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Capital Market Pressures and the Format of Intellectual Capital Disclosure in Intellectual Capital Intensive Firms

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Abstract

Purpose - A number of studies have examined firms' intellectual capital (IC) disclosure practices. However, the presentation format of IC disclosure (text, numerical and graphs/pictures) is yet to be examined. In addition, there is little evidence on the impact of capital market pressures on IC disclosure. This study aims to examine the relation between presentation format of IC disclosures and three market factors (market-to-book ratio, share price volatility and multiple listing).

Design/methodology/approach - Using content analysis, we examine the level of IC disclosure provided in the annual reports of 100 IC-intensive listed UK firms. A 61-IC-item research instrument is used to measure IC disclosure and regression analysis is employed to examine the relation between disclosure and the market factors, controlling for corporate governance and firm specific variables.

Findings - Text is the most commonly used format for IC disclosure, whilst the use of graphs/pictures is very low. The findings of the relation between market factors and IC disclosure are mixed. Market-to-book ratio is significantly related to disclosure in text and numerical, but not to graphs/pictures. Share price volatility is only associated with graphs/pictures, whilst multiple listing is only related to text.

Originality/value - Our findings suggest that the impact of capital market pressures on IC disclosure might differ with presentation format. In this context, the study makes a significant contribution to the IC disclosure literature.

Key words - Intellectual capital disclosure; content analysis; presentation format; market factors; UK

Paper type – Research paper

1. Introduction and Background to Study

Business in the twenty-first century has changed fundamentally to relying on knowledge-based assets (also referred to as intellectual capital (IC)) instead of just financial and physical assets in creating value. This is evidenced by increasing large investments in IC assets, such as human resources, information technology, R&D and advertising. Consequently, there is an increased level of attention on IC, which is now recognised as an integral part of a firm's value-creating processes and key to building competitive advantage (e.g. Bukh, 2003; Holland, 2003). However, because the existing GAAP allows immediate expensing of IC investments, financial reports fail to reflect adequately these assets (Francis and Schipper, 1999). This compounds the information asymmetry problem between managers and investors particularly given that IC reporting is largely unregulated (Francis and Schipper, 1999; Aboody and Lev, 2000). The absence of regulation gives managers discretion on what information to disclose, thus presenting difficulties for investors since IC is unique to specific firms and cannot be inferred by looking at other firms.

Given the information asymmetry problem, there have been increasing calls for firms to enhance the disclosure of IC information (e.g. Beattie et al., 2004; ASB, 2007) to improve the market's understanding of the firm's value creation processes and facilitate a more precise valuation of the firm (e.g. Bukh, 2003; Holland, 2003; Mangena et al., 2014). Consequently, a growing body of studies has examined the substance/content of IC disclosures made by firms (e.g. Brennan, 2001; Beattie and Thomson, 2007; Campbell and Abdul Rahman, 2010) and the factors, particularly firm-specific and corporate governance factors, that help explain differences in IC disclosure (e.g. Bozzolan et al., 2003; Cerbioni and Parbonetti, 2007; Li et al., 2008). These studies have shown an increasing trend in IC disclosure and demonstrated that differences in disclosure can be explained by corporate governance and firm-specific factors.

Whilst previous studies provide significant insights into IC disclosure practices, nothing is known about presentation formats of IC information. Ambler et al. (2001) advocate for the use of a mix of qualitative and quantitative data in reporting IC information to market participants. For example, text and graphs/pictures have been shown to be important for communicating non-financial information (see Beattie et al., 2004; Davison and Skerratt, 2007; Beattie et al., 2008). A combination of text, numbers and graphs/pictures in annual reports enables firms to construct their reported message about IC more meaningfully as a story. However, despite the text, numbers and graphs/pictures all being powerful communicative reporting media for constructed IC messages to be disclosed in annual reports, few studies have been conducted to examine the extent of IC disclosure in the different presentation formats. Indeed, Jones (2011) argues that the use of presentation formats in corporate disclosure research is an area that has previously been neglected.

There are, however, some studies that have examined the format of presentation in annual reports, particularly within the impression management literature (e.g. Beattie and Jones, 1992, 2002; Beattie et al., 2008; Jones, 2011). These studies have demonstrated increasing use of graphs/pictures in annual reports. They concluded that presentation formats, for example graphs/pictures, in the corporate reporting process can be used in two different ways (e.g. Muino and Trombetta, 2009; Jones, 2011). On the one hand, they can be used to enhance communication when the different presentation formats are used as complementing each other. On the other hand, they can also potentially be used to present information giving a partial and selective view in order to portray the firm in a favourable light (Jones, 2011). These studies have, however, focused on examining presentation formats relating to financial information, such as the use and abuse of graphs in annual reports (e.g. Beattie and Jones, 1992, 2002; Muino and Trombetta, 2009), and very little work is done on the use of presentation format in IC information. Given the importance of IC information to the capital

market, an understanding of IC disclosure in different presentation format helps us to build a picture of how firms communicate its IC information to the market participants and other stakeholders. In addition, and particularly relevant to the current study, the existing literature has not examined why there are differences in disclosure presentation formats. For example, in previous disclosure studies (see Gray et al., 1995; Debreceeny and Rahman, 2005; Mangena and Pike, 2005; Li et al., 2008), it has been argued and demonstrated that there are factors that motivate firms to report information, such as capital market pressures, corporate governance and firm-specific factors. However, there is no evidence on how these factors influence disclosure in the different presentation formats of IC information.

