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Disclosure Measurement in the Empirical Accounting Literature:
A Review Article

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Disclosure measurement in the empirical accounting literature - a review article

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Abstract

This is the first study to provide an extensive and critical review of different techniques used in the empirical accounting literature to measure disclosure. The purpose is to help future researchers to identify exemplars and to select suitable techniques or to develop their own techniques. It also provides in depth discussion of current measurement issues related to disclosure and identifies gaps in the current literature which future research may aim to cover.

Key words: disclosure measurement; voluntary disclosure; mandatory disclosure; financial reporting; validity; reliability.

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1. Introduction

The literature on accounting disclosure is enormous and investigates a wide range of issues: such as corporate disclosure practice looking at either obligatory or voluntary items or both; determinants of voluntary disclosure or determinants of compliance with regulation; the economic consequences of disclosure; financial analysts' use of information etc. While many disclosure studies investigate corporate disclosure for private sector companies others look at the public sector and not-for-profit organisations. In all these studies, accounting disclosure plays a key role and must be measured in some way. But disclosure is a theoretical concept that is difficult to measure directly[1]. The literature on disclosure, offers a variety of potential proxies that purport to measure disclosure.

A number of prior studies have reviewed the literature focusing on individual measures of disclosure such as the disclosure index and content analysis techniques (e.g., Marston and Shrives, 1991; 1996; Jones and Shoemaker, 1994). Others have tried to investigate all available measures of disclosure (e.g., Healy and Palepu, 2001; Beattie, McInnes and Fearnley, 2004). Marston and Shrives (1991) focused on the measurement of disclosure via the disclosure index only. Their 1996 paper updates the 1991 paper by considering a larger number of disclosure index studies. It also considers in more detail the theories behind the models used in the investigated studies to explain disclosure. The current study updates their work on the disclosure index and attempts to provide a comprehensive resume of commonly used measures of disclosure. In addition, this paper discusses measurement issues related to disclosure and different techniques that can be employed to assess the quality of inferences obtained from different measures of disclosure.

Jones and Shoemaker (1994) reviewed 68 empirical studies that used content analysis technique to investigate accounting, finance and taxation narratives. Content analysis of text can be employed using two complementary approaches with different objectives: thematic and syntactic[2]. The review identified 36 thematic studies and 32 syntactic studies. It shows that the thematic studies addressed five issues: managements' attitudes, correlations between narrative disclosures and financial reporting, prediction of key variables in tax court cases, the impact of comment letters in response to FASB exposure drafts, and the assessment of compliance with prescribed standards. Readability studies provide evidence that accounting narratives are difficult or very difficult to read. However, in-depth future research is needed to update these results because fast and continuous development in content analysis software and changes in the financial reporting environment have taken place since 1994. The current review investigates the literature from another point of view, focusing on whether the content analysis technique employed in a particular study is manual or automated or both; in addition, it discusses other available techniques to measure disclosure.

Another related review study is Healy and Palepu (2001) who discussed three proxies for voluntary disclosure used in prior studies: management forecasts, the Association for Investment Management and Research scores, and self-constructed measures (disclosure indices). However, they limit their classification to voluntary disclosure only. This classification omits other potential measures of disclosure provided in prior studies such as the existence of American Depository Receipts and disclosure frequency studies. The current review tries to explore measures of disclosure regardless types of information disclosure.

Beattie et al. (2004) classified proxies for disclosure quality provided in prior studies into subjective analysts' ratings and semi-objective approaches. The semi-objective approaches include: disclosure index studies, which are characterised in their study as a partial type of content analysis, and textual analysis. Textual analyses include thematic; meaning-oriented content analysis (where the whole text is analysed), readability studies and linguistic analysis[3]. However, this approach omits a number of other proxies of disclosure employed in prior studies that cannot be classified as either subjective analysts' ratings or semi-objective approaches such as the existence of American Depositary Receipts (ADR), disclosure frequency, management forecasts, attributes of analysts' forecasts and many others.

Current gaps in the literature provide a number of motivations for the current study. Firstly, to date there is no comprehensive study on disclosure measurement to date that can guide future researchers when they develop their own measures of disclosure or when they adopt available ones. Secondly, prior listings and classifications of different disclosure measurement proxies might not assist in the understanding or evaluation of past measures of disclosure and are not particularly helpful to those wishing to develop new measures of disclosure in the future since there is no measurement framework that can guide the analysis. Thirdly, the issues surrounding the problem of measurement in the social sciences and assessment of measures of disclosure are rarely discussed in the accounting literature. The current study tries to fill these gaps in the literature. It is the first to provide an extensive review of measures of disclosure available in the accounting literature. It discusses disclosure measurements that are commonly used in the empirical accounting literature without restricting our analysis to a particular area of research or time. It also discusses how to assess the success of a measurement through reliability and

validity tests. Furthermore, this review discusses measurement issues inherent in the concept of disclosure and provides recommendations for future research to address current issues.

The importance of this review is derived from the importance of studying accounting disclosure to researchers, professionals, market participants, companies, standard setters and regulatory bodies in general. By presenting a comprehensive listing and critical analysis of different disclosure measures we provide new insights to enable future research improvements.

The rest of this paper is organized as follows: Section (2) discusses the nature of disclosure. Section (3) presents different proxies of disclosure employed in previous studies. These measures are generally classified into two main groups: proxies for disclosure that are not based on the researcher examining the original disclosure vehicle(s), and proxies for disclosure that depend on examining the original disclosure vehicle. Section (4) discusses how to assess the success of a measure of disclosure through the reliability and validity tests. Section (5) provides a discussion of measurement issues inherent in disclosure and recommendations for future research. It develops a measurement framework of disclosure by either reducing the concept of disclosure to its components: disclosure quality and disclosure quantity or treating disclosure as a latent variable and finding out causal and indicator measures of disclosure. It also suggests how issues covered in other disciplines such as marketing and psychology could be taken into consideration in the accounting disclosure literature. Section (6) provides concluding remarks.

2. The nature of disclosure

Gibbins, Richardson and Waterhouse (1990, 122) defined financial disclosure as any deliberate release of financial (and non-financial) information, whether numerical or qualitative, required or voluntary, or via formal or informal channels. There are different means for companies to disclose information[4] such as annual reports, conference calls, analyst presentations, investor relations, interim reports, prospectuses, press releases, websites, etc. The corporate annual report is considered a very important official disclosure vehicle[5], although on its own is not sufficient in the capital market context (Marston and Shrives, 1991; Epstein and Palepu, 1999; Hope, 2003a), since other disclosure vehicles such as conference calls and interim reports can provide more timely disclosure. In addition, there are other sources of disclosure about companies' performance including, for example, financial analysts' reports and the press.

Corporate disclosure can be divided into two broad categories, mandatory disclosure and voluntary disclosure. Mandatory disclosure is information revealed in the fulfillment of disclosure requirements of statute in the form of laws, professional regulations in the form of standards and the listing rules of stock exchanges. Voluntary disclosure is any information revealed in excess of mandatory disclosure. Also, voluntary disclosure can include disclosure recommended by an authoritative code or body such as the operating and financial review in the UK. In addition, disclosure can vary between firms with respect to timing (for example, annual reports vs. quarterly reports); items disclosed (for example, quantitative vs. qualitative information); and types of news (for example, good vs. bad news disclosures).

The importance of corporate disclosure arises from being a means of communication between management and outside investors and market participants in general. Demand for corporate disclosure arises from the information asymmetry problem and agency conflicts between management and outside investors (Healy and Palepu, 2001). Enhanced corporate disclosure[6] is believed to mitigate these problems (e.g., Healy and Palepu, 2001; Graham, Harvey and Rajgopal, 2005; Lambert, Leuz and Verrecchia, 2007).

The supply of corporate disclosure or the way in which information disclosure is managed is referred to as disclosure position by Gibbins et al. (1990). They identify two dimensions to disclosure position: Ritualism and opportunism. The difference between these two dimensions is whether management plays an active or passive role in managing disclosure. Ritualism refers to uncritical adherence to predefined disclosure norms. It arises from internal behavioral patterns, motivated perhaps by an effective system of corporate governance, and not from external disclosure regulations. Also, signaling theory might explain this pattern of behavior. Opportunism is the propensity to seek firm specific advantages in the disclosure of financial information (Graham et al., 2005).

