalization, and level of carbon dioxide emissions) and client company characteristics (whether the client company has foreign operations and the client company's level of growth opportunities) may have significant impact on the choice of assurance frameworks, which may, in turn, indicate assurance provider preferences. Use of international frameworks (ISAE3000 and AA1000AS) may indicate a trend towards standardization of assurance frameworks and ease of comparison. On the other hand, use of local assurance frameworks may indicate a possible country-of-origin effect. Factors that influence the selection of assurance frameworks and the type of assurance framework selected are important because it offers insights into trends and opportunities that shape the growing assurance market in the sustainability area. This could aid companies, assurance providers, standard setting bodies and investors respond to a changing environment in a meaningful way. For example, if it found that the auditing firms do not prefer one kind of framework over the other, it may affect the client companies' choice of an assurance provider. It is possible that the client company may choose a non-audit firm in order to save costs and have the added benefit of seeking advice on management of sustainability issues.

1.5.3.1 Sustainability reporting, reporting standards and the extent of assurance

Sustainability reporting is reporting on the environmental, social and economic performance of a company which provides a means to demonstrate how non-financial factors affect financial figures and how these factors ultimate help drive a company's value (Mock, Strohm and Swartz 2007). Companies either issue sustainability reports separately from annual reports or combine them into one publication. Many companies now seek assurance on their sustainability reports, evidently, as research suggests (Simnett, Vanstraelen and Chua 2009), they

want to improve the credibility of the disclosed information. Rao, Mock and Srivastava (2009) provide a list of reporting frameworks for sustainability reporting. These include the Global Reporting Initiative G3 (generation 3) guidelines, AccountAbility AA1000 Principles Standard, AccountAbility AA1000 Stakeholder Engagement Standard and the Dutch Accounting Standards Board (DASB) sustainability standard. Most of the client organizations follow the Global Reporting Initiative (GRI) guidelines for (Ballou, Heitger, Landes and Adams 2006) for preparing the reports. The most recent guidelines from GRI are called G3.1 (for Generation 3.1) and were issued in March 2011.

Countries around the world have different landscapes related to assurance on sustainability reporting. The KPMG 2008 report provides the following information related to assurance on sustainability reporting: In Australia, there is a growing recognition of the value provided by external assurance, with 37% of companies which publish sustainability reports obtaining assurance on them. The report also mentions that the Australian Stock Exchange (ASX) Principle 7 now includes the consideration of sustainability related issues as a material business risk. In Brazil and Canada, about 12% of companies obtain assurance. In the Czech Republic and Hungary, only 4% of companies obtain assurance. In Denmark, about 10% of companies obtain assurance on sustainability reports. Further, assurance firms (in this case, the Big4) carry out 9 out of 11 assurance engagements in Denmark. In Finland, about 13% of companies obtain assurance. The KPMG 2008 report emphasizes that there is growing trend globally to seek assurance to build trust among stakeholder groups, and, this practice is expected to increase in Finland (p. 78). In France, 21% of the 100 largest companies obtain assurance, and, such assurance is expected by analysts and stakeholders in the French market. In Italy, about 35% of companies obtain assurance. In Japan, 18% of companies which publish sustainability

reports obtain assurance. However, 54% of companies which publish sustainability reports in Japan obtain third party comments on their sustainability reports. This involves hiring a group of expert individuals to comment on companies' sustainability report and related activities. The next section of this study, titled "2. Sustainability Assurance Frameworks, Level of Assurance and Assurance Providers", provides more details on third party comments. In South Africa, about 15% of companies obtain assurance on their sustainability reports. In South Korea, 28% of companies obtain assurance on their sustainability reports. Further, the KPMG 2008 report states that many South Korean companies tend to regard external assurance as important for ensuring the objectivity of their sustainability reports and enhancing their credibility. In Spain 36% of the 100 largest companies obtain assurance. In the Netherlands, 26% of companies obtain assurance. In the UK, 48% of companies obtain assurance, making it the highest. In the US, only 10% of companies obtain assurance.

1.5.3.2 Assurance on Sustainability Reports

Regulations and stock exchange rules in some parts of the world require companies to issue sustainability reports periodically (for example, the London stock exchange)..However, it is not known whether there are requirements related to selection of reporting frameworks by the company or selection of assurance frameworks by the assurance provider. Other authorities and governments have encouraging policies or provide incentives for issuing sustainability reports. The KPMG (2002) report titled, 'The International Survey of Corporate Sustainability Reporting' documents two of these requirements. This report (p. 5) points out that, from 2002, listed French companies have been required to report on their environmental and social performance. Further, the KPMG report (p. 15) points out that in Japan companies began to adopt environmental reporting guidelines issued by the Japanese government in 2001. Additional

impetus for issuing and obtaining assurance on corporate sustainability reports was provided in 2003 when the Corporate Governance Council (CGC) of the Australian **Stock** Exchange equated good governance with the concept of corporate social and environmental responsibility (Gibson and O'Donovan 2007). In 2005, the Sao Paulo Stock Exchange established a new stock index tracking companies that report on economic, social and environmental aspects of company performance, the so-called "triple bottom line." Companies which aspire to be included in this index must have adopted and met strict standards for social and environmental responsibility (Derham 2005).

Two of the most prevalent assurance frameworks are ISAE 3000 and AA1000AS (KPMG 2008). Both of these provide guidance and a best practice checklist (Viehöver, Turk and Vaseghi 2009, Oelschlagel 2005). The International Auditing and Assurance Standards Board (IAASB), the assurance arm of the International Federation of Accountants (IFAC) issued the ISAE 3000 sustainability assurance framework which is meant for assurance engagements other than audits or reviews of historical financial information (ISAE 3000, 2005). AA1000AS was issued by a non-profit organization called AccountAbility (Oelschlagel 2005) in March 2003. The latest version of AA1000AS was launched in 2008. Its purpose is to evaluate the quality of publicly disclosed information on sustainability performance (AA 2008). However, there are local/national sustainability assurance frameworks issued by the respective countries' accounting bodies. Some of these are NIVRA 3410 (Dutch), FAR SRS (Swedish), IDW (German) and the Australian assurance framework AS/NZS 5911 (Rao Mock and Srivastava 2009).

The existence of international and local/national assurance frameworks makes the selection of an assurance framework by the assurance provider an important aspect of assurance on sustainability reporting. A study of factors influencing the selection of an assurance

framework will aid academics in understanding the reasons behind the popularity of a particular assurance framework. Further, it will help regulators develop standards and stock exchanges and governments in developing policies related to assurance on sustainability reports. Next, this study will benefit investors because it will provide insight into the credibility of information in a sustainability report. Lastly, descriptive statistics on audit firms, non audit firms, countries and industries will aid in providing a view about the choices currently made by each, which will be helpful in further understanding the sustainability assurance market from the perspectives of different assurance providers and countries.

This study proceeds as follows: Section 2 introduces sustainability assurance frameworks, levels of assurance and assurance providers. Section 3 gives a background on the topic of assurance on sustainability reports. Section 4 specifies the model, explains the hypotheses development, dependent and explanatory variables, nestedness and the multi-level approach to analysis. Section 5 provides a description of data collection. Section 6 describes the sample selection. Section 7 discusses the descriptive statistics related to assurance frameworks, assurance providers, and countries. Section 8 presents bivariate correlations and discusses possible reasons for these correlations. Section 9 discusses empirical results related to the models. Section 10 examines the relationship of a few variables with the probability of selecting international assurance frameworks. Lastly, section 11 summarizes, discusses limitations and concludes.

1.5.4 Findings

Part 1 results demonstrate the following:

i. the importance of the assurance provider selecting audit procedures that directly relate to the highest level assertions,

ii. the effects of discovering during the audit that certain audit tests are less diagnostic than anticipated,

iii. the effects of obtaining mixed audit evidence,

iv. the effects of obtaining strong evidence that implies that certain assertions are not fairly stated and

v. the effects of planning to provide different levels of assurance across assertions

Each of these findings demonstrates the value of utilizing a formal evidential reasoning and cost minimization approach in providing assurance on sustainability reports.

The results for part 2 are as follows:

In terms of important descriptive findings we discover that the percentage of positive assurance statements has undergone a large decrease from 74% to 43% and correspondingly the percentage of negative assurance statements has increased from 17% to 42%. But the majority of positive statements are still being issued by non-Big4 assurance providers.

The launch of assurance guidelines by AA and IAASB; assurance training programs jointly by AA and IRCA; and new types of auditing services related to emissions provides motivation for examining associations between the characteristics of sustainability reports. For this purpose, we compare logistic regressions with the dependent variable *Big4* in the two periods.

First, consistent with the descriptive findings, we learn that Big 4 audit firms are less likely to provide positive assurance in both sets of data. Unlike the 2002-2004 sample, however, the logistic results show that the Big4 firms are now more likely to disclose procedures used in providing SR assurance. Also, compared to the 2002-2004 period, the Big4 firms are increasingly using standards (AA1000 and ISAE3000) that recommend the disclosure of procedures (KPMG 2008).

In Part III, assurance frameworks have been classified into two categories: international frameworks (ISAE 3000 issued by the IAASB and AA1000AS issued by AccountAbility), and, regional frameworks (issued by the respective countries' audit and assurance bodies; for example NIVRA 3410 N issued by the Dutch audit and assurance body NIVRA). Using data from 32 industries and 27 countries, I examine audit firm specific factors, client firm specific factors and country level factors that could influence the selection of assurance frameworks. The results for Part III suggest the following:

I present descriptive statistics in terms of country distribution of sample companies, list of all the frameworks used classified by country, type of assurance framework, countries covered, non audit assurance provider names and number of sustainability reports assured by them, and countries covered by the audit firms and non audit firms as a group. Table 14 shows that the highest numbers of assurance reports are from UK (12 assurance reports, 16.9%), US (9 assurance reports, 12.68%) and Japan (6 assurance reports, 8.45%). Since the sample of companies used in this study is all traded in the US, the above figures may indicate that companies that operate internationally may be obtaining assurance on sustainability reports. These figures may also indicate that companies from developed markets may be obtaining assurance on their sustainability reports. Table 15 shows the assurance frameworks used in different countries. Of these the country with the most variety is the US (6 assurance frameworks). In the second place are UK, The Netherlands and Korea (3 assurance frameworks each). Since this is a largely unregulated field, and, there is no governing body that recommends the use of one or more assurance frameworks, assurance providers are free to choose any of the available frameworks. Therefore, in the case of the US, UK, the Netherlands and Korea, it seems likely that as the number of companies in these countries seeking assurance on their sustainability reports increases, the frameworks used may also increase. It may also indicate that assurance providers in developed countries may be testing various assurance frameworks to see which is suitable.

Tables 16, 17, 18, and 19 respectively provide details related to the audit firms: Ernst & Young, PricewaterhouseCoopers, KPMG and Deloitte. In the sample used in this study, the audit firms are all Big4 firms. It is seen the audit firms use international frameworks as well as regional frameworks. Table 20 provides details of the non audit assurance providers. These

assurance providers can be classified as specialist assurance providers/technical experts (O'Dwyer 2011). Majority of these non audit assurance providers (16 out of 27 reports, 59.25%) use AA1000AS frameworks given by AccountAbility, a non-profit organization based in the UK. This could indicate that the non-audit assurance providers prefer to use an assurance framework from a standard setting body that is not involved with traditional audit or assurance. This, in turn suggests that the non audit assurance providers might prefer the AA1000AS framework so as to move away from ethical consideration that apply to audit and assurance firms.

The research question in this study is: What are the factors influencing the choice of assurance frameworks, when the choice is between international frameworks and local/regional frameworks? The hypotheses are as follows:

H_1: There is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework, given that the assurance provider is an audit firm or a specialist assurance provider/technical expert.

H_2: The likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for clients who have foreign operations.

H_3: There is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework for clients who have stock exchange listings in multiple countries.

H_4: There is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework for clients who have a rapid growth rate versus those who do not.

H_5: The likelihood of an assurance providers' selection of an international framework is expected to be significantly greater for client firms who are located in countries having a high disclosure environment.

H_6: The likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for client firms that are located in countries with relatively high values of proxies for national economic development (GDP and MarketCap).

H_7: The likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for client firms located in countries associated with high values of carbon dioxide emissions (metric tons per capita).

Multi-levels logistic regressions are performed to examine the factors influencing the assurance provider's choice of either an international and regional assurance framework. H_1 is supported. This suggests that the variable *Assurance provider type* is not statistically significantly related to the selection between international and regional assurance frameworks. This may be because assurance providers may view the use of either framework as being advantageous to them, since both kinds of assurance frameworks enhance credibility and provide a basis for their actions, especially in event of litigation. H_2 is not supported, since the variable *Foreign_Operations* has a significant and negative relationship with *DV_Intl_Regional*. This negative relationship suggests that for client companies who have foreign operations, assurance providers are more likely to select regional frameworks. This may be due to the country of origin effect. Client firms that have foreign operations may have operations that are partitioned by country, and, assurance provider offices are mostly staffed with people from that country. H_3 is supported. This suggests that the variable *No_of_country_listings* is not statistically significantly

related to the choice between international and regional assurance frameworks. This may be because, as mentioned earlier in the discussion related to the variable *Assurance provider type*, assurance providers of client firms who have stock exchange listings in multiple countries may view the use of either kind of assurance framework as being advantageous to them, since both kinds of assurance frameworks enhance credibility. H_4 is not supported since *Market_to_book* has a negative and significant relationship with the dependent variable *DV_Intl_Regional*. This may be because a company having a rapid growth rate may want to expand overseas by focusing on one or more specific countries. In such a case, regional assurance frameworks proposed by the target countries' audit or assurance body may prove more suitable for its goals. H_5 is supported, since there is a positive and significant relationship between *DisclosureIndex* and *DV_Intl_Regional*. Part of H_6 is supported, since there is positive and significant relationship between *MarketCap* and *DV_Intl_Regional*. Due to the move towards standardization, assurance providers in countries having a high DisclosureIndex and MarketCap may select international frameworks because they view these as a move towards standardization and hence, providing a basis for comparison. However, part of H_6 is also not supported, since the variable GDP is not significant. This suggests that GDP is not significantly statistically related to the choice between international and regional assurance frameworks. This may be because the decision to use either framework is made by the assurance provider, without any significant regard to the GDP per capita. The assurance provider may choose an assurance framework depending upon it's strategic goals, which may include a move towards standardization or doing business in a particular country. H_7 is not supported since the variable *CO2Emissions* is negatively and significantly associated with the dependent variable *DV_Intl_Regional*. This suggests that if the carbon dioxide emissions decrease, regional assurance frameworks are more likely to be

selected. Research suggests that as income levels rise in a country, pollution levels fall and tend toward "pre-industrial levels in wealthy societies" (Dasgupta, Laplante, Wang and Wheeler 2002). Due to the country-of-origin effect, companies and assurance providers located in higher income countries may view an assurance framework issued by an audit/assurance standard setter or regulator that is associated with the same country as providing higher quality of assurance. Also, the administration in higher income countries may encourage the use of regional frameworks.

This study contributes by investigating the factors that could influence the selection of assurance frameworks in the area of sustainability reporting, where the choice is between international assurance frameworks and regional assurance frameworks. Since assurance frameworks provide guidelines to assurance providers to perform various tasks such as engagement acceptance, using the work of an expert, and, obtaining evidence among other things, assurance frameworks form a crucial aspect of providing credibility to sustainability reports. Examining the selection of assurance frameworks could provide an indication of the trend in the usage of assurance frameworks. For example, if it is known that assurance providers may select international frameworks in certain parts of the world, it may indicate a trend towards standardization and comparability of assurance reports related to sustainability reporting. This could serve a backdrop for academics to examine whether the procedures used for assurance are same or different when international frameworks are used and when regional frameworks are used. Such a fact could also provide audit or assurance bodies in different countries to develop assurance frameworks so that the assurance reports that use a regional assurance framework are comparable with assurance reports that use international assurance frameworks.

This study augments prior research by using a sample of 71 companies from 27 countries, all of which are traded in the US. The results of this study suggest that country level factors (level of disclosure, market capitalization, and level of carbon dioxide emissions) and client company characteristics (whether the client company has foreign operations and the client company's level of growth opportunities) may have significant impact on the choice of assurance frameworks, which may, in turn, indicate assurance provider preferences. Use of international frameworks (ISAE3000 and AA1000AS) may indicate a trend towards standardization of assurance frameworks and ease of comparison. On the other hand, use of local assurance frameworks may indicate a possible country-of-origin effect. Factors that influence the selection of assurance frameworks and the type of assurance framework selected are important because it offers insights into trends and opportunities that shape the growing assurance market in the sustainability area. This could aid companies, assurance providers, standard setting bodies and investors respond to a changing environment in a meaningful way. For example, if it found that the auditing firms do not prefer one kind of framework over the other, it may affect the client companies' choice of an assurance provider. It is possible that the client company may choose a non-audit firm in order to save costs and have the added benefit of seeking advice on management of sustainability issues.

Further, I examine relationships between variables versus the probability of selecting international assurance frameworks. Examining such relationships contributes to this study by offering an immediate and practical view about the assurance provider's selection of assurance frameworks in various parts of the world. For example, if it is known that the assurance provider is operating in a country with a high disclosure index and a high market capitalization, then one can immediately see that there is a greater probability of the assurance provider selecting an

international framework for assurance. Such a view may help the international audit/assurance standard setting bodies, such as the IAASB, in working with regional standard setting bodies such as NIVRA to develop frameworks that are more comparable. It may also help investors in making decisions about investing in companies whose assurance reports can be compared with others.

Figure 5 suggests that in countries with higher levels of stock market development, viewed in terms of market capitalization and with high levels of disclosure, there is a greater likelihood of international framework being selected. Figure 6 suggests that the probability of selecting international assurance frameworks increases with increasing levels of disclosure. It also indicates that at high levels of disclosure, carbon dioxide emission levels may not play much of role in the selection of international assurance frameworks. Figure 7 suggest that if the number of country listings of a company increases along with the extent of development of stock markets, then the probability of selecting international assurance frameworks increases substantially.

PART I

PLANNING ASSURANCE SERVICES FOR SUSTAINABILITY REPORTING: AN ANALYSIS OF COST VERSUS ASSURANCE IN AUDIT EVIDENCE

This part of the dissertation investigates the following research questions: (RQ1) How can an evidential reasoning framework be used to help plan and implement sustainability reporting assurance? (RQ2) How can an evidential reasoning approach aid in controlling risk and in developing cost effective plans in providing varying levels of assurance on different assertions within the sustainability reports?

In order to explore the above research questions, I demonstrate how an evidential reasoning framework can enhance the provision of assurance on sustainability reporting and develop a framework based on the Dempster-Shafer theory of belief functions for the purpose of audit program planning and cost analysis. Further, I perform sensitivity analysis to show the value of the framework.

The chapters of Part 1 are organized as follows: Chapter 2 provides a background of the research on sustainability reporting and assurance on sustainability reporting. Chapter 3 provides a background on evidential diagrams and the underlying framework related to assurance on sustainability reporting. Chapter 4 illustrates the evidential reasoning approach including combination of audit evidence at the main and sub-assertion level. Chapter 5 deals with assurance planning and cost analysis which incorporates the cost function, the cost minimization model, inclusion of constraints representing the inherent nature of audit evidence and realistic scenarios with different levels of assurance on different assertions. Chapter 6 presents the summary and conclusion.

CHAPTER 2: BACKGROUND RESEARCH

Sustainability reporting is *a structured way an entity reports on its economic, environmental, and social performance* which gives companies a means to report how non-financial factors affect the financial figures and how these factors can ultimately help to drive the company's value (Mock, Strohm and Swartz 2007; Slater and Gilbert 2004; Deegan, Cooper and Shelly 2006a). The relationship between non-financial factors and financial performance is stated succinctly in a PriceWaterhouseCoopers report (Eccles, Herz, Phillips and Keegan 2001), *The Value Reporting Revolution: Moving Beyond the Earnings Game,* "To create long-term economic value for society—shareholders and other stakeholders alike—sustainability says that companies must also create social and environmental value." Additionally, companies including DuPont, Mobil, Allstate, Gap Inc. and British Petroleum-Amoco recognize the potential comparative advantages of publicly disclosing their goals related to non-financial and financial performance measures and then reporting on how well they achieve those goals (Ballou, Heitger, Landes and Adams 2006). The demands for reporting on non-financial performance measures are not only growing, but they also relate to critical corporate value creation and risk assessments.

Corporate social responsibility has been an object of interest for academicians for several decades (Heald 1957, Ullmann 1985, Moir 2001). Social accounting in its contemporary form, which involves issuing a report on social performance of an organization, started in the 1970s (Gray 2000). A number of studies have examined various aspects of sustainability reporting. Among the topics investigated are worldwide trends and frequencies of sustainability reporting (Dawkins and Ngunjiri 2008, Kolk 2004), impact of issuing sustainability reports on financial performance (McWilliams and Siegel 2000, Baron 2001, Garriga and Melé 2004, Wagner-

Tsukamoto 2007), socially responsible investing (Orlitzky, Schmidt and Rynes 2003, Sparkes and Cowton 2004, Hockerts and Moir 2004, Hellsten and Mallin 2006), regulation (Dowell, Hart and Yeung 2000, Whitehouse 2006, Detomasi 2007) and assurance related to sustainability reporting (Kok, Wiele, McKenna and Brown 2001, Hasan, Roebuck and Simnett 2003, Hasan, Maijoor, Mock, Roebuck, Simnett and Vanstraelen 2005, Mock, Strohm and Swartz 2007).

Research concerning sustainability reporting assurance began in the late 1990s. The early studies included Nitkin and Brooks (1998) and Wallage (2000). During this period, a growing number of companies started providing assured sustainability reports (Owen and O'Dwyer 2004, University of Amsterdam and KPMG Global Sustainability Services 2005, Deegan, Cooper and Shelly 2006b, Mock, Strohm and Swartz 2007).

The significance of obtaining independent third party verification on sustainability reports has been acknowledged in the preceding literature. For example, Ballou, Heitger, Landes and Adams (2006) argue that the utility of sustainability reports diminish without independent third party verification. Gray (2000) reasons that good quality attestation is essential for reliability of information conveyed in sustainability reports to fulfill its role in developing transparency and accountability. He also adds that there has been no research into auditor's practices and concerns regarding the attestation of social data, but auditors have *de facto* responsibility for social and environmental reports that are published separately or as a part of financial statements.

In the recent past, research related to assurance on sustainability reporting has burgeoned. Fonseca (2010) reports that member companies of the International Council on Mining and Metals (ICMM) have committed to publish externally assured sustainability reports and that the

ICMM has launched its own assurance procedure. Kolk and Perego (2010) find that voluntary demand for assurance services is significantly influenced by the legal environment in which a firm operates. If there are weak country level institutional mechanisms, then it is more likely that assurance and governance mechanisms will be adopted. Olson (2010) suggests that although currently non-financial auditing is not as popular as financial auditing, there will be growth in carbon accounting and auditing of greenhouse gas emissions. Further, this may lead to an increase in overall accountability and assurance level for other content in sustainability reports. Manetti and Becatti (2009) point out that auditors need to carefully plan the assurance process related to sustainability reporting and recommend that international standards should provide specific guidelines for assurance providers. Perego (2009) find that companies domiciled in weaker legal environments are more likely to choose a Big4 assurance provider. In addition, he finds that Big4 assurance providers may provide a higher quality of assurance on aspects related to reporting format and procedures used. Waddock (2009) illustrates how certain organizations and institutions have been instrumental in establishing a corporate responsibility assurance infrastructure and states that in the future there will be a greater demand for "companies to be significantly more transparent, in ways that are credibly verified, typically by external agencies". Simnett, Vanstraelen and Chua (2009) find that firms that desire to build their corporate reputation have a greater probability of getting their sustainability reports assured. In addition, they find that firms based in stakeholder-oriented economies are more likely to choose an assuror from the auditing profession. O'Dwyer and Owen (2007) find that many sustainability assurance statements indicate the limited nature of work undertaken that is often decided by the management.

Some institutions provide standards for publishing sustainability reports and others

provide standards for assurance of sustainability reports. As mentioned above, standards for issuing sustainability reports and standards for assurance of these reports are not laws that are required to be followed in any jurisdiction. The standards for publishing sustainability reports are meant to facilitate reporting by organizations on their social, environmental and economic performance. The standards for assuring sustainability reports are meant to be used by audit practitioners to verify the quality of information in the sustainability reports. The important standards for assurance of sustainability reports are issued by the following institutions: International Auditing and Assurance Standards Board (IAASB), AccountAbility (AA), Nederlands Instituut Van Registeraccountants (NIVRA) and Social Accountability International (SAI).

The International Auditing and Assurance Standards Board (IAASB) has issued International Standard on Assurance Engagements (ISAE) 3000 (Oelschlagel 2005) and its purpose is to cover assurance engagements *other than* audits or reviews of historical financial information covered by International Standards on Auditing (ISAs) or International Standards on Review Engagements (ISAE 2005). The IAASB is an arm of International Federation of Accountants (IFAC) which serves the public interest by setting standards and working toward the convergence of national and international standards (IFAC 2002). ISAE3000 provides comprehensive standard on ethical requirements for practitioners, engagements and related issues, quality control, expert assistance in performing the engagement, obtaining evidence, documentation, preparing the assurance report, effective date and difference between levels of assurance (Rao, Mock and Srivastava 2009). However, ISAE3000 does not provide specific management assertions related to SR assurance services.

AccountAbility is a global, non-profit, self-managed partnership founded in 1995 with bases in Beijing, Geneva, London, Sao Paulo and Washington D. C. and country representatives in Brazil, Canada, China, Jordan, Spain, Sweden and the US (AA 2009). AccountAbility is responsible for the AA1000 series of standards of which AA1000 AccountAbility Principles Standard (AA1000APS) and AA1000 AccountAbility Assurance Standard (AA1000AS) are a part. The latter is used by practicing auditors to evaluate and provide conclusions on the nature and extent of adherence to the AA1000APS, and, where applicable, the quality of publicly disclosed information on sustainability performance. The AA1000AS includes guidelines on using the standard, accepting, planning, performing and reporting an engagement to the management and to the users of the sustainability report (Rao, Mock and Srivastava 2009). The AA1000AS does not list any management assertions related to SR assurance services.

NIVRA, the Dutch accounting body, published the standard COS 3410N in 2007. This standard deals with assurance engagements relating to sustainability reports and discusses the scope and objective of providing assurance on such reports, engagement acceptance, risk analysis, system related products, substantive procedures, dealing with multi-locations, obtaining additional evidence, documentation and the assurance report itself. The NIVRA COS 3410N also does not list any management assertions related to SR assurance services.

Social Accountability International (SAI) has developed the SA8000 standard, which specifies voluntary conditions to be fulfilled by employers in the workplace, and can be used by auditors to provide assurance. These conditions concern the workplace conditions, worker's rights and management systems and are founded on international human rights norms, national law and canons of the International Labor Organization. SA8000 also includes social accountability requirements such as child labor, forced labor, collective bargaining,

discrimination and working hours. Similar to the other assurance standards described above, the SA8000 does not list any management assertions related to SR assurance services.

In their paper, Mock, Strohm and Swartz (2007) examine the basic characteristics of 130 assured sustainability reports and find that companies from 21 different countries publish assured sustainability reports with the European Union providing 67% of the reports. Additionally, they find that firms operating in environmental and economically sensitive areas such as utilities, mining and oil provide the most assured reports and that 65% of the assured reports were provided by Non-Big 4 firms. Interestingly, unlike in an annual financial statement audit, they find that almost all of the audit firms disclose the procedures they performed.

Some researchers express concern about the audit expectations gap. Hodge, Subramaniam and Stewart (2009) describe the audit expectation gap as the lack of effective communication by an assurance report. Hasan, Roebuck and Simnett (2003) state in a monograph commissioned by the International Federation of Accountants (IFAC 2002, i): "The accurate determination and effective communication of levels of assurance provided in assurance statements are critical issues for the well being of the profession and the future development of assurance services." Adams and Evans (2004) also emphasize the need for lucidity in the nature and level of assurance provided.

While all the above streams of research explore topics that are valuable in content and consequence, none of them analyze the actual steps taken by a professional assurance provider to provide assurance for sustainability reports. In this paper, we demonstrate the use of the evidential reasoning approach for providing attestation to sustainability reports. The evidential reasoning approach provides a structured approach to the evidence collection and aggregation

process related to assurance services. Most importantly, it supplies the assurance provider with a blueprint for aggregating evidence and facilitates scrutinizing the main objective, assertion, or sub-assertion to insure that evidence at a level desired by the assurance provider is obtained. Depending on what has been found, the assurance provider can then perform further procedures or issue a report that reflects the existing situation.