In this study, we examine the impact of capital market pressures on disclosure in the presentation format of IC information in the annual reports of IC-intensive firms. Following previous studies (e.g. Lang and Lundholm, 1993; Bushee et al., 2003; Debreceeny and Rahman, 2005; Mangena Tauringana, 2007), our proxies for capital market pressures are market-to-book ratios, share price volatility and multiple listing. The focus on IC-intensive firms is driven by the rationale that these firms have greater need for capital to fund their intensive intangible assets development (Mangena et al., 2014) and also, the capital market's information requirements about the value-creating processes is greater given the high risks involved (Holland, 2003). This study therefore contributes to the literature in a number of ways. First, we contribute to the literature on disclosure presentation formats by focusing on IC information instead of financial information as in previous studies (e.g. Beattie and Jones, 1992, 2002; Muino and Trombetta, 2009; Jones, 2011). We also contribute to the IC disclosure literature (e.g. Bozzolan et al., 2003; Cerbioni and Parbonetti, 2007) by quantifying IC disclosure in three presentation formats (text, numerical and graphs/pictures) and examine the impact of market related factors on the level of IC disclosure. The previous

literature has tended to focus on text and numerical disclosures, ignoring graphs/pictures, thus failing to capture a comprehensive picture of a firm's IC disclosure practice.

The remainder of this paper is organised as follows. Section 2 provides a review of the literature and outlines the main hypotheses. Section 3 discusses the research design and Section 4 reports the empirical results. Section 5 concludes the paper.

2. Literature Review and Hypotheses Development

2.1 Presentation Format in Corporate Reporting

The annual report, as a formal communication document, commonly comprises quantitative information, narrative, pictures/photographs, and graphs. Campbell et al. (2009) argue that the annual report is no longer used to just convey 'simple' accounting numbers, but to provide narratives, graphical, pictorial and broader aesthetic content to a wide number of constituencies. Campbell and Abdul Rahman (2010) suggest the users that are not skilled in financial analysis would arguably place a greater importance on the narrative sections of the report. In this context, they argue that the narrative reporting of IC would be a suitable vehicle for communicating value to such users. The narrative sections of the annual report include both qualitative aspects (text, graphs/pictures) and quantitative aspect (numerical, both fiscal and non-fiscal). These three formats of disclosure (text, numerical and graphs/pictures) commonly found in annual reports are important in reporting, including IC information communication (e.g. Abeysekera, 2003; Beattie and Thomson, 2007; Davison and Skerratt, 2007).

Text provides the bulk and the backbone of the reported message and is an important means not only of clarifying and validating the quantitative measures contained in financial statements (Abeysekera, 2003), but also of offering useful insights into value creating drivers of firms (Campbell and Abdul Rahman, 2010). For this reason, text has been the focus of previous studies as it is the predominant unit used in IC communication to stakeholders (see

e.g. Guthrie et al., 2007; Campbell and Abdul Rahman, 2010). However, there are calls for research to pay attention to the use of other visual forms of communication, such as graphs/pictures, which have been typically neglected (Jones, 2011) despite having been shown to provide an immediate and effective means of disclosure in annual reports (Beattie and Jones, 2002). Pictures, diagrams and graphs are deemed to be self-evident and simple to understand and are used by firms to synthesise and display information to readers in easily digestible ways (Abeysekera, 2003; Jones, 2011). They also have various communicative advantages such as their capacity to attract readers' attention, reliance on spatial rather than linguistic intelligence, enabling data to be readily retrieved and seen in a direct and immediate way, the identification of patterns, trends and anomalies, and enhancing data recall (Beattie and Jones, 2002).

In terms of empirical research, previous studies suggest that performance displayed in charts is viewed most favourably by readers (Beattie and Jones, 2002), and financial graphs are found to affect users' perceptions of annual reports (Jones, 2011). Davison and Skerratt (2007) examined the use of words and pictures in the communication of intangibles in annual reports of FTSE 100 firms. They argue that pictures are important and provide richness and variety to communicated messages. These authors found that approximately 94% of pictures captured in the annual reports and reviews communicated intangible aspects of firms' businesses and gave recognition to the communicative power of graphical representations. Therefore, graphs/pictures are potentially powerful and highly effective methods for IC communication.