Companies may benefit from providing more information to the public through a reduction in their cost of capital and/or an increase in the pure cash flows accruing to their shareholders, consequently increasing their values. However, providing information to the public is not a costless task. Among the costs of disclosure are the costs of information production and dissemination; for example the costs of adopting an information system to collect, process data and report information about the company and the costs of hiring accountants and audits, etc.

Moreover, competitors may make use of available information about a company to their own advantages; for example information about product development disclosed by one company may be used for the benefit of a competitor (Verrecchia, 1983; Dye, 1986; Darrough and Stoughton, 1990; Wagenhofer, 1990). Furthermore, lawsuit costs may be incurred when a company is sued regarding its disclosure if the information subsequently turns out to be erroneous (Skinner, 1994). Thus, a decision to provide more information to the public should, in theory, be based on a cost-benefit analysis although detailed estimation of all costs and benefits is difficult (Healy and Palepu, 1993; Botosan, 2000).

3. Proxies for disclosure

In this section, we present measures of disclosure provided in prior studies classified into two approaches. The first approach includes proxies for disclosure, which are not directly based on examining the original disclosure vehicle(s). The second approach provides measures of disclosure obtained by inspecting the original disclosure vehicle(s). Table (1) provides a summary for commonly used disclosure proxies in the accounting literature. The purpose of this preliminary classification of measures of disclosure is to discuss as many measures of disclosure as possible. Then in Section (5) we will reclassify these measures of disclosure according to our suggested measurement framework.

<<Table 1 about here>>

3.1 First approach: proxies for disclosure without recourse to the original disclosure vehicle

This approach includes proxies for disclosure that have been developed without recourse to the original disclosure vehicle(s). These proxies give some inferences about corporate disclosure or the information environment[7] in general and include disclosure surveys, the existence of American Depositary Receipts (ADR), attributes of analysts' forecasts and the number of analysts following the company among others.

3.1.1 Disclosure survey (questionnaires and interviews)

This approach examines disclosure by investigating perceptions of financial analysts, investors or other user groups about firms' disclosure practices through questionnaires or interviews.

Perhaps the most common example of using disclosure survey is the results of two surveys conducted by the Financial Analysts Federation (FAF) / the Association for Investment Management and Research[8] (AIMR) which have been used as proxies for disclosure quantity and quality in a number of prior studies (see, for example, Lang and Lundholm, 1996; Sengupta, 1998; Healy, Hutton and Palepu, 1999; Botosan and Plumlee, 2002). The FAF/AIMR reports provide a comprehensive measure of corporate disclosure practices of a number of large publicly traded companies relative to their industry peers. This measure of disclosure reflects the evaluations (ratings) of a number of leading specialist financial analysts for companies' aggregate disclosure (mandatory and voluntary disclosures) within three categories: annual published and other required information, quarterly and other published but not required information and other aspects of disclosure such as investor and analyst relations. The final disclosure score of a particular company is calculated as a weighted average of the

three categories' ratings. However, these scores are now out of date, given that they were discontinued in 1997 after ranking fiscal year 1995 (Core, 2001). Since then a number of regulatory changes have taken place in the US, which might have an impact on firms' disclosure practices (Ertimur, 2007).

Another example of a disclosure survey study is conducted by Coleman and Eccles (1997) who use interviews to examine disclosure. They survey the views of 209 financial analysts and investors regarding the value of 21 different financial and non-financial performance measures and their perceptions about whether British companies in general are adequate or deficient in providing these data. They conduct face-to-face interviews with 102 investors and telephone interviews with 107 financial analysts. However, this study relies on users' perceptions about the adequacy of disclosure of a number of items of information published by British companies rather than investigating the disclosure vehicles themselves. Results of relevance to the current review indicate that financial analysts have greater need of information than their investor counterparts. In addition the results also show some similarities between financial analysts and investors in the perceived importance of some financial measures (e.g. earnings and cash flow are found to be especially valuable when arriving at decisions). However, the results also highlight some differences between financial analysts and investors in the perceived importance of various measures of corporate performance especially non-financial measures.

The 2003 World Federation of Exchanges Disclosure Survey, conducted by Carol Ann Frost provides another example. The survey examines systems[9] for disclosure of information about listed companies at 52 members of the World Federation of Exchanges. The purposes of the questionnaire are: to describe noteworthy features of

the disclosure systems; to identify recent changes in these disclosure systems; and to identify and interpret recent trends and emerging issues relevant to the regulated financial exchanges industry. The questionnaire consists of four parts. Part one takes the form of a disclosure "checklist" and focuses on disclosure requirements in offering/listing documents and annual reports. This part covers ten categories of information[10]. Each category contains between 4 and 39 items. For each item and type of document (offering/listing, annual report), the responding exchange is required to mark whether the item is required to be disclosed by the exchange or government regulator. Using a binary score system, mean scores are then computed for each type of document for each responding exchange. Part two of the survey consists of 12 questions covering the timely, ongoing disclosure of material developments. Part three contains 13 questions addressing aspects of monitoring and enforcement of disclosure rules, and the role of exchanges in regulating disclosure. Finally, Part four of the survey contains five open-ended questions concerning disclosure enforcement, and disclosure system and regulatory changes.

The Credit Lyonnais Securities Asia (CLSA) report provides another example of using a disclosure survey to investigate financial analysts' perceptions about corporate governance at both company and country levels for hundreds of companies from emerging markets. The ranking covers both total and individual aspects of corporate governance including disclosure. The scoring of the companies is based on a questionnaire filled out by the CLSA analysts in each country for the companies they cover. Answers to the questionnaire are binary (yes/no) to reduce analyst's subjectivity. Disclosure scores provided by the CLSA have been used in prior studies such as Krishnamurti, Šević and Šević (2005).

In sum, this approach uses interviews or questionnaires to reflect analysts' (or other user group) perceptions about firms' disclosure practice rather than the disclosure policies. It has the advantages that disclosure scores constructed are not labour intensive and can be obtained for a sizable sample of firms compared to other types of disclosure proxies such as the self-constructed disclosure index. However, advantages and disadvantages of using questionnaires and interviews as research instruments apply here (e.g., Fink, 1995; Gillham, 2000; Frazer and Lawley, 2000). Furthermore, the quality of design of the research instrument will affect the quality of the results obtained. For example poorly designed questionnaire could result in misleading inferences about disclosure. Furthermore, the objectivity of the views of the investigated user group could be questioned, given that no one can know their incentives to report their ratings and kind of biases that might be included (Lang, 1999).

3.1.2 The existence of ADR

The ADR is used as a proxy for disclosure quality/quantity in prior studies (e.g., Lang et al., 2003; Doidge, Karolyi and Stulz, 2004) because non-US firms listed on the US market are thought to be committed to an increased level of disclosure (Baek, Kang and Park, 2004). A researcher typically uses a dummy variable that takes the value of one if the firm has an ADR and zero otherwise to proxy for disclosure quality. Lang et al., (2003, 318) provide a number of explanations for why cross listing on the US market improves the firm's information environment: "Cross-listing firms (in a US stock exchange) subject themselves to (1) increased enforcement by the Securities and Exchange Commission (SEC), (2) a more demanding litigation environment, and (3) enhanced disclosure and reconciliation to US generally accepted accounting principles (GAAP). In addition, cross-listing firms may face more scrutiny

from investors, more pressure to provide guidance than they did in their home markets, and increased scrutiny from their auditors. However as convergence movements to International Financial Reporting Standards increase, the ADR might eventually lose its usefulness as a proxy of increased disclosure.

3.1.3 Attributes of analysts' forecasts (AAF), and the number of analysts following the company

AAF and the number of analysts following the company are also used as proxies for information environment (Lang et al., 2003; Irani and Karamanou, 2003). Prior studies suggest that having greater analyst following with more accurate forecasts indicates a firm with a better information environment. For example, Lang and Lundholm (1993) find that firms with more informative disclosures have larger analyst following, less dispersion in analysts' forecasts, and less volatility in forecast revisions. In addition, Lang and Lundholm (1996) find that analysts' forecasts are more accurate for firms that disclose more. This is because expanded disclosure enables financial analysts to create valuable new information, such as superior forecasts and buy/sell recommendations, thereby increasing demand on their services (Healy and Palepu, 2001). However, the SEC disclosures of firms employing abusive earnings management procedures show evidence that managers can manipulate earnings toward financial analysts' forecasts (Mulford and Comiskey, 2002). In this case, attributes of analysts' forecasts might not be a good reflective measure of firms' disclosure.