The suggested approach to cost analysis should be of significant value in planning the audit procedures as well as estimating and minimizing the cost of the audit. Having knowledge of the lowest cost alternative will enable the assurance provider to concentrate on those audit procedures that will control audit risk and provide the needed level of confidence. We expand on these in subsequent sections.

CHAPTER 3: EVIDENTIAL DIAGRAM

In the auditing contexts discussed in this paper, evidential reasoning entails determining what sort of evidence is relevant to the specific assertion being considered and deciding what level of support for the assertion is obtained from each item of audit evidence that is collected. To model such decision settings, an evidential diagram may be developed comprising of the variables involved in providing assurance along with their mutual relationships and items of evidence pertaining to those variables. Once the evidential diagram is completed, the auditor can judge the influence of available evidence on the variables, and thus assess the impact of any item of evidence on all of the assertions being audited.

In such models, knowledge about one or more variables can be used to make assessments concerning other variables, if we know how these variables are interrelated (Srivastava, Buche and Roberts 2005; Sun, Srivastava and Mock 2006). Normally, knowledge about the states of these variables is incomplete. That is, there is uncertainty associated with what an auditor knows about these variables. These uncertainties translate into the audit risks that must be controlled (Srivastava and Shafer 1992; Fukukawa and Mock 2011).

3.1 Underlying Framework

Since the assurance procedures recommended by international sustainability assurance standards (IAASB 2005, AA1000 2008, NIVRA COS 3410N 2009, SA8000 2008) are general in nature and provide little guidance about collection of items of evidence, and since most sustainability reports are made according to GRI guidelines, we use G3 (GRI 2006) guidelines to investigate the use of evidential reasoning for conducting a SR audit. A company adopting sustainability reporting guidelines can use G3 guidelines in several ways with varying degrees of application.

For instance, they may choose to use them for *informal* compliance or to employ them in a series of consecutive partial implementations. Or, they may decide to give an account of their corporate sustainability achievements predicated on the stricter *in accordance* level[3]. The shift from *informal* to *in accordance* under GRI standards occurs through a greater degree of transparent reporting, expansion of reporting coverage across the company and a more developed reporting structure. G3 guidelines leave the decision to the company whether it issues reports in all three performance areas or in one or two of these reporting areas.

Table 1 lists the three major assertion categories that would need to be considered when providing sustainability reporting assurance: 'Social Assertions', 'Environmental Assertions' and 'Economic Assertions'. Table 1, column 1, labeled 'Main Assertions', describes the assertion categories. The related sub-assertions are listed in the second column.

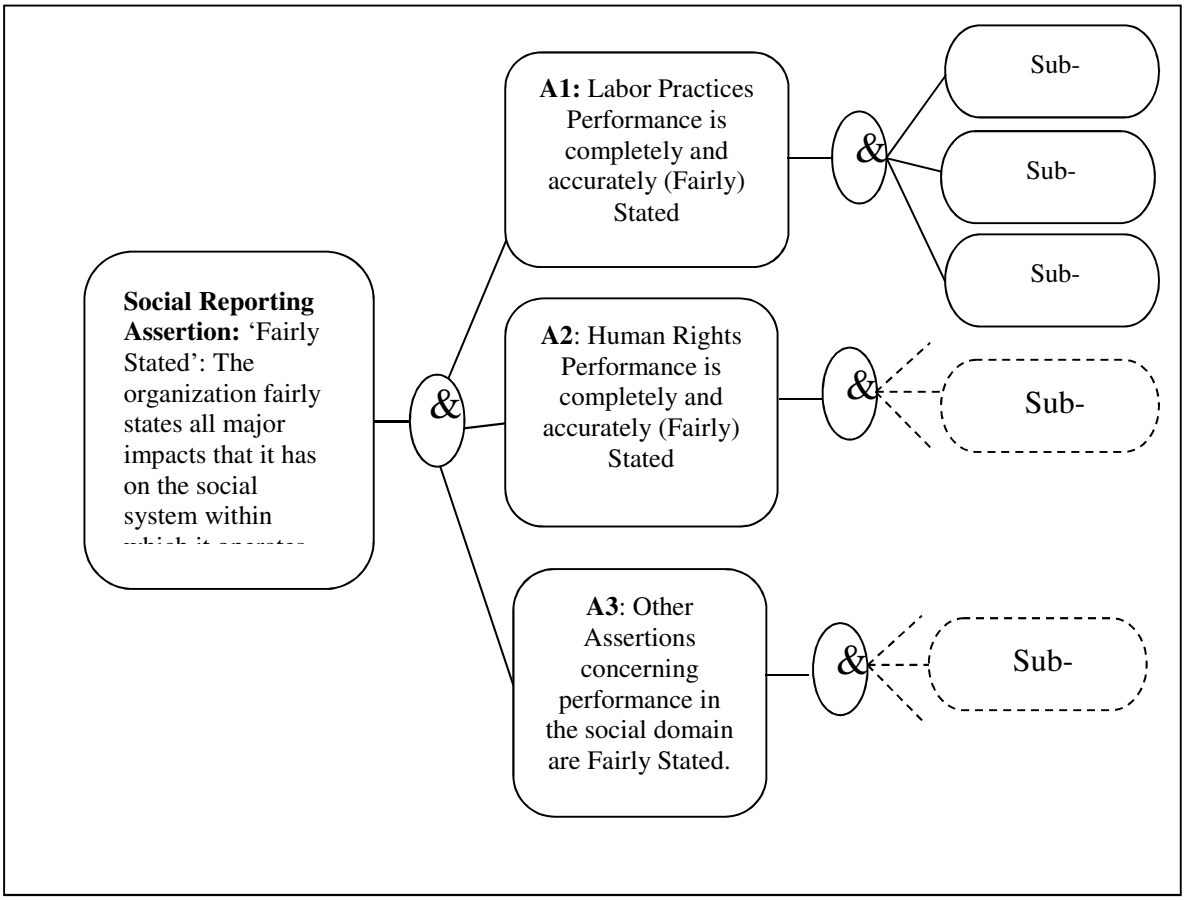
According to the G3 guidelines, social assertion category reporting requires that the entity disclose all major impacts that it has on the social system within which it operates. This includes labor practices, human rights, social interaction, and product responsibility. These conditions are expressed as assertions in column 2 of Table 1 and in Figure 1. The assurance provider will need to plan and collect adequate and pertinent evidence in support of each of these assertions. The sub-assertions are assumed to be related to the corresponding main assertions through an 'and' relationship. This relationship conveys that the main assertions are valid if and only if the corresponding sub-assertions are valid.

[3] See www.globalreporting.org/Services/ReportServices/InAccordanceChecks/ .

Table 1: Assertions and Sub-assertions for Sustainability Reporting Services (Taken from GRI guidelines, GRI 2006)

Main Assertions	Sub-Assertions
A1. Social reporting assertion: The organization fairly presents all major impacts that it has on the social system that it operates in.	A.1.1: Labor Practices - Complete and Accurate disclosure of Labor Practices. The organization fairly presents its labor practices and whether it meets internationally recognized standards.
	A1.2 Human Rights: The organization fairly presents the extent to which human rights plays a part in its operations and activities.
	A1.3 Social Interaction: The organization fairly presents the major risks that arise from interaction with other social institutions.
	A1.4 Product Responsibility: The organization fairly presents how its products and services directly affect customers.
A2. Environmental Reporting assertion: The organization fairly presents its performance and all major impacts that it has on the environment that it operates within.	A2.1 Materials: The organization fairly presents the extent to which it uses different materials by weight and by volume and the percentage of materials used that are recycled input materials. A2.2 Energy: The organization fairly presents the extent to which it consumes energy by energy source. A2.3 Water: The organization fairly presents the extent to which it withdraws water by source. A2.4 Biodiversity: The organization fairly presents the location, size of land owned, leased, managed in or adjacent to protected areas and areas of high diversity value, description of significant impacts of activities, products and services on biodiversity in protected areas and areas of high biodiversity value. A2.5 Emissions, Effluents and Waste: The organization fairly presents total direct and indirect greenhouse gas emissions by weight, emissions of ozone-depleting substances by weight, NOx and SOx and other significant air-emissions by type and weight, total water discharge by quality and destination, total weight of waste by type and disposal method, total number and volume of significant spills. A2.6 Products and Services: The organization fairly presents initiatives to mitigate environmental impacts of products and services and the extent of impact mitigation, percentage of products sold and their packing materials that are reclaimed by category. A2.7 Compliance: The organization fairly presents monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations.
A3. Economic Reporting assertion: The organization fairly presents its economic performance	A.3.1 Economic Performance: The organization fairly presents direct economic value generated and distributed, which includes revenues, operating costs, employee compensation, donations, community investments, retained earnings and payments to capital providers and governments, coverage of the company's defined benefit plan obligations and significant assistance received from government. A3.2 Financial Performance: The organization fairly presents financial implications, risks and opportunities, of the organizations activities due to climate change A.3.3 Market Presence: The organization fairly presents policy, practices and proportion of spending on locally based suppliers at significant locations of operation, procedures for local hiring and proportion of senior management hired from local community at significant locations of operation. A.3.4 Indirect Economic Impacts: The organization fairly presents development and impact of infrastructure investments and services provided primarily for public benefit through commercial, in-kind or pro-bono engagement.

Figure 1: Assertion, sub-assertions, and sub-sub assertions related to an entity reporting on its performance in the Social Category. Sub-Assertions A.1.1-A1.1.3 are described in Table 2

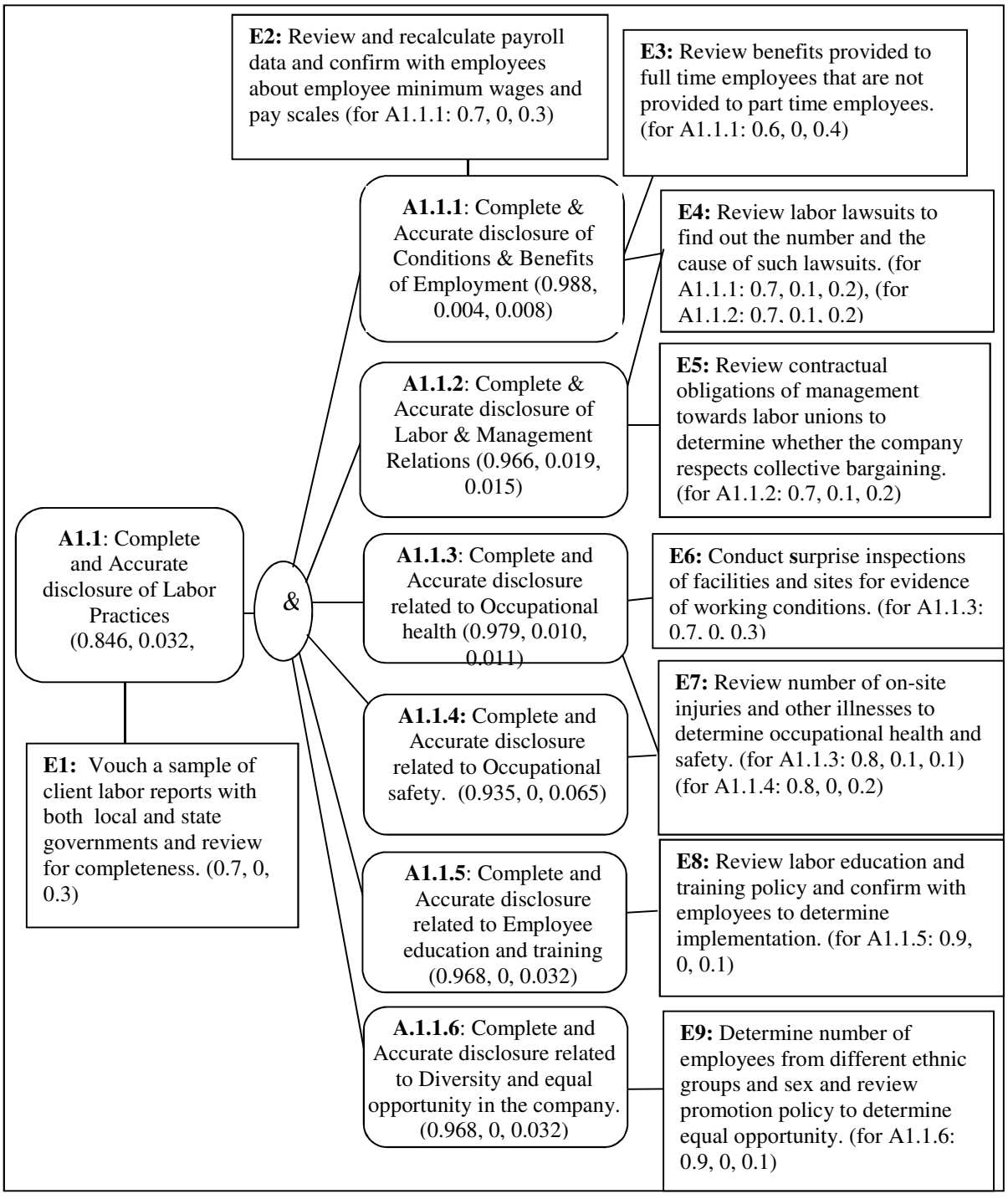


3.2 Construction of an Evidential Diagram

Figures 1 and 2 illustrate the structure of evidential diagrams. First, all the assertions (the main assertion, sub-assertions, and sub-sub-assertions) and items of evidence pertaining to these assertions must be identified. To illustrate the process of constructing an evidential diagram consider Figure 2 where the assertions are depicted as rectangular boxes with rounded corners. The main assertion on the left (A1.1) states a 'completeness accuracy assertion'[4] that "Complete and Accurate disclosure of Labor Practices." This assertion is connected through an 'and' relationship, represented by a circle with an '&', to six sub-assertions labeled A1.1.1 through A1.1.6. All sub-assertions and the corresponding main assertion are based on the G3 guidelines. The variables representing assertions and sub-assertions have values such as 'true' or 'false' which means that the assertion is valid (true) or not valid (false).

[4] Completeness and accuracy are used for illustrative purposes.

Figure 2: Evidential Diagram for Social Assertion Category A1.1: Labor Practices Performance is completely and accurately (Fairly) Stated



Next, items of evidence pertaining to various assertions must be specified. These items of evidence result from audit procedures performed by the assurance provider. Rectangular boxes are used as evidence nodes to represent items of evidence and these items of evidence are connected to the assertion or assertions that they help inform. The key challenge in providing assurance is to plan and implement a minimum cost and effective set of procedures.

As mentioned earlier, in Figure 2, the six sub-assertions to the right of the main assertion are related to it through an 'and' relationship. This relationship suggests that the main assertion is valid or true if and only if the six sub-assertions are valid. In Figure 2, the evidential diagram drawn is a network diagram, that is, a network where at least one item of evidence pertains to more than one assertion. In order to determine whether the main assertion is true, the assurance provider would plan and perform the procedures described in the rectangular boxes (evidence nodes). Each evidence node represents an audit procedure which provides positive, negative, or mixed evidence concerning the assertion to which it is linked. Based on what is ascertained from each of the procedures, the assurance provider can estimate the level of support or negation from each item of evidence for each corresponding assertion.

Following the syntax of DS theory, the first number in an assertion node is the level of support or belief mass that the assertion is true and the second number is the level of support or belief mass that the assertion is false. The third number shows the level of ignorance associated with each assertion. The procedures illustrated throughout the paper are intended to be comprehensive, but not exhaustive. That is, there could be other items of evidence that could be created using G3 guidelines. Our intention is to show how an assurance provider can use the evidential reasoning framework for planning and conducting a cost efficient SR audit. First, in Section 4, we discuss how audit evidence propagates through a SR evidential network such as

that represented in Figure 2. Then in Section 5 we propose and illustrate a sequential planning process which allows the assurance provider to provide assurance at targeted levels of assurance and thus control audit risk at minimum cost.

CHAPTER 4: EVIDENTIAL REASONING APPROACH ILLUSTRATION

In this section, the hypothetical case presented in Figure 2 is used to illustrate the evidential reasoning approach, that is, the propagation of strength of evidence (i.e., belief masses[5] or m-values) obtained from various items of evidence in performing a SR assurance service specific to a set of assertions of interest. A similar example is then used in Section 5 to illustrate audit planning.

First, we illustrate the propagation of strength of evidence in terms of m-values (belief masses) from sub-assertions to the main assertion which is *Complete and Accurate disclosure of Labor Practices* and is abbreviated as A1.1. Then we illustrate the propagation of m-values to a particular sub-assertion from the main assertion and all other sub-assertions. In particular, we choose Assertion A1.1.1: *Complete & Accurate disclosure of Conditions & Benefits of Employment* as the sub-assertion of interest. We use upper case letters to represent the name of the variables such as 'A1.1.1' for the assertion A.1.1.1 and lower case letters to represent their values. For example, 'a111' represents the situation where 'A1.1.1' is true and '~a111' the state where A1.1.1 is not true. Additionally, we label the evidence items with 'En' to signify the evidence number. Abbreviations and symbols used are listed in Table 2.

[5] We assume that readers have basic background on the DS theory of belief functions (Shafer 1976) and thus we do not provide an introduction to belief functions. For such an introduction, see Yager, Kacprzyk, Fedrizzi (1994) and Srivastava and Mock (2002).

Table 2: List of Symbols and Their Descriptions

Assertion and Sub-Assertion	Description of Assertion and Sub Assertion	Evidence/Related Assertion[s]	Audit Procedure
A1.1	Complete and Accurate disclosure of Labor Practices	E1/ A1.1	Vouch a sample of client labor reports with both local and state governments and review for completeness.
A1.1.1	Complete & Accurate disclosure of Conditions & Benefits of Employment	E2/A1.1.1	Review and recalculate payroll data and confirm with employees about employee minimum wages and pay scales
A1.1.2	Complete & accurate disclosure of Labor & Management Relations	E3/A1.1.1	Review benefits provided to full time employees that are not provided to part time employees.
A1.1.3	Complete and accurate disclosure related to Occupational health	E4/A1.1.1 & A1.1.2	Review labor lawsuits to find out the number and the cause of such lawsuits
A1.1.4	Complete and accurate disclosure related to Occupational safety	E5/A1.1.2	Review contractual obligations of management towards labor unions to determine whether the company respects collective bargaining.
A1.1.5	Complete and accurate disclosure related to Employee education and training	E6/A1.1.3	Conduct surprise inspections of facilities and sites for evidence of working conditions
A1.1.6	Complete and accurate disclosure related to Diversity and equal opportunity in the company.	E7/A1.1.3 & A1.1.4	Review number of on-site injuries and other illnesses to determine occupational health and safety.
		E8/A1.1.5	Review labor education and training policy and confirm with employees to determine implementation.
		E9/A1.1.6	Determine number of employees from different ethnic groups and sex and review promotion policy to determine equal opportunity.

4.1 Combination of Audit Evidence Relevant to the Main Assertion

Consider first the propagation of strength of evidence from sub-assertions (A1.1.1, A1.1.2, … A1.1.N) to the main assertion (A1.1) (Figure 2). To simplify the computations, we transform the evidential diagram from a network structure to a tree structure[6] using the following process. Suppose we have evidence that pertains to two sub-assertions. We split this evidence into two different items of evidence relating individually to the two sub-assertions. For example, in Figure 2, evidence E4 is linked to sub-assertion A1.1.1 and to sub-assertion A1.1.2. The partitioned input m-values are assumed to be as follows:

$m_{E4}(a111) = 0.7$, $m_{E4}(\sim a111) = 0.1$, $m_{E4}(\{a111, \sim a111\}) = 0.2$,

$m_{E4}(a112) = 0.7$, $m_{E4}(\sim a112) = 0.1$, $m_{E4}(\{a112, \sim a112\}) = 0.2$.

That is, we assume an equal amount of evidential support for the two sub-assertions. However, in general, one can choose different levels of support for each sub-assertion.

We combine multiple items of evidence at each sub-assertion using Dempster's rule as simplified by Srivastava (2005) to obtain updated m-values at each sub-assertion. Next, we use Srivastava, Shenoy and Shafer (1995) to propagate the evidence impounded in the above m-values from the six sub-assertions to the assertion 'A1.1' through the 'and' relationship. Finally, we combine the above m-values propagated to 'A1.1' from the six sub-assertions with the m-values obtained from the evidence directly bearing on 'A1.1'. The resulting m-values are the updated belief masses at ‘A1.1’ given all of the audit evidence bearing on the six sub-assertions (i.e. E2, E3 … E9), the desired result.

[6] Srivastava and Lu (2002) have demonstrated that a tree structured evidential diagram is a good approximation of a network structure under a special condition that is relevant here.

To accomplish the steps described above, we programmed, in the Frontline Solver Pro V11.0 attachment to MS Excel 2010 Spreadsheet (Frontline System Inc. 2011), the logic for combining multiple items of evidence on a variable using Dempster's rule as modified by Srivastava (2005) and programmed the Srivastava, Shenoy and Shafer (1995) approach of propagating belief masses from sub-assertions to the main assertion.

Consider the following scenario for our illustration. Suppose an assurance provider is collecting evidence pertaining to sub-assertion A1.1.1 and plans and obtains three relevant items of evidence for A1.1.1, namely E2, E3 and E4 (See Figure 2). The assurance provider examines evidence E2, that is, reviews and recalculates payroll data and confirms minimum wages and pay scales with a sample of employees. The auditor then decides that these procedures provide support for A.1.1.1 to the extent of 0.7 on a scale of 0-1 and no support for its negation with a resulting lack of knowledge of 0.3. In other words, these audit tests allow the auditor to be 70% confident that the client has complete and accurate disclosure of employment conditions and benefits. However, as the audit test provides no evidence to the contrary, thus there is still 30% ignorance.

The assurance provider then reviews benefits provided to full-time employees that are not provided to part-time employees (E3) and decides that these audit procedures provide evidence in support of A1.1.1 of 0.6. Again, the assurance provider does not find any evidence that provides negative support for A1.1.1. Here, the resulting level of ignorance is 0.4.

The assurance provider proceeds to review labor lawsuits to find out the number and cause of such lawsuits (E4) and decides that the evidence provides support in favor of A1.1.1 of

0.7 and provides negative support for A1.1.1 of 0.1, which leaves the level of ignorance to 0.2. In summary, the strengths of evidence assessed for E2, E3 and E4 are as follows:

$m_{E2}(a111) = 0.7$, $m_{E2}(\sim a111) = 0.0$, $m_{E2}(\{a111, \sim a111\}) = 0.3$,

$m_{E3}(a111) = 0.6$, mE3($\sim a111$) = 0.0, $m_{E3}(\{a111, \sim a111\}) = 0.4$,

$m_{E4}(a111) = 0.7$, mE4($\sim a111$) = 0.1, $m_{E4}(\{a111, \sim a111\}) = 0.2$.

These input m-values are based on the assurance provider's assessment of the evidence and judgment. Similarly, the assurance provider determines m-values for all other items of evidence as given in columns 3-5 in Table 3.

As mentioned earlier, the first step in propagating belief masses from the sub-assertions to the main assertion is to determine the total belief masses at each sub-assertion based on all items of evidence directly bearing on each sub-assertion. For example, using Dempster's rule, the combined m-values of the three items of evidence, E2, E3, and E4, bearing directly on the sub-assertion A1.1.1 are m(a111) = 0.961, m($\sim a111$) = 0.013, m($\{a111, \sim a111\}$) = 0.026. This means that when evidence E2, E3 and E4 are combined, the combined strength of evidence indicating that A1.1.1 is valid is 0.961, the combined strength of evidence implying that A1.1.1 is not valid is 0.013, and the combined ignorance about A1.1.1 is 0.026.

Similarly, we determine the total m-values at each sub-assertion as a result of combining all the items of evidence bearing directly on the sub-assertion using Dempster's Rule. These values are listed in columns 6-8 in Table 3.

Next, we use Proposition 1 of Srivastava, Shenoy and Shafer (1995) to propagate m-values from sub-assertions to the main assertion A1.1. The combined strength of evidence at

A1.1 propagated from the sub-assertions yields the following m-values: m(a11) = 0.521, m(~a11) = 0.101 m({a11, ~a11}) = 0.378.

The assurance provider has one additional item of evidence to consider, specifically E1. Regarding E1, suppose that the assurance provider examines a sample of labor reports filed by the client and decides that they provide evidence in support of A1.1 to the extent of 0.7, as the labor reports are judged to have a good degree of objectivity and reliability. In the assurance provider's opinion, these labor reports provide no negative evidence for A1.1, leaving the level of ignorance about A1.1 to 0.3 given this particular audit test. Thus, based on the assurance provider's judgment, we consider the following set of belief masses obtained from E1 for A1.1: m(a11) = 0.7, m(~a11) = 0.0, m({a11, ~a11}) = 0.3.

To determine the overall belief masses at the main assertion level, A1.1, we combine the belief masses obtained from E1 with the belief masses propagated from the sub-assertions, A1.1.1. – A1.1.6 (see Figure 2). This yields the following overall m-values: m(a11) = 0.846, m(~a11) = 0.032, m({a11, ~a11}) = 0.122 (see columns 9-11 in Table 3). This means that the combined audit evidence confirming the assertion that the organization completely and accurately discloses its labor practices is 0.846, the combined evidence disconfirming the assertion is 0.032 and the level of ignorance is 0.122.

Table 3: List of Input m-values and Overall m-values. The Assertion and Sub-Assertions along with the Corresponding Items of Evidence are defined in Table 2.

Assertion and Sub-assertion	Item of Evidence Pertaining to Assertion or Sub-Assertion	Positive	Negative	Θ*	Total m-values as a result of combining all the evidence directly bearing on the assertion and sub-assertions			Overall m-values		
					Positive	Negative	Θ*	Positive	Negative	Θ*
A1.1	E1	0.7	0	0.3	0.7	0	0.3	0.846	0.032	0.122
A1.1.1	E2	0.7	0	0.3	0.961	0.013	0.026	0.988	0.004	0.008
	E3	0.6	0	0.4						
	E4	0.7	0.1	0.2						
A1.1.2	E4	0.7	0.1	0.2	0.895	0.058	0.047	0.966	0.019	0.015
	E5	0.7	0.1	0.2						
A1.1.3	E6	0.7	0	0.3	0.935	0.032	0.032	0.979	0.010	0.011
	E7	0.8	0.1	0.1						
A1.1.4	E7	0.8	0	0.2	0.8	0	0.2	0.935	0	0.065
A1.1.5	E8	0.9	0	0.1	0.9	0	0.1	0.968	0	0.032
A1.1.6	E9	0.9	0	0.1	0.9	0	0.1	0.968	0	0.032

* The values in the column with heading Θ represent ignorance about the corresponding assertion or sub-assertion

The assurance provider can then use the above information to make a decision about whether the 'Labor Practices' assertion is valid or not or whether additional evidence needs to be collected. In the illustration, the evidence confirming the assertion is a moderate level of 0.846, the evidence disconfirming the assertion is only 0.032, but the plausibility that the assertion is not valid is 0.154. If the Srivastava and Shafer (1992) plausibility definition of audit risk is used, the audit risk that the assurance is not true is 0.154 (i.e., 15.4%).

Given that the belief that the assertion is true is 0.846, the SR assurance provider has two main alternatives. First, the auditor could conclude and report that the assertion is fairly stated at what might be considered a 'moderate' level of assurance. Or, the auditor could continue to collect audit evidence to the point where the plausibility of misstatement was much lower (it is conventional to use 5% in a financial audit). An approach to obtaining such evidence at minimum cost is discussed later in this paper.

A third possibility is to conclude that the evidence suggests that the assertion is not valid, but this would be unlikely given the evidence only supports a very small belief of 0.032 supporting such a conclusion. Given the low plausibility of misstatement, the auditor could opine that the main assertion is fairly stated at an acceptable level of audit risk; describe the nature of any observed deficiencies in labor practices; and identify specific areas the management should focus on to mitigate such deficiencies. SR assurance standards and practices provide much more flexibility than conventional financial statement audit reports in what the auditors may communicate (Mock, Strohm and Swartz 2007; Mock, Rao, Srivastava and Swartz 2011).

4.2 Combination of Evidence at a Sub-assertion

Evidential networks are somewhat peculiar in that the information obtained at each node flows to all other connected nodes (Shenoy and Shafer 1990, and Pearl, 1990). To consider this aspect, we use sub-assertion A1.1.1: Complete & Accurate disclosure of Conditions & Benefits of Employment – to exemplify the propagation of strength of evidence from assertion A1.1 and from the other sub-assertions to the chosen sub-assertion (A1.1.1). Again, we use Figure 2 to illustrate this.