2.2 Hypotheses Development

There are a number of studies investigating the relationship between IC disclosure and firm-specific factors (such as firm size, industry) (e.g. Bozzolan et al., 2003; Striukova et al., 2008) and corporate governance factors (e.g. Cerbioni and Parbonetti, 2007; Li et al., 2008; Li et al.,

2012). These studies have neither examined presentation formats of IC information nor the impact of capital market pressures (such as market-to-book ratio, share price volatility and multiple listing) on IC disclosures. The stock markets are an important source of finance for firms and this creates incentives for managers to provide information. As Healy and Palepu (2001) argue, investors' perception of the firm is important to managers expecting to raise capital. Information asymmetry between managers and outside investors can potentially make capital more costly to raise, as investors demand a premium for bearing information risk (Healy and Palepu, 2001). In the context of IC disclosure, Mangena et al. (2014) demonstrate the capital market consequences of greater disclosure via a lower cost of capital. To the extent that improved disclosure reduces the cost of capital, managers should be motivated to provide greater levels of disclosure. Lang and Lundholm (1993) show evidence to suggest that firms' disclosure policies are influenced by capital market pressures. Gray et al. (1995) also demonstrate that capital market pressures were key considerations in firms' disclosure policies. We draw from this literature, and develop hypotheses of the relationship between IC disclosure in three presentation formats and capital market pressures, proxied by three variables (market-to-book ratio, share price volatility and multiple listing).

2.2.1 Market-to-book Ratio

The literature demonstrates significant differences between market and book values (e.g. Gu and Lev, 2004; Beattie and Thomson, 2005). Such differences, frequently illustrated by market-to-book ratios, represent –albeit very imperfectly– the IC value of firms (Brennan, 2001). Bushee et al. (2003) argue that market-to-book ratios reflect the level of informativeness of a firm's accounting information, thus the higher the market-to-book ratio, the greater the information asymmetry. To the extent that the market penalises firms with greater information asymmetry, for example with a higher cost of capital (Healy and Palepu, 2001; Mangena et al., 2014), firms with higher market-to-book ratio are more likely to

provide greater IC disclosures voluntarily in their annual reports. Such IC disclosures might be made in various presentation formats (e.g. text, numerical, and graphs/pictures), with the aim of increasing information richness and decision usefulness. This should help reduce the differences between the market and book values, and therefore the perceived risk associated with the firm (Lang and Lundholm, 1993) and reduce the cost of capital (Healy and Palepu, 2001; Mangena et al., 2014).

Empirical evidence on the relation between market-to-book ratio and IC disclosure is limited and mixed. Brennan (2001) and García-Meca et al. (2005) found insignificant results. García-Meca and Martínez (2007) report a weak positive relation between IC information and market-to-book ratio. Cerbioni and Parbonetti (2007) find no significant relationship between market-to-book ratio and overall IC. However, they find a positive relation with internal (weak) and external (significant) capital, and a negative relation with human capital. Drawing from both the theoretical arguments and empirical literature discussed above, we hypothesise:

H1: There is a positive relationship between the level of IC disclosure and market-to-book ratio, ceteris paribus.

2.2.2 Share Price Volatility

Healy and Palepu (2001) argue that the higher a firm's share price volatility, the more difficult it is for investors to assess the firm's value, and the more likely they are to incur information costs. Share price volatility reflects the perceived level of riskiness (Bushee et al., 2003), and firms whose share prices are volatile are more likely to experience lower stock liquidity and a higher cost of capital (Healy and Palepu, 2001). Expanded disclosure helps to reduce the magnitude of periodic surprises about the firm's performance, and thus reducing share price volatility and cost of capital (Lang and Lundholm, 1993; Bushee et al., 2003).

Given the increasing importance of IC information to the stock market (Amir and Lev, 1996; Holland, 2003), failure to disclose will increase share price volatility, thus increasing

the perceived risks attached to the firm. Firms are therefore likely to increase IC disclosures in their annual reports to mitigate the perceived risks of their shares. These disclosures could be in different presentation formats, such as text, numbers and graphs/pictures, to improve clarity.

Empirically, Debreceeny and Rahman (2005) find that firms with higher price volatility provide more regular and frequent online continuous disclosures. Lang and Lundholm (1993) find a positive, although weak, association with corporate disclosure practices. Hence, it is hypothesised that:

H2: There is a positive relationship between the level of IC disclosure and share price volatility, ceteris paribus.