3.1.4 Other proxies

Other studies used a number of different proxies for disclosure that do not depend on examining the disclosure vehicle. The level of measurement varies from a discrete to a continuous variable and this affects the ability of the different proxies to

differentiate between different levels of disclosure. On the face of it, continuous measures might appear to be 'better' than dummy variables. However issues such as limitations on researcher time and problems of access to data are relevant factors in the choice of proxy. For example, Clarkson and Thompson (1990) use period of listing (continuous variable) as a proxy for firm disclosure. Other studies such as Bailey, Karolyi, and Salva (2006) proxy for disclosure using a dummy variable (discrete variable) that takes the value of one for stocks from developed countries and the value of zero for stocks from emerging countries based on assumptions about the quality of the accounting standards employed in these countries. Another example is Healy et al. (1999) who use a dummy variable that takes the value of one during a disclosure increase period (based on analysts' ratings of disclosure reported in the AIMR Reports) and zero otherwise. Other studies use an event to proxy for disclosure, for example Leuz and Verrecchia's (2000) measure of increased disclosure is based on a switch from Germany GAAP to either IAS or US GAAP. Bushee and Leuz's (2005) proxy for mandatory disclosure is the regulatory change mandating Over-The-Counter Bulletin Board firms to comply with reporting requirements under the 1934 Securities Exchange Act.

3.2 Second approach: disclosure proxies based on examining the original disclosure vehicle

This approach provides measures of disclosure by inspecting the original disclosure vehicle(s) such as annual reports, companies' web-sites etc. Inspection of disclosure vehicles can be implemented by means of content analysis and the use of a disclosure index. Alternatively, a measure of disclosure can be constructed by counting the number of disclosures made by and/or about the firm such as number of conference calls (disclosure frequency). In addition, this approach includes other measures of disclosure that are developed from a disclosure vehicle such as management forecasts,

attributes of management forecasts, voluntary disclosure of good (bad) news and firm size. Firm size[11] is also used in Clarkson and Satterly (1997) and Dargenidou, Mcleay and Raonic (2006) as a proxy for disclosure and measured by total assets in place prior to listing and market capitalisation respectively. Another approach is adopted by Bowen, Davis and Matsumoto (2002) who measure voluntary disclosure via a dummy variable equal to one if the quarter is a conference call quarter and zero otherwise.

3.2.1 Content analysis

Content analysis is a research technique for making replicable and valid inferences from data to their context (Krippendorff, 1980, 21). Using the content analysis technique, the amount of information disclosed can be measured per category or per company by counting the data items, i.e. the number of words, the number of sentences, and the number of pages (see, for example, Marston and Shrives, 1991; Hackston and Milne, 1996).

For the purpose of the current study, we observed two main types of content analysis: conceptual content analysis and relational content analysis. The conceptual content analysis is a research tool used to determine the existence or the frequency of certain key words or concepts within texts or sets of texts. In contrast, relational content analysis goes one step further by examining the relationships among concepts in a text. The former is frequently used in the disclosure literature. Content analysis can be partial or comprehensive. Partial content analysis covers part of the document or selected items of information or key words. Comprehensive content analysis, also called holistic content analysis (Beattie et al., 2004), covers the whole document.

Content analysis can be conducted either manually or automatically or using both methods. A number of prior studies employ manual content analysis (e.g.,

Hackston and Milne, 1996; Francis, Hanna and Philbrick, 1997; Beretta and Bozzolan, 2004; Linsley and Shrives, 2006). One of the major limitations of manual content analysis is that this method is a labour-intensive data collection process, which inevitably restricts the sample size employed by prior studies (Beattie and Thomson, 2007). Therefore, the use of automated content analysis emerged in 1980s and it has been developing ever since with different content analysis software (e.g., Frazier, Ingram and Tennyson, 1984; Abrahamson and Amir, 1996; Rogers and Grant, 1997; Smith and Taffler, 2000; Breton and Taffler, 2001; Kothari, Li and Short, 2009). Other studies employ both manual and automated content analysis (e.g., Hussainey, Schleicher and Walker, 2003; Clatworthy and Jones, 2003; Beattie and Thomson, 2007).

Automated content analysis, on one hand, enjoys a number of advantages: ease of use, an economic technique in terms of time, effort and money. It can be easily used to conduct a comprehensive content analysis and to cover sizable samples. On the other hand, automated content analysis is not a problem-free technique. When using the frequency of words or key words, one should include all possible synonyms and words with multiple meanings (Weber, 1990). In addition, using words or key words in isolation of the meaning of the whole sentence either electronically or manually does not provide a sound unit of analysis (Milne and Adler, 1999; Beattie and Thomson, 2007) and can yield misleading results. For example, if companies give a note that the amount of deferred tax is not practical to measure. In this case, if deferred tax is one of the key words in the automated content analysis search, it will recognize the existence of deferred tax in this statement when in fact no information is provided. The opposite could also be true as in the case of using inappropriate or insufficient key words which could lead to over or under estimation of disclosure

level. For example, Bontis (2003) search 10,000 firms for intellectual capital disclosures using 39 search terms and only find 74 disclosures. The list of terms is formulated by a panel of expert researchers. It is possible that the use of more search terms would have yielded more observed disclosures. This is consistent with Beattie and Thomson's (2007) findings about the inferiority of using automated word search to examine intellectual capital (IC) disclosure where they find that using automated search of 105 IC terms generated 264 hits compared to 906 pieces of information obtained from the manual search, and 107 of these (i.e. 40%) were found to contain no IC content. Another drawback of automated content analysis is that different qualitative software has different limitations[12]. For example, for Nudist software, documents have to be in the form of text files; hence content analysis cannot be performed for other forms of documents like image files and PDF files. Some automated content analysis software is limited to English text applications only, such as the GI software employed by Kothari et al. (2009).

3.2.2 Disclosure index

Disclosure indices are extensive lists of selected items, which may be disclosed in company report (Marston and Shrives, 1991: 195). A disclosure index could include mandatory items of information and/or voluntary items of information. It can cover information reported in one or more disclosure vehicles such as corporate annual reports, interim reports, investor relations…etc. It can also cover the information reported by the company itself and/or others such as financial analysts reports. Hence, a disclosure index is a research instrument to measure the extent of information reported in a particular disclosure vehicle(s) by a particular entity(s) according to a list of selected items of information. The first use of such an index was

in 1961 by Cerf and it has been used ever since. Selected exemplars include articles from: the 1970s [see, for example, Singhvi and Desai, 1971; Choi, 1973; Buzby, 1974; 1975; Firth, 1979]; the 1980s [see, for example, Chow and Wong-Boren, 1987; Firth, 1984]; the 1990s [see, for example, Cooke, 1992; Wallace et al., 1994; Meek et al., 1995; Inchausti, 1997; Botosan, 1997] and the 2000s [see, for example, Depoers, 2000; Hope, 2003a; 2003b; Abd-Elsalam and Weetman, 2003; 2007; Naser and Nuseibeh, 2003; Ali, Ahmed and Henry, 2004; Coy and Dixon, 2004; Hassan, Romilly, Giorgioni and Power, 2009].

A review of prior studies shows a great variation in the construction of a disclosure index. Prior studies using the disclosure index vary in terms of the degree of the researcher involvement in constructing the index, the type of information disclosure and the number of items of information included in the index. There are differences in the measurement approach, the range of industries/countries covered by the index and other differences, which are subject to the research purpose(s), design, and context. For example, studies from developing countries tend to examine level of compliance with mandatory disclosure because of a relaxed enforcement policy compared to that of developed countries (e.g., Ali et al., 2004).

