

A longitudinal study of voluntary disclosure quality in the annual reports of innovative firms

Voluntary
disclosure
quality

Si Jie Lim

*Head of Trade Credit, Singapore, AIG Asia Pacific Insurance Pte Ltd,
Singapore, and*

*Gregory White, Alina Lee and Yuni Yuningsih
School of Accounting, Curtin University, Perth, Australia*

89

Received 19 August 2013
Revised 6 July 2015
Accepted 28 August 2015

Abstract

Purpose – This paper aims to measure mean voluntary intellectual capital disclosure (ICD) quality score for a sample of Australian Stock Exchange-listed biotechnology firms in the 2003, 2006 and 2010 reporting periods. The aim was to use data for the same companies over the whole period to discover whether the quality of voluntary reporting practice was improving over time, measuring lagged-mean ICD quality score against possible determinants of management disclosure practice.

Design/methodology/approach – Mean ICD quality score, and associated frequency data, was measured against possible determinants of managers' disclosure practice. The dependent variable was an 18-item classification of ICD based on Sveiby's Intangible Assets Monitor (Sveiby, 1997). Data collected from S&P Capital IQ database were used to compare ICD disclosure quality with possible drivers: competition (capital intensity); performance (profit and market returns); monitoring (audit firm and ownership); and control variables (revenue and leverage).

Findings – Mean voluntary disclosures of internal capital and external capital lower the quality over time using paired sample *t*-test comparison against 2003 as a base year. The lowest quality disclosure was about human capital, and the highest quality was about internal capital. Individual disclosure items within internal, external and human capital classification showed that internal capital items (intellectual property, corporate culture, management processes and financial relations) and external capital item (customers) were the significant contributors. Investigation of drivers using Spearman's correlation against lagged ICD data showed that performance (relative market returns) and monitoring (ownership diffusion) were significant drivers of voluntary ICD, both in expected and unexpected ways.

Originality/value – Voluntary ICD quality and quantity are rarely measured in the same paper. The findings are unique and interesting especially for innovative Australian R&D firms when compared to recent findings for a larger sample of French companies.

Keywords Intellectual capital, Content analysis, Biotechnology, ICD, Voluntary disclosure, Withholding

Paper type Research paper

1. Introduction

This study examines the quality and quantity of voluntary intellectual capital disclosures (ICDs) that were made by a group of Australian Stock Exchange (ASX)-listed biotechnology companies in their 2003, 2006 and 2010 annual reports. Mindful of recent reviews that have been critical of content analysis of annual reports (Dumay and Cai, 2014; Goebel, 2015), an important focus of this work was measurement of the quality of information. This paper's contribution to the current literature is in its rigorous methodology for scoring quality of ICD narrative about, and consideration of drivers of disclosure practice (Depoers and Jeanjean, 2012).



Wyatt (2008) has explored the relevance of non-financial intangibles information for investors. In particular, her review of studies in this field of research categorised the firm's technological resources as firms' research and development (R&D) expenditure and related intellectual property. Past research has confirmed that R&D (Bosworth and Rogers, 2001; Lev and Sougiannis, 1996) (i.e. R&D expenditures and patent activity) is positively related to a firm's market value and subsequent stock return. Using a different dependent variable measure than this study, Nimtrakoon (2015) has shown that financial performance and market value are positively correlated with firm's intellectual capital (IC). Managers, in their quest to obtain a favourable source of capital, release information regarding R&D (among other disclosures) that has been shown to result in increased market-to-book values (Deng *et al.*, 1999; Hirschey, 1998; Lev, 2001). The pre-commercialisation, R&D and proof-of-concept (pre-commercialisation scale-up) business models of many biotechnology companies form an interesting arena within which to study managers' voluntary reporting activities (White *et al.*, 2010).

Depoers and Jeanjean (2012) recently published an interesting investigation of information withholding in annual reports. This research has direct application here because it considers determinants of withholding disclosure, and the same determinants are an interesting comparison for voluntary information disclosure about ICDs measured in this work. The effect of competition (capital intensity), performance (profit and market returns) and monitoring (audit firm and ownership) and expected control variables (size, revenue and leverage) were investigated as independent variable explaining changes in mean ICD quality and quantity in this study.

Agency theory explains that voluntary disclosure in annual reports should reduce information asymmetry and uncertainty for investors and other stakeholders who are using the reported information (Jensen and Meckling, 1976). In addition, equity market regulators like the ASX have published disclosure guidelines to overcome the gap of knowledge which exists between the managers and various other stakeholders of these companies (Code of Best Practice for Reporting by Life Science Companies, 2013). Measurement of ICD quantity and quality in the annual reports of these firms over an extended period is entirely relevant and important for this type of company.

Major transformations are taking place in the global economy. Historic debt-levels and future uncertainty have galvanised world governments' commitment to spending on R&D activities for future development and capacity. Owning the best infrastructure assets is no longer an assurance of competitive advantage for firms when compared to the future promise of innovative processes and intellectual property ownership. The basis of competition experienced by firms in many industries is shifting from traditional physical and financial resources to performance of intangible assets (Khan and Ali, 2010). Intangible assets, which can be collectively called IC, are a key which can unlock new parts of the value chain and a competitive advantage for innovative firms (Ghosh and Wu, 2007; Li *et al.*, 2008; Wong and Gardner, 2005).

This longitudinal study seeks to discover how the quality of ICD has changed for a group of innovative companies. This study measures mean ICD quality score, from annual reports over an important period of global financial reporting history – from the same firms in 2003, 2006 and 2010. In a financial reporting context, these time points are interesting, as they rest either before or after key global and local events. First, 2003 is a base year for our sample companies falls before the full economic effect of the global financial crisis and may have exerted its effect on financial managers' disclosure practice. Second, 2003 to 2006 is a period of deepening global economic pressures,

reducing debt finance availability but relatively generous government funding models supporting innovative firms.

2. Related literature and hypothesis development

A recent study of determinants for information withholding in annual reports by [Depoers and Jeanjean \(2012\)](#) is considered very relevant for development of the hypothesis and investigation of results for the current study. They measured a voluntary disclosure withholding score in French firms for two concurrent reporting periods, 2000 to 2001 (Period 1) and 2001 to 2002 (Period 2), whereas in the current study, we measured change in ICD quality and frequency in Australian firms for two distant periods from 2003 to 2010 (Period 1) and 2006 to 2010 (Period 2). Although not specifically a withholding score, our study measures change in mean voluntary disclosure quality and frequency, and the same determinants could apply to measured reduction in quality over time. We use a number of similar independent variables to [Depoers and Jeanjean \(2012\)](#) in the development of the conceptual framework and hypotheses below.