2.2.3 Multiple Listing

Prior research (e.g. Gray et al., 1995; Mangena and Pike, 2005) suggests a number of reasons why multiple listed firms might provide greater disclosures. For example, the monitoring problems for multiple listed firms are greater because share ownership is more dispersed, and this makes monitoring costs of investors more significant (Mangena and Pike, 2005). Gray et al. (1995) and Xiao et al. (2004) argue that multiple listed firms are faced with a combination of competitive market pressures and reporting requirements of international financial markets, and therefore engage in greater disclosures. Mangena and Tauringana (2007) points to that multiple listed firms will disclose more information because of the need to raise cheaper funding on foreign stock exchanges. They argue that foreign investors are more likely to be less informed as the search for private information is more costly owing to distance, and increased disclosure will support their assessment of the firm.

The costs for private information are more likely to be greater for IC because it is unique to the specific firm and cannot be inferred by looking at other similar firms (Aboody and Lev, 2000). In this context, investors will demand a premium for bearing information risk, thus

forcing multiple listed firms to enhance their IC disclosures. IC disclosure in different formats will improve the informativeness of information for multiple listed firms and help them to enhance share liquidity and reduce the cost of capital (Healy and Palepu, 2001; Mangena et al., 2014).

Prior studies have supported a positive relationship between multiple listing and the extent of voluntary disclosure (e.g. Gray et al., 1995; Mangena and Pike, 2005; Mangena and Tauringana, 2007). In the context of IC disclosure, studies (e.g. García-Meca et al., 2005; Cerbioni and Parbonetti, 2007; García-Meca and Martínez, 2007) reported insignificant results. We, however, hypothesise a positive relationship given the importance of IC information to investors, thus:

H3: There is a positive relationship between the level of IC disclosure and multiple listing, ceteris paribus.

2.2.4 Control Variables

To test the hypotheses, we control for a number of corporate governance factors and firm characteristics. Following previous studies and for reasons specified therein, we control for board independence, significant share ownership (Haniffa and Cooke, 2002; Mangena and Tauringana, 2007; Li et al., 2008), audit committee size, frequency of meetings and share ownership by audit committee members (Mangena and Pike, 2005; Li et al., 2012), listing age, and firm size (Haniffa and Cooke, 2002).

3. Research Design

3.1 Sample

We draw our sample from UK IC-intensive sector firms that were fully London Stock Exchange (LSE) listed as at 30 December 2005. Following previous studies (see Guthrie et al., 2007; Striukova et al., 2008), the sectors we considered to be IC-intensive are listed in Table 1. The decision to include IC-intensive sectors only derives from the fact that the

existing financial reporting model is not suited for IC-intensive sectors (Francis and Schipper, 1999) and thus, the role of IC information in firm valuation by the capital market participants is particularly critical for firms in these sectors. The population size for the seven IC-intensive sectors on the LSE was 319 firms, from which a sample of 100 was selected using proportionate stratified sampling approach.¹ Table 1 provides a breakdown of the number of firms selected from each sector.

[Table 1 insert here]

3.2 IC Disclosure Measures

Content analysis is used to measure IC disclosure in each of the three presentation formats. Our measure is developed from annual reports with financial year ends between March 2004 and February 2005. We chose the period of study with an aim to eliminate the possible disclosure effects of the OFR requirements, which were to become effective early 2005.² We took the view that using annual reports published prior to, instead of after the mandatory OFR, allows a clearer determination of voluntary IC disclosure and would result in greater variations in the IC disclosure³ and hence a clearer analysis of the effect of market factors on voluntary IC disclosure practice in its various presentation formats. Although the use of annual reports as the sole source of content analysis data has its limitations (e.g. Striukova et al., 2008), its use for measuring corporate disclosure is widely adopted and well justified in the literature (see e.g. Bozzolan et al., 2003). Previous studies have also taken the view that the annual report offers a relevant and useful proxy for the level of IC disclosure provided by

¹ To ensure that we build a sample that is representative of the sectors selected and the size of the firms, we used a 2-step selection process. First, we computed the number of firms required from each of the seven sectors (see Table 1, columns 4-5). Second, to ensure that our sample includes both large and small firms, we ranked firms in each sector by market capitalisation and systematically selected one firm from every three firms in each industry grouping.

² The statutory requirement for quoted companies to publish an OFR was repealed in January 2006. The requirements of an OFR cover some of the issues relevant to IC, particularly human and relational capital. Instead, companies are now required to include Business Review in the Director's Report, which is a reduced version of OFR. It requires quoted companies to include information about environmental matters, the company's employees, and social and community issues, and an analysis using financial and other key performance indicators (KPI) (Companies Act, 2006, chap. 5). However, it does not stipulate any particular KPIs and issues related to employee, environment, social and community, that companies have to include in the Business Review. Hence, the selection of KPIs and issues to be discussed in the review are at the discretion of the directors.

³ This is particularly important because multiple regressions work well when there is meaningful variability in the variables of interest, in this case the extent of IC disclosure in different presentation formats. In a mandatory reporting environment, variability of IC disclosure in the three presentation formats is likely to be very small, thus making the results less powerful.

a firm along all disclosure avenues (e.g. Guthrie et al., 2007).