The degree of the researcher involvement in constructing a disclosure index varies from full involvement to no involvement. Full involvement means that the researcher controls the entire process of constructing a disclosure index from selecting the items of information to be included in the index, to scoring these items. No involvement means that the researcher depends on available disclosure indices from prior studies or professional organisations. A number of prior studies use available disclosure indices from professional organisations as measures of disclosure level

(e.g., Patel, Balic and Bwakira, 2002; Ali et al., 2007; Barron, Kile and O'Keefe, 1999; Salter, 1998; Hope, 2003a; 2003b; Bushman et al., 2004; Richardson and Welker, 2001;) This include: Standard and Poor's Transparency and Disclosure scores, the Securities and Exchange Commission ratings of the Management Discussion and Analysis disclosure, the Center for International Financial Analysis and Research (CIFAR) evaluations and the joint Society of Management Accountants of Canada / University of Quebec and Montreal disclosure scores. Between these two extremes, various degrees of the researcher involvement are observed (see, for example, Choi, 1973; Buzby, 1974; Buzby, 1975; Firth, 1979; 1984; Chow and Wong-Boren, 1987). Using an existing index has an advantage in that direct comparisons with previous research work can be made (Marston and Shrives, 1991, 203).

Different disclosure indices have been used in previous studies since there is no agreed theory on either the type or the number of items of information to be included in the index. The number of items of information included in disclosure indices in prior studies varies from a few items (Tai, Au-Yeung, Kwok and Lau, 1990) to a few hundreds of items of information (Spero, 1979). In addition the type of information selected can cover mandatory disclosure (e.g., Tai et al., 1990; Ahmed and Nicholls, 1994; Wallace et al., 1994) or voluntary disclosure (e.g., Chow and Wong-Boren, 1987; Botosan, 1997; Depoers, 2000; Meek et al., 1995) or both (e.g., Singhvi and Desai, 1971; Buzby, 1975; Cooke, 1992; Inchausti, 1997; Marston and Robson, 1997; Naser and Nuseibeh, 2003; Hassan et al., 2009).

Items of information included in the disclosure index are often weighted. Weights can be assigned to different items of information either by the researcher

who takes into consideration the type of information (quantitative or qualitative) in assigning weights to different items of information (e.g., Botosan, 1997; Richardson and Welker, 2001) or by a relevant user group(s) through a survey.

To summarise, the use of disclosure indices in the literature demonstrates a wide variety of approaches indicating the flexibility of the method. While various proprietary indices exist, many researchers choose to construct their own indices to meet the needs of their own research. Self-constructed disclosure index studies generally employ small samples due to the labour-intensive data collection process. Giving that the type and number of items of information to be included in a self-constructed disclosure index is subject to judgment, another potential limitation of using a disclosure index to measure level of disclosure is that the results are only valid to the extent that the index used is appropriate (Hassan et al., 2009). In addition, the construction of a disclosure index in studies to date does not explicitly account for the inter-relationships between different items of information, i.e. it does not take into account the incremental information content of each new item of information added to the index.

3.2.3 Management forecasts

A management forecast is a type of forward-looking information, which management can voluntarily provide in annual reports, interim reports or elsewhere. This forward-looking information could be quantitative or qualitative. For example, management earnings forecasts available in the First Call database can take the following forms: point, range, one-sided directional, or confirming statements (Hutton and Stocken, 2007). They can be verified through actual earnings realizations, and hence they enable researchers to construct variables such as management forecasts

accuracy. Management earnings forecasts have been used widely in the accounting literature as a measure of disclosure quality, in particular in US studies. This might be due to the availability of these data in different database such as the First Call database and the Dow Jones News Retrieval Service.

Coller and Yohn (1997) use quarterly earnings forecasts including point estimates, range estimates, and upper and lower bound estimates disclosed by management to investigate issues concerning the information asymmetry in the market. Ng, Tuna and Verdi (2008) argue that management forecasts offer a unique setting to examine whether disclosure quality affects any under reaction to news because they can measure forecast quality, given that forecasts vary in terms of prior accuracy, precision, and horizon. They use a number of attributes of management forecasts to proxy for disclosure such as: precision of the forecasts, prior forecast accuracy and whether the firm is a repeat forecaster. However management forecasts could be subject to earnings management which would affect the quality of management forecasts as a measure of disclosure.

3.2.4 Disclosure of good (bad) news

A number of prior studies used earnings figures to develop a measure of voluntary disclosure of good (bad) news (e.g., Skinner, 1994; Clarkson, Kao, and Richardson, 1994; Ali et al., 2007). For example, Skinner (1994) find that good news disclosures tended to be point or range estimates of annual earnings, and motivated by a desire to signal how well the firm is doing. Whereas bad news disclosures tended to be qualitative and related to quarterly earnings announcements and driven by a need to pre-empt large negative quarterly earnings surprises to avoid reputational and litigation costs if managers failed to disclose bad news promptly. He constructs a

measure of disclosure, where disclosures are classified as good/bad/no news depending on the differences between current earnings and expected earnings by investors (if not available, prior period's earnings). Clarkson, et al. (1994) measure voluntary disclosure of good (bad) news by positive (negative) changes in earnings in the current year compared to those of previous year (or analysts' forecasts of earnings). Alternatively, a firm is classified as good news if the cumulative residuals from the market model for each firm over the eight-month period subsequent to the annual report date are larger than zero. Ali et al. (2007) use the change in earnings per share from that of the same quarter in the previous fiscal year, deflated by stock price at the beginning of the quarter as a proxy for voluntary disclosure of bad news (negative changes) and vice versa.

3.2.5 Disclosure frequency

Disclosure frequency is also used in prior accounting studies; for example, Lang and Lundholm (2000) use a comprehensive measure of disclosure based on all available public disclosure by or about each firm. They use disclosure frequency and changes in disclosure frequency to proxy for the level of disclosure. Schrand and Verrecchia (2004) use disclosure frequency defined as the number of disclosures made by the firm during the 90-day period preceding the initial public offering (IPO) and the 90-day period following the IPO. Brown, Hillegeist and Lo (2004) use the number of conference calls made by each firm as their measure of voluntary disclosure.

4. Reliability and validity assessment

In our discussion of different proxies of disclosure, we found that most prior studies tend to use a single measure of disclosure. Other studies use more than one

measure for disclosure to check the robustness of their research results. Clarkson and Satterly (1997) use three proxies for the quantity of information: firm size as measured by total assets in place prior to listing, number of articles (entries) in the Australian Business Index and the length of the firm's operating history prior to listing in years. Another example is Ali et al. (2007) who use voluntary disclosure of bad news through management earnings forecasts and voluntary disclosure of corporate governance practices in regulatory filings as aspects of corporate disclosures.

However, whether a study uses one or more proxies of corporate disclosure, and whatever the approach or scale used to develop it, it is constructed to measure a theoretical concept that cannot be measured directly. Hence, it is necessary to assess whether the measure of disclosure is a relatively reliable and valid proxy for the extent or quality of disclosure. If the measure is not reliable and valid the resulting statistical inferences will not be meaningful. Therefore, this section discusses different tests of reliability and validity that can be used to assess the success of a measure of disclosure.

4.1 Reliability assessment

Reliability concerns the extent to which an experiment, test, or any measuring procedure yields the same results on repeated trials (Carmines and Zeller, 1991, 11). It concerns the ability of a measurement instrument to reproduce consistent results on repeated measurements (some refer to it as the stability of the measurement instrument over time). In terms of a disclosure index, for example, companies with the highest disclosure scores on a first measurement trial using a disclosure index will tend to be among the companies with the highest disclosure scores on repeated trials using the same disclosure index. The same will be true for the entire sample of

companies whose disclosure level is being measured via the same disclosure index. In addition, reliability concerns the internal consistency of a measurement instrument; that is the extent to which all parts of a measurement instrument are measuring the same thing. Thus, measures of disclosure that are subject to judgment in their construction, coder error, and by definition consist of different parts (items of information, or key words, etc) must be subject to reliability tests in order to get useful inferences from employing them in research. These include for example, the disclosure index, manual content analysis, and automated content analysis.

There are three common forms of reliability: test-retest, inter-coder reliability, and internal consistency. The test-retest measures the stability of the results obtained from a measurement instrument over time. In terms of content analysis, for example, stability can be determined when the same content is coded more than once by the same coder (Weber, 1990: 17). For example, Rogers and Grant (1997) conducted this kind of test to assess the stability of coding using content analysis. One person coded all reports over a four-month period of time then about 80% of these reports were recoded by the same person to ensure the stability of coding. Another example is Hussainey et al. (2003) who coded all annual reports at one time using Nudist software. After a short period of time, samples of these reports are recoded using the same software. The resulting scores yielded from the second round matched exactly with those from the first round, which proves the stability of the results obtained from the measurement instrument over time. Although, the test-retest is easy to conduct using automated content analysis as a research instrument to measure the extent of corporate disclosure, it might not be particularly relevant to manual content analysis. This is because of its general drawbacks[13] in addition to economic factors in terms of time, money and effort consumed in repeated trials.