2.1 A disclosure framework for intellectual capital disclosure frequency

A way to identify IC is by its components ([Whiting and Woodcock, 2011](#)). Frameworks used to identify IC have been developed in prior research by [Bontis \(2001\)](#); [Edvinsson and Malone \(1998\)](#); [Roos et al. \(1997\)](#); [Stewart \(1997\)](#) and [Sveiby \(1997\)](#). A tripartite framework that has gained validity in prior ICD studies ([Petty and Cuganesan, 2005](#)) was that originally developed by [Sveiby \(1997, pp. 8-11\)](#). Sveiby theorised that IC is an invisible asset, and that it lacks a generally accepted definition and a measurement standard ([Sveiby, 1997](#)), although such assets can be classified into three categories:

- (1) internal structures (organisational capital);
- (2) external structures (customer/relational capital); and
- (3) employee competence (human capital).

Many studies have used [Sveiby's \(1997\)](#) framework to measure the frequency of ICD disclosures in firms ([Abeysekera and Guthrie, 2005](#); [April et al., 2003](#); [Brennan, 2001](#); [Bozzolan et al., 2003](#); [Goh and Lim, 2004](#); [Guthrie et al., 1999](#); [Olsson, 2001](#); [Petty and Cuganesan, 2005](#)). The reader is referred to an excellent recent review of the IC content analysis field by [Dumay and Cai \(2014\)](#).

In Australia, [Guthrie and Petty \(2000\)](#) are early pioneers in applying content analysis to the frequency of ICD reporting by companies. In a study for the OECD, which looked at the ICD of a sample of Australian annual reports ([Guthrie et al., 1999](#)), a modified version of [Sveiby's \(1997\)](#) intangible assets monitor was used to collect the data. Bozzolan and co-investigators studied a group of Italian companies' ICD at a single time point and found that external capital ICD was the most frequent disclosure about ICD in firms' reports ([Bozzolan et al., 2003](#); 549). [Bukh \(2003\)](#) published findings from Danish firm IPO prospectuses that clearly demonstrated increased ICD frequency from 1990 to 1999 based on Bukh's longitudinal study with a similar measure we would propose *H1*:

H1. The quantity of voluntary ICD is increasing in firms' annual reports over time.

2.2 A disclosure framework for intellectual capital disclosure quality

[Petty and Cuganesan \(2005\)](#) highlighted that future research in ICD studies could focus on the quality of disclosure in annual reports to extend current research. [Yi and Davey \(2010\)](#)

reviewed previous research in IC disclosure and whether any measures of quality were used. It was noted that while prior studies looked into ICDs using the many frameworks available, they have generally failed to measure the quality of ICDs (Yi and Davey, 2010). Yi and Davey (2010) found the average disclosure quality of IC by 49 mainland Chinese firms to be at 0.44[1], with two-thirds of the firms scoring below 0.5. The average quality score for each category of IC (internal, external and human capital) was below 0.50. The low-quality scoring indicates that most of the reported attributes were expressed in narrative rather than numerical or monetary terms (which would have been indicated by a higher scoring). Guthrie *et al.* (2006), in their study of ICD in Hong Kong and Australia, revealed that nearly every instance of IC reported was in narrative rather than numerical terms, which was similar to the findings in Ireland by Brennan (2001). If we consider the quantity and quality of voluntary disclosure related to ICD, it would be expected that the amount of disclosure also correlates with increased quality. In other words, firm managers who report a lot of ICD also demonstrate high-quality disclosure. This leads us to propose the following two hypotheses about changes in quality of ICD and the relationship between quality and frequency of voluntary disclosure:

H2. The quality of voluntary ICD is decreasing in firms' annual reports over time.

H3. There is a positive correlation between the quantity and quality of ICD.

2.3 Voluntary disclosure of intellectual capital disclosure and agency theory

Depoers and Jeanjean (2012) present a more complex framework within which to consider the drivers of information withholding for these firms. The following hypotheses are used for comparison with their findings. The managers of firms as agents reporting information to the principals (lenders and shareholder) may cause information asymmetry through deliberate withholding or, as is often the case, with innovative firms with R&D operations because the firms' disclosures are difficult to articulate or explain to the average investor. The financial self-interest of the managers themselves may well reduce the quality and quantity of ICD. The external auditor is a monitoring control by which investors seek to reduce adverse selection risk; large audit firms foster independence by encouraging managers to issue financial reports that meet the decision-making needs of shareholders (Depoers and Jeanjean, 2012, p. 123).

In the context of biotechnology firms with complex R&D, drug or medical device development pipeline the degree of information asymmetry between managers and principals is potentially very large. Agency theory (Jensen and Meckling, 1976) explains that managers will actively seek to disclose extra information to mitigate these costs. The bonding cost to managers of voluntarily disclosing information in the firm's annual report about ICD is favourable when compared to the unfavourable increased attention and monitoring by internal and external business financiers. In addition to the above bonding and monitoring mechanisms, the composition of the board of directors is an indicator of good corporate governance. The presence of scientific and technical directors of a biotechnology company is a fair indicator that sound stewardship is taken seriously by their peers on the board. The expectation would be that an independent scientist or technician, an expert in the company's field of endeavour, would drive increased ICD during the reporting process. From the above proposition, we propose the following hypotheses related to information asymmetry, monitoring and board independence:

H4. Firms with a big-six auditor increase voluntary ICD quality and quantity over time.

-
- H5. Increasing ownership diffusion will lead to increasing voluntary ICD quality and quantity over time.
- H6. Increasing board independence will lead to increasing voluntary ICD quality and quantity over time.

2.4 Voluntary disclosure of intellectual capital disclosure and competition

The “mystery” surrounding a firm's successful IP and managers' fears of openly articulating the mechanics of their success are the reasons why IC reporting may reduce as a firm matures. [Depoers and Jeanjean \(2012\)](#) explain it well:

[. . .] models developed by [Wagenhofer \(1990\)](#) and Darrough and Stoughton (1990) show that a firm's disclosure strategy is the result of the trade-off between the benefits of a higher firm value and the possibility of incurring a proprietary cost through competitor response (p. 120).