Our approach applies the 61-IC-item checklist developed by Li et al. (2008, see p.155-159) without any adjustments. This checklist provides a comprehensive list of voluntary IC items. The scoring of the IC research instrument was performed manually covering the whole annual report. Each IC item was scored based on three presentation formats (i.e. text, numerical and graphical/pictorial), using the binary coding approach, i.e. an IC item scores 1 if disclosed under a presentation format and 0 otherwise. Thus a firm can score a maximum of 61 points under each of the three presentation formats.⁴ All items are equally weighted because weighting does not influence the results of regression analysis (see Haniffa and Cooke, 2002).

After scoring all the 61 IC items in the three presentation formats, the IC disclosure scores in each of the three presentation formats for each firm are computed as an index by dividing the sum of items disclosed in a particular format (adding all the 1s) by the total number of items expected (i.e. 61) (see Haniffa and Cooke, 2002). For each firm, we created three disclosure indices to capture IC disclosure in text (ICDI_T), numerical (ICDI_N) and graphs/pictures (ICDI_GP). The disclosure indices capture the *variety* of IC information disclosed in a certain presentation format.⁵

3.3 Regression Model

Multiple regression analysis is used to test the relationship between IC disclosure in three

⁴ All items in the designed research instrument were considered equally applicable and therefore equally capable of disclosure across all sample firms in all three formats. This treatment is based on the view that deciding on whether certain IC items are non-applicable or non-disclosure, when no disclosure is found, can be a very subjective judgement. Whilst it may help reduce the subjectivity when the researcher goes through the whole annual report to determine whether an item is applicable or not (e.g. Marston and Shrivs, 1991), given that the IC items in the research instrument can be disclosed in diverse and varied ways, it remains difficult to make the final judgement that an item certainly cannot be disclosed by the firm. Take corporate culture as an example, for which it can be considered as difficult to disclose in graphs/pictures. Firms can use diagrams/figures to present the key issues that are central to their corporate culture. They could also use pictures to demonstrate their corporate history to support their corporate culture. The diverse and varied ways of illustrating and presenting IC information available led us to the view that all items in the IC research instrument were equally applicable and equally capable of disclosure across all sample firms in all three formats.

⁵ The scoring process was mainly completed by one researcher. This raises questions about reliability of the scores (Beattie and Thomson, 2007). Therefore, seven annual reports were randomly selected and recoded by another two independent coders to test for and ensure reliability in coding. Krippendorff's (1980) alpha was computed to test for reliability because it can account for chance agreement among multiple coders. The independent scores (not tabulated) are all above the minimum 80% threshold considered reliable for content analysis.

presentation formats and the market factors and control variables. We specify the following regression model separately for IC disclosure indices.

$$IC\ Disclosure = \beta_0 + \beta_1 LnM2B + \beta_2 LnSPV + \beta_3 ML + \beta_4 INED + \beta_5 SqSSO + \beta_6 SAC + \beta_7 MAC + \beta_8 LnADISH + \beta_9 LnAGE + \beta_{10} LnSA + \varepsilon$$

All variables are as defined in Table 2.

[Table 2 insert here]

4. Empirical Results

4.1 Descriptive Analysis

Table 3 Panel A presents the descriptive statistics of IC disclosure indices for the three presentation formats.

[Table 3 insert here]

On average, out of the 61 IC items, 70% were disclosed in text, 29% in numerical form, and 8% in graphs/pictures. These results reveal that IC disclosures are mainly in text form, in line with findings of previous studies (e.g. Brennan, 2001; Guthrie et al., 2007), suggesting that managers view narratives as providing better understanding to investors. This is consistent with Brown and Duguid's (2000) argument that people learn best from stories and that a convincing narrative is the most effective way of communicating knowledge. Therefore, the substantial use of text could be due to firms' attempts to achieve the maximum impact when constructing their IC story.

The results indicate that the use of numerical information in IC disclosure is greater than the use of graphs/pictures. Nevertheless, the level of both quantified IC information reported and graphs/pictures use is low. As Campbell and Abdul Rahman (2010) argue, this might derive from the difficulty in conveying complex messages in simple, factual terms, such as numbers or graphs. An interesting find is that although there are firms that chose not to employ graphs/pictures, at the other extreme, some firms disclosed one-third of the IC items in this form of reporting. Graphs/pictures use is particularly popular for items such as pictures

of employees, customers and brands, figures showing market presence, and photographs demonstrating relationships with various stakeholders.

Table 3 Panel B presents the summary descriptive statistics for the independent variables included in the model. The mean market-to-book ratio is 3.89 (ranging from 0.52 to 17.81) which is consistent with those reported in Gu and Lev (2004) and Beattie and Thomson (2005). The mean share price volatility is 0.80 (ranging from 0.16 to 3.73). Sixty-one percent of the sampled firms are multiple listed. The mean significant share ownership is 30% and board independence is 47%⁶. The mean audit committee size is approximately three members, consistent with the recommendation of the Smith Report (2003) and the UK Code (2012), and audit committees meet, on average, about four times per year. The mean audit committee directors' shareholding is 1.6%, ranging from 0% to 51.4%. The mean firm size is £4,036.7 million and the average listing age is 17 years.