The m-values from various items of evidence at the sub-assertions (A1.1.2, A1.1.3, A1.1.4, A1.1.5, and A1.1.6) and the assertion (A1.1) are given in Table 3. The input m-values are assumed to be based on the assurance provider's assessment of the various strength of evidence provided by each audit procedure as indicated in columns 3, 4 and 5.

As considered in the previous case, we use the same input m-values at A1.1 from evidence E1: $m_{E1}(a11) = 0.7$, $m_{E1}(\sim a11) = 0$, and $m_{E1}(\{a11,\sim a11\}) = 0.3$ (see row 1, and columns 3-5 in Table 3) in the present discussion. To determine the overall combined m-values at sub-assertion A1.1.1, three sets of m-values must be combined. One set comes from A1.1 (i.e., from E1), another from the other sub-assertions, and the last set of m-values are defined at A1.1.1 originating from evidence E2, E3, and E4. We again use Dempster's rule and Srivastava, Shenoy and Shafer (1995) to combine the above m-values.

The resulting overall combined belief masses at A1.1.1 are: $m(a111) = 0.988$, $m(\sim a111) = 0.004$, $m(\{a111,\sim a111\}) = 0.008$ (see columns 9-11 in Table 3). These values indicate that there is a very high degree of positive support for A1.1.1 (0.988) and almost no support for the negation of the sub-assertion (0.004). Given this situation, the assurance provider should be

confident that the sub-assertion A1.1.1 is valid, could provide a high level of assurance with little audit risk on this assertion, and thus would not need to perform any additional audit procedures. However, if the evidence provided less than the assurance provider's target acceptable level of belief, say 0.95, then the assurance provider should either perform additional procedures to obtain a higher level of assurance, qualify the opinion by listing any shortcomings or even provide a negative opinion of some sort suggesting that the assertion may not be 'fairly stated'.

Again, SR assurance provides a wide latitude of options (Mock, Strohm and Swartz 2007). For example, as described in the introduction, there are varying levels of assurance being provided by auditors on various performance metrics. In applying the evidential reasoning framework, the auditor can set the target level of assurance for each assertion to differ (e.g., BAT 2010, Cathay Pacific 2010, France Telecom Orange 2010, and Vancity 2010) and plan accordingly to collect enough evidence to achieve the target level. This aspect is further elaborated in the next section within the context of cost of performing the service.

CHAPTER 5: ASSURANCE PLANNING AND COST ANALYSIS

In this section, we develop a cost minimization model and illustrate how such a model can be used by an assurance provider to conduct an engagement at the minimum cost by identifying those procedures that provide, in combination, the desired level of assurance for each specific assertion. Our approach begins with a general discussion of a cost function associated with a procedure (evidence) which is assumed to increase exponentially with the increase in the targeted level of assurance intended from the procedure. Next, we discuss the cost minimization model along with the constraints based on the inherent limitations of audit procedures. Finally, we consider the sequential, iterative nature of assurance planning where plans are updated as additional items of evidence are obtained.

5.1 Cost Function

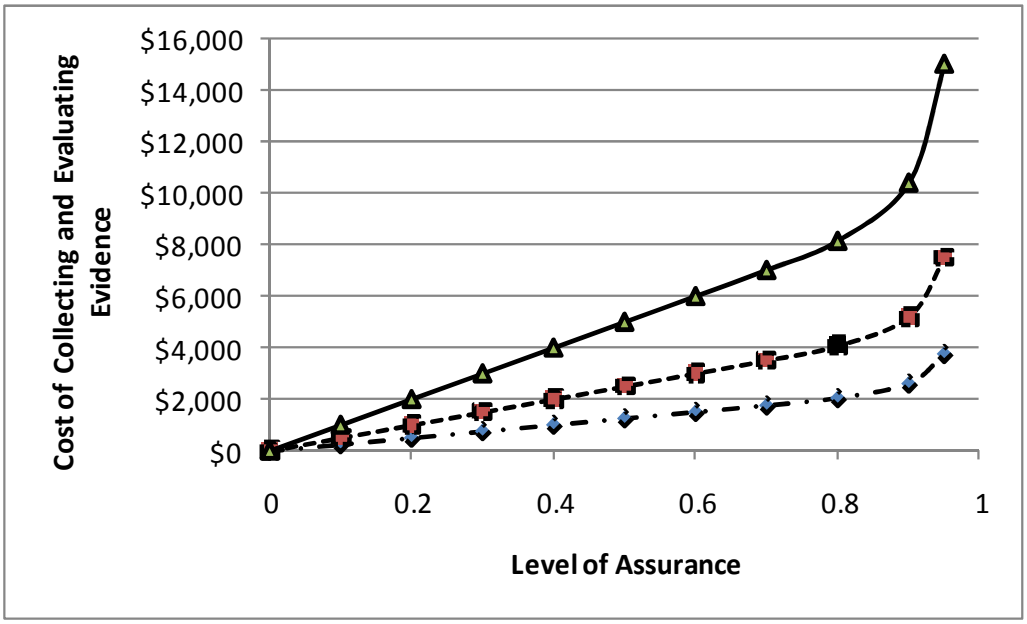
We assume the cost of an item of evidence is bounded at each endpoint as follows. If the desired level of assurance (belief mass) from the evidence pertaining to the corresponding assertion is zero (i.e., B = 0, where B represents the desired level of assurance measured in terms of the belief that the assertion is true), then the cost of performing the procedure is zero. Similarly, the cost is infinitely high if the target belief is certainty, that is, 1.0. Mathematically, such a cost function[7] can be expressed as: $\text{Cost} = aB/(1-\text{Exp}(-b(1-B))$, where a and b are parameters that together determine the amount of cost and the rate at which the cost increases as the target assurance level, B, increases.

Figure 3 plots such a function with three sets of values for 'a' (a = \$2,500, \$5,000, and \$10,000), and one value for b = 20. At a lower assurance level, the cost increases linearly as a

[7] Desai, Roberts and Srivastava (2010) have used a similar cost function in cost-benefit analysis in the context of external auditor assessing the reliance on internal audit function.

function of the level of assurance B desired with a slope of ‘a’. However, at higher level of assurance, the cost increases as a function of B, much more rapidly, with an increasing slope proportional to ‘a’ and inversely proportional to ‘b’ and risk squared, $(1\text{-}B)^2$. This makes logical sense because the incremental cost incurred by the auditor would be of the same order when the auditor plans to acquire more evidence to achieve an additional level of assurance say, 0.1, from 0.4 to 0.5 or from 0.5 to 0.6. However, this additional cost would be expected to be much higher if the auditor increases the target level of assurance from 0.85 to 0.95. Our choice of parameters, ‘a’, between $2,500 and $10,000, and b = 20, is intended to reflect a reasonable set of values for the Figure 2 illustration and for the following scenarios.

Figure 3: Cost Function Cost(B) = a*B/(1 - exp(-b(1-B)) with b = 20 for an audit procedure. B represents the level of assurance, and a and b together determine the level of cost and rate at which cost increases



The assurance provider can use the evidential diagram in Figure 2 and the corresponding cost function as discussed above to plan for a desired level of overall assurance at a minimum cost. This is achieved by minimizing the total cost function for the planned level of belief (assurance) and associated risk in the main assertion and in each sub-assertion. The assurance provider may then specify additional constraints related to the nature of the audit evidence and procedures. These possibilities are illustrated in the following.

5.2 Cost Minimization Model

As noted earlier, the assumed cost function associated with each audit procedure is Cost = aB/[1−Exp(−b(1−B))]. In this cost function, B determines the level of assurance an assurance provider intends to achieve through this item of evidence that a certain assertion or sub-assertion is true. In our illustration, first we assume that the assurance provider plans the service to achieve a reasonable assurance, that is, a high level of assurance, at least 0.9 level of assurance for the main assertion (A1.1) and 0.95 level of assurance for the sub-assertions with known values of a and b for each procedure. The challenge is to determine the minimum cost of a set of audit procedures. Later, we will illustrate examples of “medium” and “limited” levels of assurance.

In those situations where a certain audit procedure pertains to more than one assertion, only the maximum cost of performing such a procedure is taken into consideration in our model. For example, in the Figure 2 illustration, evidence E4 is relevant to both sub-assertions A1.1.1 and A1.1.2. The cost function for E4 in our model is defined to be the maximum of the cost of performing E4 for A1.1.1 and for A1.1.2. That is, the Cost of E4 equals the maximum of {Cost of E4 for A1.1.1, Cost of E4 for A1.1.2}.

Since we have nine items of evidence in Figure 2, we need to minimize the sum of all nine cost functions. Thus, the objective function to minimize the total costs of the assurance engagement for the assertions depicted in Figure 2 can be written as:

$$\text{Minimize:} \quad \text{Total Cost} = \sum_{i=1,2,3,5,6,8,9} (\text{Cost of Ei}) + \text{Max}\{\text{Cost of E4 for A1.1.1, Cost of E4 for A1.1.2}\} + \text{Max}\{\text{Cost of E7 for A1.1.3, Cost of E7 for A1.1.4}\}, \quad (1)$$

where cost of evidence Ei is given by $a_i.B_i/[1-\text{Exp}(-b_i(1-B_i)]$.

We begin our investigation of this minimization problem by assuming it is subject to the following constraints:

1. There is a minimum target level of assurance for each assertion, i.e., $B_i \geq B_{i\text{-min}}$.

2. The belief masses from each item of evidence for the corresponding assertion or sub-assertion are assumed to be positive, i.e., $0 \leq m_{Ei}(x) \leq 1$, and $m_{Ei}(\sim x) = 0$ and the sum of belief masses from each item of evidence pertaining to an assertion must add to one as required by DS theory, i.e., $m_{Ei}(x) + m_{Ei}(\sim x) + m_{Ei}(\{x, \sim x\}) = 1$.

We use the 'Standard GRG Non-Linear Engine' of Frontline Premium Solver Pro V11.0 attachment (Frontline System Inc. 2011) to MS Excel 2010 Spreadsheet to minimize the above cost function by varying the input belief masses from all the nine items of evidence. This provides a baseline solution, labeled Scenario 1, where it is assumed that all the procedures are equally reliable and can provide any level of assurance between zero and one depending on the extent performed, as discussed below (See Table 4).

The results for Scenario 1 in Table 4 suggest that the minimum cost of a set of procedures in this case is to perform just the procedures related to evidence E1 to obtain 0.95 level of assurance for assertion A1.1 and not perform any other procedures. Since this is least costly procedure, the total cost of this audit is only $3,757. This is a logical result under the assumptions.

Since evidence E1 is at the main assertion level, A1.1, the information about the assertion A1.1 being true can be propagated back to the sub assertions. This suggests that all its sub-assertions are true with the same level of assurance. Since we assumed the auditor desired at least 0.95 level of assurance for all the sub-assertions of A1.1, and 0.9 level of assurance for A1.1, a 0.95 level of assurance for A1.1 should meet all the requirements. That is, all the sub-assertions are true at 0.95 level, and the main assertion A1.1 is true at least 0.90 level of assurance (in fact, A1.1 is true at 0.95 level of assurance).

However, this is not a realistic situation for most audit contexts. The above result is obtained under the assumption that all the items of evidence are equally reliable and can provide a maximum of 1.0 level of assurance for the corresponding assertion or sub-assertions. However, in practice, some items of evidence may be less reliable and hence provide a lower level of support for the corresponding assertion or sub-assertion. The reliability of evidence depends on the nature, timing, and extent of the procedure performed. We discuss such scenarios next.

5.3 Including Constraints Representing the Inherent Nature of the Audit Evidence

An interesting finding from the previous analysis is that, if the auditor assumes each audit procedure has the potential to provide essentially unlimited assurance, the minimum cost audit program is one that emphasizes procedures which directly provide assurance on the main

assertion A1.1. However, in practice it has been found to be essentially impossible to find and implement such procedures, certainly at reasonable cost. Thus in practice, limitations are placed on the maximum reliance on procedures which reflect the inherence limitations on the evidence (Bell, Marrs, Solomon and Thomas 1997).

For example, the procedure in Figure 2 that bears directly on the main assertion A1.1 is to vouch (verify the accuracy of) a sample of the labor reports the client files with local or state governments. The inherent limitations of such a procedure include sampling error if a complete sample is not verified and the ability to actually obtain copies of such documents may be confidential in certain jurisdictions or may be incomplete. Such limitations are reflected in an additional constraint we now add to the cost minimization formulation:

3. The maximum level of support that can be expected from each item of evidence is assumed to be a given level less than 1.00 based on the reliability and relevance of the evidence.

We consider six additional scenarios to illustrate the application of our planning approach for varying levels of assurance and the effects of alternative situations on the minimum cost audit program and the expected maximum support from various items of evidence.

Scenario 2 (Reasonable Assurance): Again, assume the assurance provider has specified the acceptable minimum level of overall belief (i.e., assurance) that each assertion and sub-assertion is true. As in the prior illustrations, we assume that the assurance provider is planning the audit at a reasonable assurance level, that is, say at the 0.95 level for all sub-assertions and 0.90 for the main assertion. Sensitivity analysis can be used to evaluate the effects on the planned audit program and on minimum cost of changing these thresholds.

Assume also, consistent with constraint #3, that the assurance provider establishes the maximum level of support (an 'upper limit' on assurance) that is expected to be obtained from each item of evidence as follows: E1: 0.7, E2: 0.8, E3: 0.8, E4 (for A1.1.1): 0.95, E4 (for A1.1.2): 0.9, E5: 0.9, E6: 0.9, E7 (for A1.1.3): 0.8, E7 (for A1.1.4): 0.95, E8: 0.95, E9: 0.95. These could be based on the auditor's prior experience with the inherent nature of these procedures adjusted to the particular SCR client.

The next step would be to estimate the cost of obtaining each item of evidence. As noted, wherever one item of evidence is connected to more than one variable, the model considers the highest cost.

Determining the cost of each item of evidence involves estimating two parameters, 'a' and 'b', whose values depend on the nature and extent of the procedure performed. An assumed set of values for 'a' and 'b' are given in Table 4 for each item of evidence for Scenarios 1 and 2. These scenarios apply constraints 1 and 2 and thus assume only positive audit evidence. Scenario 2 differs from Scenario 1 in that a limit is placed on the expected reliance that can be placed on each item of evidence as depicted in Table 4 (Column 7).

Table 4: Sensitivity Analysis: Scenarios 1 and 2 with the Cost Parameter b =20

Evidence number	Assertions Evidence is Linked to	Cost Para-meter 'a' ($)	**Scenario 1 (Reasonable Assurance)** Main assertion: 0.9 level of assurance Sub-assertions: 0.95 level of assurance			**Scenario 2 (Reasonable Assurance)** Main assertion: 0.9 level of assurance Sub-assertions: 0.95 level of assurance		
			Upper limit on assurance belief	Level of support needed in Min. Cost Solution	Cost ($)	Upper limit on assurance belief	Level of support needed in Min. Cost Solution	Cost ($)
E1	A1.1	2,500	1.0	0.95	$3,757	0.70	0.70	$1,754
E2	A1.1.1	5,000	1.0	0	0	0.80	0.306	1,530
E3	A1.1.1	5,000	1.0	0	0	0.80	0.306	1,530
E4	A1.1.1	10,000	1.0	0	0	0.95	0.900	10,409
E4	A1.1.2	10,000	1.0	0	0	0.90	0.900	10,409
E5	A1.1.2	8,000	1.0	0	0	0.90	0	0
E6	A1.1.3	6,000	1.0	0	0	0.90	0.865	5,569
E7	A1.1.3	10,000	1.0	0	0	0.80	0.800	8,149
E7	A1.1.4	10,000	1.0	0	0	0.95	0.916	11,237
E8	A1.1.5	8,000	1.0	0	0	0.95	0.932	10,000
E9	A1.1.6	8,000	1.0	0	0	0.95	0.938	10,514
					$3,757			**$52,543**

The results of Scenario 2 in Table 4 demonstrate the following. First, it is not possible to get the desired level of assurance on the main assertion, A1.1, and its various sub-assertions just by gathering evidence E1 because of its assumed reliability maximum of 0.70. Other items of evidence must be gathered in order to meet the desired level of assurance at each assertion/sub-assertion and consequently the minimum cost of the audit is significantly higher, that is $52,543 compared to $3,757 for Scenario 1.

Note also that procedures related to evidence E5 are not needed. The reason for this is that E4 is needed to satisfy the minimum assurance of 0.95 for sub-assertion A1.1.1 along with E1, E2 and E3. Since E4 is necessary for A1.1.1, it is most efficient to use E4 for sub-assertion A1.1.2. A 0.9 level of assurance from E4 for A1.1.2 along with 0.7 from E1 for A1.1 is enough to yield 0.95 level of assurance for A1.1.2, the required minimum. Thus, there is no need to perform audit procedure E5 for A1.1.2.

Scenario 3 (Reasonable Assurance): Subsequently, suppose the assurance provider, still working at a reasonable level of assurance as assumed in Scenario 2, determines that the maximum level of assurance that can be achieved from E1 cannot be more than 0.5 because certain jurisdictions have declined to provide the requested documentation. In such a situation, a change in the cost minimization problem is required to decrease the maximum level of assurance for E1 from 0.7 to 0.5. Note that this decrease applies to an audit test at the main assertion level.

We summarize the effects of this change by comparing Scenarios 2 and 3 (see Tables 4 and 5). This one change brings about the following complex set of changes:

1. The cost of conducting E1 decreases from $1,754 to $1,250 because the level of support needed from E1 decreased from 0.7 to 0.5, which is the maximum that could be obtained from E1 in Scenario 3.
2. The cost of E2 and E3 increased from $$1,530 to $3,754 because the needed assurance increased from 0.306 to 0.746.
3. The cost of E4 (linked to A1.1.1) decreases from $10,409 to $7,528 because the needed level of support from E4 (linked to A1.1.1) decreases from 0.90 to 0.748.
4. The cost of E4 (linked to A1.1.2) decreases from $10,409 to $9,941 because the needed level of support from E4 (linked to A1.1.2) decreases from 0.90 to 0.888.
5. The cost of E5 increased from $0 to $8,029 because the needed level of support from E5 increased from zero to 0.891.
6. The cost of E6 increases from $5,569 to $6,226 because the needed level of support from E6 increases from 0.865 to 0.899.
7. The cost of E7 (linked to A1.1.3) remains unchanged at $8,149, because the needed assurance from this evidence for A1.1.3 remained unchanged. The cost of E7 (linked to A1.1.4) increases from $11,237 to $12,438 because the needed level of support from this evidence increased from 0.916 to 0.931.
8. The costs of E8 increased significantly from $10,000 to $12,023 and of E9 from $10,514 to $12,023 because of the increased levels of support needed from E8 and E9 (0.932 to 0.95 for E8, and 0.938 to 0.95 for E9).
9. The total cost of the assurance engagement increased significantly from $52,534 in Scenario 2 to $69,438 in Scenario 3.

Table 5: Sensitivity Analysis: Scenarios 3, 4, 5, and 6 with the Cost Parameter b =20

Evidence number	Assertions Evidence is Linked to	Cost Para-meter 'a' ($)	Upper limit on assurance belief	**Scenario 3 (Reasonable Assurance)** Main assertion: 0.9 Sub-assertions: 0.95		**Scenario 4 (Medium Assurance)** Main assertion: 0.7 Sub-assertions: 0.7		**Scenario 5 (Limited Assurance)** Main assertion: 0.5 Sub-assertions: 0.5		**Scenario 6 (Reasonable Assurance with Mixed Evidence)** Main assertion: 0.9 Sub-assertions: 0.95	
				Level of support needed in Min. Cost Solution	Cost ($)	Level of support needed in Min. Cost Solution	Cost ($)	Level of support needed in Min. Cost Solution	Cost ($)	Level of support needed in Min. Cost Solution	Cost ($)
E1	A1.1	2,500	**0.50**	**0.5**	1,250	**0.5**	1,250	**0.5**	1,250	**0.5**	1,250
E2	A1.1.1	5,000	0.80	0.746	3,754	0	0	0	0	0.745	3,750
E3	A1.1.1	5,000	0.80	0.746	3,754	0	0	0	0	0.745	3,750
E4	A1.1.1	10,000	0.95	0.748	7,528	0.890	10,021	0	0	0.746	7,502
E4	A1.1.2	10,000	0.90	0.888	9,941	0.890	10,021	0	0	0.897	10,281
E5	A1.1.2	8,000	0.90	0.891	8,029	0	0	0	0	0.897	8,229
E6	A1.1.3	6,000	0.90	0.899	6,226	0	0	0	0	0.900	6,245
E7	A1.1.3	10,000	0.80	0.800	8,149	0.800	8,149	0	0	0.800	8,149
E7	A1.1.4	10,000	0.95	0.931	12,438	0.847	8,879	0	0	0.948	14,750
E8	A1.1.5	8,000	0.95	0.950	12,023	0.863	7,384	0	0	0.950	12,023
E9	A1.1.6	8,000	0.95	0.950	12,023	0.863	7,384	0	0	0.950	12,023
					$69,438		**$34,917**		**$1,250**		**$72,303**

Here we observe that a decrease in the maximum level of support obtained from E1 at the main assertion level brings about a significant increase in the total cost from $52,534 to $69,438. This result suggests that, in order to minimize the total cost of an engagement, the assurance provider should work to obtain more reliable evidence at the higher level of assertions. Evidence at the overall assertion level exerts a larger influence on the costs and the needed level of support from the other items of evidence pertaining to the sub-assertions. In practice, auditors do place more effort in assessing the evidence at the overall level (e.g., see Bell, Marrs, Solomon and Thomas 1997, p. 14) than evidence at the sub-assertion level. Our results provide analytical support for such practices.

Scenario 4 (Medium Assurance): For this scenario, assume that the assurance provider is planning to provide a medium level of assurance on the main assertion and its sub-assertions. Just for the illustration purpose, let us assume that a medium level of assurance means 0.7 level of assurance on the main assertion and all its sub-assertions. Using the same evidence constraints as considered in Scenario 3, we determine the minimum cost to perform the assurance service to achieve a 0.7 level of assurance. This change in the desired level of assurance from a high level as in Scenario 3 to a medium level in Scenario 4 brings about the following changes.

1. The procedures related to E2, E3, E5, and E6 are not needed to be performed because of the lower level of overall assurance needed.
2. The cost of E4 (linked to A1.1.1) increased from $7,528 to $10,021 because the needed level of support from E4 (linked to A1.1.1) increased from 0.748 to 0.890.
3. The cost of E4 (linked to A1.1.2) increased from $9,941 to $10,021 because the needed level of support from E4 (linked to A1.1.2) increased from 0.888 to 0.890.

4. The cost of E7 (linked to A1.1.4) decreased from $12,438 to $8,879 because of the needed level of assurance decreased from 0.931 to 0.847.
5. The costs of E8 and E9 decreased significantly from $12,023 to $7,384 because of the needed assurance from E8 and E9 decreased from 0.95 to 0.863.
6. The total cost of this part of the assurance engagement decreased significantly from $69,438 to $34,917.

This example illustrates how an assurance plan for a medium level of assurance would differ from a plan for a high level of assurance. As illustrated, the assurance provider may not perform certain procedures and may perform other procedures at a reduced level.

Scenario 5 (Limited Assurance): Here we illustrate the use of the evidential reasoning approach for an engagement where the assurance provider gives a limited level of assurance. Consider the same constraints in terms of the reliability of evidence, except that the overall desired assurance at the main assertion and all the sub-assertions is 0.5. It is interesting to see that to achieve this low level of assurance the assurance provider needs to perform procedures relevant to just E1, and no other procedures. The corresponding minimum cost for such an engagement is only $1,250, a significantly lower cost compared to the costs in other scenarios. This result makes logical sense. Since evidence E1 can provide a maximum of 0.5 level of support for the main assertion A1.1, when this procedure is performed at its highest level, the desired level of assurance would be achieved for A1.1 and all its sub-assertions. This type of engagement is equivalent to a ‘review’ as defined in audit standards.

Scenario 6 (Reasonable Assurance with Mixed Evidence): To further evaluate sensitivity, we next consider the case of reasonable assurance as considered in Scenarios 2 and 3, but with

mixed evidence. Suppose that, due to finding significant weaknesses in accounting control systems within the client's disclosure of labor practices, the auditor assigns a low level of support, say 0.1, to the negation of assertion A1.1. Thus, the assessment of the results of E1 is (0.5, 0.1, 0.2) which represents a mixed evidence case. This change brings about the following changes in the minimum cost solution compared to the prior Scenario 3 (See Table 5):

1. The costs of E1, E2, E3, E7 (linked to A1.1.3). E8, and E9 remained the same because the needed assurance from these procedures were unchanged from Scenario 3 to Scenario 4.
2. The cost of E4 (linked to A1.1.1) decreased slightly from $7,528 to $7,502 because the needed level of support from E4 (linked to A1.1.1) decreased slightly from 0.748 to 0.746.
3. The cost of E4 (linked to A1.1.2) increased from $9,941 to $10,281 because the needed level of support from E4 (linked to A1.1.2) increased from 0.888 to 0.897.
4. The cost of E5 and E6 increased slightly because the needed level of support from E5 and E6 increased slightly.
5. The cost of E7 (linked to A1.1.4) increased significantly from $12,438 to $14,750 because the needed level of support from E7 (linked to A1.1.4) increased from 0.931 to 0.948.
6. The total cost of this part of the assurance engagement increased from $69,438 to $72,303.

As seen above, the impact of a negative piece of evidence at the main assertion level, especially at a low level, the minimum cost process yields a set of procedures where certain procedures are performed at a higher level of assurance while some at a lower level assurance,

ultimately yielding a higher minimum audit cost. However, if the negative evidence is strong then we may not get a feasible solution. This scenario is discussed next.

5.4 Updating the optimal audit plan as evidence is collected

The prior scenarios are assumed to pertain to an early stage in a SR assurance engagement when an initial audit plan in being developed. As it is a plan, and as in most audits, as evidence is actually collected the plan must be revised. For example, the plan may assume the evidence related to E1 will be primarily positive with only minimal negative evidence. We illustrate an approach to addressing such a case in Scenario 7.

Scenario 7 (reasonable assurance, strong negative evidence obtained): Again consider the situation of reasonable assurance. Suppose the assurance provider determines that the management is not reporting accurately issues related to sub-assertion A1.1.4 “Complete and Accurate disclosure related to Occupational safety” and thus assigns 0.4 level of assurance to the negation of A1.1.4; that is mE7(~a114) = 0.4.

For this situation, we cannot find a minimum cost solution because it is not possible to achieve the minimum threshold of 0.9 for A1.1 and 0.95 for all the sub-assertions given that the auditor has strong negative evidence about one of the sub-assertions. Such a situation may arise either due to inherent weaknesses in the occupational safety reporting system or due to intentional management fraud in reporting.

In such a case, the assurance provider has several options. For example, if the problem is due to inherent weaknesses in the occupational safety reporting system, then the assurance provider can propose changes in the management report. If such changes are made, an unqualified report on this part of the audit is appropriate. However, if management is unwilling

to change the report, then the assurance provider could possibly issue a negative report for this part of the audit. Many other reporting and action options are available including, if the problem is judged to be due to management fraud, withdrawing from the engagement.

CHAPTER 6: SUMMARY AND CONCLUSION

This study focuses on both theoretical and applied aspects of sustainability reporting assurance services. We have demonstrated the use of an evidential reasoning framework based on the Dempster-Shafer theory of belief functions for SR assurance services. We use the G3 sustainability reporting guidelines to develop the evidential diagrams for seven illustrations.

In addition, we develop a cost minimization model and illustrate its application in assurance planning for the intended level of assurance for each assertion and sub-assertion. The cost minimization model allows the assurance provider to concentrate on those procedures that are relatively less costly and more reliable and to provide different levels of assurance for different assertions. This approach equips the assurance provider with a powerful tool that can be used to plan an assurance service in order to minimize the cost of the service.

This study contributes to both the sustainability literature as well as to the auditing literature. Our study is not only the first one to view sustainability reporting assurance from the perspective of an evidential reasoning schema, but also the first to put forward a framework which determines the minimum cost of an assurance service or audit engagement using DS theory. Thus, the framework enables an assurance provider to concentrate on those audit procedures that provide cost-effective assurance.

Since this paper is the first attempt to apply the evidential reasoning approach to the assurance of sustainability reports, there are limitations as well as opportunities for future research. Our models likely do not identify all of the relevant variables or associated items of audit evidence. Future research, especially performing case studies, can improve the evidential network by identifying omitted assertions and relevant evidence. We also use DS theory to

represent uncertainties in the SR setting. Future research should examine the empirical ramifications of using this approach.