Because of this idea, we propose that reduced quality and quantity of ICD information may result from managers' anxiety about product market, increased competition and reduced barriers to entry. As a proxy measure, we collected gross property plant and equipment data for each company as a ratio to total assets and propose the following:

- H7. Firms with low PPE to TA ratio have reduced barriers to entry, higher product market concerns and decreasing ICD quality and quantity over time.

2.5 Voluntary disclosure of intellectual capital disclosure and firm performance

[Depoers and Jeanjean \(2012; p. 122\)](#) hypothesised that, “The higher the firm performance, the less firms withhold information”. For this reason, and that management will always be interested in signalling with quality information about their firm's performance to outsiders ([Verrecchia, 1990](#)), we propose the following hypothesis:

- H8. Increasing firm performance (ROA, ROAinc and relative market returns) results in increasing ICD quality and quantity over time.

2.6 Control variables

Highly leveraged firms have significant obligations under existing debt covenants and incur monitoring costs to achieve equilibrium between self-interested managers as agents for external debt-holders ([Dhaliwal et al., 1982](#)). [Watts and Zimmerman \(1986\)](#) further explained that as organisations use more external financing, management are more likely to attempt to use different policies for their own benefit. This study used the level of company's leverage (long-term debt divided by total assets) as a proxy to reflect the obligations, that managers had under existing debt covenants, to voluntarily disclose IC information. A positive correlation between firm leverage and voluntary segment disclosures was found by [Bradbury \(1992\)](#), while no relationship was found between the same two variables measured in New Zealand firms ([Chow and Wong-Boren, 1987](#)). [White et al. \(2007\)](#) found strong evidence that leverage was a significant driver of the amount of ICD for listed Australian biotechnology companies. Therefore, this study will control for leverage and size (the proxy measure used for size of the companies was total revenue):

- H9. Larger firms will have increased ICD quality and quantity over time.

3. Research methodology

Content analysis involves codifying qualitative and quantitative information to derive patterns in the presentation and reporting of information (Guthrie *et al.*, 2004). The 2003, 2006 and 2010 annual reports from 28 Australian biotechnology companies (listed on the ASX) were the original objects of study from which voluntary ICD data were collected. Voluntary ICD in the firms' annual reports were analysed using the framework developed by Guthrie and Petty (2000). Guthrie *et al.* (2006) re-modified the IC framework to account for recent developments in Australia as well as the work of other researchers (see Table I for ICD classifications).

Content analysis of annual reports was adopted as the primary research method. To ensure the reliability of the data collected, two coders were used for consistency. The method was for one coder to read the annual reports, identify and record information related to each item of the ICD onto a coding sheet. The second coder cross-checked the scoring sheet against the scored annual reports, and by way of a forward test also separately scored a sample of annual reports to confirm accuracy of interpretation. The mean disclosure quality score was in effect a weighted average of frequency and disclosure quality. A second coder randomly coded and checked one in five annual reports for consistency and accuracy (see Table II for a definition of variables).

Internal capital

1.1 Intellectual property	Comprises patents, copyrights and trademarks
1.2 Management philosophy	As evidenced by vision/mission statements
1.3 Corporate culture	Comprises the attitudes, experiences, beliefs and values of the company
1.4 Management processes	Relates to processes within a company
1.5 Information/networking systems	Details the development, application and impact of information/networking systems
1.6 Financial relations	Relationships between the company and finance providers, such as banks

External capital

2.1 Brands	Details of brands and reputation building
2.2 Customers	Information (indicators) relating to customers
2.3 Customer loyalty	Indicators of customer satisfaction/positive feedback
2.4 Company names	Names of companies collaborating with the company
2.5 Distribution channels	Information regarding how a company's service and products reach its customers
2.6 Business collaborations	Business collaboration involving the company
2.7 Licensing agreements	Licensing agreements and franchising agreements held by a company

Human capital

3.1 Know-how	Employee knowledge
3.2 Education	Education/ongoing programmes initiated by the company
3.3 Training	Training programmes undertaken/provided by the company
3.4 Work-related knowledge	Gained "on the job" or as part of ongoing training
3.5 Entrepreneurial spirit	Encompasses innovativeness; proactive and reactive abilities; and changeability

Table I.

ICD classification: a modified intangible asset monitor

Sources: IC Framework adopted from Guthrie *et al.* (2006); description adapted from Schneider and Samkin (2008) and represent the focus of analysis when narrative examined during scoring of the company annual reports

Variable	Definition	Source of information
PPE to TA	Gross PPE divided by total assets. Expressed as a decimal	S&P CapitalIQ database
ROA	Operating income before tax divided by total assets as a percentage	S&P CapitalIQ database
ROAinc	Dummy variable for increasing ROA coded 1 if the ROA increases from $t-1$ to t , otherwise zero	In MS Excel by comparing ROA between years
Rel. Mkt. Ret	Annual stock market returns of a firm scaled against the returns of its peers. Returns were measured five months after year end to allow for market corrections during reporting	S&P CapitalIQ database to obtain marked share price then MS Excel for calculation
Audit	Dummy variable coded 1 if the firm had a big six audit firm	S&P CapitalIQ database to collect auditor details and manually scored
Own Diff	Sum of the three largest shareholders. Expressed as a percentage of total ordinary shares	Hand-collected data from firm annual reports at 30 June 2003, 2006 and 2010
Board Ind	Percentage of non-executive directors	Hand-collected data from firm annual reports at 30 June 2003, 2006 and 2010
Leverage	Long-term debt divided by total assets. Expressed as a decimal	S&P CapitalIQ database
Revenue	Natural log of total revenue	S&P CapitalIQ database
ICDQint	Internal capital disclosure quality of items related to IP, management philosophy, corporate culture, management process and information and networking systems. Expressed as a decimal mean quality score	Hand-collected data from firm annual reports at 30 June 2003, 2006 and 2010
ICDQext	External capital disclosure quality of items related to brands, customer, company names, distribution channels, business collaborations, licensing agreements and customer loyalty. Expressed as a decimal mean quality score	
ICDQhum	Human capital disclosure quality of items related to know-how, education, training, entrepreneurial-spirit and work-related knowledge. Expressed as a decimal mean quality score	
ICDFint	Measures the frequency of all internal capital disclosures with a quality score greater than zero	
ICDFext	Measures the frequency of all external capital disclosures with a quality score greater than zero	
ICDFhum	Measures the frequency of all human capital disclosures with a quality score greater than zero	

Table II.
Definition of variables[3]

Previous studies have assessed the quality of IC disclosure using differing quality criteria scales (Abeysekera and Guthrie, 2005; Bontis, 2001; Bozzolan *et al.*, 2003; Brennan, 2001; Goh and Lim, 2004; Guthrie *et al.*, 1999; Guthrie *et al.*, 2006; Schneider and Samkin, 2008; Shareef and Davey, 2005; Wong and Gardner, 2005; Yi and Davey, 2010). Often IC reporting is done in narrative rather than numerical measures (Guthrie *et al.*, 1999; Guthrie *et al.*, 2006). In this study, we concluded that a four-point (0-3) scale would be sufficient to capture the quality of IC disclosure in annual reports and ensure the reliability of the results. A value of zero (0) was assigned if the variable did not appear in the annual report:

- if the variable appeared in narrative form;
- if the variable was expressed in specific (numerical) terms; and
- if the variable was quantified in dollar terms.