4.2 Multiple Regression Results

Prior to running the multiple regression analysis, we first examine our data to detect violations of normality and problem of multicollinearity. We find that, whilst IC disclosure in text is normally distributed, IC disclosure in numerical form and graphs/pictures and some of the independent variables are not. These variables were thus transformed.⁷ For multicollinearity, we examine the correlation matrix among the independent variables (see Table 4) and calculate the variation inflation factors (VIF) (see Table 5). The associations between independent variables are all below 0.80 and the VIFs are all less than 3.6, suggesting multicollinearity is not a major problem.⁸

[Table 4 insert here]

⁶ This suggests non-compliance with the recommendation of the then Combined Code (2003) and the current UK Code (2012) for at least half of the board to be independent non-executive directors.

⁷ ICDI_N, ICDI_GP and significant share ownership are transformed using square root transformation, whereas the natural log transformation is more effective for market-to-book ratio, share price volatility, audit committee directors' shareholding, listing age and firm size. The transformed variables all indicate normality of distribution (not tabulated).

⁸ Previous authors suggest multicollinearity becomes a serious problem where correlations exceed 0.8 or VIFs exceed 10 (see Li et al., 2008).

Table 5 presents the regression results. Model 1 presents the results of the ICDI_T model, whilst Models 2 and 3 present the results for SqICDI_N and SqICDI_GP, respectively.

[Table 5 insert here]

As can be seen from Table 5, the explanatory powers (adjusted R^2) of the model for ICDI_T (60.7%) and SqICDI_N (61.3%) are very high, whereas it is much lower for SqICDI_GP (17.2%). This suggests that the market and control variables in the model explain a significant amount of variation in IC disclosure.

In respect to the market factors, the results show that market-to-book ratio (LnM2B), is significantly and positively associated with both ICDI_T ($p < 0.05$) and SqICDI_N ($p < 0.01$), supporting hypothesis H1. The results differ from the insignificant results reported in Brennan (2001) and García-Meca et al. (2005), but are consistent with Cerbioni and Parbonetti (2007). The significant results suggest that IC-intensive firms with greater market-to-book ratio are more likely to use IC disclosure in text and numerical forms to enhance decision usefulness of the information and mitigate information asymmetry. The results for SqICDI_GP are not significant, suggesting for IC information in graphs/pictures market-to-book ratio is not an influencing factor. These results are inconsistent with Davison and Skerratt's (2007) findings that firms with greater intangible assets contain extensive references to intangibles in pictures.

Share price volatility (LnSPV), on the other hand, shows a significant positive association with SqICDI_GP, supporting hypothesis H2, but not with ICDI_T and SqICDI_N. The positive association is in line with the findings of Debrecey and Rahman (2005) in the context of online continuous corporate disclosure. This suggests that firms with more volatile share prices, and thus higher perceived level of risk, are more likely to use graphs/pictures as a vehicle for IC communication. This implies that high share price volatility firms might complement other format of IC disclosures with graphs/pictures to

improve the quality of their disclosures thus improving the market's understanding of the firm.

The results also indicate that firms with multiple listings (ML) provide significantly greater IC disclosure in text than firms with only a LSE listing. Hypotheses H3 is therefore supported. However, no significant relationship between multiple listing and SqICDI_N or SqICDI_GP is found, rejecting H3. The significant result for ICDI_T is consistent with findings of Xiao et al. (2004) and Mangena and Pike (2005). This indicates that international capital market pressures deriving from the needs of foreign investors and regulators do influence IC disclosure practices in annual reports. The insignificant results in SqICDI_N and SqICDI_GP may be due to the lack of regulatory requirements in the disclosure of IC information in those formats, and thus less pressure for firms to disclose such information.

For the control variables, the results for board independence (INED) are mixed. INED is associated positively with ICDI_T ($p < 0.05$) and SqICDI_N ($p < 0.10$), but negatively with SqICDI_GP ($p < 0.05$). Audit committee size (SAC) is significantly associated with ICDI_T and SqICDI_N ($p < 0.01$), while frequency of audit committee meeting (MAC) and significant share ownership (SqSSO) are significantly related to SqICDI_N ($p < 0.05$). The significant associations suggest that audit committee resources in terms of their size and level of activity influence IC disclosure practice in text and numerical forms. Share ownership by audit committee members (LnADISH) is not significantly related to IC disclosure in any of the three formats. The finding that none of the audit committee characteristics is associated with SqICDI_GP may suggest that audit committees do not consider these to be important in communicating with investors. Finally, whilst firm size is significantly and positively associated with all three formats of IC disclosure, listing age is only significant for ICDI_T at the 10% level.