This paper is also the first attempt to develop a framework that allows an assurance provider to estimate and minimize the cost of the service. The cost function used in the study is a hypothetical function and involves some potentially restrictive assumptions such as the assumption that the audit procedures usually provide confirming evidence. Future research should explore other possibilities and also explore and incorporate cost functions based on empirically derived cost functions.

PART II

THE DEVELOPMENT OF WORLWIDE ASSURED SUSTAINABILITY REPORTING

This part of the dissertation investigates the general research question (RQ) of how the characteristics of assured sustainability reports evolved during the first decade of the 21st century. These developments may be due to new services offered by the auditing profession (Elliot 1995) and the methodologies used to provide these services (Bell, Landsman and Shackelford 2001.) The above general RQ has been divided into several sub-RQs as follows:

1. What are the basic characteristics of assured sustainability reports?
2. How have some of these characteristics evolved since the 2002-2004 period and what are some of the potential reasons for this evolution?
3. What changes in the observed characteristics and their associations have occurred since the 2002-2004 sample?

To address the above RQs, I use a sample of 148 assured sustainability reports published in 2006-2007 and contrasts this sample with the sample discussed in Mock, Strohm and Swartz (2007). The remaining chapters of this part are organized as follows: Chapter 7 discusses the background and the research questions. Chapter 8 explains the sample selection and research method. Chapter 9 examines the descriptive results, describes the additional characteristics of sustainability assurance statements and changes in the observed characteristics and associations between variables. Chapter 10 presents the conclusion.

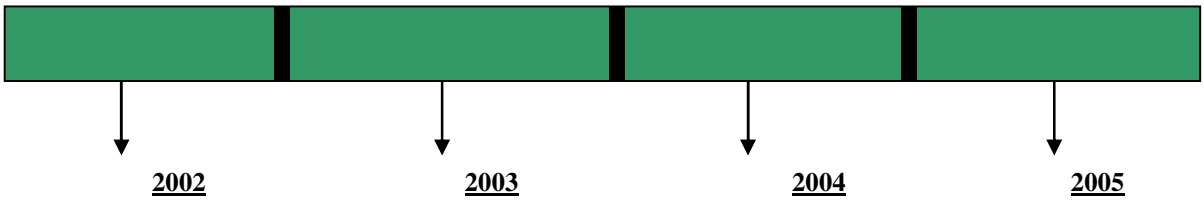
CHAPTER 7: BACKGROUND AND RESEARCH QUESTIONS

A number of factors that may affect the audit and assurance services market pique our interest in understanding the development and evolution of this market. These include the general development of the profession in terms of the services it attempts to offer (Elliott 1995) and the methodologies used to provide these services (Bell, Landsman and Shackelford, 2001). It includes market factors which motivate investors to consider 'green' companies and for companies to publish SRs and to obtain assurance on these SRs such as the increasing prominence within the capital markets of indexes such as the Dow Jones Sustainability Indexes (DJSI), the Ethibel Sustainability Indexes (ESI) and FTSE4Good.[8]

There are also events specific to the provision of assurance services within the years 2002-2005 which call for the contrasts discussed in our paper. These events have been illustrated by means of a timeline in Figure 4 and are discussed below. These events are significant in the area of sustainability reporting and assurance and provide a firm foundation for conducting a study that compares sustainability assurance characteristics and their associations related to 2002-2004 with that of 2006-2007.

[8] FTSE4Good is an index launched by FTSE, an independent company jointly owned by The Financial Times and the London Stock Exchange.

Figure 4: Timeline of Important Events in Sustainability Reporting and Assurance



2002

GRI is inaugurated in NYC and relocates in the Netherlands.

G2 is released at the WSSD.

French companies listed on stock exchange are required to report on their social and environmental performance.

Japanese companies are encouraged to adopt environmental

2003

AccountAbility (AA) issues its first sustainability assurance standard, the AA1000 AS.

IAASB launches ISAE3000.

The Australian Stock exchange links the good governance to the concept of corporate social and environmental

2004

IRCA launches the social systems auditor program.

AA and IRCA launch the *Certified Sustainability Assurance Practitioner Program.*

PWC offers auditing services related to emissions to evaluate companies' carbon risk.

2005

The Sao Paulo Stock Exchange launches a new stock index for tracking companies that sport a triple bottom line called the Corporate Sustainability Index.

In 2002, the Global Reporting Initiative (GRI) was inaugurated and GRI's second generation of guidelines, G2, was released at the World Summit for Sustainable Development (WSSD). G2 and WSSD are clearly landmarks in the area of sustainability. Following their release, the number of sustainability reports increased substantially from 150 organizations in 2002, to 325 in 2003, to 500 in 2004 to 750 in 2005 (GRI 2011; (http://www.globalreporting.org/AboutGRI/WhatIsGRI/History/)). Such a growing market for assurance services presented opportunities for many important developments in the nature of the assurance being provided.

The period 2002-2005 also saw important changes in sustainability assurance guidelines. In 2003, AccountAbility (AA) issued its first sustainability assurance standard (AA 2003). Also, in 2003, the International Auditing and Assurance Standards Board (IAASB) launched International Standard on Assurance Engagements (ISAE) 3000 to develop assurance standards dealing with subject matter other than historical financial statements. The ISAEs provide auditors with standards for addressing the sustainability reporting processes of their clients. The launch of these assurance guidelines suggests that assurance firms and the profession in general had identified a significant opportunity to supply assurance on these reports.

In 2004, the International Register of Certificated Auditors (IRCA) launched a new auditor training program in the social reporting area called the *Social Systems Auditor Program*. This program is designed to help businesses in the domain of ethical sourcing (IRCA 2004a). In addition, AccountAbility (AA) and IRCA launched the world's first individual certification scheme in the field of sustainability assurance called *The Certified Sustainability Assurance Practitioner Program* (IRCA 2004b). The creation of such programs also indicates that there is a

growing demand for auditors in the field of sustainability reporting. In addition, Richter (2004) notes that the audit firm PwC started providing audit services to evaluate companies' carbon risk.

The period 2002-2005 also saw changes in regulation and stock exchange requirements. Many of these changes are documented in the International Survey of Corporate Sustainability Reporting (KPMG, 2002). This report (p.5) points out that, from 2002, listed French companies have been required to report on their environmental and social performance. Further, the KPMG report (p. 15) points out that in Japan companies began to adopt environmental reporting guidelines issued by the Japanese government in 2001. Additional impetus for preparing assured CSRs occurred in 2003 when the Corporate Governance Council (CGC) of the Australian Stock Exchange equated good governance with the concept of corporate social and environmental responsibility (Gibson and O'Donovan 2007).

In 2005, the Sao Paulo Stock Exchange established a new stock index tracking companies that sport a "triple bottom line." Companies which aspire to be included in this index must adopt and meet strict standards for social and environmental responsibility (Derham 2005). The fact that stock exchanges and governments in different countries have established requirements, incentives and encouraging policies, shows that the stance at these organizations is one which views sustainability reporting as crucial and immediate.

In addition to the events listed in Figure 4, various authors have identified other trends which can be expected to influence the likelihood that companies would publish SRs and would decide to have them assured in some way and influence the nature of the types of assurance that are being provided. One example is the apparent increase in importance of indices tracking the sustainability performance of companies, in particular the Dow Jones Sustainability Index

(DJSI). As early as 2001, Knoepfel called attention to the fact that the DJSI was increasingly being used as a benchmark.

A comparison between the components of the DJSI and the Dow Jones Global Index (DJGI) shows better than average returns on equity, on investments and on assets for the companies included in the index. Cerin and Dobers (2001) state that the DJSI is used by corporations, Non-Governmental Organizations (NGOs) and governmental agencies to demonstrate that integrating economic, environmental and social factors into the operations and management of a company increases shareholder value and business activity transparency and the DJSI is also used by global corporations to legitimize the efforts they put into sustainability.

The 2002 KPMG report (p. 15) points out that growth of indices such as the DJSI and the FTSE4Good Index in the USA and several European countries may have been a contributory factor for the growth in sustainability reporting activities. Márquez and Fombrun (2005) assert that the three most important social responsibility indices in Europe are FTSE4Good, the Ethibel ESI and the DJSI.

Simnett, Vanstraelen and Chua (2009) argue that companies seeking to enhance the credibility of their reports and build their corporate reputation are more likely to have their sustainability reports assured. They further argue that "the sustainability agenda was linked to social audits and human resource accounting in the 1970s, to intellectual capital, environmental and triple bottom line reporting in the 1990s and to recent versions of the Global Reporting Initiative."

Martinov-Bennie and Pflugrath (2009) examine the effect of a company's ethical environment on auditor judgment. They find that auditors with more experience made higher

quality judgments. In addition, their results suggest that managers are more sensitive to the strength of the ethical environment than seniors. They recommend that companies need to use caution when they select the means to communicate and strengthen ethical principles, since people in different ranks are influenced differently.

Kolk and Perego (2010) examine the adoption of sustainability assurance statements among the fortune global 250 companies. Their results suggest that companies operating in countries that are more stakeholder oriented and have a weaker governance regime are more likely to adopt a sustainability assurance statement. Furthermore, their results suggest that the likelihood of choosing a large audit firm as an assurance provider increases for companies domiciled in countries that are shareholder oriented and have a lower level of litigation. In addition, the demand for assurance is higher in countries where sustainable corporate practices are enabled by market and institutional mechanisms.

Dhaliwal, Li, Tsang and Yang (2011) examine whether issuing sustainability reports leads to a reduction in a company's cost of capital. They find that companies with superior sustainability performance do enjoy a reduction in the cost of equity capital. Additionally, companies with superior sustainability performance attract dedicated institutional investors and analyst coverage.

In contrast to most prior research, the MSS 2007 paper and this study document a number of characteristics of assured sustainability reports and investigate possible interrelationships among these characteristics. The current study is based on a slightly larger sample of 148 assured sustainability reports issued worldwide within a two-year window, 2006-2007. MSS 2007

examined 130 assured sustainability reports and investigated a number of characteristics unique to SRs:

- How the audit reports differed, for example, whether both positive and negative assurance was observed;
- Whether assurance was provided on all three categories of assured reports (environmental, social, and economical) or only on one or two categories;
- Whether the use of the assurance report was restricted to certain stakeholders; and
- Given that alternative standards could be used, whether the assurance framework being utilized was specified.

MSS 2007's sample comes from 21 different countries with the European Union providing 67% of the reports. They find that firms operating in environmental and economically sensitive areas such as utilities, mining and oil published the highest number of assured reports. Moreover, they find that 65% of all the assured reports were audited by non-Big 4 firms.

The multivariate and correlation analyses by MSS 2007 demonstrates that there was a significant association between the type of assurance provided (positive or negative) and the type of assurance provider, with Big4 assurers being less likely to provide positive assurance. In addition the following characteristics were found to be associated with the type of assurance provider and thus with the level of assurance provided:

- whether symbols are used to indicate the nature of the assurance,
- whether both qualitative and quantitative assertions are assured,

- whether recommendations are provided concerning possible enhancements of the sustainability report, and
- whether the assurance report specifies that framework (standards) relied upon.

In this study, we consider important developments in the area of sustainability reporting and assurance illustrated in Figure 4 and discussed above. These events and developments provide an environment where significant developments in practice may be expected. To address the nature of such developments, the following research questions are addressed:

RQ1. A. What are the basic characteristics of assured sustainability reports?

RQ1. B. How have some of these characteristics evolved since the 2002-2004 period, and what are some of the potential reasons for this evolution?

The growth in the assurance of sustainability reports, the release of G2 at the WSSD, the new requirements and encouraging policies instituted by governments and stock exchanges, and the rise in the prominence of indices such as the DJSI calls for an examination of the basic characteristics of assurance, the changes in the nature of the assurance and the factors such as the type of assurance firm providing the assurance that are correlated with these changes. We focus on the characteristics of assured sustainability reports and their evolution since 2002-2004 because obtaining assurance is a costly decision for companies and leads to increased stakeholder confidence in the quality of such information (Simnett, Vanstraelen and Chua 2009). An examination of the characteristics of assured sustainability reports and their evolution since 2002-2004 will help reveal the influence and consequences of the events sketched in Figure 4 and the other factors discussed earlier.

The MSS 2007 study was able to document a number of interrelationships among the attributes that characterize assured sustainability reports such as type of provider and level of assurance provided. We are interested in whether these interrelations still hold, which leads to the next research question:

RQ2. What changes in the observed characteristics and their associations have occurred since the MSS 2002-2004 sample?

As illustrated in Figure 4 above, AA and IAASB launched assurance guidelines in 2003. In addition, assurance training programs aimed at individuals was also instituted by AA and IRCA. Notably, the audit firm PwC started offering auditing services related to emissions so that they could evaluate companies' carbon risk. The launch of assurance guidelines and training programs suggests various organizations and auditors were equipping themselves for the rise in demand for such services.

An examination of the characteristics and their associations will aid audit firms, organizations offering training and individuals undergoing the training understand various relationships that might lead to higher quality assurance, and, possibly, better grounded audit procedures. In order to investigate the above question, we analyze bivariate associations between the variables of interest and compare logistic regression analysis for the two samples. We elaborate this aspect of the analysis in the following sections.

CHAPTER 8: RESEARCH METHOD

Like the MSS 2007 study, this study focuses on the nature of assured sustainability reports but additionally investigates changes in this activity. The key research methods issue in trying to contrast the nature of assurance in the two periods examined relates to attempting to obtain comparable samples. This proved to be a challenge as MSS did not draw a random sample from the population nor publish or maintain company specific details on their sample. Thus using a matched-pairs approach proved infeasible.

However, MSS did attempt to use as complete a sample as was feasible by examining a number of sources that compiled information on SRs and identifying all SRs which contained assurance reports. GRI (2011) states that there were approximately 150 assured SRs in 2002 where as MSS were able to identify and investigate 130 assurance reports during 2002 – 2004. Consequently their sample represents approximately 87% of the population. Thus, our random sample of 148 reports from 2006-2007 should be comparable to the MSS sample and should differ only by the sampling error and by systematic differences in the nature of the provision of assurance between the two periods being examined.

To collect our sample, Corporateregister, the world's largest database for non-financial reports, provided access to their database to collect a random sample of 450 assured sustainability reports published during 2006 or 2007. The two-year window was used to maintain comparability with MSS 2007. Also, because some companies do not issue their reports on an annual basis, a multiyear window provides the best possibility of gaining a representative sample.

Reports were eliminated from the initial sample for several reasons. First, a number of the reports were for activities outside of this two-year window. Second, some sustainability reports were eliminated because they did not contain an assurance statement despite their being coded as such by Corporateregister or because the assurance report was not in English. Finally, those that did not report on all three areas of performance, that is economic, social, and environmental, were eliminated. This was done to ensure comparability across assurance statements as the focus of a particular report could well drive the features of the assurance statement. There were 179 reports remaining after making the eliminations described above.

Sample size was further reduced because data on total assets of companies was available only for 148 companies. Data on total assets was obtained from Factiva, Yahoo Finance and MSN Money. This data related to the year ending 2007. Data on total assets for year ending 2006 or 2008 was used, if it was not available for 2007. Each company in our sample was matched on location and industry for the purpose of collecting data on total assets. Information on the location and industry for each company was available from the assurance statement in sustainability reports. Due to the fact that our sample consists of companies from countries around the world, data on total assets was available in different currencies. Also, total assets were stated under different accounting systems: International Financial Reporting Standards (IFRS), local/national reporting standards or US GAAP.

We use the exchange rates on December 31, 2007 to convert the data on total assets available in different currencies into millions of US dollars (USD). Further, total asset figures in millions of USD were divided by 10,000 for the purpose of including them as an independent variable in our logistic regression. This was done for ease of interpretation. The exchange rates for different currencies were obtained from http://www.exchange-

rates.org/HistoricalRates/E/USD/12-31-2007, a website that provides currency exchange rates history. The final sample consisted of 148 companies.

The methods used to address the above research questions involve first an analysis of basic descriptive data and then use of logistic regressions including replicating the regressions used by MSS and introducing one additional regression model. The results are discussed in the following sections.

CHAPTER 9: RESULTS

Research Questions 1A and 1B deal with basic descriptive data of both samples and comparisons with the 2002-2004 sample. Results are presented in Tables 6-10.

Table 6: Descriptive Statistics: Frequency of Assured Sustainability Reports by Industry

Industry	2002-2004		2006-2007	
Airline, Airports & Transport	8	6.15%	8	5.41%
Business, Financial & other Services	19	14.62%	28	18.92%
Electronics, Computer & Communication	10	7.69%	7	4.73%
Electricity & Utilities	28	21.54%	31	20.95%
Manufacturing	15	11.54%	18	12.16%
Mining & Oil	20	15.38%	20	13.51%
Pharmaceuticals & Chemicals	7	5.38%	5	3.38%
Real Estate & Construction	9	6.92%	7	4.73%
Tobacco, Food and Drinks	0	0.00%	9	6.08%
Others	14	10.77%	15	10.14%
	130	100.00%	148	100.00%

Table 6 indicates that the relative industry distribution of companies publishing sustainability reports is evolving. For example, the second highest percentage of assured sustainability reports come from business, financial and other services in 2006-2007, whereas this distinction was held by Mining and Oil in 2002-2004. Also, unlike 2002-2004, companies from the tobacco, food and drinks industry have started producing assured reports.

However, there are certain similarities: The highest numbers of assured sustainability reports are issued by Electricity and Utilities in both time periods. The lowest numbers of assured sustainability reports are issued by Pharmaceuticals and Chemicals in both sets of years.

The 2008 KPMG survey of corporate sustainability reporting states that sustainability reporting is now the norm among the world's largest companies. Further, two of the most common reasons behind issuing sustainability reports are ethical considerations and innovation. Companies in environmentally sensitive industries such as Electricity and Utilities (21%), Mining and Oil (13.5%) and Manufacturing (12%) are among the leading reporters. Perhaps due to the housing bubble in the years 2002-2006, the early stages of the financial crises in 2005-2006, and the subsequent need to demonstrate ethical behavior, we now see that companies in economically sensitive industries are issuing assured sustainability reports in substantial numbers. For example, the category of Business, Financial and other services (19%) occupy the second highest position among leading reporters.

A chi-square goodness-of-fit test was performed to assess if the frequency of assured sustainability reporting by industry for the 2002-2004 period and the 2006-2007 period is significantly different or not. The null hypothesis is that the frequencies for the industries are not

significantly different when comparing both sets of years. With a p-value of 0.26 and using a 0.10 threshold, we cannot reject the null hypothesis.

Table 7: Descriptive Statistics: 2006 – 2007 Frequency of Assured Sustainability Reports by Country

Country	No of assurance reports	Percentage
Australia	8	5.41%
Austria	2	1.35%
Belgium	2	1.35%
Brazil	5	3.38%
Canada	4	2.70%
Denmark	1	0.68%
Finland	1	0.68%
France	13	8.78%
Germany	3	2.03%
India	5	3.38%
Italy	10	6.76%
Japan	6	4.05%
Luxembourg	1	0.68%
New Zealand	5	3.38%
Norway	6	4.05%
Pakistan	1	0.68%
Portugal	9	6.08%
Russia	3	2.03%
South Africa	5	3.38%
South Korea	11	7.43%
Spain	10	6.76%
Sri Lanka	1	0.68%
Sweden	1	0.68%
The Netherlands	11	7.43%
UK	22	14.86%
USA	1	0.68%
Multi-Country Entity	1	0.68%
Total	148	100.00%

Table 7 presents the frequency of assurance reports by country. This table shows that two European countries have the highest number of assured sustainability reports: UK (22 assurance reports, 14.86%), France (13 assurance reports, 8.78%). This is followed by South Korea and The Netherlands (11 assurance reports, 7.43%). On the other end, USA is represented by only 1 assured sustainability report (0.68%) in our sample. Other countries that are represented by only one assured sustainability report are Denmark, Finland, Luxembourg, Pakistan, Sri Lanka and Sweden (each 0.68%).

Table 8: Frequency by Assurance Provider and Assurance Type

2002-2004

		Assurance Type		
Assurance Provider	**Total Reports Assured**	**Positive**	**Mixed**	**Negative**
Deloitte	7 (5.4 %)	3	1	3
Ernst & Young	13 (10 .0 %)	8	2	3
KPMG	13.5 (10.4%)	2.5	3	8
PwC	12.5 (9.6%)	8.5	1	3
Non-Big 4	84 (64.6%)	73	7	4
		95 (73.84%)	14 (9.23%)	21 (16.92%)
	130	130		

2006-2007

		Assurance Type		
Assurance Provider	**Total Reports Assured**	**Positive**	**Mixed**	**Negative**
Deloitte	15 (10.84%)	1	0	14
Ernst & Young	16 (10.81%)	4	1	11
KPMG	20 (13.51%)	4	7	9
PwC	25 (16.89%)	5	2	18
Non-Big 4	72 (48.65%)	49	13	10
		63 42.57%	23 15.54%	62 41.89%
	148	148		

A key choice when providing assurance is whether the assurance is positive, negative, or mixed (some elements receive positive and some negative assurance). Table 8 shows that there has been a large decrease in the percentage of SRs with positive assurance—a drop from 73.84% in 2002-2004 to 42.57% in 2006-2007 and commensurately a considerable increase in negative assurance from 16.92% in 2002-2004 to 41.89% in 2006-2007. Interestingly, non-Big-4 auditors are providing by far most of the positive assurance reports in both sets of years. These findings may be driven by the increase in assurance statements provided by Big4 auditors from 35.4% in 2002-2004 to 51.35% in 2006-2007. The decrease in positive assurance statements and the increase in negative assurance statements should be viewed in tandem with the increase in assurance statements by Big4 auditors. This is consistent with the Big4 concern with litigation cost and the ability of Big4 auditors to reduce their litigation exposure by issuing negative assurance statements.

Firms who publish assured sustainability reports may want to be associated with the Big4, despite the Big4 providing negative rather than positive assurance, because these firms may be viewed as being more experienced in practice of auditing and thus providing a higher perceived quality of assurance. The growth in the proportions getting assurance going up from 30 to 40 percent among the Global Fortune 250 companies (KPMG 2008) and the vast majority of these companies choose the major audit firms to provide assurance may be a result of similar considerations. The Big4 are well known all over the world, are perceived to provide higher quality audits, have deep roots in the assurance business and have deep pockets to market themselves appropriately.

Table 9: Frequency of Reporting Categories Assured

2002-2004

		Reporting Categories			
Assurance firm	**Total Reports Assured**	**All three**	**Environmental & Social**	**Environmental Only**	**Economic Only**
Deloitte	7 (5.38%)	5	0	2	0
Ernst & Young	13 (10%)	12	0	1	0
KPMG	13.5 (10.38%)	9.5	1	1	1
PwC	12.5 (9.62%)	4	6	3	0
Non-Big 4	84 (64.62%)	56.5	14	14	0
	130 (100.00%)	87 (66.92%)	21 (16.15%)	21 (16.15%)	1 (0.77%)

2006-2007

		Reporting Categories				
Assurance firm	**Total Reports Assured**	**All three**	**Environmental & Social**	**Environmental Only**	**Economic Only**	**Social Only**
Deloitte	15 (10.84%)	6	6	2	0	1
Ernst & Young	16 (10.81%)	4	10	1	1	0
KPMG	20 (13.51%)	10	9	1	0	0
PwC	25 (16.89%)	9	10	2	1	3
Non-Big 4	72 (48.65%)	32	24	13	0	3
	148	61	59	19	2	7
	100%	41.22%	39.86%	12.84%	1.35%	4.73%

Table 9 shows the frequency of assured SRs by reporting categories. The proportion of assured sustainability reports on all three categories has decreased from 67% in 2002-2004 to only about 41% in 2006-2007. The percentage of companies reporting on Environmental and Social categories has, however, increased from 16% in 2002-2004 to about 40% in 2006-2007. In addition, companies are increasingly engaging assurance providers to assure only the social category, something that rarely existed in the 2002-2004 sample. These changes are consistent with companies relying on the assured financial statements to provide economic performance results and the SRs to provide performance information on social and environmental performance. Interestingly, in the 2006-2007 sample, the non-Big4 provide the majority of assurance on all three categories (32/61 = 52.46%) and the Big-4 provide the majority of assurance on environmental and social categories (35/59 = 59.32%).

Table 10: Frequency of Frameworks Utilized

2002-2004

		Assurance Framework			
Assurance firm	**Total Reports Assured**	**AA1000**	**International**	**Local/ National**	**None Specified**
Deloitte	7 (5.38%)	1	2	3	1
Ernst & Young	13 (10%)	4	2	3	4
KPMG	13.5 (10.38%)	2	9	1	1
PwC	12.5 (9.62%)	1	6	4	2
Non-Big 4	84 (64.62%)	24	4	9	47
		32 (24.52%)	23 (17.69%)	20 (15.38%)	55 (42.31%)
	130	130			

2006-2007

2006-2007		Assurance Framework			
Assurance firm	**Total Reports Assured**	**AA1000**	**International**	**Local/National**	**None Specified**
Deloitte	15 (10.84%)	5	8	2	0
Ernst & Young	16 (10.81%)	1	12	2	1
KPMG	20 (13.51%)	3	15	2	0
PwC	25 (16.89%)	2	19	3	1
Non-Big 4	72 (48.65%)	44	13	3	12
		55 37.16%	67 45.27%	12 8.11%	14 9.46%
	148 100.00%	**148**			

Table 10 shows the frequency of assured sustainability reports by assurance framework utilized. The proportion of assurance providers using the AA1000 assurance standard has increased slightly from approximately 25% in 2002-2004 to about 37% in 2006-2007. The non-Big-4 auditors, however, still form a majority of the users of the AA1000 assurance standard. A reason for this is provided by O'Dwyer and Owen (2005, p. 211):

> A key feature of this [AA1000AS] guidance relates to the recommendations for conclusions as to the report quality and underlying organizational processes, systems and competencies. This covers issues surrounding the materiality of performance information to stakeholders, the ability of the organization to report in a complete fashion and the responsiveness of the organization to stakeholders. The standard also requires assurance providers to make information publicly available, within the assurance statement or related public document, concerning their independence from the reporting organization, impartiality towards stakeholders and their own competencies.

Due to the comprehensive coverage of issues and the stipulations related to the assurance provider's independence and competencies given by the AA1000AS, it is possible that non-Big4 assurance providers use this standard to build credibility.

Further, it is possible that the some of the non-Big4 assurance providers are non-accounting firms. Such non-accounting firms might prefer to use AA1000AS because this standard is supplied by an organization that is not involved with accounting standard setting. In this connection, it is relevant to mention that ISAE 3000 is supplied by the International Auditing and Assurance Standards Board (IAASB), which is an independent standard setting body and is an arm of the International Federation of Accountants (IFAC) and contributes to the development of professional accounting bodies. Non-Big4 assurance providers that are also non-accounting firms might prefer to use AA1000AS because it is free from professional standards such as the code of ethics that might apply to assurance guidelines supplied by IAASB.

The use of international standards has increased significantly from about 18% in 2002-2004 to about 45% in 2006-2007. Commensurately, the use of local/national standards has decreased from 15.4% in 2002-2004 to about 8% in 2006-2007. A decrease is also observed in the percentage of auditors who do not specify any standards from about 42% in 2002-2004 to about 10% in 2006-2007. This is presumably due to the maturing of the discipline, considerations about transparency and the increased potential for litigation if standards are not specified.

9.1 Additional characteristics of sustainability assurance statements

Level of Assurance provided

In both samples, Big4 audit firms which tend to have larger clients (MSS 2007) are less likely to provide positive assurance. This is consistent with the 2008 KPMG survey which points out that 51% of the Global Fortune 250 companies seek a limited level of assurance, which is, "a lower level of assurance that requires less work, and, therefore, lower costs". Furthermore, the KPMG (2008, p. 66) survey states that choosing a lower level of assurance is not surprising because assurance of sustainability information is mainly a voluntary activity.

The language used to communicate positive and negative assurance in the 2006-2007 is similar to that of the 2002-2004. For example, to indicate positive assurance, phrases such as *fair and balanced representation*, *provides a fair account*, *accurately portrays the performance* are used in both samples. To indicate negative assurance, phrases such as *report contained no inaccuracies or misleading statements*, and *nothing has come to our attention* are used.

Symbols Used

In 2006-2007, only 9 out 148 reports or 6.08% of the companies used symbols as compared to 10% in the 2002-2004 sample. These symbols included  , font set in **gray type**, the symbol *v*, the symbol  , the symbol  , and the symbol  . Such symbols evidently were used to indicate not just the parts of the reports that were assured by an audit firm, but also to communicate extra information available, to display certain social, environmental or economic indicators and to bring attention to certain key figures.