Guthrie *et al.* (2006), in their study of Hong Kong and Australian firms, divided the annual reports into five sections:

- (1) the vision/strategy section;
- (2) the director's section;
- (3) the business/operational section;
- (4) the financial section; and
- (5) the "other" sections.

Their findings showed IC elements were most widely reported in the "business/operational" section of the annual report with nearly half of all reporting in that section. The "other" section, which included any items that did not fit into the classification of the remaining sections, was the second most popular with nearly one quarter of all IC items disclosed in that location. The least amount of disclosure was in the financial section. This is as expected as there are no corporation laws or accounting standards that require the quantification of IC. This approach provides a description of the disclosure practices of organisations. In this study, we measured ICD location using five sections (Guthrie *et al.*, 2004) and also included the CEO's and Chairman's letter (Table VII) as other points of interest considering the agency theory context of this study.

Data pertaining to the market capitalisation and level of company's leverage were sourced from the *Capital IQ* (S&P) database. In this study, the distribution of the data collated was not normally distributed; skewness and kurtosis were high for some variables (see Table III for descriptive statistics), and because of this, non-parametric analysis was conducted with IBM's SPSS Statistics 22 software when required. To test for any significant relationships between the variables, Spearman's rank correlation coefficient was run to determine the correlations between the variables in each year. Mann–Whitney U tests (not shown) were performed to test whether leverage and market capitalisation had a significant effect on the quality of the disclosed IC categories. Finally, Wilcoxon signed-rank tests were performed to determine significant change in ICD quality between years.

4. Results

The measured quality and frequency of ICD reported in 2003, 2006 and 2010 for the sampled biotechnology companies shows that the firms reported the highest quality information about internal capital in all periods – mean quality score of 0.57 in 2003, 0.50 in 2006 and 0.45 in 2010 (see Table III for mean dependent variable descriptive data and *t*-test results). Human capital was the lowest quality ICD reported with 0.23 mean quality score in 2003, 2006 and 2010. External capital disclosures had mean disclosure quality between the score for external capital and human capital with 0.57 in 2003, 0.50 in 2006, and 0.45 in 2010.

In the second half (bottom nine rows) of Table III, the mean ICD frequency (ICDF) data are reported showing that external ICD is disclosed more frequently than internal ICD in the firms' annual reports with the frequency of human ICD lowest. The internal capital reporting about intellectual property, management philosophy, culture, processes and systems was less frequent but higher quality in these firms' annual reports than external capital reporting about brands, customers, customer loyalty, collaborations and licensing

	Mean score	Minimum	Maximum	SD	Skewness	Kurtosis
ICDQint03	0.57	0.33	0.92	0.16	0.44	-0.43
ICDQint06	0.50** (2.446, 0.023)	0.17	0.92	0.19	0.29	-0.55
ICDQint10	0.45** (2.586, 0.017)	0.08	0.75	0.18	-0.18	-0.84
ICDQext03	0.45	0.11	0.79	0.17	0.34	-0.30
ICDQext06	0.39 (1.588, 0.127)	0.16	0.58	0.13	-0.24	-1.17
ICDQext10	0.37* (2.009, 0.058)	0.11	0.68	0.14	0.01	-0.26
ICDQhum03	0.23	0.18	0.45	0.07	1.78	4.56
ICDQhum06	0.23 (0.224, 0.825)	0.09	0.36	0.08	0.00	-0.62
ICDQhum10	0.23 (0.000, 1.000)	0.18	0.55	0.08	2.76	9.73
ICDFint03	10.95	3.00	23.00	5.57	0.90	-0.08
ICDFint06	9.82 (1.083, 0.291)	4.00	18.00	3.90	0.53	0.17
ICDFint10	10.64 (0.257, 0.800)	4.00	23.00	4.35	0.96	1.76
ICDFext03	15.14	6.00	37.00	8.43	1.19	1.02
ICDFext06	13.91 (0.613, 0.547)	4.00	40.00	8.50	1.60	3.34
ICDFext10	11.86** (2.356, 0.028)	2.00	23.00	5.30	0.58	0.22
ICDFhum03	3.77	1.00	14.00	2.76	2.62	8.80
ICDFhum06	5.14** (-2.131, 0.045)	1.00	13.00	3.52	1.11	0.55
ICDFhum10	3.32 (0.865, 0.397)	1.00	8.00	1.94	1.15	0.84

Notes: (p -values, $0.1 > p > 0.05$, *; $0.05 > p > 0.01$, **; $0.01 > p$, ***); paired-samples t -test results are reported as (t statistic, 2-tailed sig); t -test comparisons were done against 2003 as the base year

Table III.
Descriptive statistics and paired-sample t test comparison of mean disclosure quality score and disclosure frequency of ICD in 2006 and 2010 compared to base 2003

agreements which were more frequent but of lower quality. In addition, paired-sample t -test results shown in Table III compare the mean ICD quality score to 2003 as a base showing that there was a significant 26.7 per cent reduction (0.57-0.45/0.45) in internal capital disclosure quality and significant 21.6 per cent reduction (0.45-0.37) in external capital quality over the eight financial reporting periods from 2003 to 2010. In summary, we measured a significant decrease in quality of internal capital ICD from 2003 to 2006 and 2003 to 2010, despite consistency between these periods for the amount of disclosure. Disclosures about external capital ICD appeared to also be reducing in quality from 0.45 to 0.37 over the same time frame, but this was not significant. The only significant change measured in ICD frequency was a reduction in external capital ICD from 2003 to 2006 and an increase in human capital ICD from 2003 to 2006, but neither of these changes in the amount disclosed seemed to effect quality (as stated above).