The correlation between the results produced by more than one coder can be used to assess reliability[14]. Inter-coder reliability refers to the extent to which content classification produces the same results when the same text is coded by more than one coder (Weber, 1990:17). The higher the correlation coefficient obtained, the higher the reliability of the measurement instrument. However, correlation coefficients are not perceived as adequate measures for inter-rater reliability unless the discrepancies between the coders are few or if the discrepancies have been analyzed and any differences have been resolved (Milne and Adler, 1999; Rogers and Grant, 1997). For example, Hackston and Milne (1996) performed three rounds of re-testing to compare the judgments of three coders as to what constituted a corporate social disclosure sentence to assess the reliability of their measure of disclosure level. Another example of testing inter-coder reliability is Hussainey et al. (2003) who calculated the correlation between the automated disclosure scores obtained using an automated content analysis and disclosure scores obtained via manual searching of a sample of annual reports. The result shows a high and significant correlation between the two measures (0.96). In this example the coding method was different. Other studies calculated the inter-coder reliability using Scott's pi (Linsley and Shrives, 2006). While two coders are needed to perform this test it might be argued that having one well-trained coder who works consistently is also acceptable.

The third form of reliability is internal consistency, which is considered to provide an excellent technique for assessing the reliability of a measurement instrument (Carmines and Zeller, 1991). Litwin (1995, 21) describes internal consistency as "an indicator of how well the different items measure the same issue. This is important because a group of items that purports to measure one variable should indeed be clearly focused on that variable". The most popular test for internal

consistency[15] is Cronbach's alpha. It is a measure of inter-item correlation. Carmines and Zeller (1991, 48) define Cronbach's alpha as 'an estimate of the expected correlation between one test and a hypothetical alternative form containing the same number of items'. It reflects the homogeneity among a number of items grouped together to form a particular scale. It shows how well the different items complement each other in their measurement of different aspects of the same variable (Litwin, 1995: 24). It can take a value from zero to one. The higher the coefficient alpha obtained, the higher the reliability of the scale. It takes the maximum value of one when the correlation between each pair of items is one. As a general rule, an alpha of 0.8 for widely used scales is believed to indicate that the correlations are attenuated very little by random measurement error (Carmines and Zellner, 1991). Botosan (1997) and Hassan et al. (2009) used this technique as a measure of the internal consistency of their measures of disclosure. In addition, Botosan (1997), Hail (2002) and Kelton and Yang (2008) measured the correlations among the components (categories) of a disclosure index.

A review of a number[16] of prior studies provided in Table (2) shows that a test for the reliability of a proxy of disclosure has been performed only in 16 out of 50 cases. This is consistent with Beatttie and Thomson (2007) who reported that reliability issues do not appear to be addressed in the majority of intellectual capital disclosure studies to date. However, it is possible that reliability testing was carried out by the researchers without being reported in the paper. Table (2) also shows that reliability tests have been performed mainly in studies that use proxies for disclosure developed by examining the original disclosure vehicle namely, disclosure index, content analysis and frequency of disclosure. This type of disclosure measures reflects a construct which consists of a number of items grouped together to form a

score, hence measuring internal consistency is a necessity. In addition these measures are susceptible to coder error and judgment. Some of the proxies relate to facts that are less susceptible to coder error and judgment. For example, the period of listing, event (change of GAAP), and existence of ADR are based on facts with less room for coder error and judgment to be introduced.

<insert table 2 about here>

4.2 Validity assessment

Validity is defined as ' the extent to which any measuring instrument measures what it is intended to measure' (Carmines and Zeller, 1991, 17). There are three common types of validity: criterion validity, content validity and construct validity.

Criterion validity is a measure of how well one instrument stacks up against another instrument or predictor (Litwin, 1995, 37). Criterion validity is assessed if there is a significant correlation between a measure and an external criterion. The higher the magnitude of the correlation coefficient, the more valid is this instrument or measure for this particular criterion. There are two types of criterion validity: concurrent validity and predictive validity. The difference between them is the time horizon; the concurrent validity concerns the correlation between a measure and the criterion at the same time, whereas the predictive validity concerns the correlation between a future criterion and the relevant measure. Assuming that different measures of disclosure should be positively correlated with one another, Botosan (1997) measured the correlation between her self-constructed disclosure index and each of the AIMR scores, the number of Wall Street Journal articles written about the firm and the number of analysts following the firm. Hope (2003b) compared his own

scoring of accounting policy disclosures against CIFAR's for a sample of 21 firms. Also, he compared CIFAR's overall disclosure scores with various countries' "Best Annual Report Awards" and with Botosan's 1997 scores. However, criterion validity is less likely to be used in assessing the validity of social science measures. The reason is that most social science measures represent theoretical concepts for which there are no known criterion variables to be compared (Carmines and Zeller, 1991).

The second type of validity is content validity. Content validity is assessed through seeking subjective judgment from non-experts and/ or professionals, hence some refer to it as face validity, on how well the instrument measures what it is intended to measure. However, this type of validity is always seen as insufficient to conclude the validity of a measure. This might be due to concerns about users' perception regarding their own use of information (Dhaliwal, 1980). Six out of 50 cases summarised in Table (2) provided a test of content validity: Hail, 2002; Schadewitz and Kanto, 2002; Hope, 2003a; 2003b; Clarkson et al., 2008; Kelton and Yang, 2008. Not surprisingly, all these six studies are disclosure index studies which are subject to judgment; hence the authors seek advice on the face validity of their measurements of disclosure. For example, Schadewitz and Kanto (2002) used an internal report on the views of the interest groups connected with the development of the Helsinki Exchanges (HE) in order to evaluate the validity of the disclosure indices. This report was based on interviews with representatives of the main interest groups (managers, bankers, analysts) connected with the HE (24 representatives from Finland and 13 representatives from the UK). Healy et al. (1999) used increases in analysts' ratings of disclosure reported in the AIMR Reports 1980-1991 as their proxy for improved firm disclosure. To get some confidence on their measure of disclosure, they reviewed reasons for rating changes.

In contrast to the others, construct validity "has generalized applicability in the social sciences. It focuses on the extent to which a measure performs in accordance with theoretical expectations. Specifically, if the performance of the measure is consistent with theoretically derived expectations, then it is concluded that the measure is construct valid" (Carmines and Zeller, 1991, 27). Therefore, testing for the construct validity of a measure of disclosure requires a pattern of consistent findings with prior studies. Prior studies on disclosure have examined the relationship between a measure of disclosure quantity or quality and a number of company characteristics: company size, listing/cross listing, profitability, gearing, and others (see, for example, Singhvi and Desai, 1971; Choi, 1973; Buzby, 1975; Firth, 1979; Chow and Wong-Boren, 1987; Cooke, 1992; Wallace et al., 1994; Ahmed and Nicholls, 1994; Meek, et al., 1995; Inchausti, 1997; Depoers, 2000; Abd-Elsalam and Weetman, 2003; Ali et al., 2004). While the results for firm size and listing/cross listing are usually significant among prior studies, other variables yield mixed results. The mixed results could relate to problems of construct validity in the disclosure index but could also relate to problems with model specification and the proxies used for the determinants of disclosure.

Ahmed and Courtis (1999) used a meta-analysis to investigate the findings from 29 disclosure index studies that investigate determinants of disclosure to identify factors that might drive these results. The results show that the relationship between disclosure levels and corporate size, listing status and leverage are significant and positive. No significant association between aggregate disclosure levels and corporate profitability and size of audit firm is found. Most importantly they documented that differences in results are primarily due to sampling error, differences in disclosure index construction, differences in definition of the explanatory variables,

and differences in research settings. When a hypothesis is tested in a disclosure index study this is an explicit test of the theory underlying the hypothesis and an implicit test of construct validity. If the hypothesis does not work the theory might be wrong or there may be problems with the construct validity of the disclosure index or the proxies used for the explanatory variables.