Third party commentary

Another trend that is becoming popular is commentary by a third party other than the assurance provider on the sustainability report. Such third parties include stakeholder panels or subject matter experts. In the 2006-2007 sample, 11 companies out of 148 (7.43%) had third party commentary. These commentaries may use internationally recognized assurance frameworks or may use self-developed standards. The KPMG (2008) survey shows that only 7% of the Global Fortune 250 companies utilize formal assurance and third party commentary. Companies in our sample utilized one or the other, but not both.

Restrictions on the use of the assurance report

Occasionally, audit firms include certain statements in their assurance reports which are intended to limit a decision maker's ability to base his/her decisions on a sustainability assurance report. In 2002-2004, 16% of the assurance reports restricted its usage. In 2006-2007, 19 out of 148 (12.84%) reports had statements which restricted their usage. These included statements

such as, “meant for management’s use only”, “not to be used for basing investment decisions”, and, “not meant for third party use.”

Disclosure of procedures used and recommendations

Disclosure of the general types of procedures used is an element that is peculiar to sustainability reporting. In 2006-2007, we find that 139 out of 148 reports (93.92%) disclosed procedures and in 2002-2004, 121 reports out of 130 (93.08%) disclosed procedures. These procedures have not changed much from the 2002-2004 period and include interviews, visiting various sites, analytical review, documentation review and testing data.

In the 2006-2007 period, 71 out of 148 reports (47.97%) provided recommendations for improvement, compared to 55 out of 130 reports (42.31%) in the 2002-2004 period. These improvements concern reporting, performance, inclusion of certain indicators and selection of material issues. Recommendations are provided by audit firms or third party commentators.

9.2 Changes in Observed Characteristics and Associations between the Variables

Our second research question, RQ2, investigates the associations in the observed characteristics of assured sustainability reports and how the associations have evolved. In order to examine these associations, we compute Spearman correlations between the variables for the 2006-2007 sample of 148 companies (Table 11). Then, we consider the significant correlations over the two time periods (Table 12) and find that five variables correlate significantly with one or more of the other variables:

- whether the assurance firm is a Big4 firm (*Big 4*),
- whether positive assurance is provided (*Positive Assurance*),

- whether the framework used to prepare the sustainability report was disclosed in the assurance report (*Disclosure of framework used*),
- whether the assurance report uses symbols to identify assured statements (*Symbols Used*), and
- whether audit procedures performed during the audit of the sustainability report are disclosed (*Disclosure of procedures used*).

Table 11: Variables and Spearman correlation for the 2006-2007 sample of 148 companies

[Significant correlations highlighted]

	Big4	Positive assurance	Assured all categories	Qualitative and quantitative	Symbols used	Usage restricted	Recomm-endation provided	Disclosure of procedures used	Disclosure of framework used	Total assets
Big4	1.00									
Positive assurance	-0.50* 0.00	1.00								
Assured all categories	-0.05 0.54	0.04 0.59	1.00							
Qualitative and quantitative	0.08 0.33	-0.08 0.34	-0.25* 0.00	1.00						
Symbols used	0.08 0.35	0.01 0.91	-0.16* 0.05	0.07 0.43	1.00					
Usage restricted	-0.03 0.71	-0.04 0.59	0.04 0.61	0.10 0.21	-0.10 0.24	1.00				
Recommendation provided	-0.39* 0.00	0.27* 0.00	0.03 0.68	0.08 0.35	0.04 0.64	0.08 0.36	1.00			
Disclosure of procedures used	0.20* 0.01	-0.07 0.42	-0.07 0.39	0.21* 0.01	0.06 0.43	0.10 0.24	0.02 0.83	1.00		
Disclosure of framework used	0.24* 0.00	-0.24* 0.00	0.23* 0.01	-0.17* 0.04	0.08 0.32	-0.08 0.32	-0.15* 0.07	-0.08 0.32	1.00	
Total assets	0.15* 0.07	-0.09 0.27	-0.10 0.23	0.01 0.95	0.09 0.29	-0.03 0.69	-0.11 0.19	-0.03 0.75	0.01 0.89	1.00

Similar to the MSS 2007 sample, Table 11 shows that the variable *Big4* correlates significantly negatively with the variable *Positive Assurance* showing that Big4 auditors are still less likely to issue a positive assurance statement. This may be due to the possibility that Big4 auditors attempt to minimize their litigation exposure, as they are said to have 'deep pockets' (Canegham 2010, Hillison and Pacini 2004). Table 11 also shows that *Big4* correlates significantly positively with *Disclosure of procedures used, Disclosure of framework used, Company size as measured by total assets* and correlates significantly negatively with *Recommendation*. This means that the *Big4* auditors are more likely to reveal the procedures used, are more likely to reveal the framework used and less likely to provide recommendations for future improvement. The positive correlations between *Big4* and disclosures of procedures and framework may indicate that the major accounting organizations may use more disclosures to differentiate themselves from smaller accounting firms and to limit litigation risk. The significant positive correlation of *Big4* with *Company size measured by total assets* means that Big4 auditors have larger clients. This may be due to the perception that the Big4 auditors provide higher quality audits or because of the fact that Big4 auditors have more capacity to audit larger companies.

The variable *Positive Assurance* correlates significantly positively with *Recommendation* and correlates significantly negatively with *Disclosure of framework used*. This means that a sustainability report that gets positive assurance is more likely to get recommendations for improvements in the sustainability report from the auditor. Also, a sustainability report that gets positive assurance is less likely to have the framework used disclosed. On the other hand, Big4 auditors, who are more likely to provide negative assurance are also less likely to provide recommendations and more likely to disclose the framework used. Viewed together, these

suggest that providing recommendations for future improvement and disclosure of framework used may be substitutes.

Further, the positive correlation of *Positive Assurance* with *Recommendation* and the negative correlation of *Positive Assurance* with *Disclosure of framework used* also suggest negative assurance is associated with disclosure of framework used and not providing recommendations. Deegan, Cooper and Shelly (2006b) associate negative assurance statements with limited assurance engagements and positive assurance statements with reasonable assurance engagements. They, however, suggest that providing recommendations for improvement might be construed as undermining the perceived independence of the assurance provider by sustainability report users, since it may give an impression that the provision of assurance services is tied in with an effort to obtain additional work relating to those areas identified for improvement. The above reasoning points towards a more cautionary approach taken by the Big4 auditors since they are more likely to provide negative assurance and reveal the framework used, but are less likely to provide recommendations. This behavior seems consistent with attempting to minimize litigation costs.

The variable *Assured all categories* correlates significantly negatively with *Qualitative and Quantitative* and with *Symbols used*. This means that if an assurance report covers all three areas (economic, environmental and social), it is less likely that the assurance provided applies to both qualitative and quantitative assertions made in the report and it is less likely that symbols are used in the assurance report. The variable *Assured all categories* correlates significantly positively with *Disclosure of framework used*. This means that if an assurance report covers all three areas, it is more likely that the framework used to prepare the sustainability report is

disclosed. This may be because greater demand for assured data leads to more areas being assured and thus more disclosures about this assurance.

Lastly, Table 11 shows that *Qualitative and Quantitative* correlates significantly positively with *Disclosure of procedures used* and correlates significantly negatively with *Disclosure of framework used*. The greater demand for assured sustainability data might lead the assurance provider to assure both qualitative and quantitative data, and, hence provide more disclosures about this assurance.

Table 12: Comparison of Significant Correlations from 2002-2004 and 2006-2007 Samples

	Big 4		Positive Assurance		Assured all Categories		Qualitative & Quantitative		Symbols Used		Usage Restricted		Recommendation Provided		Disclosure of Procedures used		Total Assets
	'02-'04	'06-'07	'02-'04	'06-'07	'02-'04	'06-'07	'02-'04	'06-'07	'02-'04	'06-'07	'02-'04	'06-'07	'02-'04	'06-'07	'02-'04	'06-'07	
Big 4																	
Positive Assurance	-0.43 (0)	-0.50 (0)															
Assured All Categories																	
Qualitative & Quantitative	-0.15 (0.08)				0.23 (0.01)	-0.25 (0)											
Symbols Used	0.35 (0)		-0.25 (0)			-0.16 (0.05)											
Usage Restricted	0.19 (0.03)																
Recommen-dation Provided	-0.3 (0)	-0.39 (0)	0.17 (0.05)	0.27 (0)													
Disclosure of Procedures used		0.2 (0.01)						0.21 (0.01)									
Disclosure of Framework used	0.39 (0)	0.24 (0)	-0.23 (0.01)	-0.24 (0)		0.23 (0.01)		-0.17 (0.04)			-0.22 (0.01)			-0.15 (0.07)	0.23 (0.01)		
Total Assets		0.15 (0.07)															

Table 12 provides a comparison of significant correlations over the two time periods. Consider the significant correlation results that are the same in both periods. First, *Big4* correlates negatively for both periods with whether the assurance report is positive and with whether recommendations are provided. Second, *Big4* is found to correlate negatively with whether the assurance report includes recommendations for improvements in the sustainability report. Third, Big4 correlates positively with whether the framework used is disclosed. Fourth, *Big4* does not correlate significantly with whether all categories of a sustainability report are assured in both time periods.

For the *Big4* variable, however, we also observe period-to-period changes. First, three variables that exhibited significant correlations in the prior period are no longer significant: whether both quantitative and qualitative assurance is provided, whether symbols are used to identify assured statements, and, whether usage is restricted. Interestingly, the correlation with respect to whether procedures used are disclosed is significant in the new sample, whereas it was not in the MSS 2007 sample. Since disclosure of procedures is not conventional for financial statement audits, this result might portend an important change of practice. Also, *Big4* is significantly correlated with Company size as measured by total assets in the 2006-2007 sample. The latter was not used as an independent variable by MSS 2007.

Another finding that might indicate a significant change in sustainability practices, both reporting and assurance, is related to whether or not assurance is provided on all three categories of sustainability reporting. Table 12 shows that, whereas no significant correlations were observed in the earlier period, now assurance of all elements of a sustainability report is correlated positively with whether framework used is disclosed.

As pointed out earlier, this may be because greater demand for assured data leads to more areas being assured and thus more disclosures about this assurance. However, the use of symbols is less likely when assurance is provided on all elements. Interestingly, *assured all categories* was positive correlated with whether assurance provided applies to both the qualitative and quantitative assertions made in the report in the MSS 2007 sample, but, these two variables are now negatively correlated. This may be because greater demand for assured data in the 2006-2007 period leads to greater number of areas being assured. This, in turn, might lead auditors to concentrate on quantitative data related to each of the elements, since this data might be easier to verify. The auditors might choose to do this instead of assuring both the qualitative and quantitative aspect of one or two elements.

For the variable *Positive Assurance*, the positive correlation with whether the assurance report includes recommendations for improvements and the negative correlation with whether framework used is disclosed has not changed in the 2006-2007 time period. However, the negative correlation of *Positive Assurance* with whether the assurance report uses symbols to identify assured statements does not exist in the 2006-2007 period. This means that an assurance report that gets positive assurance is no longer less likely to use symbols to identify assured statements. This, in turn, means that an assurance report, whether it gets positive assurance or negative assurance, may use symbols to identify assured statements. This change may be due to the fact that symbols are viewed as tools that make assurance communication easier.

Other correlations that are no longer significant in the 2006-2007 period, but were significant in the 2002-2004 period are as follows: *Disclosure of framework used*'s significant negative correlation with *Usage restricted*, and, *Disclosure of procedures used*'s significant positive correlation with *Disclosure of framework used*. But the significant negative correlation

of *Disclosure of framework used* with *Positive assurance* has not changed. In addition, in 2006-2007, *Disclosure of framework used* is significantly negatively correlated with whether the assurance applied to both the qualitative and quantitative assertions made in the assurance report and with whether the assurance report includes recommendations for improvement. The latter correlations did not exist in the 2002-2004 sample.

Lastly, the significant positive correlation between the variables *Positive assurance* and *Recommendation* has not changed. Manneti and Becatti (2009) state that a high level of assurance, i.e., positive assurance, is almost impossible to achieve due to the characteristics of the subject matter. Hence, when the assurance provider gives positive assurance, the provider also provides recommendations for improvement. Also, *Disclosure of procedures used* is significantly positively correlated with assuring both *Qualitative and Quantitative* information in 2006-2007, even though it was not in 2002-2004. One of the reasons for this could be reduction in litigation risk.

9.3 Associations between key variables

Although Tables 11 and 12 provide evidence of pair wise interrelationships between these variables, they do not indicate more complex interrelationships. To pursue this possibility, we conduct two logistic regressions. This facilitates a comparison with the prior results.

The model variables are defined as follows:

- ***Big4*** = 1 if the assurance report is issued by a Big 4 firm, 0 otherwise.
- ***Positive_assurance*** = 1 if the assurance provided is positive, 0 otherwise.
- ***Assured_all_categories*** = 1 if the assurance report covers all areas (economic, environmental and social), 0 otherwise.

- ***Qual_and_quant*** = 1 if the assurance provided applies to both the qualitative and quantitative assertions made in the report, 0 if assurance is applied to only quantitative assertions (there were no cases where only qualitative assurance was provided).
- ***Symbols_used*** = 1 if the assurance report uses symbols to identify assured statements, 0 otherwise
- ***Usage_restricted*** = 1 if usage of the assurance report is restricted, 0 otherwise.
- ***Recommendation*** = 1 if the assurance report includes recommendations for improvements in the sustainability report, 0 otherwise.
- ***Disclosure_of_procedures_used*** = 1 if audit procedures performed during the audit of the sustainability report are disclosed, 0 otherwise.
- ***Disclosure_of_framework_used*** = 1 if the assurance framework used is disclosed, 0 otherwise.
- ***Total Assets*** = Total assets in millions of USD as on December 31, 2007 divided by 10,000.

9.3.1 Associations between Big4 and the Other Variables

We compare associations in the logistic regression analyses for the two samples when the dependent variable is *Big4*. Table 13 shows both multivariate models to be highly significant and to explain a considerable amount of the variance with R squares of 39% and 34%.

Table 13: Logistic regression of variables related to Big4

[Significant independent variables]**

Independent variables	Dependent variable = Big4: 2002-2004 sample	Dependent variable = Big4: 2006-2007 sample
	(1)	(1)
	Logit estimate (p-value)	Logit estimate (p-value)
Positive assurance	**-1.40** (0.01)**	**-1.97** (0.00)**
Assured all categories	0.42 (0.46)	-0.23 (0.61)
Qualitative and Quantitative	**-1.43** (0.07)**	0.22 (0.69)
Symbols used	**2.86** (0.02)**	0.56 (0.51)
Usage restricted	0.70 (0.29)	-0.07 (0.92)
Recommendation provided	**-1.64** (0.00)**	**-1.63** (0.00)**
Disclosure of procedures used	0.01 (0.99)	**3.07** (0;01)**
Disclosure of framework used	**2.13** (0.00)**	**1.90** (0.07)**
Firm size -Total Assets in millions of USD on 12/31/2007	--	**0.02** (0.06)**
Number of observations of the dependent variable	46	76
Number of observations	126	148
Likelihood ratio	62.26 (0.00)	69.74 (0.00)
R square	38.99%	34.01%

Most results show that the relationships that are significant in the pair wise correlation analyses are also significant and directionally the same in the multivariate models. For example, *Big4* is significantly negatively associated with whether positive assurance is provided in both samples and not significantly associated with whether the assurance report covers all areas in both samples.

Importantly, there are a number of differences in the two sample periods that may portend practice developments. As indicated above, there are new economic, legal, regulatory and practice changes that may impact assurance firm behavior. These have been illustrated in Figure 4 and discussed above.

First, consider the finding that Big4 firms are less likely to provide positive assurance (b = -1.97, p = 0.00) which is the same result as the 2002-2004 sample. A reluctance to provide positive assurance might be due to the fact that Big4 firms have larger clients as is revealed by the significant positive association between *Big4* and Company size. In addition, the KPMG 2008 survey (p. 66) states that 51% of the Global Fortune 250 companies seek a limited level of assurance, which is, "a lower level of assurance that requires less work, and, therefore, lower costs". Because assurance services for sustainability related information is a relatively new and unregulated field, it is more difficult (Wallage, 2000) and may be more risky to provide positive assurance for larger, more complex clients. Greater risk would include greater litigation risk for large clients, thus leading to an assurance report by Big4 firms that provides a lower level of assurance.

We next note the change in the nature of the relationship of the variable *Big4* with the variable *Disclosure of procedures used*. In the 2002-2004 period, *Big4* did not have a significant

relationship with *Disclosure of procedures used*, but, in the 2006-2007 period, *Big4* had a significantly positive relationship (b = 3.07, p = 0.01) indicating the larger audit firms now have a greater propensity to disclose the audit procedures used than the smaller firms. Additionally, compared to the 2002-2004 period, the Big4 firms are increasingly using standards (AA1000 and ISAE3000) that recommend the disclosure of procedures (KPMG 2008). The Big4 firms, however, were less likely to provide assurance on both qualitative and quantitative sustainability report assertions. The 2002-2004 regressions that showed a significant negative relationship between the *Big4* and *Qualitative and quantitative* variables, but no significant relationship in the 2006-2007 logistic regression (b = 0.22, p = 0.69). This shows that, considering the other relationships accounted for in the logistic regressions, there is no longer a significant difference in the propensity of Big4 firms and the non-Big4 firms to provide assurance on qualitative and quantitative assertions in the report. This may be because a greater demand for assured data has caused the focus to be shifted from the type of information assured (qualitative versus quantitative) to more information being disclosed (for example, the disclosure of procedures and disclosure of frameworks). The association of *Big4* with *Disclosure of procedures used* has been discussed above. The association of *Big4* with *Disclosure of frameworks used* is discussed shortly.

Some possible reasons why so much of growth in assurance has gone to the Big4 despite the fact that they provide a lower level of assurance are given by the KPMG (2008) report and Simnett, Vanstraelen and Chua (SVC) (2009). The KPMG (2008) report suggests that this could be due to the trend toward a more comprehensive approach to assurance that covers the full report and the process behind it, rather than assuring certain sections of the sustainability report. Further, with investors showing more interest in corporate responsibility data, and with

regulation on the horizon in many countries, there is an increased focus on information systems and controls, which may lead companies seeking sustainability assurance to choose a Big4 audit firm. SVC 2009, who explore the determinants of choice of assurance provider, distinguish between assurance providers who are members of the auditing profession and other assurance providers, not between Big4 and non-Big4. They argue that companies operating in stakeholder-oriented countries are more likely to choose a member of the auditing profession as an assurer as compared to companies operating in shareholder oriented countries. Further, SVC 2009 find that companies that are larger in terms of size and companies with lower leverage are more likely to choose members of the auditing profession as their assurance provider. On the other hand, members of the auditing profession are less likely to be the assurance provider for companies with higher levels of financial risk.

Over the two periods examined, there is no change in the relationship between *Big4* and the *Disclosure of framework used*. This relationship was significant in the 2002-2004 period (b = 2.13, p = 0.00), and, it is so (b = 1.90, p = 0.07) during 2006-2007. Next, in the 2002-2004 sample, the variable *Big4* had a positive significant relationship with *Symbols used* (b = 2.86, p = 0.02) suggesting that Big4 auditors were more likely to use symbols, rather than words, in the sustainability report. However, in the 2006-2007 period, *Big4* is no longer has a significant association with *Symbols used*. This may be due to the fact that the focus has shifted from communication of assurance to making more disclosures such as revealing the framework used and revealing the procedures used, both of which have been discussed above.

In both samples, the variable *Big4* has a significant negative relationship with whether recommendation is provided. This means that the larger audit firms continue to be less likely to provide recommendations in their assurance report.

Lastly, in the 2006-2007 period, Big4 has significant positive relationship with company size which is a variable not used in the earlier model. This is consistent with many prior archival studies of audit practice (e.g. Lawrence, Minutti-Meza and Zhang 2011, p. 282) and adds power to the formulation used in this paper by accounting for a variable (client size) that correlates with other economic variables not explicitly included in our model such as stock returns (Bettman, Kosev and Sault 2011) and accruals (Hafzalla, Lundholm and Van Winkle 2011, p.209).

CHAPTER 10: CONCLUSION

This study examines a 2006-2007 sample of assured sustainability reports and compares it to a 2002-2004 sample analyzed by Mock, Strohm and Swartz (2007). We first identify important events in the area of sustainability reporting and disclosure that have occurred since 2004 which may have affected sustainability reporting and its assurance. These important events include the release of GRI's second generation of guidelines, G2, the requirements and policies instituted by governments and stock exchanges illustrated in Figure 4 and the rise in popularity of the Dow Jones Sustainability Index.

In terms of important descriptive findings we discover that the percentage of positive assurance statements has undergone a large decrease from 74% to 43% and correspondingly the percentage of negative assurance statements has increased from 17% to 42%. But the majority of positive statements are still being issued by non-Big4 assurance providers.

The launch of assurance guidelines by AA and IAASB; assurance training programs jointly by AA and IRCA; and new types of auditing services related to emissions provides motivation for examining associations between the characteristics of sustainability reports. For this purpose, we compare logistic regressions[9] with the dependent variable *Big4* in the two periods.

First, consistent with the descriptive findings, we learn that Big 4 audit firms are less likely to provide positive assurance in both sets of data. Unlike the 2002-2004 sample, however, the logistic results show that the Big4 firms are now more likely to disclose procedures used in

[9] The regression models are identical except for adding a variable for client size. This makes the current model more consistent with current academic research and helps account for the influence of client size on the other interrelations ships. It does not, however, change the overall results in comparing the two periods.

providing SR assurance. Also, compared to the 2002-2004 period, the Big4 firms are increasingly using standards (AA1000 and ISAE3000) that recommend the disclosure of procedures (KPMG 2008).

The above results should be considered along with limitations of this study. The sample used in this study was a random sample obtained from CorporateRegister.com with some reports being eliminated if they did not have an English language report. Such criteria may make generalization to worldwide assurance practice risky. Further, the characteristics of assurance reports that we identify and list are comprehensive but not exhaustive. There might be other characteristics that are important in describing current practices in assuring SRs. In addition, limitations on the company-size measure used, including the fact that company financial information were based on different GAAP, were noted earlier in this study.

Exploratory studies such as this one often raise more questions than answers, and this is no exception. Whereas our research questions consider basic descriptive characteristics of assured sustainability reports and their evolution, an additional question that needs to be addressed relates to the basic characteristics of the audit procedures utilized and to what extent using particular assurance frameworks such as AA1000 affects the provision of assurance on sustainability reports. For example, one can examine whether the Big4 audit firms undertake more rigorous procedures than the non-Big4 audit firms. Another question that could be examined is whether the Big4 audit firms disclose more information about their procedures than the non-Big4 audit firms.

Another relevant study is audit quality. Since there are many guidelines available for assurance on sustainability reporting, one can investigate whether, for example, the AA1000

assurance standard correlates with measures of higher audit quality than ISAE3000. Since these assurance guidelines have been revised several times in the past decade, one can examine whether improvement in assurance guidelines is correlated with measures of improvement in both sustainability performance as well as financial performance. This area of research provides many other opportunities for future research including examining the characteristics of clients that obtain specific recommendations for improving their sustainability reports and whether the Big4 audit firms give more recommendations.

PART III

ASSURANCE ON SUSTAINABILITY REPORTS: A STUDY OF FACTORS INFLUENCING THE SELECTION OF AN ASSURANCE FRAMEWORK

This part of the dissertation investigates the research question (RQ) of which factors influence the selection of an assurance framework, when the choice is between international frameworks and regional frameworks. An assurance framework is a critical aspect of assurance on sustainability reports because it furnishes guidelines to assurance providers on various matters related to assurance. For instance, assurance frameworks provide guidelines on suitable criteria, engagement acceptance, obtaining evidence, documentation and preparing the assurance report among other things. This study recognizes that companies are nested within countries which a naturally occurring hierarchy and hence employs a multi-level model for analysis.

CHAPTER 11: SUSTAINABILITY ASSURANCE FRAMEWORKS, LEVEL OF ASSURANCE AND ASSURANCE PROVIDERS

The American Institute of Certified Public Accountants (AICPA) has now dedicated a portion of its website to sustainability accounting, reporting and assurance with the intention to provide resources to enable AICPA members add value to client sustainability initiatives. In this section of its website, the AICPA has a frequently-answered-questions (FAQ) link, which states that AA1000AS and ISAE3000 are the internationally accepted assurance frameworks. In addition, the KPMG 2008 report mentions that two of the most prevalent assurance frameworks are ISAE 3000 and AA1000AS. AA1000AS and ISAE3000 are described as 'international' because the organizations that have issued them are international in nature and because these frameworks are used by companies and their assurance providers all over the world.

Other assurance frameworks are usually described as national or regional, because they have been provided by the respective countries' auditing standard setters [See Table 2 for a list of national/regional frameworks]. For example, the Dutch NIVRA provides 3410N which is titled *Assurance engagements relating to sustainability reports*. Both international and national/regional assurance frameworks are usually used by assurance providers to assure the quality and contents of sustainability reports. Manetti and Becatti (2009) point out assurance frameworks that have been issued by individual countries' auditing bodies (NIVRA 3410N (Dutch), FAR SRS (Swedish), IDW (German) etc.) have all been inspired by the ISAE3000.

ISAE 3000 in its 2011 explanatory memorandum (Simnett 2012) states that it recognizes that two levels of assurance are possible: reasonable assurance and limited assurance. Deegan, Cooper and Shelley (2006) point out that "'reasonable assurance engagements' are deemed to

involve greater levels of testing and assurance – as is generally the case with audits of financial statements.

There is a generally accepted view, at least within the auditing profession, that for a 'reasonable assurance engagement' (which involves providing a 'high' level of assurance (IAASB 2012, p.12)) a positive form of opinion should be used. However, for a 'limited assurance engagement,' a negative form opinion should be used (p. 363)". Mock, Strohm and Swartz (2007) highlight negative and positive forms of expressions in their study. Positive assurance statements such as '*fairly stated in all material respects*', and, '*are free from material misstatements*' are perceived to have the highest assurance level. Whereas, negative assurance statements such as '*We have not identified material errors*', and, '*Nothing has come to our attention*' are considered to provide a lower level of assurance. Studies (Mock Strohm and Swartz (2007), Mock, Rao and Srivastava (2012)) also suggests that the Big4 assurance providers are associated with providing a lower level of assurance on sustainability reports.

Assurance providers on sustainability reports can be classified into two main categories: auditing firms and specialist assurance providers/technical experts (O'Dwyer 2011). In this study, the auditing firms that have provided assurance on sustainability reports are all Big4 firms. While the auditing firms can count audit and assurance expertise among their strengths, the specialist assurance providers/technical experts usually offer services in dealing with sustainability issues and assurance on sustainability reports. Auditing firms are increasingly being asked to provide assurance on non-financial information (Admiraal, NIVRA and Turksema 2009) by companies which publish such information. The KPMG (2008) report states that the majority of Global Fortune 250 companies who sought assurance on their sustainability reports selected major auditing organizations. The reasons given are as follows (KPMG 2008, p. 63):

> "This could be due to the trend toward a more comprehensive approach to assurance that covers the full report and the process behind it, rather than just isolated sections such as environmental indicators. With investors starting to show interest in corporate responsibility data, and with regulation on the horizon in many countries, there is an increased focus on information systems and controls, which may lead companies seeking an assurance provider to opt for a major accounting organization."

In the recent years, there has been an increase in companies hiring a panel of expert individuals to comment on the sustainability report and activities. For example, Abbott Laboratories (2011, p. 113-117) provides external commentary by the following six people: Joseph H. Hotchkiss (Professor and Director of the School of Packaging at Michigan State University), Laurel Nelson-Rowe (Managing Director at American Society for Quality, a global community of experts and the leading authority on quality in all fields, organizations and industries), Chris Perceval (Director of Corporate Relations at the World Resources Institute), Mark Rosenberg (President and CEO of the Task Force for Global Health in Atlanta), Jeffrey L. Sturchio (President and CEO of the Global Health Council, the world's largest membership alliance of public health organizations and professionals, active in more than 100 countries on six continents), Thomas Tighe (President and CEO of Direct Relief International, a nonprofit humanitarian medical organization funded entirely with private support).

The KPMG 2008 (p. 57) report uses the term 'formal assurance' to describe formal statements issued by independent professional assurance providers, including audit, certification, and technical firms. These statements are the result of a systematic, evidence-based process that allows the provider to draw conclusions on the quality of the report and its data and, in some cases, the underlying systems and processes used to gather and present the information. Further, the KPMG 2008 report (p. 60) states that "instead of a formal assurance statement, some companies opt to include the views or commentary of other external parties in their reports, but does not provide formal conclusions on the quality of the reported information on these issues".