The measurement of significant changes in mean ICD quality and frequency in Table III led to more detailed investigation of which independent variables drivers might be responsible for changes in disclosure quality and frequency over time. Lagged Spearman's correlation results for lagged-mean ICD quality score are presented in Table IV. The most important results here show that multi-collinearity does not appear to be an issue among

Table IV.
Spearman's
correlation of lagged
dependent variable
data for ICD
frequency and
quality

	Mean disclosure quality index				Disclosure frequency					
	ICDQint 2006 to 2010	ICDQint 2003 to 2010	ICDQext 2006 to 2010	ICDQext 2003 to 2010	ICDQhum 2006 to 2010	ICDQhum 2003 to 2010	ICDFext 2006 to 2010	ICDFext 2003 to 2010	ICDFhum 2006 to 2010	ICDFhum 2003 to 2010
<i>Mean disclosure quality index</i>										
ICDQint 2003 to 2010	1.000									
Correlation Coefficient	0.754***	0.090	0.143	0.235	-0.118	0.129	0.460**	0.183	0.377*	-0.063
Significance (2-tailed)	0.000	0.692	0.526	0.293	0.602	0.567	0.031	0.415	0.084	0.969
ICDQint 2006 to 2010		1.000								
Correlation Coefficient		0.124	0.099	0.356	-0.078	0.241	0.362*	0.180	0.440**	-0.003
Significance (2-tailed)		0.581	0.662	0.104	0.731	0.279	0.098	0.423	0.040	0.988
<i>N</i>										
ICDQext 2006 to 2010			1.000							
Correlation Coefficient			0.485**	0.117	-0.010	-0.151	-0.317	0.756***	0.152	0.285
Significance (2-tailed)			0.022	0.605	0.966	0.502	0.151	0.000	0.499	0.199
ICDQext 2003 to 2010			1.000							
Correlation Coefficient			1.000	0.190	-0.141	-0.270	-0.305	0.337	0.710***	0.304
Significance (2-tailed)				0.396	0.531	0.224	0.168	0.126	0.000	0.169
ICDQhum 2006 to 2010				1.000						
Correlation Coefficient				0.398*	0.156	-0.186	-0.186	0.252	0.353	0.318
Significance (2-tailed)				0.067	0.488	0.407	0.407	0.258	0.107	0.149
ICDQhum 2003 to 2010				1.000						
Correlation Coefficient				1.000	1.000	-0.020	-0.432*	-0.044	-0.141	-0.083
Significance (2-tailed)						0.931	0.045	0.847	0.531	0.712

(continued)

	Mean disclosure quality index						Disclosure frequency			
	ICDQint 2006 to 2010	ICDQint 2003 to 2010	ICDQext 2006 to 2010	ICDQext 2003 to 2010	ICDQhum 2006 to 2010	ICDQhum 2003 to 2010	ICDFint 2003 to 2010	ICDFext 2003 to 2010	ICDFhum 2006 to 2010	ICDFhum 2003 to 2010
<i>Disclosure frequency</i>										
ICDFint										
2006 to 2010										
Correlation Coefficient										
Significance (2-tailed)										
ICDFint										
2003 to 2010										
Correlation Coefficient										
Significance (2-tailed)										
ICDFext										
2006 to 2010										
Correlation Coefficient										
Significance (2-tailed)										
ICDFext										
2003 to 2010										
Correlation Coefficient										
Significance (2-tailed)										
ICDFhum										
2006 to 2010										
Correlation Coefficient										
Significance (2-tailed)										
ICDFhum										
2003 to 2010										
Correlation Coefficient										
Significance (2-tailed)										

Notes: p -values, $0.1 > p > 0.05$, *; $0.05 > p > 0.01$, **; $0.01 > p$, ***

Table IV.

dependent lagged-disclosure quality data compared to lagged-disclosure frequency. The results in [Table IV](#) also show that there is an expected correlation between the lagged data over Period 1 (2003-2010) compared to Period 2 (2006-2010).

Mean disclosure quality score was measured for each disclosure item separately to get a clearer picture of where change in disclosure quality was happening. Statistical analysis was done using non-parametric Chi-squared and *P*-value confidence levels of a Friedman's test. This determined whether there was any significant difference between the change in mean quality score. Post hoc analysis by Wilcoxon signed-rank test then measured the direction of the change for each disclosure item (see [Table V](#) for details).

The first observation that can be made about differences in IC reporting quality between 2003, 2006 and 2010 is that items measuring internal capital reporting quality changed significantly. Friedman's test revealed significant change in the quality of "intellectual property" ($\chi^2 = 7.038, P = 0.030$), "corporate culture" ($\chi^2 = 18.0, P = 0.000$), "management processes" ($\chi^2 = 10.0, P = 0.007$) and "financial relations" ($\chi^2, P = 0.041$) disclosures. In contrast, reporting quality of only one external capital item changed significantly over the same period, the "customer" items ($\chi^2 = 6.4, P = 0.015$). This meant that the quality of only one of the seven possible external capital items had changed significantly over the period of study. No significant changes was measured in the quality of human capital disclosure.

Post hoc analysis with Wilcoxon signed-rank tests was done to see the directionality and period when significant changes in reporting quality took place. In summary, the most important and surprising finding from this analysis is that all significant changes in IC reporting point to decreasing quality over time.

[Table VI](#) measures the change in mean ICD quality and change in ICD frequency over the whole period of the study against some important explanatory variables, as discussed in the literature review and hypothesis section.

The annual report was divided into seven locations, namely, vision/strategy, director's report, business/operational, financial statements and notes, chairman's letter, CEO's letter and others. [Table VII](#) presents the descriptive statistics with regards to the frequency of ICD classification per location in the annual report. The total counts of disclosure for each year ranged from 632 in the 2010 data set (lowest) to 757 in the 2003 data set.