5. Conclusion

Disclosure practice is a complex process, affected by a broad set of factors, both internal and external (Gibbins et al., 1990; Haniffa and Cooke, 2002). This paper has examined whether the extent of IC disclosure in three presentation formats are associated with capital market factors. In this case, the study contributes to the IC disclosure literature by examining the presentation format of disclosure, an issue largely neglected in the literature (see Jones, 2011). It also contributes by providing insights into the relationship between the presentation format of IC disclosure and market factors.

The findings demonstrate that IC disclosures captured are mainly in text, but there is substantial disclosure made in the numerical form. The use of graphs/pictures in the communication of many IC items is, however, significantly lower. In terms of the market factors examined, the results indicate that market-to-book ratio is positively associated with IC disclosure in text and numerical forms; share price volatility is positively associated with IC disclosure in graphs/pictures; and multiple listing is positively associated with IC disclosure in text form. This implies that the impact of capital market pressures on IC disclosure might differ with presentation format.

The findings must be interpreted in the context of a number of limitations. Firstly, the study uses annual reports for one year only. Further research could be conducted on other communication media and over time. Second, the study focuses on IC-intensive industry sectors only and cannot be generalised to other sectors. Future research could include both IC-intensive and non-IC-intensive sectors in the analysis. Finally, the study does not address issues relating to the processes by which the board influences disclosure decisions. Interviews and questionnaire surveys may shed some interesting light into this.

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Table 1 Number of samples by industry sector

	Industry Category	Population of Firms	% of total population	Sample
1	Biotechnology & Pharmaceutical (BPH)	40	12.54%	13
2	Information Technology (IT)	60	18.81%	19
3	Media & Publishing (M&P)	45	14.11%	14
4	Business Services Providers (BSP)	83	26.02%	26
5	Telecommunication Services (Telecom)	18	5.64%	6
6	Banks & Insurance (B&I)	51	15.99%	15
7	Food Production & Beverage (F&Bev)	22	6.90%	7
	Total	319	100% (Round up)	100

Table 2 Dependent and independent variables, measurement and source of information

	Variable	Operationalisation	Source	Acronym
Panel A Dependent variables				
IC disclosure index	IC Disclosure in text, numerical form, graphs/pictures	An IC disclosure index is computed for each of the three presentation formats, i.e. IC disclosure in text form (ICDI_T), in numerical form (ICDI_N), and in graphs/pictures (ICDI_GP), as the number of IC items disclosed in the respective presentation format divided by 61. ICDI_N and ICDI_GP are transformed using square root.	Annual report (AR)	ICDI_T SqICDI_N SqICDI_GP
Panel B Independent variables				
Market factors	Market-to-book ratio	Stock market value over book value of assets as at the financial year end studied. The ratio is transformed using natural logs.	Thomson one	LnM2B
	Share price volatility	Difference between the highest and lowest share price during the financial year of study, scaled by the lowest share price (e.g. Bushee et al., 2003). This is transformed using natural logs.	Thomson one	LnSPV
	Multiple listing	Dummy variable with a value of 1 if the firm is listed on one or more international stock exchange(s), otherwise a value of 0 is given (e.g. Haniffa and Cooke, 2002).	Thomson one	ML
Control variables				
Corporate governance factors	Board independence	Number of independent non-executive directors on board (specified in the annual reports) divided by total number of directors on board at the financial year end. (%)	AR	INED
	Significant share ownership	Percentage cumulative shareholdings by individuals or organizations classified as substantial shareholders (i.e. owning 3% or more of the firm's share capital), excluding significant directors' shareholdings, to the total number of outstanding ordinary shares at the financial year end. This is transformed using square root transformation.	AR	SqSSO
	Audit committee size	Number of board directors on the audit committee as at the financial year end.	AR	SAC
	Frequency of audit committee meetings	Number of audit committee meetings held during the financial year of study.	AR	MAC
	Audit committee directors' shareholding	Percentage cumulative shareholdings by audit committee directors to total number of outstanding ordinary shares at the financial year end. This is transformed using natural logs.	AR	LnADISH
Firm specific characteristics	Listing age	Number of days listed on LSE scaled by 365 days a year, transformed using natural logs.	LSE website	LnAGE
	Firm size (sales)	The natural log of sales revenue of the financial year of study.	AR	LnSA

Table 3 Descriptive statistics for IC disclosure indices and independent variables