Following the KPMG 2008 report definition of formal assurance, commentary by a panel of individuals is not considered assurance for the purposes of this study, and such companies have been excluded from the sample.

CHAPTER 12: BACKGROUND

Scholars agree that assurance on sustainability reports is beneficial (O'Dwyer 2011, Manetti and Becatti 2009, Simnett, Nugent and Huggins 2009, Simnett, Vanstraelen and Chua 2009, Fonseca 2010, Kolk 2008). The International Auditing and Assurance Standards Board (IAASB 2012, p. 22) defines an assurance engagement as follows:

"*An assurance engagement is an engagement in which a practitioner expresses a conclusion designed to enhance the degree of confidence of the intended users other than the responsible party about the outcome of the evaluation or measurement of a subject matter against criteria. The outcome of the evaluation or measurement of a subject matter is the information that results from applying the criteria (*the IAASB definition of Criteria is in the section titled 1. Introduction*). Under the* International Framework for Assurance Engagements *there are two types of assurance engagement a practitioner is permitted to perform: a reasonable assurance engagement and a limited assurance engagement.*

Reasonable assurance engagement—*The objective of a reasonable assurance engagement is a reduction in assurance engagement risk to an acceptably low level in the circumstances of the engagement as the basis for a positive form of expression of the practitioner's conclusion.*
Limited assurance engagement—*The objective of a limited assurance engagement is a reduction in assurance engagement risk to a level that is acceptable in the circumstances of the engagement, but where that risk is greater than for a reasonable assurance engagement, as the basis for a negative form of expression of the practitioner's conclusion.*"

The AICPA defines an attest engagement as follows: "This section applies to engagements in which a certified public accountant in the practice of public accounting (hereinafter referred to as a *practitioner*) is engaged to issue or does issue an examination, a review, or an agreed-upon procedures report on subject matter, or an assertion about the subject matter (hereafter referred to as *the assertion*), that is the responsibility of another party."

Subramaniam, Hodge and Ratnatunga (2006) point out that the words 'audit', 'verification', 'validation' or 'assurance' have been generally used to denote similar activities. They note that 'verification' suggests a process whereby information provided by management

has been compared against agreed criteria, while 'validation' examines whether reported information meets a particular need. The term 'audit', on the other hand, more closely relates to its traditional usage in external financial reporting and the provision of a high level of assurance whereby the procedures used are in line with a standardized set of guidelines. Verification and validation can be construed as denoting a more limited level of assurance. In this study, the term, 'sustainability report assurance', consistent with IAASB standard ISAE 3000 will mean evaluation of information in sustainability reports against established frameworks. The term 'assurance provider' will be used to refer to people or person who provide(s) assurance on sustainability reports.

Jeannette Oelschlagel (2005) points to a collaborative study conducted by Accountability and KPMG B.V. in the Netherlands to determine whether AA1000AS and ISAE 3000 are consistent, complementary or conflicting in terms of providing value to the assurance process and in terms of impact on users. She reports that the study finds that the two assurance standards are complementary. Further, the main difference between ISAE 3000 and AA1000AS is that the former focuses on assurance procedures and the latter focuses on the quality of reporting process. Both frameworks could be used in practice as follows: AA1000AS could be used by the reporting organization to determine reporting scope and subject matter information to report. The ISAE 3000 could then be used by the assurance provider terms of assurance engagement, planning and performing the engagement, obtaining evidence and ethical requirements, among other things. The assurance provider could then use AA1000AS to provide commentary on principles of materiality, completeness and responsiveness . The AA1000 AS could also be used by the assurance provider to provide recommendations, information on their competencies, independence and impartiality. If assurance is provided solely according to ISAE 3000, users of

the assurance report may not get a "bigger picture" of past and expected future performance. If the assurance is provided solely on the basis of AA1000AS may not have high data accuracy. However, if they are used together, the result is likely to be "enhanced results in approach, methodology and conclusion, their communication, credibility and, ultimately the outcome in relation to stakeholder trust and behavior. (Oelschlagel 2005, p. 1)" In the sample used in this study, AA1000AS and ISAE3000 have been used together by assurance providers for 12 client companies out of a total of 71 client firms in the sample. Out of these 12 client companies, 4 have been assured by Ernst & Young, and 2 each by Pricewaterhouse Coopers, KPMG, Deloitte and non-audit assurance providers (SGS and Bureau Veritas).

The KPMG (2008) report shows that among the global Fortune 250 companies, the use of ISAE 3000 has increased from 24% in 2005 to 62% in 2008, and, the use of AA1000AS increased from 18% to 33% in the same period. Further, it shows that among the 100 largest companies by revenue, the use of ISAE 3000 increased from 14% in 2005 to 54% in 2008 and the use of AA1000AS increased from 10% to 36% during the same period. The KPMG (2011, p. 28) report emphasizes that companies without external assurance on their sustainability reports run a higher risk of restatements in the future. Further, the report suggests that such companies may send the message that corporate responsibility information is not held in as high regard as financial information, which is frequently assured in most businesses. My research question is as follows: What are the factors influencing the choice of assurance frameworks, when the choice is between international frameworks and local/regional frameworks?

CHAPTER 13: MODEL SPECIFICATION, HYPOTHESES DEVELOPMENT, DEPENDENT AND EXPANATORY VARIABLES

To explore the above research question, I examine a sample of international companies who publish sustainability reports and get them assured. All of these international companies trade in the US. I use multi-level modeling because these companies are nested in countries.

To address the above RQ, I estimate the following multi-level logistic model where the dependent variable is the choice of assurance frameworks and the explanatory variables are audit-firm specific, client-firm specific and country level factors. The dependent and independent variables in this model are discussed below.

$$\text{Ln } [P/(1-P)] = [\gamma_{00} + \gamma_{01}\text{DisclosureIndex} + \gamma_{02}\text{GDP} + \gamma_{03}\text{MarketCap} + \gamma_{04}\text{CO2Emissions} + u_{0j}] + \gamma_{10}\text{AssuranceProviderType}_{ij} + \gamma_{20}\text{ForeignOperations}_{ij} + \gamma_{30}\text{NoOfCountryListings}_{ij} + \gamma_{40}\text{FinancialCondition}_{ij} + \gamma_{50}\text{MarketToBook}_{ij} + e_{ij}$$

where

Where P is the probability of Y=1, and,

Y is the categorical dependent variable AssuranceFramework = that is coded 0 when a regional assurance framework is used (for example, the Dutch assurance framework 3410N) and coded 1 when an International assurance framework(s) (ISAE3000 and/or AA1000AS) is used.

Audit firm specific variable

Assurance provider type = a categorical variable that is coded 1 if the assurance provider is an audit firm, 0 if the assurance provider is a specialist assurance providers/technical experts.

Client firm specific variables

Foreign_Operations = a categorical variable that is coded 1 if a client has foreign operations, 0 otherwise.

No_of_country_listings = Number of countries in which the client is listed.

Financial_Condition = Net Income divided by Total assets of a client

Market_to_book = A client's market-to-book ratio (Common Shares Outstanding * Closing price/Total Assets)

e_{ij} = Level 1 (i.e. audit firm specific variables and client firm specific variables) residuals

Country level variables

DisclosureIndex = Provided by the World Bank on its website; measures the extent to which investors are protected through disclosure of ownership and financial information. The index ranges from 0 to 10, with higher values indicating more disclosure.

GDP = GDP per capita in a country in USD based on 2011 prices.

MarketCap = Market capitalization of listed clients as a percentage of GDP; calculated for the year 2009 as the share price times the number of shares outstanding.

CO2Emissions = Metric tons per capita of carbon dioxide emissions for a country for the years 2007-2011.

u_{0j} = Level 2 (i.e. country level variables) residuals

As mentioned earlier, I examine the factors influencing the selection of assurance frameworks by the assurance provider related to sustainability reporting. In this study, the dependent variable is which assurance framework is indicated in the client company's assurance report. As independent variables, I consider audit-firm-specific, client-firm-specific, industry-level and country-level factors that may influence the selection of the assurance framework.

The sustainability assurance market cannot be assumed to be the same throughout the world because assurance on sustainability reports is sought with much more enthusiasm in some countries than in others and countries provide different regulatory requirements (e.g. Japan and France, as mentioned in the introduction). In addition, different industries may provide different motivations for assuring sustainability reports, which might influence the selection of one or more assurance frameworks. Some assurance providers and the client companies use two international frameworks together for the purpose of assuring sustainability reports. For example,

Pricewaterhouse Coopers provides assurance on the sustainability report of Novo Nordisk AS (2011). For this purpose, Pricewaterhouse Coopers uses both international standards, namely ISAE 3000 and AA1000AS (p. b111).

Also, some clients seek assurance from two assurance providers. For example, Total S. A. (2011), an oil and gas company based in Paris, France, obtained assurance from two assurance providers for its sustainability report, namely KPMG and Ernst & Young (Total S. A. 2011, p. 77). Total S. A.'s assurance report does not indicate whether the two auditors provided assurance on different parts of the sustainability report or whether it was a joint audit. I now discuss the factors that may influence the selection of assurance frameworks.

13.1 Dependent Variable

The dependent variable is classified into 2 categories: international frameworks (AA1000AS and ISAE3000 or both), and, regional frameworks (for example, the assurance framework issued by NIVRA, the Dutch accounting body.). If international assurance frameworks are used, the dependent variable is marked 1, and, if regional assurance frameworks are used, the dependent variable is marked 0.

13.2 Audit Firm Specific Factors

I. Assurance Provider Type: Assurance providers have the major role to play in the selection of assurance frameworks due to the fact that the responsibility of assurance falls on them. Assurance provider type is an indicator variable that equals 1 if the assurance provider of a client company is an auditing firm and, 0 if the assurance provider is a specialist assurance providers/technical expert (non-audit firm). Assurance provider type has been chosen as an explanatory variable because the decision to use a certain assurance framework has to be made

by the assurance provider. The choice of an assurance framework can be expected to be different between audit firms and non-audit firms because of the differences in their focus and experience.

I use a country-of-origin variable to investigate the choice of international or regional frameworks. Dichter (1962) was the first to identify this variable as affecting important choices. He describes it as "national feeling manifests itself in many ways", and, "nationalism plays a major role in determining acceptance (p. 115)." In addition, he says that country-of-origin can exercise "tremendous influence on the acceptance and success of products (p. 116)." According to Verlegh and Steenkamp (1999), Schooler (1965) first tested this variable in an empirical setting and found that significant differences in the evaluation of products exist, for products that are identical in all respects except the name of the country appearing on the label. Peterson and Jolibert (1995) claim that country-of-origin effect "is somewhat generalizable". In their meta-analysis, Verlegh and Steenkamp (1999) conclude that country-of-origin can be classified as a substantial factor in product evaluations.

I argue that assurance frameworks can be viewed as products because they have properties that satisfy their purpose in the context of assurance on sustainability reports. The purpose of an assurance framework is to provide guidance to assurance providers on various matters concerning the assurance of sustainability reports. For providing guidance, an assurance framework has guidelines regarding professional behavior, professional competence, acceptance of an assurance engagement, collecting evidence, and, preparing an assurance report, among other things. Since assurance frameworks can be viewed as products for assurance providers as well as for client companies, country-of-origin effect presents the appropriate lens for the purpose of examining the choice of assurance frameworks.

Because of the possible country-of-origin effect, it seems likely that the local offices of assurance providers may prefer a regional framework over an international one. This may be because the audit firm offices or specialist assurance provider offices in any country are mostly staffed with local people. However, some assurance providers, particularly the auditing firms have international operations and they may be expected to select international frameworks because of standardization considerations and ease of comparison and because of their international nature. Hence, I hypothesize as follows:

H_1: There is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework, given that the assurance provider is an audit firm or a specialist assurance provider/technical expert.

13.3 Client Firm Specific Factors

Foreign Operations and the number of countries in which a client firm is listed is expected to influence the assurance provider's choice of an assurance framework by bringing into focus the international nature of the client firm. Prior literature (Ettredge, Kwon and Lim 2009) suggests that market_to_book (a growth proxy) and financial condition of a company (proxied by Scaled_net_income) are client firm characteristics that influence assurance provider's decisions.

II. Foreign Operations: A company's foreign operations is likely to influence the assurance provider's selection of assurance frameworks because if a client company sells its products all over the world, it seems likely that the assurance provider will use international assurance frameworks, as the latter might contribute towards the credibility of information presented in their sustainability reports (Simnett, Vanstraelen and Chua 2009). This variable is labeled Foreign_Operations and marked 1 if a company has foreign operations, 0 otherwise.

An assurance provider has an incentive for choosing international frameworks for a client company that has international operations, because of standardization considerations and ease of comparison and because international frameworks are aligned with the client firm's international operations. I hypothesize the following:

H_2: The likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for clients who have foreign operations.

III. Number of Country Listings: If a client firm is listed on multiple stocks exchanges in different countries, it may influence the assurance provider's selection of assurance frameworks because such client firms will have to observe the rules of all the stock exchanges that it is listed on. As pointed out earlier, from 2002, listed French companies have been required to report on their environmental and social performance (KPMG 2002, p.5) and Japanese companies began to adopt environmental reporting guidelines issued by the Japanese government in 2001 (KPMG 2002, p.15). Even though there are limited requirements regarding assurance, assurance frameworks or even reporting frameworks, it might be more likely that client companies listed on these stock exchanges seek assurance. This variable is labeled No_of_Country_Listings and it provides a count of countries that a company's stock is listed in. For example, if a company's stock is listed on the NYSE and NASDAQ, No_of_Country_Listings is 1. If this company's stock is listed in various exchanges in US and Germany, No_of_Country_Listings is 2.

Further, it seems more likely that assurance providers of client firms with stock exchange listings in multiple countries are more likely to use international assurance frameworks because the latter appear to be more compatible with their international listing status. However, the

regulatory ambiance, especially the rules of a stock exchange in a certain country might encourage client firms operating in that country to use local standards. Hence,

H_3: There is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework for clients who have stock exchange listings in multiple countries.

IV. Growth of the client company: I use market-to-book equity ratio to proxy for growth opportunities is labeled Market_to_Book [(common shares outstanding * price close)/total assets] (Ettredge, Kwon and Lim 2009). If the client firm is growing at a rapid rate, it seems more likely that its assurance provider will select international assurance frameworks in order to build credibility (Simnett, Vanstraelen and Chua 2009). Further, it seems more likely that assurance providers of client firms with growth opportunities are more likely to use international assurance frameworks because these client firms might want to expand overseas. However, if a company's aim is to focus on one or more specific countries, its assurance provider might select regional assurance frameworks since they are more suitable for the client firm's goals. Hence,

H_4: There is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework for clients who have a rapid growth rate versus those who do not.

V. Financial condition of the client company: This variable is a control variable. The financial condition of the company is proxied by Net income/Total Assets and is labeled Scaled_Net_Income.

13.4 Industry Level Factors

Even though prior literature suggests that industry levels factors may influence assurance provider decisions, analysis for this study suggests that only audit firm specific factors (whether the assurance provider is an audit firm or specialist assurance provider/technical expert) client company specific factors (Foreign_Operations, Number_of_company_listings, Market_to_book, Scaled_net_income) and country specific factors (DisclosureIndex, GDP, MarketCap, CO2Emissions) should be included in this model. Industry level variables have not been included in this model because the analysis suggests that they do not influence the dependent variable (i. e. they contribute only an insignificant amount of variance towards the dependent variable).

13.5 Country Level Factors

Country level factors are expected to influence the choice of assurance frameworks by providing a setting where a high value is placed on the credibility of information disclosed by client firms in their sustainability reports (Ettredge, Kwon and Lim 2009). Assurance frameworks play an important role in enhancing the credibility of sustainability reports issued by companies by providing guidance to assurance providers. CO2Emissions has been included as an explanatory variable because it is expected to influence reporting and obtaining assurance on issues that affect the environment, an integral part of sustainability and climate change (KPMG 2011).

13.5.1 Extent of Disclosure in a Country

I use the disclosure index provided by The World Bank on its website (http://data.worldbank.org/indicator/IC.BUS.DISC.XQ) as a proxy for the disclosure ambiance in a particular country. This index is called ‘Business extent of disclosure index’ and it measures the extent to which investors are protected through disclosure of ownership and financial

information. The index ranges from 0 to 10, with higher values indicating more disclosure. Sustainability information and assurance on it is increasingly being revealed by companies in order to assess how external risks affect their business (Mock, Strohm and Swartz 2007), and, are viewed as value relevant (KPMG 2011, p. 28). Hence, this index arguably provides an overall view of the weight that is placed on disclosure environment in a country.

It seems likely that assurance providers in high disclosure environments may view international frameworks as contributing towards disclosure because they are perceived to be more credible and because they represent a move towards standardization and hence, providing a basis for comparison. Hence,

H_5: The likelihood of an assurance providers' selection of an international framework is expected to be significantly greater for client firms who are located in countries having a high disclosure environment.

13.5.2 National Economic Development

Ettredge, Kwon and Lim (2009) argue that higher levels of economic development increase the demand for credible information. This demand may translate into selection of sustainability assurance frameworks which arguably increase the credibility of assurance statements and, in turn, the information in the corresponding sustainability reports.

I employ two variables that reflect national economic development. The first is the level of annual gross domestic product (GDP) per capita in each country. GDP per capita has been collected from the CIA Factbook (https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html) and is in US Dollars based on 2011 prices. Since higher national economic development is reflected in GDP per capita and is associated with an

increased demand for credible information, companies and/or assurance providers based in countries with higher GDP per capita can be expected to choose international frameworks, as they may be perceived to provide higher credibility.

My second proxy for national economic development is the extent of development of national stock markets. According to Demirgüç-Kunt and Levine (1996), poorer countries have lower stock market development than richer countries on average. Thus, stock market development indicates the level of national economic development. Further, they point out that countries with more developed stock markets are associated with strong information disclosure laws. Healy and Palepu (2001) emphasize the role of disclosure of information in the working of stock markets. That is, more information is preferred by investors in more developed stock markets. Further, they suggest that assurance providers enhance credibility of information revealed by companies in stock markets. Assurance providers play a central role in the selection of frameworks for assuring sustainability reports. I expect assurance providers in more developed markets to use international frameworks since they may be perceived as lending credibility and as a move towards standardization and ease of comparison. Stock market development is measured by market capitalization of listed companies as a percentage of GDP and is calculated for the year 2009 as the share price times the number of shares outstanding. For this calculation of market capitalization, listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year. Listed companies do not include investment companies, mutual funds, or other collective investment vehicles. This data is provided by the World Bank on its website (http://data.worldbank.org/indicator/CM.MKT.LCAP.GD.ZS/countries/1W?display=default).

Therefore,

H_6: The likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for client firms that are located in countries with relatively high values of proxies for national economic development (GDP and MarketCap).

13.5.3 Greenhouse Gas Emissions by Country

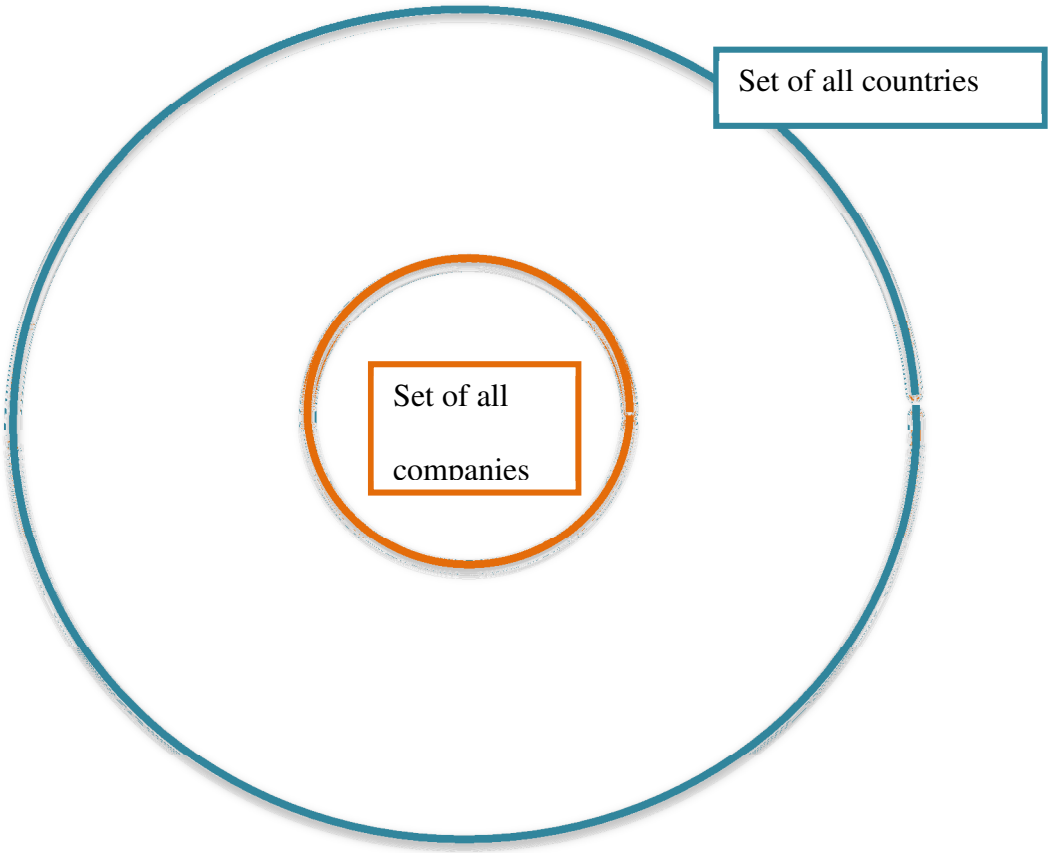
The US Environmental Protection Agency (EPA) notes on its website (http://www.epa.gov/climatechange/emissions/index.html) that gases that trap heat in the atmosphere are called greenhouse gases. Currently, carbon dioxide is one of most ubiquitous greenhouse gas. As early as 1994, Fankhauser stated that greenhouse gases are stock pollutants. That means that global warming damage is not caused by the flow of emissions as such, but by their accumulation in the atmosphere. Consequently a ton of emissions has its impact not only in the period of emission, but over several time periods--as long as the gas or fractions of it remain in the atmosphere.

Since human activities cause greenhouse gas emissions in every country in the world, the amount of emissions in a country may influence a company's reporting on such issues (Maclean and Gottfrid 2000) and seeking assurance on such information. The World Bank provides data on its website (http://data.worldbank.org/indicator/EN.ATM.CO2E.PC/countries/1W?display=default) on the carbon dioxide emissions (metric tons per capita) by country for the years 2007-2011. In order to make such information more credible, an assurance provider may use international frameworks to assure sustainability report(s) because they are perceived to lend credibility and because they represent a move towards standardization and ease of comparison. I hypothesize as follows:

H_7: The likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for client firms located in countries associated with high values of carbon dioxide emissions (metric tons per capita).

13.6 Nestedness

Nestedness occurs when one group/set is contained in another preceding group/set. That is, one is a subset of another. For example, students are nested in classrooms, which in turn, are nested in schools. In this study, companies are nested in countries. This is because the country in which the sustainability report assurance is conducted may exert an influence on some of the characteristics related to companies. For example, an average company in the US may be expected to be bigger in terms to sales or assets than an average company in Taiwan. Likewise, companies in the mining industry may feel more pressured than companies in other industries to keep track of and report their carbon dioxide emissions. Nesting can be illustrated in terms of diagrams as follows:



To indicate this nesting, the set that is *included in* another set is called level 1 (in this case, the set of all companies in my sample). Hence, variables associated with each company, such as its assurance provider, or, whether a company has foreign operations is classified as level

1 variable. On the other hand, the set that *includes* another set is a higher level set and is called level 2. Variables associated with each country (GDP per capita, Disclosure Index etc.) are classified as level 2 variables.

Due to the nestedness, a multi-level approach, also called the hierarchical linear model (HLM) is appropriate for analysis. The basic idea of multi-level analysis is that data sets with a nesting structure that includes unexplained variability at each level of nesting, (for example, companies within countries, or, companies within industries) are usually not adequately represented by multiple linear regression analysis, but are often adequately represented by the hierarchical linear model (Snijders and Bosker 2012, p. 3). Not recognizing the nestedness can yield an overly rosy evaluation of one's findings.

Under the multi-level approach, if level 2 variables are not available, it may affect conclusions one can draw from the data that is available. One option for improving this situation is replacing missing values with the variable's mean. However, this underestimates variance and increases the chances of detecting spurious effects (Cohen, Cohen, West and Aiken 2003). Another option is deleting cases where missing values occur, but, this may lead to reduction in statistical power of the tests conducted. Multiple imputation provides a good solution to this problem by having acceptable properties and by being easy to implement. In this study, certain observations related to country level variables have been imputed because they could not be obtained. This has been elaborated in the next section.

CHAPTER 14: DATA COLLECTION

This window of 2009-2011 has been chosen in order to identify recent trends. The sample of international companies in this study is traded in the US and is on the Securities and Exchange website. Data related to sustainability assurance variables have been gathered from sustainability reports collected from CorporateRegister.com, the world's largest database for sustainability reports. These include the observations for the dependent variable (names of assurance frameworks) and the independent variable labeled Assurance Provider Type. Data for Total_Assets (proxy for size of the client company), Foreign_Operations (categorical variable marked 1 if the company has foreign operations, 0 otherwise), No_of_Country_Listings (a count of countries that a company's stock is listed in), Scaled_Net_Income (financial condition of a company, proxied by Net income/Total Assets), and, Market_to_Book (common shares outstanding * closing stock price at fiscal year-end/Total Assets) is from Compustat database, and, 20-F forms and 10-k forms filed by the company to the Securities and Exchange Commission (SEC) and provided by the SEC on its website. One observation related to total assets and four observations related to common shares outstanding and closing stock price at fiscal year-end were obtained from Yahoo finance website.

Each company was then classified according to the 49-industry portfolio classification provided by the Kenneth R. French data library (specifically, the industry definitions link) (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/changes_ind.html). Data on Business extent of disclosure index, market capitalization in each country, and, carbon dioxide emissions by country was obtained from the World Bank website. Data on annual gross domestic product per capita in each country is in US dollars and is provided by the CIA Factbook website. When the assurance report states that the assurance procedures have been

carried out in two different countries (for example, Wipro Ltd.'s 2011 sustainability report states that assurance procedures have been carried out in India and Norway), figures for the country level variables (DisclosureIndex, GDPperCapita, MarketCap and CO2Emissions) have to be imputed. In addition, disclosure index is not available for two countries (Switzerland and Taiwan), and MarketCap and CO2Emissions are not available for Taiwan. Since the multi-level approach requires all of the data at level 2, these have been were imputed for country level variables. An explanation of nestedness, level 1 and level 2 variables have been provided in the section titled **4.6 Nestedness** above.

CHAPTER 15: SAMPLE SELECTION

To begin with, all the international client firms who had published sustainability reports in English and obtained assurance on them in the years 2009, 2010 and 2011 were selected. These client firms were 1100 in number and listed under the category 'Assured Sustainability Reports' on CorporateRegister.com. 995 international client firms were eliminated from the sample because of two reasons: restricted access to data on total assets, net income, stock price at the end of the fiscal year and number of shares outstanding and because the assurance report consisted of commentary by a panel of experts, which is not recognized as formal assurance by the KPMG 2008 report [see section titled 2. Sustainability Assurance Frameworks, Level of Assurance and Assurance Providers for further details]. 105 client firms were remaining at this stage, all of which were traded in the US and were listed on the Securities and Exchange (SEC) website. Next, 10 client firms were eliminated because these client firms did not file financial statements, even though they were listed on the SEC website. 95 client firms were remaining in the sample at this point.

However, the assurance providers of 24 client firms did not list the assurance frameworks used by them in their assurance reports. Due to missing data on assurance frameworks, these 24 client firms were also eliminated from the sample. The number of client firms remaining at this point was 71 and has been used for this study.

CHAPTER 16: DESCRIPTIVE STATISTICS

Table 14: Number of Assurance Reports versus Countries in this Study

Country Name	Country Number assigned in this study	Number of reports	Percentage
Australia	1	2	2.82%
Austria	2	2	2.82%
Belgium	3	1	1.41%
Brazil	4	2	2.82%
Burma and South Africa	5	1	1.41%
Canada	6	2	2.82%
China	7	1	1.41%
Denmark	8	1	1.41%
France	9	4	5.63%
Germany	10	1	1.41%
Hungary	11	1	1.41%
India	12	1	1.41%
India and Norway	13	1	1.41%
Italy	14	1	1.41%
Japan	15	6	8.45%
Korea	16	5	7.04%
Mexico	17	2	2.82%
Norway	18	1	1.41%
Portugal	19	1	1.41%
South Africa	20	3	4.23%
Spain	21	3	4.23%
Switzerland	22	1	1.41%
Taiwan	23	1	1.41%
The Netherlands	24	5	7.04%
UK	25	12	16.90%
USA	26	9	12.68%
USA and UK	27	1	1.41%
Total		**71**	100%

Table 14 provides the number of assurance reports versus countries in this study. It is seen that out of a sample of 71 companies, the three highest figures are as follows: 12 assured sustainability reports are from UK (16.9%), 9 sustainability reports are from the USA (12.68%), and, 6 sustainability reports are from Japan (8.45%). Since the companies in this study are all traded in the US, the above figures may indicate that companies that operate internationally may be obtaining assurance on sustainability reports. These figures may also indicate that companies from developed markets may be obtaining assurance on their sustainability reports.