Table V.
ICD quality changes: Significant quality changes in specific IC items (missing disclosure items did not show significant changes in disclosure quality)

	2003	2006	2010		2003 to 2006	2006 to 2010	2003 to 2010
	Mean rank			Friedman's test	Wilcoxon's signed-ranks test		
1.0 Internal capital							
1.1 Intellectual property	2.25	1.77	1.98	$\chi^2 = 7.038,$ $P = 0.030^{**}$	$Z = -2.636,$ $P = 0.008^{***}$		
1.3 Corporate culture	1.68	2.16	2.16	$\chi^2 = 18.0,$ $P = 0.000^{***}$	$Z = -3.000,$ $P = 0.003^{***}$		$Z = -3.000,$ $P = 0.003^{***}$
1.4 Management processes	2.18	2.18	1.64	$\chi^2 = 10.0,$ $P = 0.007^{***}$		$Z = -2.500,$ $P = 0.012^{**}$	$Z = -3.000,$ $P = 0.008^{***}$
1.6 Financial relations	2.21	2.02	1.77	$\chi^2 = 6.4,$ $P = 0.041^{**}$			$Z = -2.460,$ $P = 0.014^{**}$
2.0 External capital							
2.2 Customers	2.29	2.00	1.71	$\chi^2 = 8.4,$ $P = 0.015^{**}$			$Z = -2.230,$ $P = 0.026^{**}$

Notes: *p*-values, $0.1 > p > 0.05$, *, $0.05 > p > 0.01$, **, $0.01 > p$, ***

Table VI.
Spearman's correlation matrix (extract) of lagged ICD quality and frequency with possible determinants

	ICDQ _{int} 2003 to 2010	ICDQ _{ext} 2003 to 2010	ICDQ _{hum} 2003 to 2010		ICDF _{int} 2003 to 2010	ICDF _{ext} 2003 to 2010	ICDF _{hum} 2003 to 2010	Determinants
PPE to TA	0.161	0.239	0.078	PPE to TA	-0.233	0.349	0.073	Product market concerns
ROA	0.474	0.283	0.731	ROA	0.296	0.112	0.746	Performance
ROA _{inc}	-0.129	0.256	0.252	ROA _{inc}	-0.043	0.180	0.213	Performance
Rel. Mkt. Ret	0.568	0.251	0.257	Rel. Mkt. Ret	0.850	0.424	0.342	Performance
Audit	-0.321	-0.187	0.000	Audit	0.023	-0.344	-0.219	Performance
Own. Diff	0.145	0.406	1.000	Own. Diff	0.920	0.118	0.327	Ownership
Board Ind	0.073	-0.543***	0.165	Board Ind	0.001	-0.519**	-0.314	Monitoring
Leverage	0.747	0.009	0.463	Leverage	0.998	0.013	0.155	Risk
Revenue	-0.259	-0.093	0.246	Revenue	-0.297	-0.144	0.044	Size
	0.245	0.679	0.269		0.179	0.523	0.847	
	0.399*	-0.045	-0.223		0.458**	-0.065	-0.446**	
	0.066	0.841	0.318		0.032	0.773	0.038	
	-0.176	0.004	0.348		-0.183	-0.029	0.358	
	0.433	0.985	0.113		0.414	0.897	0.102	
	-0.202	0.514**	0.398*		-0.484**	0.011	0.015	
	0.367	0.014	0.067		0.022	0.962	0.946	
	-0.030	0.019	-0.175		-0.231	-0.126	0.040	
	0.894	0.934	0.437		0.301	0.577	0.861	

The least amount of ICD disclosure was in the vision/strategy section, accounting for no more than 1 per cent of total counts recorded in any one year. A fair amount of total ICD was found in the Chairman's letter and CEO's letter sections of the annual reports, with a total averaging about 17 per cent period of the study (18.36 per cent in 2003; 16.50 per cent in 2006; and 19.78 per cent in 2010). This was interesting given that these sections were short compared to the length of the whole annual report, but probably reflect the firm executives' engagement with intangible firm-value when constructing their sections of the annual report. It is difficult to make assumptions about the reason or possible motives of management, but the recorded observation of where ICD frequency occurred may inform future content analysis research using annual report data. For example, recent reviews have surmised that new and more interesting methodologies are required for measuring ICD to improve on the haphazard nature of prior research work in the field (Dumay and Cai, 2014).

5. Discussion

A central research question of this study was to examine voluntary ICD quality (ICDQ) over time for these companies – *H2* is accepted for our findings. In Table III, *t*-test results of mean internal and external capital ICDQ were shown to reduce significantly over the 2003-to-2010 period. In particular, items related to disclosures about intellectual property (item 1.1; see Table I), management processes (item 1.3), corporate culture (item 1.4), financial relations (item 1.6) and customers (item 2.2) showed significantly reduced quality over time (Table V).

Table VII.
Reporting ICD
frequency in different
annual report
locations

	Vision/ strategy	Director's report	Business/ operational	Financial	Chairman's letter	CEO's letter	Others	Sum
<i>Internal capital</i>								
2003 Count	2	70	57	42	25	11	67	274
2006 Count	5	89	71	19	16	6	35	241
2010 Count	1	86	20	20	26	1	121	275
<i>External capital</i>								
2003 Count	0	99	122	17	55	34	60	387
2006 Count	0	113	107	12	44	43	52	371
2010 Count	0	58	54	28	80	10	39	269
<i>Human capital</i>								
2003 Count	0	51	19	0	6	8	12	96
2006 Count	0	77	22	0	8	3	6	116
2010 Count	0	62	9	0	8	0	9	88

In the field of voluntary disclosure practice, different agency theory drivers have been shown to have an effect on management voluntary ICD practices, especially in larger firms (Bukh *et al.*, 2005; Van der Zahn, 2007; White *et al.*, 2007). *H1* is rejected because ICD frequency (ICDF) *t*-test results in Table III only showed external capital ICD decreasing, and only between the mean disclosures in 2003 and 2010. There was no significant decrease in total mean ICDF over the study period. The only other significant decrease was measured for the mean results in human capital ICDF from 2003 and 2006.

Over the full period of this study, between 2003 and 2010, *H3* is accepted with correlation between lagged ICDQ and ICDF data in Table IV. The cluster of significant correlations in the upper-right of Table IV support the conclusion that managers internal ICD and/or external ICD was positively correlated with higher ICDQ. Although not measured, it seems likely that the customer ICD findings in Table V, support the findings of previous research about UK and Australian biotechnology firms (White *et al.*, 2010). This statement is supported by the findings in paragraph one related to item 2.2 above.

Monitoring variables (*H4* audit firm size and *H6* board independence) did not correlate with a significant change in ICDF or ICDQ comparing 2003 to 2010. The *t*-test results confirmed significant increasing board independence for these companies over this period, but this did not correlate with improved mean ICDQ score.