Construct validity is tested in 23 out of 50 selected cases reviewed in Table (2). Some studies explicitly test whether the disclosure proxy is validly constructed; e.g., Botosan, 1997; Hail, 2002; Hope, 2003a; Brown et al., 2004. Other studies test validity implicitly by regressing one or more determinant of disclosure such as firm size as a control[17] variable (s) in the research model, e.g., Welker, 1995; Lang and Lundholm, 1996; Salter, 1998; Leuz and Verrecchia, 2000. (See Appendix 1).

5. Discussion and recommendations for future research

In the previous sections we discussed the nature of disclosure, different proxies of disclosure developed in the empirical accounting literature and how to assess the success of a measure of disclosure. In this section, we discuss different measurement issues related to disclosure and gaps in the current literature which future research may aim to cover.

When constructing or evaluating concepts and quantitative measures, a checklist developed by Goertz (2008) might be helpful. It suggests, among other things, that one must first consider the theory embodied in the concept. One should also consider the necessary (minimum) and sufficient (maximum) parts of the concept. Then one should survey plausible aggregation techniques and structural relationships that could be applied in a quantitative measure. Goertz (2008) also notes that the most common methods of aggregation are the sum and the mean. With

respect to disclosure, to date, there is no general theory of disclosure which makes it more complex to develop or evaluate a measure of disclosure. Scholars are invited to contribute to the construction of a general theory of disclosure which can guide future research when constructing a new measure of disclosure or evaluating an existing one.

Disclosure is generally viewed as a latent variable[18], i.e., not amenable to be observed and measured directly. Therefore, we have to indirectly observe it through the values of an observed variable(s). In this respect, measures of disclosure can be reclassified into two approaches: the first approach tries to measure disclosure by reducing it to its observable characteristics in order to be able to measure it. The second approach tries to measure disclosure by identifying some observable variables that are assumed to have some relationship with disclosure.

The first approach reduces (operationalises) disclosure into two parts: information quality and information quantity. However, in the absence of a generally agreed model for disclosure quality as well as relevant and reliable techniques to measure it, prior studies tend to use disclosure quantity[19] (e.g., Hail, 2002) as a proxy for disclosure quality assuming that quantity and quality are positively related, although quantity and quality measures may lead to different ranking for a sample of companies. Core (2001) makes some suggestions on how to accomplish a measure of disclosure quality. However, to date there is no single measure of disclosure quality that attracts no criticisms (e.g., Beretta and Bozzolan, 2004; Brown and Hillegeist, 2007). Botosan (2004, 291-292) suggests that quantifying the qualitative characteristics underlying disclosure quality is extraordinarily difficult and that it would be virtually impossible to employ the procedure in an empirical setting. In sum, the academic debate on this issue is still open and scholars are invited to review the

extensive research on construct measurement in other disciplines to obtain new perspectives on how to measure disclosure quality. Hence, prior studies to date tend to count information items provided in a disclosure vehicle (e.g. disclosure index and content analysis studies). One limitation of this approach is that disclosure is not limited to words only; it includes graphics, photos, etc. So measuring disclosure by merely counting the number of words or key words might not be enough. Also the problem of the position and presentation of information can add to the complexity of measuring disclosure.

In addition, whatever the technique used to measure disclosure quantity (e.g., disclosure index; content analysis; disclosure frequency) the disclosure proxies merely rank companies relative to each other, i.e., whether a company discloses more or less than another one. There is no true zero point, i.e. these measures do not possess the characteristics of a ratio scale but at the best they only possess the characteristics of an interval scale.

Furthermore, these measures do not reflect the relative usefulness of different items of disclosure included in the scale. Authors of prior studies are aware of this problem, hence some have tried to overcome (or to reduce the influence of) this problem by giving different weights to different items of disclosure. Weights for different items of information can be assigned by investigating the views of users (Chow and Wong-Boren, 1987). However, results obtained will be highly dependent on the choice of user group investigated since significant differences between the perceptions of different user groups about different items of information are documented (e.g., Coleman and Eccles, 1997; Beattie and Pratt, 2002). Also culture could play a key role in the perceived importance of different types of disclosure. In

addition, there are some concerns about user perceptions such as lack of self-insight regarding their own use of information and lack of consensus over the relative importance of different items of information among the same user group (Dhaliwal, 1980). Alternatively, equal weights could be assigned according to the existence of items of information. An item takes the value of one if it exists in the investigated report and the value of zero if not (Cooke, 1992; Inchausti, 1997; Meek et al., 1995; Depoers, 2000). Some studies use mixed approaches (Choi, 1973; Chow and Wong-Boren, 1987; Naser and Nuseibeh, 2003) and provide mixed results. Chow and Wong-Boren (1987) and Robbins and Austin (1986) find similar results when they use both equally weighted and differently weighted disclosure indexes. In contrast Naser and Nuseibeh (2003) report significant differences between the mean and median of scores obtained from equally weighted disclosure indices (i.e. indices constructed using binary scores for items of information) and scores obtained from weighted disclosure indices (i.e. indices constructed using users' ratings of the same items of information in a mailed questionnaire) in Saudi Arabia.

Alternatively, weights might be assigned by the researcher based on the perceived importance of different items of information. For example, Botosan (1997) argue that quantitative information is more important than qualitative information; hence she gave more weights to quantitative disclosures. This is because quantitative information tends to be seen as more precise and more useful and may enhance management's reporting reputation and credibility. This view gives more importance to financial statement information which is mainly quantitative. However, financial statement information has a number of limitations: a lack of timeliness, subjectivity,

accounting manipulations, and its historical nature which implies a limited ability to convey details about future prospects and risks facing the firm. In addition, there is an increasing support for the importance of narrative disclosure in explaining and offering useful insights about quantitative measures included in the disclosure vehicle (e.g., Abrahamson and Amir, 1996; Rogers and Grant, 1997; Smith and Taffler, 2000; Clatworthy and Jones, 2003; Beretta and Bozzolan, 2004). For example, Smith and Taffler's (2000) findings about the significant association between narrative disclosure in the chairman's statement and firm insolvency, reinforce the argument that narrative disclosures contain important information associated with the future of the company. Moreover Skinner's (1994) findings show that bad news disclosure tend to be qualitative and timely (i.e., qualitative statements about a quarter's earnings) and typically associated with large negative stock price reactions. Hence excluding or undervaluing this type of information could lead to potential bias in the obtained results. However, caution should be exercised when dealing with narrative disclosure as it is subject to impression management. At the end of the day, both quantitative and qualitative information appear to have information content (Gibbins et al., 1990).

Another drawback is that prior studies using the disclosure index do not explicitly consider the incremental information content of different items of information included in the index. The appropriate method of aggregation is of relevance here. For example, to what extent coding two different companies as having similar levels of disclosure could be valid, although in reality these two companies might have disclosed completely different sets of information within the disclosure index. Future research might develop an approach which can better reflect the relative usefulness or the incremental information content of each item of information, which

can be captured by means of data reduction techniques such as factor analysis and/or step-wise regression (Dhaliwal, 1980).

The second approach measures disclosure through other observable variables, examples are the existence of American Depositary Receipts and firm size. These observable variables are assumed to have some relationships with the underlying concept (disclosure) that needs to be measured.

Observable variables or measures can be further classified into causal (or formative) variables and indicator (reflective) variables. The difference between causal variables and indicator variables is in the direction of causality between the latent variable and the observable variables (e.g., Fayers and Hand, 2002; Jarvis, Mackenzie and Podsakoff, 2003). If the direction of causality is from the latent variable to the observable variables and changes in the latent variable are hypothesized to cause changes in the observable variables, then these measures are referred to as reflective or indicator variables. If measures are hypothesized to cause changes in the latent variable, they are referred to as causal or formative variables. Jarvis et al. (2003) provide decision rules for determining whether a construct is causal/formative or indicator/reflective although they note that answering the questions may be difficult or the answers may be contradictory. However, the use of econometric analysis might help here. For example Granger causality test can statistically detect the direction of causality (Gujarati, 2010). In the context of disclosure, examples of indicator variables might include disclosure surveys, financial analysts' forecast attributes and number of analysts following a company. Examples of causal variables are firm size, cross-listing, and existence of ADRs. It might also be argued that the number of analysts following a company is a causal variable if

analysts induce companies to disclose more information. Hence, future research is invited to investigate this issue further to draw firm conclusions on what could be treated as causal vs. indicator variables of disclosure. Several studies in the disclosure literature use firm size, cross listing and ADRs as independent/predictor variables in a multiple regression model with another measure of disclosure such as disclosure index as the dependent variable[20] (e.g., Buzby, 1975; Wallace et al., 1994; Inchausti; 1997; Depoers, 2000; Lang et al., 2003) to investigate determinants of the extent of disclosure.