Table 15: List of all Assurance Frameworks used in different Countries in this Study

Assurance Framework	**Country**
ISAE 3000 and AA1000AS ISAE 3000	**Australia**
AA1000AS Austrian Environmental Management Act	**Austria**
ISAE 3000	**Belgium**
AA1000AS Rule NPO 1-Brazilian Independent Auditors Institute (IBRACON)	**Brazil**
ISAE 3000	**Burma and South Africa**
ISAE 3000	**Canada**
AA1000AS	**China**
ISAE 3000 and AA1000AS	**Denmark**
ISAE 3000 and AA1000AS ISAE 3000	**France**
ISAE 3000	**Germany**
ISAE 3000	**Hungary**
ISAE 3000	**India**

AA1000AS	**India and Norway**
ISAE 3000	**Italy**
Japanese Ministry of Environment guidelines ISAE 3000	**Japan**
AA1000AS AA1000AS and ISO26000 ISAE 3000	**Korea**
ISAE 3000 AA1000AS	**Mexico**
ISAE 3000	**Norway**
ISAE 3000 and AA1000AS	**Portugal**
ISAE 3000	**South Africa**
ISAE 3000 and AA1000AS	**Spain**
ISAE 3000	**Switzerland**
AA1000AS	**Taiwan**
NIVRA 3410 N AA1000AS ISAE3000	**The Netherlands**
AA1000AS ISAE 3000 and AA1000AS ISAE 3000	**UK**
ISAE 3000	**UK and USA**
AICPA attestation framework International Council on Metals and Mining Sustainable Development Framework: Assurance Procedure AA1000AS Practices drawn from U.N. Global Compact, the DJSI, AA1000, and ISO ISAE 3000 ISAE 3000 and AA1000AS	**USA**

Table 15 provides a list of all the assurance frameworks used in different countries in this study. Of these the country with the most variety is the US (6 assurance frameworks). In the second place are UK, The Netherlands and Korea (3 assurance frameworks each). The frameworks that are most often used are international ones (ISAE 3000 and/or AA1000AS). Regional frameworks have also been used in the US (AICPA attestation framework) and in the Netherlands (NIVRA 3410N). Since this is a largely unregulated field, and, there is no governing body that recommends the use of one or more assurance frameworks, assurance providers are free to choose any of the available frameworks. Therefore, in the case of the US, UK, the Netherlands and Korea, it seems likely that as the number of companies in these countries seeking assurance on their sustainability reports increases, the frameworks used may also increase. It may also indicate that assurance providers in developed countries may be testing various assurance frameworks to see which is suitable.

Table 16: Ernst & Young Details – type of Assurance Framework and Countries Covered

Type of Assurance Framework	Frequency	Percentage
NIVRA 3410 N (Regional)	1	6.67%
ISAE 3000 and AA1000AS	4	26.67%
ISAE 3000	10	66.67%
Total	**15**	**100.00%**

Country	Frequency	Percentage
Belgium	1	6.67%
Canada	1	6.67%
France	2	13.33%
Italy	1	6.67%
Japan	2	13.33%
Norway	1	6.67%
The Netherlands	2	13.33%
UK	5	33.33%
Total	**15**	**100.00%**

Tables 16, 17, 18, and 19 respectively provide details related to the audit firms: Ernst & Young, PricewaterhouseCoopers, KPMG and Deloitte. In the sample used in this study, the audit firms are all Big4 firms. These details relate to the types of assurance framework used by each and countries in which the sustainability reports were assured by a particular audit firm. Table 16 reveals that 10 out of 15 reports (approximately 67%) assured by Ernst & Young used the ISAE 3000 framework and 4 out of 15(approximately 27%) reports used both ISAE 3000 and AA1000AS. Only 1 report assured by Ernst & Young used a regional framework (The Dutch regional assurance guidelines, NIVRA 3410N). The highest numbers of reports assured by Ernst & Young were from the UK (5 out of 15; approximately 33%). The second place is shared by The Netherlands, France, and Japan (2 each out of 15; approximately 13%).

Table 17: PricewaterhouseCoopers Details – Type of Assurance Framework and Countries Covered

Assurance Framework	Frequency	Percentage
AICPA attestation standards	1	7.14%
ISAE 3000	11	78.57%
ISAE 3000 and AA1000AS	2	14.29%
Total	**14**	**100.00%**

Country	Frequency	Percentage
Australia	1	7.14%
Canada	1	7.14%
Denmark	1	7.14%
Germany	1	7.14%
Hungary	1	7.14%
Japan	1	7.14%
Korea	1	7.14%
Mexico	1	7.14%
South Africa	2	14.29%
Spain	1	7.14%
Switzerland	1	7.14%
UK	1	7.14%
USA	1	7.14%
Total	**14**	**100.00%**

Table 17 provides details about PricewaterhouseCoopers (PWC). Similar to Ernst & Young, the assurance framework that was used most often is ISAE 3000 (11 out of 14 reports; approximately 79%), the second place is taken by ISAE 3000 and AA1000AS used together to assure reports (2 out of 14 reports; about 14%), and, only 1 out of 14 reports is assured with a regional framework (AICPA attestation framework). However, PWC assured the highest numbers of reports from South Africa (2 out of 14 reports; 14.29%), and assured one report each from Australia, Canada, Denmark, Germany, Hungary, Japan, Korea, Mexico, Spain, Switzerland, UK and USA (7.14% each).

Table 18: KPMG Details – Type of Assurance Framework and Countries Covered

Assurance Framework	Frequency	Percentage
AA1000AS	1	11.11%
ISAE 3000	5	55.56%
ISAE 3000 and AA1000AS	2	22.22%
Rule NPO 1-Brazilian Independent Auditors Institute (IBRACON)	1	11.11%
Total	**9**	**100.00%**

Country	Frequency	Percentage
Australia	1	11.11%
Brazil	1	11.11%
France	1	11.11%
India	1	11.11%
Japan	1	11.11%
Mexico	1	11.11%
South Africa	1	11.11%
The Netherlands	1	11.11%
UK	1	11.11%
Total	**9**	**100.00%**

Table 18 reveals the details for KPMG. In this case also, the highest numbers of reports used ISAE 3000 (5 out of 9 reports; 55.56%), and the second place is taken by ISAE 3000 and AA1000AS used together (2 out of 9 reports; about 22%). Only in one instance out of 9, KPMG has used a regional assurance framework (the framework provided by the Brazilian Independent Auditors Institute). Interestingly, KPMG provided assurance with Ernst & Young for the client company called Total S. A. (France) using ISAE 3000 and with Deloitte for the client company called Westpac Banking Corporation (Australia) using ISAE 3000 and AA1000AS together. These companies were included with the KPMG data so as to count these observations only once. Only 1 report was assured using AA1000AS all by itself. KPMG has assured one report each from Australia, Brazil, France, India, Japan, Mexico, South Africa, The Netherlands and UK (11.11% each).

Table 19: Deloitte Details – Type of Assurance Framework and Countries Covered

Assurance Framework	Frequency	Percentage
AICPA	2	33.33%
ISAE 3000	2	33.33%
ISAE 3000 and AA1000AS	2	33.33%
Total	**6**	**100.00%**

Country	Frequency	Percentage
Burma and South Africa	1	16.67%
Japan	1	16.67%
Spain	2	33.33%
USA	2	33.33%
Total	**6**	**100.00%**

Table 19 provides details about Deloitte. It has provided assurance on 2 reports each using ISAE 3000, ISAE 3000 and AA1000AS, and, regional frameworks (both have been assured using the AICPA attestation framework), out of a total of 6 reports (33.33% each). Deloitte has provided assurance to 2 reports each from Spain and the US (33.33% each), one report from Japan, and, one report that has been assured in Burma and South Africa. This report had been published by Imperial Holdings Ltd.

Table 20: Non Audit Firm Details – Assurance Provider Names and Frequencies

Name of non audit firm Assurance Provider	Number of reports assured by each	Percentage of reports assured by each
Bureau Veritas	4	14.81%
Corporate Citizenship	1	3.70%
Corporate Integrity Ltd	1	3.70%
Denkstatt GMBH	1	3.70%
DNV	3	11.11%
Environmental Resources Management	2	7.41%
Firmus Agnitio	1	3.70%
ISOS Group	1	3.70%
Japan Audit and Certification Organization for Environment and Quality	1	3.70%
Korea Productivity Center	1	3.70%
Korea Research Institute for Measurement and Assessment (KRIMA)	1	3.70%
Lloyds Register Quality Assurance Limited	2	7.41%
SGS	5	18.52%
Sustainable Business	1	3.70%
The Institute for Industrial Policy Studies	1	3.70%
Two Tomorrows	1	3.70%
Total	**27**	**100.00%**

Country	Number of assurance reports from each country	Percentage
Austria	2	7.41%
Brazil	1	3.70%
China	1	3.70%
France	1	3.70%
India and Norway	1	3.70%
Japan	1	3.70%
Korea	4	14.81%
Portugal	1	3.70%
Taiwan	1	3.70%
The Netherlands	2	7.41%
UK	5	18.52%
UK and USA	1	3.70%
USA	6	22.22%
Total	**27**	**100.00%**

Table 20 provides details of the non audit assurance providers. The largest numbers of reports have been assured by SGS (5 out of 27 reports; 18.52%), Bureau Veritas (4 out of 27 reports; 14.81%), and Det Norske Veritas (DNV) (3 out of 27 reports; 11.11%). These assurance providers can be classified as specialist assurance providers/technical experts (O'Dwyer 2011). Notably, in this sample, audit firms other than Big4 firms have not provided assurance services on sustainability reporting. The AA1000AS framework has been used by 59.25% (16 out of 27 reports) of the non audit assurance providers. Only 14.81% (4 out of 27 reports) of non audit assurance providers have use the ISAE 3000 framework and only 7.41% of them (2 out of 27 reports) have used ISAE 3000 and AA1000AS together. It is interesting to note that environmental guidelines issued by legislation (for example, Japanese Ministry of environment guidelines) and an assurance procedure developed by industry coalition (for example, the assurance procedure developed by International Council on Metals and Mining (ICMM)) are also used by non-audit assurance providers. Regarding the countries covered by the non audit assurance providers, the first place is held by the US (6 out of 27 reports; 22.22%) the second place is held by UK (5 out of 27 reports; 18.52%), and, the third place is held by Korea (4 out of 27 reports; 14.81%). This may also be a reflection of the fact that companies that operate internationally may be obtaining assurance on sustainability reports.

There seem to be some differences in the choice of assurance frameworks by the audit firms and non audit firms. Among the audit firms, the ISAE 3000 seems to be popular, and, among the non audit firms, the AA1000AS seems to be popular. This may be because the audit firms may prefer to use frameworks from standard setting bodies that are involved with assurance. In this connection, ISAE 3000 has been issued by The International Auditing and Assurance Standards Board (IAASB), the international arm of the International Federation of

Accountants (IFAC.) Due to the fact that ISAE 3000 comes from a standard setting body that is involved with assurance, ethical considerations to which audit and assurance firms are expected to live up to might apply to others that use this framework. This, in turn might influence non audit assurance providers to move away from ISAE 3000 towards AA1000AS, since the latter has been issued by AccountAbility, a non-profit organization which provides "solutions to the most critical challenges in corporate responsibility and sustainable development" (http://www.accountability.org/about-us/index.html). Another point of interest is that while the audit firms sometimes use regional assurance frameworks (for example, Dutch assurance framework NIVRA 3410N) issued by the accounting body in a particular region, the non audit firms seem to prefer to sometimes use the legislative acts that provide recommendations regarding environmental reporting. This may also reflect an audit firm preference for associating themselves with audit standard setting organizations and non audit firm preference for using recommendations provided by the law in a particular region.

Table 21: Assurance Frameworks Used and Countries Covered by Audit Firms Together as a Group

Assurance Framework	Frequency	Percentage
AA1000AS	1	2.27%
AICPA	3	6.82%
ISAE 3000	28	63.64%
ISAE 3000 and AA1000AS	10	22.73%
NIVRA 3410 N	1	2.27%
Rule NPO 1-Brazilian Independent Auditors Institute (IBRACON)	1	2.27%
Total	**44**	**100.00%**

Country	Frequency of reports from each country	Percentage
Australia	2	4.55%
Belgium	1	2.27%
Brazil	1	2.27%
Burma and South Africa	1	2.27%
Canada	2	4.55%
Denmark	1	2.27%
France	3	6.82%
Germany	1	2.27%
Hungary	1	2.27%
India	1	2.27%
Italy	1	2.27%
Japan	5	11.36%
Korea	1	2.27%
Mexico	2	4.55%
Norway	1	2.27%
South Africa	3	6.82%
Spain	3	6.82%
Switzerland	1	2.27%
The Netherlands	3	6.82%
UK	7	15.91%
USA	3	6.82%
Total	**44**	**100.00%**

Table 21 provides a list of assurance frameworks and a list of countries in which audit firms have assured sustainability reports. A large number of audit firm assurance providers (28 out of 44 assurance reports; 63.64%) use ISAE 3000. As explained in the paragraph above, this may reflect an audit firm preference for using an assurance framework that has been issued by an organization that is involved with audit standard setting. The highest number of reports that have been assured by the audit firms are from UK (7 reports out of 44, 15.91%) and, the next highest are from Japan (5 reports out of 45, 11.36%).

The large number of assured sustainability reports from the UK may be because of various initiatives in the UK. Some of them are as follows: First, in a 2009 report titled, *Exchanges and Sustainable Development*, the World Federation of Stock Exchanges (http://www.world-exchanges.org/sustainability/WFE-ESG.pdf, p. Sec1:7), points out that the London Stock Exchange established several sustainability indices in 2001 (for example, the FTSE4Good Global Index, the FTSE4Good US Index, the FTSE4Good Europe Index, the FTSE4Good UK Index, among others). Since it was the first in the world to do so, it is likely that companies listed on it might have competed to be part of the index, which gave rise to the practice of issuing sustainability reports and getting those assured, the latter action to establish credibility. Second, Sustainable Development Commission was established as a limited company to be the UK government's independent advisor on sustainable development (http://www.sd-commission.org.uk/publications.php?id=1035, the downloadable pdf link, p. 5-6). Its primary aim is to, "contribute to the policy goal of facilitating and accelerating progress on sustainable development, acting as an adviser, advocate and in a 'watchdog' or scrutiny role to government on ways to achieve environmental, social and economic progress in an integrated way and with a view to improve quality of life for future generations." Third, Institute for Sustainability (http://www.instituteforsustainability.co.uk/index.html) was established in March 2009. Its board consists of various people from businesses, environmental groups, city administration, and, academics, and, which works towards cross sector collaboration and innovation in the delivery of sustainable places to live and work. This institute helps organizations, including businesses, "to identify best practice, encourage investment, and actively support social and economic development." Fourth, an organization called AccountAbility (http://www.accountability.org/about-us/index.html) was established in 1995 to provide

"innovative solutions to the most critical challenges in corporate responsibility and sustainable development." It is known for AA1000 series of frameworks, including AA1000 assurance framework (AA1000AS), and, for helping corporations in accounting for their ethical, environmental, social, and governance activities. This is in keeping with the KPMG 2008 (p. 15) report emphasizes that in the UK, the consumer, media, employee and shareholder voices demand greater accountability and transparency in key issues. Such initiatives by various institutions raise awareness about sustainable development and related issues, and, aid in creating an atmosphere in which issuing sustainability reports and getting them assured are viewed as being competent and in tune with the times. It seems likely that the initiatives listed above, along with others, contributed towards the large number of assured sustainability reports from the UK. The high number of reports from Japan maybe because of the environmental reporting and indicator guidelines issued by the Japanese government in 2001 (KPMG 2002, p. 17.) It seems likely that as more and more companies start issuing sustainability reports in Japan, there might be an increasing emphasis on making this information credible, because of which the issuing companies seek assurance from the audit firm assurance providers, as the latter are seen as more effective in providing credibility.

CHAPTER 17: BIVARIATE CORRELATIONS

Table 22: Spearman Correlations for Variables in Model

[N=71; Significant Correlations Highlighted]

		DV_intl_regional	DisclosureIndex	GDP	MarketCap	CO2Emissions	APT*	Foreign_Operations	No_of_country_listings	Scaled_net_income	market_to_book
DV_intl_regional	Corr Coeff	1.000									
	Sig.										
	N	71									
DisclosureIndex	Corr Coeff	.265*	1.000								
	Sig.	.025									
	N	71	71								
GDP	Corr Coeff	-.306**	-.125	1.000							
	Sig.	.009	.301								
	N	71	71	71							
MarketCap	Corr Coeff	.072	.593**	.151	1.000						
	Sig.	.553	.000	.209							
	N	71	71	71	71						
CO2Emissions	Corr Coeff	-.256*	-.163	.678**	.233	1.000					
	Sig.	.031	.174	.000	.050						
	N	71	71	71	71	71					
APT*	Corr Coeff	.050	.100	-.190	-.028	-.142	1.000				
	Sig.	.677	.408	.113	.818	.237					
	N	71	71	71	71	71	71				
Foreign_Operations	Corr Coeff	.024	.017	.007	-.200	-.195	.195	1.000			
	Sig.	.843	.888	.954	.095	.103	.103				
	N	71	71	71	71	71	71	71			
No_of_country_listings	Corr Coeff	.197	-.041	-.313**	-.179	-.214	.159	.114	1.000		
	Sig.	.099	.733	.008	.135	.073	.185	.345			
	N	71	71	71	71	71	71	71	71		
Scaled_net_income	Corr Coeff	.012	-.244*	.089	-.033	.043	-.265*	.136	-.024	1.000	
	Sig.	.918	.040	.462	.783	.724	.026	.256	.842		
	N	71	71	71	71	71	71	71	71	71	
market_to_book	Corr Coeff	-.064	-.133	.129	.010	-.021	-.248*	.016	-.294*	.597**	1.000
	Sig.	.596	.269	.284	.936	.859	.037	.898	.013	.000	
	N	71	71	71	71	71	71	71	71	71	71

APT = Assurance Provider Type

**. Correlation is significant at the 0.01 level (2-tailed); Highlighted in Yellow

*. Correlation is significant at the 0.05 level (2-tailed); Highlighted in Green

Correlation is significant at the 0.1 level (2-tailed); Highlighted in Orange

Table 22 shows the bivariate correlations for variables in the Model. As mentioned earlier, all bivariate correlations whose significance is 0.1 or below are discussed. Table 9 shows that the highest correlation is between *CO2Emissions* and *GDP* (0.678, p-value 0.000).

According to Goldsmith (2009), correlation is considered to be of a high degree when it is 0.82 or above. Only when then the correlation between two or more independent variables is high, the standard errors are large (Blalock 1963). Since the significant correlations in this study do not exceed 0.678, it is not high enough to inflate standard errors.

The dependent variable *DV_intl_regional* is correlated with the variable *DisclosureIndex* (0.265, p-value 0.025). This correlation can be interpreted as follows: the disclosure index is likely to be higher if the assurance framework used is an international one, than when the assurance framework used is a regional one. This means that when the assurance framework used is an international one, more information is disclosed. This may be because of the move towards uniformity and standardization of sustainability reporting and assurance (KPMG 2011, p. 3), and, international frameworks being viewed as promoting both of these. As developed economies tend to have higher levels of disclosure (and, in turn, higher values of Disclosure Index) and they might be the ones to move towards standardization, it seems likely that higher levels of disclosure index are correlated with international assurance frameworks.

The variable *DV_intl_regional* is negatively correlated with the variable *GDP* (-0.306, p-value 0.009) and also with the variable *CO2Emissions* (-0.256, p-value 0.031). This means that the regional frameworks are associated with lower levels of Gross Domestic Product (GDP) and with lower levels of CO2 (carbon dioxide) emissions. Low levels of GDP and CO2Emissions are associated with countries with low levels of industrialization. In such countries, assurance providers may be of the view that a regional framework that has been given by an assurance body in the same country may be more suitable for assurance purposes, since it takes into account the current conditions in which client firms operate.

The dependent variable *DV_intl_regional* is correlated with the variable *No_of_country_listings* (0.197, p-value 0.099). This means that if a company uses international frameworks, then it is likely to be listed in different countries. It is possible that companies with international operations may choose to list on stock exchanges internationally and choose international frameworks to signal that they have operations throughout the world. Hence, the positive correlation.

The variable *DisclosureIndex* is correlated with the variable *MarketCap* (0.593, p-value 0.000). This may be because both variables are country level variables and associated with the size and development level of a country. Hence, as the size and development level increases, so do the levels of disclosure and market capitalization. The variable *DisclosureIndex* is negatively correlated with the variable *Scaled_net_income* (-0.244, p-value 0.040). This correlation means that as the disclosure levels in a country increase the net income scaled by total assets of companies' decreases. This may be because higher levels of disclosure cause companies to be more conservative in their calculation of income.

The variable *GDP* is correlated with the variable *CO2Emissions* (0.678, p-value 0.000). Both of these are country level variables. This correlation can be explained by the fact that higher levels of development are associated with higher gross domestic product and higher levels of carbon dioxide emissions. The variable *GDP* is also negatively correlated with the variable *No_of_country_listings* (-0.313, p-value 0.008). This correlation is between the number of country listings of a company and the gross domestic product per capita. This may be a reflection of a tendency of companies who want to expand. They list on stock exchanges in countries that are developing and have a lower gross domestic product per capita, so as to exploit opportunities in emerging markets.

The variable *MarketCap* is correlated with the variable *CO2emissions* (0.233, p-value 0.050). Both are country level variables and associated with higher levels of development, which may be the reason for the correlation. The variable *MarketCap*, which is a country level variable, is negatively correlated with the variable *Foreign_Operations* of a company (-0.200, p-value 0.095). This means that as the market capitalization of a country increases, it is likely that foreign operations of a company decreases. In addition, *CO2Emissions* is negatively correlated with *No_of_country_listings* (-0.214, p-value 0.073). This means that as the level of carbon dioxide emissions of a country increases, it is likely that the number of stock exchange listings of a company in different countries decreases. Even though country level variables do affect factors related to individual companies, there does not seem to be a direct link between market capitalization of a country and foreign operations of a company, and, between carbon dioxide emissions of a country and a company's stock exchange listings in different countries.

The variable A*ssuranceProviderType* is negatively correlated with both the variables *Scaled_net_income* (-0.265, p-value 0.026) and *Market_to_book* (-0.248, p-value 0.037). This means that as a company's net income scaled by total assets increases, it is less likely that its sustainability assurance provider is one of the audit firms. Since *Market_to_book* is a proxy for the growth of a company, this correlation can be interpreted as follows: as a company grows, it is less likely that its sustainability assurance provider is one of the audit firms. It is likely that as a company grows and its net income scaled by total assets increases, its sustainability activities also grow. It is also common for non audit sustainability assurance providers to function in an advisory capacity, since they are viewed as having technical expertise in sustainability arena (such as evaluating equality among sexes in an organization). In order to manage their sustainability activities, such companies may seek non audit assurance providers to advise them

on managing their sustainability activities and provide assurance at the same time, as combining these two functions may be cost effective.

The variable *No_of_country_listings* is negatively correlated with the variable *Market_to_book* (-0.294, p-value 0.013). This means that as a company's business grows, its stock exchange listings in different countries decreases. This may be because as a company's business grows internationally, it may choose to incorporate privately held companies in other countries in order to provide some time for the business to acclimatize to a new environment. Listing on stock exchanges in other countries may come about once the business matures and it gains a foothold in the new country. The variable *Scaled_net_income* is positively correlated with the variable *Market_to_book* (0.597, p-value 0.000). This may be due to the following reason: it is likely that as a company's business grows, it makes more income, scaled by its total assets.

CHAPTER 18: EMPIRICAL RESULTS

Table 23: Results – Multi-Level Model

Independent variables		Variable Type	Dependent Variable = Assurance Framework (Intl_regional)			
			Multi-level regression estimate	Odds ratio	T-ratio	p-value
G00	Intercept		-0.331	0.718	-0.154	0.879
G01	DisclosureIndex	Country level variable	0.472	1.603	3.098	0.006
G02	GDP	Country level variable	0.000	1	1.102	0.283
G03	MarketCap	Country level variable	0.013	1.013	2.592	0.017
G04	CO2Emissions	Country level variable	-0.326	0.722	-2.975	0.007
G10	Assurance Provider Type	Audit firm level variable	-0.359	0.699	-0.278	0.782
G20	Foreign_Operations	Client firm level variable	-0.795	0.452	-2.245	0.028
G30	No_of_country_listings	Client firm level variable	0.255	1.29	0.594	0.554
G40	Scaled_net_income	Client firm level variable	3.356	28.671	0.634	0.528
G50	Market_to_book	Client firm level variable	-0.011	0.989	-1.692	0.095

N=71;

Number of observations of the dependent variable marked 1 = 62
If the confidence interval does not include 1, the variable is significant. Significant correlations highlighted.

Table 23 presents the results related to the multi-level regression model. The dependent variable in this model is called *DV_Intl_Regional*. It is marked 1 if an international assurance framework has been used, and, marked 0 if a regional assurance framework has been used. As mentioned earlier, I interpret only the sign of the coefficient of a variable. The significant variables have been highlighted in Table 23.

Analysis for the multi-level Model suggests that only one factor specific to assurance provider (whether the assurance provider is an audit firm or not), four client company specific factors (Foreign_Operations, Number_of_company_listings, Market_to_book, Scaled_net_income), and four country specific factors (DisclosureIndex, GDP, MarketCap, CO2Emissions) should be included in this model. Industry level variables have not been included in this model because the analysis suggests that they do not influence the dependent variable (i.e., they contribute only an insignificant amount of variance towards the dependent variable). As a broad guideline, for the multi-level model, variables have been interpreted as follows: positive significant correlations are associated with the use of an international assurance framework, and, negative significant correlations are associated with the use of a regional framework. If a variable is not significant, then it is interpreted as being statistically unrelated with the choice between an international framework and a regional framework.

The variable *Assurance provider type* does not have a significant relationship with the dependent variable *DV_Intl_Regional* (-0.359, p-value = 0.782), and, hence provides support for hypothesis 1, H_1 (H_1 states that there is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework, given that the assurance provider is an audit firm or a specialist assurance provider/technical expert). This suggests that the variable *Assurance provider type* is not statistically significantly related to the selection between international and regional assurance frameworks. This may be because assurance providers may view the use of either framework as being advantageous to them, since both kinds of assurance frameworks enhance credibility and provide a basis for their actions, especially in event of litigation.

The variable *Foreign_Operations* has a significant and negative relationship with *DV_Intl_Regional* (-0.795, p-value = 0.028), and, hence does not provide support for H_2 (H_2 states the likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for clients who have foreign operations). This negative relationship suggests that for client companies who have foreign operations, assurance providers are more likely to select regional frameworks. This may be due to the country of origin effect. Client firms that have foreign operations may have operations that are partitioned by country, and, assurance provider offices are mostly staffed with people from that country.

The variable, *No_of_country_listings*, is not significant (0.255, p-value = 0.554), and, hence provides support for H_3 (H_3 states that there is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework for clients who have stock exchange listings in multiple countries). This suggests that the variable *No_of_country_listings* is not statistically significantly related to the choice between international and regional assurance frameworks. This may be because, as mentioned earlier in the discussion related to the variable *Assurance provider type*, assurance providers of client firms who have stock exchange listings in multiple countries may view the use of either kind of assurance framework as being advantageous to them, since both kinds of assurance frameworks enhance credibility.

As mentioned earlier, the variable *Scaled_net_income* is a proxy for the financial condition of a client company, and has been included as control variable. Due to this reason, there are no hypotheses associated with this variable.

The variable *Market_to_book* (a proxy for company growth; number of common stock outstanding*price close/total assets) has a negative and significant relationship with the

dependent variable *DV_Intl_Regional* (-0.011, p-value = 0.095). As mentioned earlier, H_4 states that there is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework for clients who have a rapid growth rate versus those who do not. The above negative relationship suggests that H_4 is not supported and that the assurance provider client companies who have a rapid growth rate may choose regional frameworks. As explained earlier, if a client firm has a rapid growth rate, it may want to expand overseas by focusing on one or more specific countries. In such a case, regional assurance frameworks proposed by the target countries' audit or assurance body may prove more suitable for its goals.