Ownership diffusion and leverage as measures of agency cost of equity and debt were examined in *H5* and *H10*, respectively. The score for ownership diffusion is the greatest when the percentage ownership attributed to the top three shareholders is small, and we can observe that ownership diffusion is more significant and positively correlated as a driver of ICDF than ICDQ (Table VI). This suggests that ownership diffusion is significant and accepted. This

ownership diffusion finding is consistent with the result of [Depoers and Jeanjean \(2012; p. 139\)](#) for information withholding in reports:

Our results show more precisely that what helps to achieve this aim [consistent disclosure policy to mitigate agency costs] is not so much the volume of voluntary disclosures [...] but the stability and comparability of that information over time.

Another interesting finding is that increasing leverage appears to be positively associated with ICDQ but negatively correlated with ICDF. In fact, looking closer at ICD classification and whether *H10* can be accepted, debt is significant and positive for voluntary disclosures about external capital which not surprisingly fits with findings from previous research with Australian biotechnology firms in an agency theory context ([White et al., 2007](#)).

H8 is not accepted based on these findings. Increased relative market returns was the only performance measure which was significantly associated with ICDQ and ICDF as managers' signal through annual reports and, most likely, the expectation of an imperfect market and price adjustment. Internal financial performance variables such as ROA and ROAinc were not significant ([Table VI](#)). In this case, the negative correlation of mean ICDQ with market return measure seems to show that poor relative market returns is driving managers to justify performance with narrative instead of reporting a value. This conclusion is based on how the ICDQ scoring was done for each disclosure item – highest when actual dollar value was measured for a disclosure item.

Finally, it is interesting to observe that in relation to biotechnology firms there has been specific examples in past research which definitely show mature firms listing through IPO disclose more IC information ([Cordazzo and Vergauwen, 2012](#)) in the UK. [White et al. \(2010\)](#) have also demonstrated interesting ICD differences in the annual reports of UK and Australian biotechnology companies. A reasonable application of these findings, when compared to this paper, is that this paper has analysed paired data for companies listed at least eight years on the ASX. The enthusiasm of reporting ICD in the companies' early-years may result in the measured decreases in frequency and quality over the whole study period. This possibility does not diminish the other observations we have been able to make about the drivers of disclosure.

6. Conclusions, limitations and future research

One limitation of this study is that it only examines the annual reports of a sample of Australian biotechnology firms that were operating during the period 2003-2010; therefore, results may be industry and country specific. This limitation is somewhat mitigated by the analysis of paired-sample firms throughout the period under examination, rather than a random sample of firms in each period. The study was planned to sample the same companies throughout the period, and companies which had not significantly changed their activity during that period.

Although we have not examined the literature around measuring management enthusiasm for voluntary disclosure, it would be intriguing to see this avenue explored in future studies, as fatigue must be an issue when measuring disclosure practice in the highly regulated annual reporting process of listed companies.

Note

1. Average disclosure quality out of a maximum of 1.

References

- Abeysekera, I. and Guthrie, J. (2005), "An empirical investigation of annual reporting trends of intellectual capital in Sri Lanka", *Critical Perspectives on Accounting*, Vol. 16 No. 3, pp.151-163.
- April, K.A., Bosma, P. and Deglon, D.A. (2003), "IC measurement and reporting: establishing a practise in SA mining", *Journal of Intellectual Capital*, Vol. 4 No. 2, pp. 165-180.
- Bontis, N. (2001), "CKO wanted – evangelical skills necessary: a review of the chief knowledge office position", *Knowledge and Process Management*, Vol. 8 No. 1, pp. 29-38.
- Bosworth, D. and Rogers, M. (2001), "Market value, R&D, and intellectual property: an empirical analysis of large Australian firms", *The Economic Record*, Vol. 77 No. 239, pp. 323-337.
- Bozzolan, S., Favotto, F. and Ricceri, F. (2003), "Italian annual intellectual capital disclosure: an empirical analysis", *Journal of Intellectual Capital*, Vol. 4 No. 4, pp. 543-558.
- Bradbury, M.E. (1992), "Voluntary disclosure of financial segment data: New Zealand evidence", *Accounting and Finance*, Vol. 32 No. 1, pp. 15-26.
- Brennan, N. (2001), "Reporting intellectual capital in annual reports: evidence from Ireland", *Accounting, Auditing & Accountability Journal*, Vol. 14 No. 4, pp. 423-436.
- Bukh, P.N. (2003), "The relevance of intellectual capital disclosure: a paradox", *Accounting, Auditing & Accountability Journal*, Vol. 16 No. 1, pp. 49-56.
- Bukh, P.N., Nielsen, C., Gormsen, P. and Mouritsen, J. (2005), "Disclosure of information on intellectual capital in Danish IPO prospectuses", *Accounting, Auditing and Accountability Journal*, Vol. 18 No. 6, p. 713.
- Chow, C.W. and Wong-Boren, A. (1987), "Voluntary financial disclosure by Mexican corporations", *The Accounting Review*, Vol. 62 No. 3, pp. 533-541.
- Code of Best Practice for Reporting by Life Science Companies (2013), 2nd edn., available at: www.asx.com.au/documents/research/Code_of_Best_Practice_for_Reporting_by_Life_Science_Companies.pdf (accessed 3 December 2013).
- Cordazzo, M. and Vergauwen, P.G.M.C. (2012), "Intellectual capital disclosure in the UK biotechnology IPO prospectuses", *Journal of Human Resource Costing*, Vol. 16 No. 1, pp. 4-19.
- Deng, Z., Lev, B. and Narin, F. (1999), "Science and technology as predictors of stock performance", *Financial Analyst Journal*, Vol. 20 No. 3, pp. 20-32.
- Depoers, F. and Jeanjean, T. (2012), "Determinants of quantitative information withholding in annual reports", *European Accounting Review*, Vol. 21 No. 1, pp. 115-151.
- Dhaliwal, D.S., Salamon, G.L. and Smith, E.D. (1982), "The effect of owner versus management control on the choice of accounting methods", *Journal of Accounting and Economics*, Vol. 4 No. 1, pp. 41-53.
- Dumay, J. and Cai, L. (2014), "A review and critique of content analysis as a methodology for inquiring into IC disclosure", *Journal of Intellectual Capital*, Vol. 15 No. 2, pp. 264-290.
- Edvinsson, L. and Malone, M.S. (1998), *Intellectual Capital*, Judy Piatkus.
- Ghosh, D. and Wu, A. (2007), "Intellectual capital and capital markets: additional evidence", *Journal of Intellectual Capital*, Vol. 8 No. 2, pp. 216-235.
- Goebel, V. (2015), "Is the literature on content analysis of intellectual capital reporting heading towards a dead end?", *Journal of Intellectual Capital*, Vol. 16 No. 3, pp. 681-699.
- Goh, P.C. and Lim, K.P. (2004), "Disclosing intellectual capital in company annual reports: evidence from Malaysia", *Journal of Intellectual Capital*, Vol. 5 No. 3, pp. 500-510.
- Guthrie, J. and Petty, R. (2000), "Intellectual capital: Australian annual reporting practices", *Journal of Intellectual Capital*, Vol. 1 No. 3, pp. 246-251.
- Guthrie, J., Petty, R. and Ricceri, F. (2006), "The voluntary reporting of intellectual capital: comparing evidence from Hong Kong and Australia", *Journal of Intellectual Capital*, Vol. 7 No. 2, pp. 254-271.