Jarvis et al. (2003) note that the type of indicator is important in deciding which type of statistical model to apply in the marketing literature. They examine published papers using latent variable structural equations modeling (SEM) and confirmatory factor models to establish the extent of incorrectly specified constructs. In the disclosure literature the use of these techniques is rare (see Grüning, 2007 for an example) as most studies use multiple regression techniques. If SEM gains popularity in the disclosure literature researchers will need to investigate the measurement issues raised by Fayers et al., (2002) and Jarvis et al. (2003). Jackman (2008, 126) comments that 'SEMs are essentially unheard of in American economics, and indeed staples of measurement modeling such as factor analysis and item-response modeling are conspicuously absent from econometrics texts'. The disclosure literature to date appears to be informed mainly by the econometrics approach. One exception is Bushman, Piotroski and Smith (2004) who use factor analysis to measure corporate transparency. They construct a measure of corporate transparency using ten individual measures of countries' firm-specific information environments using the CIFAR data base, then they reduce them using factor analysis to two distinct factors: financial transparency and governance transparency. These

two factors are subsequently used by Habib (2008) to measure corporate transparency. We find that researchers in the literature we have reviewed seldom construct a measure of disclosure from a number of observed variables. Future researchers might wish to consider greater use of factor analysis to measure disclosure.

6. Concluding remarks

This review identifies over 25[21] measures for disclosure, each has its advantages and disadvantages and the use of a particular technique depends on the research purpose and context. If the research purpose is to explain disclosure or differences in disclosure in a particular setting the choice of disclosure measure could differ from a disclosure measure in study that seeks to establish the outcomes of increased or enhanced disclosure. Where disclosure is merely a control variable in a model a simple dummy variable might be adequate. In the context of some emerging markets, there is no available disclosure index from prior studies or professional organisations, hence a researcher has to develop his/her own measure of disclosure depending on the research purpose(s), e.g., whether the study covers voluntary or mandatory items of disclosure. In addition, the availability of data plays a key role in adopting a specific technique of disclosure measurement. For example, a large number of US disclosure studies use the AIMR scores because they were widely available for a large number of companies. Future researchers might consider using more than one disclosure proxy, as a robustness check[22], with appropriate sensitivity analysis of the results.

In addition, an assessment of the reliability and validity of the measure of disclosure should be provided. There are three common ways of assessing reliability: test-retest, inter-coder reliability, and internal consistency. In addition, there are three

common types of validity: criterion validity, content validity and construct validity. However, prior studies do not always test the reliability and validity of their measures of disclosure. We recommend that appropriate reliability and validity tests should be incorporated in future research in order to obtain reliable results.

Acknowledgements

Notes

1   It does not possess inherent characteristics by which one can determine its intensity or quality like the capacity of a car (Cooke and Wallace, 1989, 51).

2   The purpose of thematic analysis is to extract and analyze themes inherent within the message to identify trends, attitudes, inferences…etc. The purpose of syntactic analysis is to analyze the readability of the text.

3   The current study excludes readability studies and linguistic analysis.

4   Corporate disclosure can also be directed to parties other than outside investors such as stakeholders, strategic investors, and strategic debt holders.

5   Prior studies highlight the importance of the corporate annual report as a disclosure vehicle; for example, Lang and Lundholm, 1993 and Botosan and Plumlee, 2002 found a high and significant positive correlation between annual report disclosures and other forms of disclosure. Furthermore, the weights applied to the annual report disclosure by the Association for Investment Management and Research (AIMR) range between 40-50% of the overall disclosure scores. This led Botosan and Plumlee (2002, 30) to conclude that the annual report is viewed as a particularly important form of disclosure. Therefore, it is not surprising that most prior research used annual reports to investigate issues relating to corporate disclosure (see, for example, Wallace, Naser and Mora, 1994; Meek, Roberts and Gray, 1995; Inchausti, 1997; Botosan, 1997; Ahmed and Courtis, 1999; Depoers, 2000; Hail, 2002; Botosan and Plumlee, 2002; Hope, 2003a; Hope, 2003b; Abd-Elsalam and Weetman, 2003; 2007; Coy and Dixon, 2004).

6   Finance theory predicts that more public information will enhance stock liquidity by reducing transactions costs and increasing the demand for shares (Merton, 1987; Amihud and Mendelson, 1986; 2000). Moreover, it predicts that firms for which more information is available will be perceived as less risky (Barry and Brown, 1985). This means that ceteris paribus, the rate of return required by investors to buy the firm's shares will decrease; hence the firm's cost of equity capital will decrease and firm value will increase. Moreover, it is argued that increased disclosure can influence firm value through pure cash flow effects by reducing agency costs. Increased disclosure is expected to reduce the potential diversion of the firm's cash flows to managers and controlling shareholders (Lang, Lins and Miller, 2003).

7   Includes corporate reporting, private information acquisition and information dissemination (Lang et al., 2003).

8   'In 1989 the Financial Analysts Federation (FAF) combined with the Institute of Chartered Financial Analysts (ICFA) to form the Association for Investment Management and Research (AIMR). Thus from 1990 onwards, the corporate disclosure evaluations were published by the AIMR under the new title: Corporate Information Committee Report (CICR). The evaluations, however, are still prepared by a committee of FAF stated Sengupta (1998, footnote no.2, 460).

9   In this survey, "disclosure system" refers to :

- requirements for disclosure of company information imposed by stock exchange and government regulators at the time of listing and on a continuing basis,
- monitoring and enforcement of disclosure requirements, and
- stock exchange mechanisms for the dissemination of information about listed companies.

10   include: identity of directors, senior management, and advisors; offer statistics; key information, such as risk factors, selected financial data; company history, business overview, competitive position; operating and financial review and prospects; directors and officers, including compensation and share ownership; major shareholders and related party transactions; financial statements; offer terms; additional information such as material contracts, exchange controls, dividend restrictions, etc.

11   Measures of firm size can be developed from corporate historical financial statements such as total assets and sales. Other measures such as market value can be developed without recourse to corporate disclosure vehicles.

12   However improvements in software never stop. For example, new version of Nudist, called Nvivo 8 can search PDF files.

13   Weber (1990, 17) stated that: 'inconsistencies in coding constitute unreliability. These inconsistencies may stem from a variety of factors, including ambiguities in the coding rules, ambiguities in the text, cognitive changes within the coder, or simple errors, such as recording the wrong numeric code for a category. Because only one person is coding, stability is the weakest form of reliability'.

14   Other measures include: Krippendorff's alpha, Cohen's kappa and Leigh's lambda (see Milne and Adler, 1999, and references therein).

15   Other measures of internal consistency include: split-half reliability test.

16   Prior studies on modelling the determinants of disclosure have not been included here. The main purpose of these studies is to test for an association between a proxy of disclosure and a number of company characteristics. Since this would overlap with construct validity measures we decided to concentrate on other types of studies using measures of disclosure for our summary table

17   Since a construct validity test involves an investigation of a correlation between a measure of disclosure quantity or quality and a number of company characteristics and a correlation between firm size and disclosure has been confirmed in a huge number of prior studies, firm size is subsequently used as a control variable.

18   For more information about different definitions and attributes of latent variables, see Bollen (2002).

19   As well as other measures of disclosure discussed in the current research such as disclosure survey studies.

20   The problem of endogeneity is of relevance here (see Jackson, 2008).

21   The number of different measures identified depends on how we identify one measure as being different from another. For example there are several different types of disclosure index.

22   It might be argued that using two techniques to measure disclosure (as suggested in the paper) may not address a lack of reliability if they are both unsuitable in the first place. We agree but assuming that measures of disclosure are carefully constructed, one can be more confident about the results if the researcher got similar results when employing completely two different measures of disclosure rather then relying only on the results obtained from one measure.