Coming to country level variables, Table 23 reveals that the variables *DisclosureIndex* (0.472, p-value = 0.006), and, *MarketCap* (0.013, p-value = 0.017) are both positively and significantly associated with the dependent variable *DV_Intl_Regional*, and, hence, provides support for H_5 (H_5 states that The likelihood of an assurance providers' selection of an international framework is expected to be significantly greater for client firms who are located in countries having a high disclosure environment) and part of H_6 (H_6 states that the likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for client firms that are located in countries with high values of proxies for national economic development (MarketCap)).

The positive and significant relationship between *DisclosureIndex* and *DV_Intl_Regional* suggests that as the extent of disclosure increases, international frameworks are more likely to be selected. The positive and significant relationship between *MarketCap* and *DV_Intl_Regional* suggests that as the national economic development, viewed in terms of *MarketCap*, increases, international frameworks are more likely to be selected. As suggested earlier, due to the move

towards standardization, assurance providers in countries having a high DisclosureIndex and MarketCap may select international frameworks because they view these as a move towards standardization and hence, providing a basis for comparison.

However, the variable GDP (GDP per capita) is not significant (0.000, p-value = 0.283) (H_6 states that assurance provider's selection of an international framework is expected to be significantly greater for client firms that are located in countries with high values of proxies for national economic development (GDP), and hence does not provide any support for H_6. This suggests that GDP is not significantly statistically related to the choice between international and regional assurance frameworks. This may be because the decision to use either framework is made by the assurance provider, without any significant regard to the GDP per capita. The assurance provider may choose an assurance framework depending upon it's strategic goals, which may include a move towards standardization or doing business in a particular country.

The variable *CO2Emissions* is negatively and significantly associated with the dependent variable *DV_Intl_Regional* (-0.326, p-value = 0.007). As mentioned earlier, H_7 states that the likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for client firms located in environments associated with high values of carbon dioxide emissions (metric tons per capita)). Hence, H_7 is not supported and this suggests that if the carbon dioxide emissions decrease, regional assurance frameworks are more likely to be selected. Research suggests that as income levels rise in a country, pollution levels fall and tend toward "pre-industrial levels in wealthy societies" (Dasgupta, Laplante, Wang and Wheeler 2002). Due to the country-of-origin effect, companies and assurance providers located in higher income countries may view an assurance framework issued by an audit/assurance standard setter or regulator that is associated with the same country as providing higher quality of assurance.

Also, the administration in higher income countries may encourage the use of regional frameworks.

The variable *Total_Assets* had been included in the model as a proxy for client size. However, its inclusion caused all standard errors to be not robust, and, was hence removed from the reported model.

CHAPTER 19: PROBABILITY OF SELECTING AN INTERNATIONAL ASSURANCE FRAMEWORK

In this section I present graphs to examine the relationship between a few variables and the probability of selecting international assurance frameworks. As mentioned earlier, my research question is: What are the factors influencing the choice of assurance frameworks, when the choice is between international frameworks and local/regional frameworks? Examining these relationships (1. the probability of selecting international assurance frameworks versus stock market development, viewed in terms of MarketCap, at various levels of disclosure index, 2. the probability of selecting international assurance frameworks versus disclosure index at various levels of carbon dioxide emissions, and, 3. the probability of selecting international assurance frameworks versus number of country listings of a client company at various levels of MarketCap) allows an immediate and practical perspective of how certain variables influence the likelihood of selecting international frameworks. For example, if it is known that a company is operating in a country that has a high MarketCap and disclosure index, then one can immediately see that there is a greater probability of an assurance provider selecting an international framework for assurance. Such a view may help the international audit/assurance standard setting bodies, such as the IAASB, in working with regional standard setting bodies such as NIVRA to develop frameworks that are more comparable. It may also help investors in making decisions about investing in companies whose assurance reports can be compared with others.

Figure 5: Market Capitalization versus Probability of Selecting International Assurance Frameworks at Various Levels of Disclosure Index

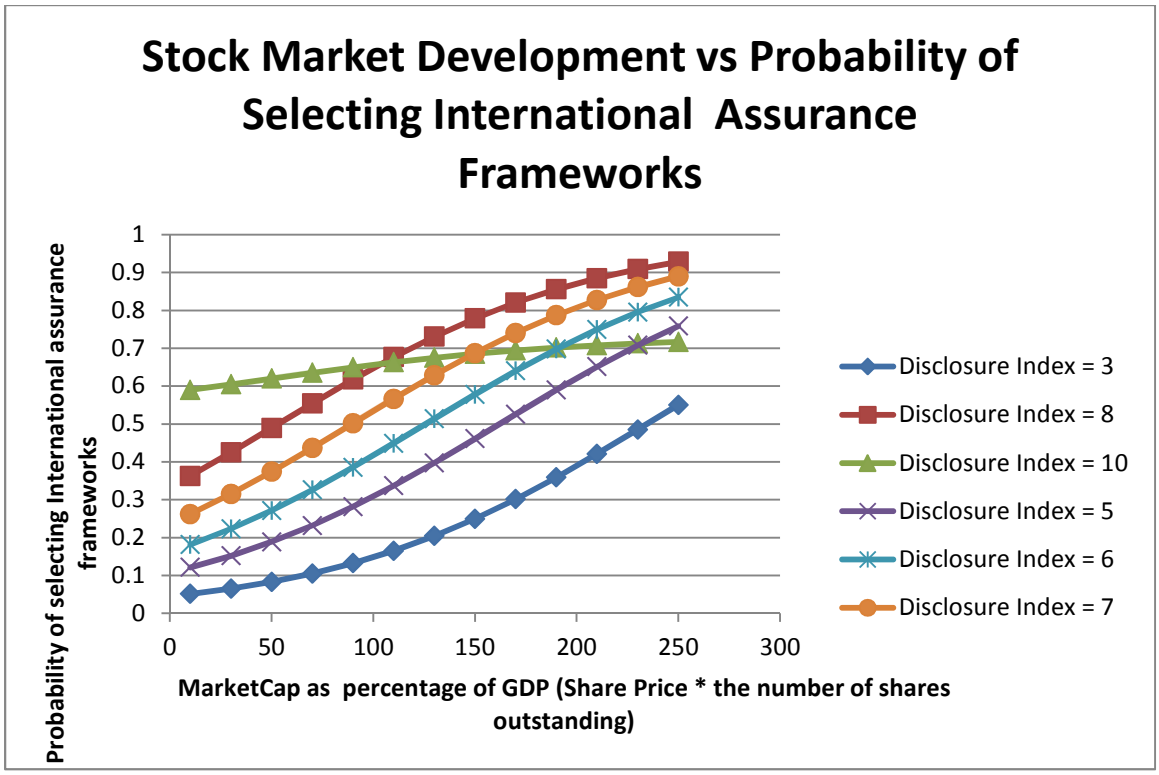


Figure 5 shows the relationship of the extent of stock market development with the probability of selecting international assurance frameworks at various levels of Disclosure Index. Stock Market Development is measured by market capitalization (MarketCap) of listed companies as a percentage of GDP. Disclosure Index is a proxy for the disclosure ambiance in a particular country, with higher values indicating more disclosure. This figure reveals that the probability of selecting international assurance frameworks is low if the extent of development of stock markets is low and the disclosure index is low. However, if the extent of development of stock markets is low but the disclosure index increases, then the probability of selecting international assurance frameworks increases. At higher levels of stock market development, the probability of selecting international assurance frameworks is higher, and, it increases as the

disclosure index increases. Figure 1 also shows that the curves related to Disclosure Index = 5, 6, 7 & 8 intersect with the curve related to Disclosure Index = 10. This intersection may indicate the fact that at medium and higher levels of disclosure index and MarketCap, the probability of selecting international assurance frameworks may not differ by much. However, at the highest level of disclosure index (Disclosure Index = 10), the extent of development of stock market may not play much of a role in the probability of selecting international assurance frameworks. But, for other medium and high levels of disclosure index, MarketCap may play a more important role in the probability of selecting international assurance frameworks.

Figure 6: Disclosure Index versus Probability of Selecting International Assurance Frameworks at Various Levels of Carbon Dioxide Emissions

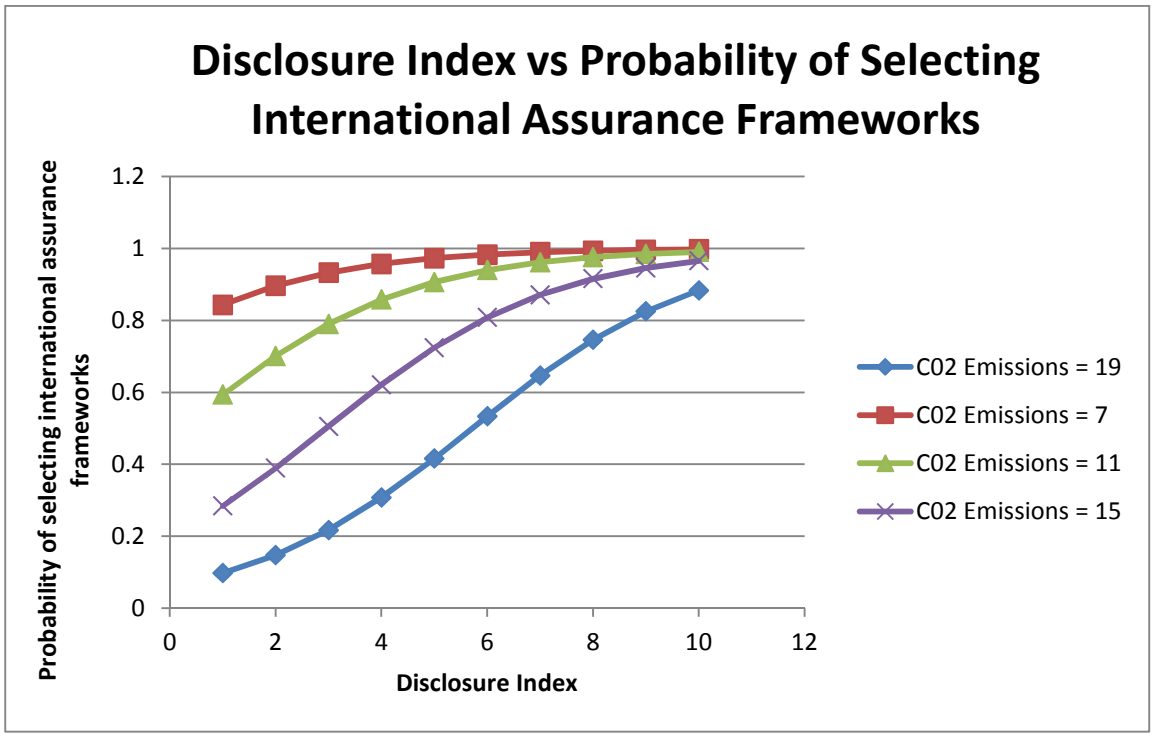


Figure 6 shows the relationship between disclosure index versus the probability of selecting international assurance frameworks at various levels of carbon dioxide emissions. As mentioned before, Disclosure Index is a proxy for the disclosure ambiance in a particular country, with higher values indicating more disclosure. Carbon dioxide emissions are measured in metric tons per capita for every country in the sample. This figure shows that for low levels of disclosure and high levels of carbon dioxide emissions, the probability of selecting international assurance frameworks is low. However, for low levels of disclosure and low levels of carbon dioxide emissions, the probability of selecting international assurance frameworks is much higher. Figure 6 also indicates that at high levels of disclosure, carbon dioxide emission levels may not play much of role in the selection of international assurance frameworks. In addition,

Figure 6 suggests that the probability of selecting international assurance frameworks increases with increasing levels of disclosure.

Figure 7: Number of Country Listings versus Probability of Selecting International Assurance Frameworks at Various Levels of Market capitalization

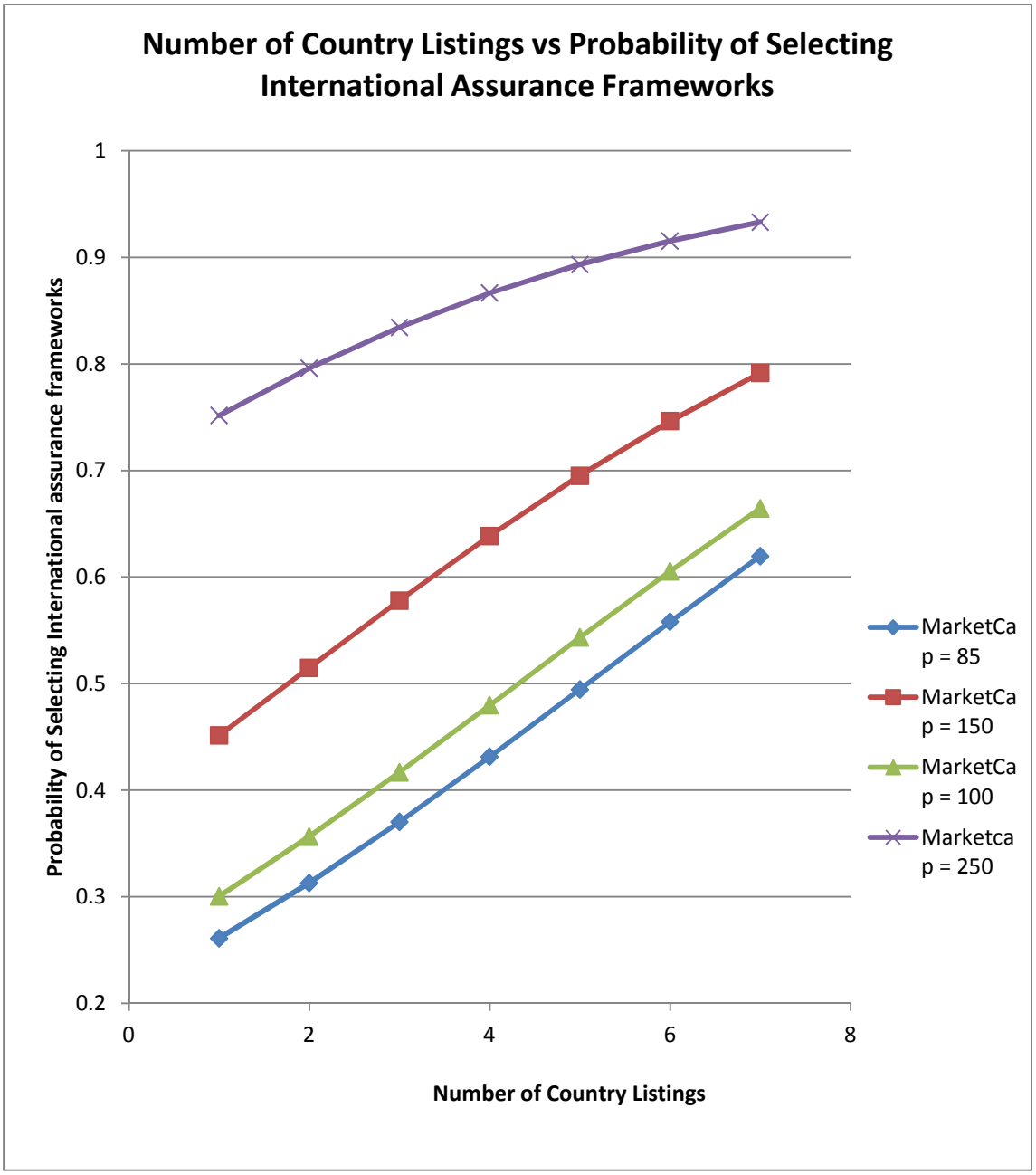


Figure 7 shows the number of country listings of a company versus the probability of selecting international assurance frameworks at various levels of market capitalization of various countries. The probability of selecting international assurance frameworks is low if the number of country listings is low and the extent of stock market development is low. However, if the number of country listings is low, but the extent of development of stock markets is high, then the probability of selecting international assurance frameworks is higher. The different curves with similar slopes in Figure 7 indicate that the probability of selecting international assurance frameworks increases with the number of country listings. They also seem to suggest that if the number of country listings of a company increases along with the extent of development of stock markets, then the probability of selecting international assurance frameworks increases substantially.

CHAPTER 20: SUMMARY, LIMITATIONS AND CONCLUSION

This study examines factors influencing the selection of assurance frameworks in the area of sustainability reporting. Assurance frameworks related to sustainability reporting may be thought of as a counterpart of auditing standards in the area of financial reporting. The fact that assurance frameworks provide guidelines to assurance providers to enable them to form an opinion about a client company's sustainability report makes assurance frameworks a critical aspect of assurance on sustainability reporting. Assurance on sustainability reports has now become important and the KPMG 2011 report (p. 28) suggests that companies without an external assurance program not only run the risk of restatements in the future, but may also send the message that CR information is not held in as high regard as financial information.

Assurance frameworks can be classified into two categories: international frameworks (ISAE 3000 issued by the IAASB and AA1000AS issued by AccountAbility), and, regional frameworks (issued by the respective countries' audit and assurance bodies; for example NIVRA 3410 N issued by the Dutch audit and assurance body NIVRA). Using data from 32 industries and 27 countries, I examine audit firm specific factors, client firm specific factors and country level factors that could influence the selection of assurance frameworks.

I present descriptive statistics in terms of country distribution of sample companies, list of all the frameworks used classified by country, type of assurance framework, countries covered, non audit assurance provider names and number of sustainability reports assured by them, and countries covered by the audit firms and non audit firms as a group. Table 14 shows that the highest numbers of assurance reports are from UK (12 assurance reports, 16.9%), US (9 assurance reports, 12.68%) and Japan (6 assurance reports, 8.45%). Since the sample of companies used in this study is all traded in the US, the above figures may indicate that

companies that operate internationally may be obtaining assurance on sustainability reports. These figures may also indicate that companies from developed markets may be obtaining assurance on their sustainability reports. Table 15 shows the assurance frameworks used in different countries. Of these the country with the most variety is the US (6 assurance frameworks). In the second place are UK, The Netherlands and Korea (3 assurance frameworks each). Since this is a largely unregulated field, and, there is no governing body that recommends the use of one or more assurance frameworks, assurance providers are free to choose any of the available frameworks. Therefore, in the case of the US, UK, the Netherlands and Korea, it seems likely that as the number of companies in these countries seeking assurance on their sustainability reports increases, the frameworks used may also increase. It may also indicate that assurance providers in developed countries may be testing various assurance frameworks to see which is suitable.

Tables 16, 17, 18, and 19 respectively provide details related to the audit firms: Ernst & Young, PricewaterhouseCoopers, KPMG and Deloitte. In the sample used in this study, the audit firms are all Big4 firms. It is seen the audit firms use international frameworks as well as regional frameworks. Table 20 provides details of the non audit assurance providers. These assurance providers can be classified as specialist assurance providers/technical experts (O'Dwyer 2011). Majority of these non audit assurance providers (16 out of 27 reports, 59.25%) use AA1000AS frameworks given by AccountAbility, a non-profit organization based in the UK. This could indicate that the non-audit assurance providers prefer to use an assurance framework from a standard setting body that is not involved with traditional audit or assurance. This, in turn suggests that the non audit assurance providers might prefer the AA1000AS framework so as to move away from ethical consideration that apply to audit and assurance firms.

The research question in this study is: What are the factors influencing the choice of assurance frameworks, when the choice is between international frameworks and local/regional frameworks? The hypotheses are as follows:

H_1: There is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework, given that the assurance provider is an audit firm or a specialist assurance provider/technical expert.

H_2: The likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for clients who have foreign operations.

H_3: There is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework for clients who have stock exchange listings in multiple countries.

H_4: There is expected to be no significant difference in the likelihood of an assurance provider's selection of an international versus a local framework for clients who have a rapid growth rate versus those who do not.

H_5: The likelihood of an assurance providers' selection of an international framework is expected to be significantly greater for client firms who are located in countries having a high disclosure environment.

H_6: The likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for client firms that are located in countries with relatively high values of proxies for national economic development (GDP and MarketCap).

H_7: The likelihood of an assurance provider's selection of an international framework is expected to be significantly greater for client firms located in countries associated with high values of carbon dioxide emissions (metric tons per capita).

Multi-levels logistic regressions are performed to examine the factors influencing the assurance provider's choice of either an international and regional assurance framework. H_1 is supported. This suggests that the variable *Assurance provider type* is not statistically significantly related to the selection between international and regional assurance frameworks. This may be because assurance providers may view the use of either framework as being advantageous to them, since both kinds of assurance frameworks enhance credibility and provide a basis for their actions, especially in event of litigation. H_2 is not supported, since the variable *Foreign_Operations* has a significant and negative relationship with *DV_Intl_Regional*. This negative relationship suggests that for client companies who have foreign operations, assurance providers are more likely to select regional frameworks. This may be due to the country of origin effect. Client firms that have foreign operations may have operations that are partitioned by country, and, assurance provider offices are mostly staffed with people from that country. H_3 is supported. This suggests that the variable *No_of_country_listings* is not statistically significantly related to the choice between international and regional assurance frameworks. This may be because, as mentioned earlier in the discussion related to the variable *Assurance provider type*, assurance providers of client firms who have stock exchange listings in multiple countries may view the use of either kind of assurance framework as being advantageous to them, since both kinds of assurance frameworks enhance credibility. H_4 is not supported since *Market_to_book* has a negative and significant relationship with the dependent variable *DV_Intl_Regional*. This may be because a company having a rapid growth rate may want to expand overseas by focusing

on one or more specific countries. In such a case, regional assurance frameworks proposed by the target countries' audit or assurance body may prove more suitable for its goals. H_5 is supported, since there is a positive and significant relationship between *DisclosureIndex* and *DV_Intl_Regional*. Part of H_6 is supported, since there is positive and significant relationship between *MarketCap* and *DV_Intl_Regional*. Due to the move towards standardization, assurance providers in countries having a high DisclosureIndex and MarketCap may select international frameworks because they view these as a move towards standardization and hence, providing a basis for comparison. However, part of H6 is also not supported, since the variable GDP is not significant. This suggests that GDP is not significantly statistically related to the choice between international and regional assurance frameworks. This may be because the decision to use either framework is made by the assurance provider, without any significant regard to the GDP per capita. The assurance provider may choose an assurance framework depending upon it's strategic goals, which may include a move towards standardization or doing business in a particular country. H7 is not supported since the variable *CO2Emissions* is negatively and significantly associated with the dependent variable *DV_Intl_Regional*. This suggests that if the carbon dioxide emissions decrease, regional assurance frameworks are more likely to be selected. Research suggests that as income levels rise in a country, pollution levels fall and tend toward "pre-industrial levels in wealthy societies" (Dasgupta, Laplante, Wang and Wheeler 2002). Due to the country-of-origin effect, companies and assurance providers located in higher income countries may view an assurance framework issued by an audit/assurance standard setter or regulator that is associated with the same country as providing higher quality of assurance. Also, the administration in higher income countries may encourage the use of regional frameworks.

This study contributes by investigating the factors that could influence the selection of assurance frameworks in the area of sustainability reporting, where the choice is between international assurance frameworks and regional assurance frameworks. Since assurance frameworks provide guidelines to assurance providers to perform various tasks such as engagement acceptance, using the work of an expert, and, obtaining evidence among other things, assurance frameworks form a crucial aspect of providing credibility to sustainability reports. Examining the selection of assurance frameworks could provide an indication of the trend in the usage of assurance frameworks. For example, if it is known that assurance providers may select international frameworks in certain parts of the world, it may indicate a trend towards standardization and comparability of assurance reports related to sustainability reporting. This could serve a backdrop for academics to examine whether the procedures used for assurance are same or different when international frameworks are used and when regional frameworks are used. Such a fact could also provide audit or assurance bodies in different countries to develop assurance frameworks so that the assurance reports that use a regional assurance framework are comparable with assurance reports that use international assurance frameworks.

This study augments prior research by using a sample of 71 companies from 27 countries, all of which are traded in the US. The results of this study suggest that country level factors (level of disclosure, market capitalization, and level of carbon dioxide emissions) and client company characteristics (whether the client company has foreign operations and the client company's level of growth opportunities) may have significant impact on the choice of assurance frameworks, which may, in turn, indicate assurance provider preferences. Use of international frameworks (ISAE3000 and AA1000AS) may indicate a trend towards standardization of assurance frameworks and ease of comparison. On the other hand, use of local assurance

frameworks may indicate a possible country-of-origin effect. Factors that influence the selection of assurance frameworks and the type of assurance framework selected are important because it offers insights into trends and opportunities that shape the growing assurance market in the sustainability area. This could aid companies, assurance providers, standard setting bodies and investors respond to a changing environment in a meaningful way. For example, if it found that the auditing firms do not prefer one kind of framework over the other, it may affect the client companies' choice of an assurance provider. It is possible that the client company may choose a non-audit firm in order to save costs and have the added benefit of seeking advice on management of sustainability issues.

Further, I examine relationships between variables versus the probability of selecting international assurance frameworks. Examining such relationships contributes to this study by offering an immediate and practical view about the assurance provider's selection of assurance frameworks in various parts of the world. For example, if it is known that the assurance provider is operating in a country with a high disclosure index and a high market capitalization, then one can immediately see that there is a greater probability of the assurance provider selecting an international framework for assurance. Such a view may help the international audit/assurance standard setting bodies, such as the IAASB, in working with regional standard setting bodies such as NIVRA to develop frameworks that are more comparable. It may also help investors in making decisions about investing in companies whose assurance reports can be compared with others.

Figure 5 suggests that in countries with higher levels of stock market development, viewed in terms of market capitalization and with high levels of disclosure, there is a greater likelihood of international framework being selected. Figure 6 suggests that the probability of

selecting international assurance frameworks increases with increasing levels of disclosure. It also indicates that at high levels of disclosure, carbon dioxide emission levels may not play much of role in the selection of international assurance frameworks. Figure 7 suggests that if the number of country listings of a company increases along with the extent of development of stock markets, then the probability of selecting international assurance frameworks increases substantially.

11.1 Limitations and Future Research

The results of this study are based on a sample of international companies that are traded in the US, which is not conducive for the generalization of results to a larger sample of international companies or to companies trading outside the US. In addition, the model explained variance, model significance and goodness of fit of the multi-level regression model are not known. Moreover, in this sample, all the audit firms that have provided assurance on sustainability reports are all Big4 firms. Therefore, caution has to be exercised in generalization of results to audit firms other than the Big4. In addition, this study follows the KPMG 2008 report definition of formal assurance, and therefore, excludes those assurance reports that are a commentary by a group of individuals. These impose a further limitation in the generalization of results.

Future research should include a larger sample of international clients and use methods of model estimation that provides model explained variance, model significance and goodness of fit. Future research can also explore other audit firm level variables. For example, a future study should explore the differences in the selection of assurance frameworks between Big 4 audit firms, mid-tier audit firms and non-audit firms. Future research should also explore the

differences in assurance when international assurance frameworks are used alone and when they are used together or when international frameworks are used together with regional guidelines.

Stebbins (2001), in his book titled *Exploratory Research in the Social Sciences* states that "sometimes, exploration in different areas is needed because the world has changed and the old formulas no longer fit sufficiently." He also adds that "to understand well any phenomenon, it is necessary to start looking at it in broad non-specialized terms. In other words, first observe the woods, and then study its individual trees. (p. viii)" This study is intended to explore the broad subject of assured sustainability reporting, which is increasing in importance in academics (Kolk and Perego 2010, Simnett, Vanstraelen and Chua 2009) and in the capital markets (KPMG 2011, p. 28). The focus on factors influencing the choice of assurance frameworks offers a glimpse into an aspect of assurance that provides a core schema for assurance providers to form an opinion and provide conclusions. Examining the choice of assurance frameworks offers us clues about the issues that are considered relevant by assurance providers. For example, in this exploratory study there is evidence that the assurance provider is more likely to use an international framework when it has operations in a country that encourages disclosure. This study also suggests that the assurance provider is less likely to use an international framework when a client has foreign operations. Further, the assurance provider's choice choice is not significantly affected by the GDP per capita of a particular country.

However, as with most exploratory research, this study may not have considered all the factors that go into the selection of assurance frameworks. For example, past and current litigation, especially in the environmental or social arena, may cause the assurance provider to prefer a certain kind of assurance framework over others. Also, administrations and powerful organizations like stock exchanges and federal agencies may steer companies may steer

companies towards a certain assurance framework. Future research should consider these elements in the examination of the assurance provider's choice of assurance frameworks.

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