- Guthrie, J., Petty, R. and Yongvanich, K. (2004), "Using content analysis as a research method to inquire into intellectual capital reporting", *Journal of Intellectual Capital*, Vol. 5 No. 2, pp. 282-293.
- Guthrie, J., Petty, R., Ferrier, F. and Wells, R. (1999), *There is No Accounting for Intellectual Capital in Australia: A Review of Annual Reporting Practices and the Internal Measurement of Intangibles*, OECD Symposium on Measuring and Reporting of Intellectual Capital, Amsterdam, Holland.
- Hirschey, M. (1998), "How much is a tulip worth?", *Financial Analyst Journal*, Vol. 54 No. 4, pp. 11-17.
- Jensen, M.C. and Meckling, W.H. (1976), "Theory of the firm: managerial behaviour, agency costs and ownership structure", *Journal of Financial Economics*, Vol. 3 No. 4, pp. 305-360.
- Khan, M.H.U.Z. and Ali, M.M. (2010), "An empirical investigation and users' perceptions on intellectual capital reporting in banks", *Journal of Human Resource Costing and Accounting*, Vol. 14 No. 1, pp. 48-69.
- Lev, B. (2001), *Intangibles: Management, Measurement, and Reporting*, The Brookings Institution, Washington, DC.
- Lev, B. and Sougiannis, T. (1996), "The capitalization, amortization, and value-relevance of R&D", *Journal of Accounting and Economics*, Vol. 21 No. 1, pp. 107-138.
- Li, J., Pike, R. and Haniffa, R. (2008), "Intellectual capital disclosure and corporate governance structure in UK firms", *Accounting and Business Research*, Vol. 38 No. 2, pp. 137-159.
- Nimtrakoon, S. (2015), "The relationship between intellectual capital, firms' market value and financial performance", *Journal of Intellectual Capital*, Vol. 16 No. 3, pp. 587-618.
- Olsson, B. (2001), "Annual reporting practices: information about human resources in corporate annual reports in major Swedish Companies", *Journal of Human Resource Costing & Accounting*, Vol. 6 No. 1, pp. 39-52.
- Petty, R. and Cuganesan, S. (2005), "Voluntary disclosure of intellectual capital by Hong Kong companies: examining size, industry and growth effects over time", *Australian Accounting Review*, Vol. 15 No. 36, pp. 40-50.
- Roos, J., Roos, G., Dragonetti, N.C. and Edvinsson, L. (1997), *Intellectual Capital: Navigating the New Business Landscape*, MacmillanPress Limited, Basingstoke, Hampshire.
- Schneider, A. and Samkin, G. (2008), "Intellectual capital reporting by the New Zealand local government sector", *Journal of Intellectual Capital*, Vol. 9 No. 3, pp. 456-486.
- Shareef, F. and Davey, H. (2005), "Accounting for intellectual capital: evidence from listed english football clubs", *Journal of Applied Accounting Research*, Vol. 7 No. 3, pp. 78-116.
- Stewart, T.A. (1997), *Intellectual Capital: The New Wealth of Organizations*, Nicholas Brealey, London.
- Sveiby, K.-E. (1997), *The New Organisational Wealth: Managing and Measuring Knowledge Based Assets*, Berrett-Koehler Publishers, San Francisco, CA.
- Van der Zahn, M.J.-L.W., Singh, I. and Heniro, J. (2007), "Is there an association between intellectual capital disclosures, under-pricing and long-run performance", *Journal of Human Resource Costing and Accounting*, Vol. 11 No. 3, p. 178.
- Verrecchia, R.E. (1990), "Essays on disclosure", *Journal of Accounting and Economics*, Vol. 12, pp. 365-380.
- Wagenhofer, A. (1990), "Voluntary disclosure with a strategic opponent", *Journal of Accounting and Economics*, Vol. 12, pp. 341-363.
- Watts, R. and Zimmerman, J. (1986), *Positive Accounting Theory*, Prentice Hall, Edgewood Cliffs, NJ.
- White, G., Lee, A. and Tower, G. (2007), "Drivers of voluntary intellectual capital disclosure in listed biotechnology companies", *Journal of Intellectual Capital*, Vol. 8 No. 3, pp. 517-537.

- White, G., Lee, A., Yuningsih, Y., Nielsen, C. and Bukh, P.N. (2010), "The nature and extent of voluntary intellectual capital disclosures by Australian and UK biotechnology companies", *Journal of Intellectual Capital*, Vol. 11 No. 4, pp. 519-536.
- Wong, M. and Gardner, C. (2005), "Intellectual capital disclosure: New Zealand evidence", paper presented at the AFFANZ 2005 conference, Melbourne.
- Whiting, R.H. and Woodcock, J. (2011), "Firm characteristics and intellectual capital disclosure by Australian companies", *Journal of HRCA: Human Resource Costing & Accounting*, Vol. 15 No. 2, pp. 102-126.
- Wyatt, A. (2008), "What financial and non-financial information on intangibles is value relevant? a review of the evidence", *Accounting and Business Research*, Vol. 38, pp. 217-256.
- Yi, A. and Davey, H. (2010), "Intellectual capital disclosure in Chinese (mainland) companies", *Journal of Intellectual Capital*, Vol. 11 No. 3, pp. 326-347.

Further reading

- Vandemaale, S.N., Vergauwen, P.G.M.C. and Smiths, A.J. (2005), "Intellectual capital disclosure in the Netherlands, Sweden and the UK", *Journal of Intellectual Capital*, Vol. 6 No. 3, pp. 417-426.

Corresponding author

Gregory White can be contacted at: Greg.White@cbs.curtin.edu.au

Reproduced with permission of copyright owner. Further reproduction prohibited without permission.