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Table 1 Summary of disclosure proxies

Proxy	Types of variables	Exemplars using the proxy
Proxies that are not derived from a disclosure vehicle		
Disclosure survey	Continuous	Lang & Lundholm (1996); Sengupta (1998); Healy et al. (1999); Botosan & Plumlee (2002)
Existence of ADR	Discrete	Lang et al.(2003); Doidge et al. (2004)
Attributes of analysts' forecasts	Continuous	Lang & Lundholm (1996)
Analyst following	Continuous	Lang & Lundholm (1993)
Period of listing	Continuous	Clarkson & Thompson (1990); Clarkson & Satterly (1997)
Event (change of GAAP)	Discrete	Leuz & Verrecchia (2000)
Event (OTC reporting requirements)	Discrete	Bushee & Leuz (2005)
Others Such as a dummy variable takes the value of 1 if the company from developed markets and 0 otherwise. Another example is a dummy variable that takes the value 1 during the disclosure increase period (based on analysts' ratings of disclosure reported in the AIMR Reports 1980-1991) and zero otherwise.	Discrete	Bailey et al. (2006); Healy et al. (1999)
Proxies derived from disclosure vehicles.		
Management forecasts An indicator variable that takes the value of one if the managers make an earnings forecast , and zero otherwise	Discrete	Ali et al. (2007); Coller & Yohn (1997)

Proxy	Nature of disclosure variable	Exemplars using the proxy
Attributes of Management forecast Such as: precision of the forecasts; prior forecast accuracy; whether the firm is a repeat forecaster	Discrete	Ng et al. (2008)
Good (bad) news disclosure measured by positive (negative) changes in earnings per share.	Continuous	Skinner (1994); Clarkson et al. (1994); Ali et al. (2007)
Disclosure frequency measured by variables such as: Firms are partitioned on the basis of the number of articles (entries) in the Australian Business Index into those with no articles versus those with one or more articles.	Discrete	Clarkson & Satterly (1997);
the number of conference calls held during calendar quarter;	Continuous	Brown et al. (2004),
Manual content analysis	Continuous	Hackston & Milne (1996); Francis et al. (1997) ; Beretta & Bozzolan (2004); Linsley & Shrives (2006)
Automated content analysis	Continuous	Hussainey et al. (2003); Kothari et al. (2009); Hussainey (2004), Schleicher, Hussainey & Walker (2007)

Proxy	Nature of disclosure variable	Exemplars using the proxy
Disclosure index	Continuous	Hundreds e.g. Depoers (2000); Hope (2003a); Abd-Elsalam & Weetman (2003; 2007); Naser & Nuseibeh (2003); Ali et al., (2004); Coy & Dixon (2004); Hassan et al. (2006)
Others Such as firm size;	Continuous	Clarkson & Satterly (1997); Dargenidou et al. (2006)
Event (a dummy variable equal to one if the quarter is a conference call quarter and zero otherwise)	Discrete	Bowen et al. (2002),

Table (2) A review of a sample of 40 studies from 1990 to 2008 to investigate whether they have tested for the reliability and validity of their proxy(s) of disclosure.

Proxy	Frequency	%*	Reliability: test-retest	Reliability: inter-coder reliability	Reliability: internal consistency	Validity: content validity	Validity: Construct validity
Disclosure index	16	0.32	0	2	2	6	12
Automated content analysis	8	0.16	2	7	0	0	0
Disclosure survey	7	0.14	0	0	0	0	3
Disclosure frequency	4	0.08	0	1	0	0	2
Manual content analysis	2	0.04	0	1	1	0	0
Period of listing	2	0.04	0	0	0	0	0
Event (change of GAAP)	2	0.04	0	0	0	0	2
Other proxies that do not refer to annual reports	2	0.04	0	0	0	0	1
Existence of ADR	1	0.02	0	0	0	0	0
Attributes of analysts' forecasts	1	0.02	0	0	0	0	1
Analyst following	1	0.02	0	0	0	0	1

Proxy	Frequency	%	Reliability: test-retest	Reliability: inter-coder reliability	Reliability: internal consistency	Validity: content validity	Validity: Construct validity
Management forecasts	1	0.02	0	0	0	0	0
Attributes of management forecast	1	0.02	0	0	0	0	0
Good (bad) news disclosure in management forecasts	1	0.02	0	0	0	0	1
Other proxies derived from annual reports	1	0.02	0	0	0	0	0
Total*	50		2	11	3	6	23

* Total number of studies reviewed is 40 but because some studies used two or more proxies for disclosure the total number of studies becomes 50.

Frequency % is calculated as the percentage of the frequency of the use of the disclosure proxy to the total number of studies (40). Studies that investigate determinants of disclosure have been dropped from this table their main objective will overlap with the construct validity measure.

See Appendix 1 for details of papers included.

Appendix (1) Reliability and validity testing in a sample of prior studies that have been investigated in the current study.

Reference	Reliability: test-retest	Reliability: inter-coder reliability	Reliability: Internal consistency	Validity: content validity	Validity: Construct validity	Explicit or Implicit Test
Clarkson & Thompson (1990)	0	0	0	0	0	-
Welker (1995)	0	0	0	0	1	I
Abrahamson& Amir (1996)	0	1	0	0	0	E
Lang & Lundholm (1996)	0	0	0	0	1	I
Rogers & Grant (1997)	1	1	0	0	0	E
Botosan (1997)	0	0	1	0	1	E
Clarkson & Satterly (1997)	0	0	0	0	0	-
Coller & Yohn (1997)	0	0	0	0	0	-
Francis et al. (1997)	0	0	0	0	0	-
Sengupta (1998)	0	0	0	0	0	-
Salter (1998)	0	0	0	0	1	I
Barron et al. (1999)	0	0	0	0	1	I
Healy et al. (1999)	0	0	0	0	1	I
Schleicher & Walker (1999)	0	0	0	0	1	I
Bushee & Noe (2000)	0	0	0	0	1	I
Lang & Lundholm (2000)	0	1	0	0	1	I
Leuz & Verrecchia (2000)	0	0	0	0	1	I
Smith & Taffler (2000)	1	1	0	0	0	E
Richardson & Welker (2001)	0	0	0	0	1	E
Breton & Taffler (2001)	0	1	0	0	0	E
Botosan & Plumlee (2002)	0	0	0	0	0	-

Reference	Reliability: test-retest	Reliability: inter-coder reliability	Reliability: Internal consistency	Validity: Content validity	Validity: Construct validity	Explicit or Implicit Test
Bowen et al. (2002)	0	0	0	0	0	-
Lundholm & Myers (2002)	0	0	0	0	0	-
Patel et al. (2002)	0	0	0	0	0	-
Schadewitz & Kanto (2002)	0	0	0	1	0	-
Hope (2003a)	0	1	0	1	1	E
Hope (2003b)	0	1	0	1	1	E
Clatworthy & Jones (2003)	0	1	0	0	0	E
Hussainey et al. (2003)	0	1	0	0	0	-
Lang et al. (2003)	0	0	0	0	1	E
Baek et al. (2004)	0	0	0	0	0	-
Brown et al. (2004)	0	0	0	0	1	E
Bushee & Leuz (2005)	0	0	0	0	1	E
Krishnamurti et al. (2005)	0	0	0	0	0	-
Bailey et al. (2006)	0	0	0	0	0	-
Linsley & Shrives (2006)	0	1	1	0	0	-
Ali et al. (2007)	0	0	0	0	1	E
Bassett et al. (2007)	0	0	0	0	1	I
Schleicher et al. (2007)	0	1	0	0	0	-
Clarkson et al. (2008)	0	0	0	1	1	E
Hodgdon et al. (2008)	0	0	0	0	1	I
Kelton & Yang (2008)	0	0	1	1	1	E
Ng et al. (2008)	0	0	0	0	0	-
Kothari et al. (2009)	0	0	0	0	0	-

1 = evidence of test in paper, 0 = no evidence of test. Studies that performed both manual and automated content analysis such as Hussainey et al., 2003; Clatworthy & Jones (2003) were cited once in the tables of the current study as automated content analysis.

E = construct validity test is explicit, I = construct validity test is implicit.