		Mean	Median	Min.	Max.	Std. Dev.
Panel A – IC disclosure indices						
Intellectual Capital (IC) Disclosure Indices	Text	0.70	0.72	0.31	0.93	0.12
	Numerical	0.29	0.30	0.11	0.62	0.11
	Graphs/Pictures	0.08	0.09	0.00	0.33	0.08
Panel B - Independent variables						
<i>Market factors</i>						
Market-to-book ratio		3.89	2.70	0.52	17.81	3.40
Share price volatility		0.80	0.59	0.16	3.73	0.73
Multiple listing		0.61	1	0	1	0.49
<i>Control variables</i>						
<i>Corporate governance factors</i>						
Board independence		0.47	0.50	0.18	0.75	0.13
Significant share ownership		0.30	0.26	0.00	0.79	0.20
Audit committee size (number)		3.46	3	1	7	1.06
Frequency of audit committee meetings (number)		3.70	4	1	9	1.41
Audit committee directors' shareholding		0.016	0.00033	0.00	0.514	0.068
<i>Firm specific characteristics</i>						
Listing age (Years)		17.15	10.69	0.45	71.87	16.71
Firm size - Sales (£m)		4036.7	383.1	0.00	39792.2	8782.4

Table 4 Correlation matrix: dependent and non-categorical independent variables

	ICDI_T	SqICDI_N	SqICDI_GP	LnM2B	LnSPV	SAC	MAC	LnADISH	INED	SqSSO	LnAGE	LnSA
LnM2B	0.202**	0.238**	0.133	1								
LnSPV	-0.218**	-0.234**	0.042	0.084	1							
SAC	0.531***	0.505***	0.197**	0.188*	-0.206**	1						
MAC	0.462***	0.516***	0.175*	0.109	-0.133	0.283***	1					
LnADISH	-0.537***	-0.578***	-0.29***	-0.037	0.195*	-0.305***	-0.437***	1				
INED	0.374***	0.366***	0.006	0.165	0.121	0.234**	0.185*	-0.337***	1			
SqSSO	-0.354***	-0.434***	-0.265***	-0.023	0.234**	-0.167*	-0.179*	0.238**	-0.173*	1		
LnAGE	0.111	0.164	0.105	0.135	-0.352***	0.265***	0.137	-0.072	0.121	-0.118	1	
LnSA	0.688***	0.687***	0.33***	-0.042	-0.48***	0.485***	0.51***	-0.663***	0.206**	-0.399***	0.287***	1

*** Significance at the 1% level or better; ** Significance at the 5% level or better; * Significance at the 10% level or better

Variables

ICDI_T – IC disclosure in text form; *SqICDI_N* – IC disclosure in numerical form (square root transformed); *SqICDI_GP* – IC disclosure in graph/picture form (square root transformed); *LnM2B* – market-to-book ratio (logarithmic transformed); *LnSPV* – share price volatility (logarithmic transformed); *SAC* - audit committee size; *MAC* - frequency of audit committee meetings; *LnADISH* - audit committee directors’ shareholding (logarithmic transformed); *INED* - board independence; *SqSSO* – significant share ownership (square root transformed); *LnAGE* - listing age (logarithmic transformed); *LnSA* - sales (a proxy for firm size) (logarithmic transformed).

All variables are as defined in Table 2.

Table 5 Multiple regression results: IC disclosure in three presentation formats

	VIF	ICDI_T		SqICDI_N		SqICDI_GP	
		t	Sig.	t	Sig.	t	Sig.
(Constant)		8.181	.000	7.860	.000	3.408	.001
LnM2B	1.159	2.046	.044	2.738	.007	1.193	.236
LnSPV	1.679	.910	.365	.221	.825	3.057	.003
ML	1.428	2.358	.021	.156	.877	.945	.347
INED	1.291	2.151	.034	1.736	.086	-2.238	.028
SqSSO	1.311	-.509	.612	-2.506	.014	-1.643	.104
SAC	1.506	2.183	.032	2.119	.037	.128	.898
MAC	1.471	.775	.440	2.035	.045	-.648	.518
LnADISH	2.200	.330	.742	-1.238	.219	-.951	.344
LnAGE	1.279	-1.952	.054	-1.082	.282	1.010	.315
LnSA	3.578	4.972	.000	3.315	.001	2.196	.031
R ²		.647		.652		.256	
Adj. R ²		.607		.613		.172	
S.E.		.073		.061		.114	
F value		16.287		16.654		3.060	
Sig. F		.000		.000		.002	

Variables

ICDI_T – IC disclosure in text form; *SqICDI_N* – IC disclosure in numerical form (square root transformed); *SqICDI_GP* – IC disclosure in graph/picture form (square root transformed); *LnM2B* – market-to-book ratio (logarithmic transformed); *LnSPV* – share price volatility (logarithmic transformed); *SAC* - audit committee size; *MAC* - frequency of audit committee meetings; *LnADISH* - audit committee directors' shareholding (logarithmic transformed); *INED* - board independence; *SqSSO* – significant share ownership (square root transformed); *LnAGE* - listing age (logarithmic transformed); *LnSA* - sales (a proxy for firm size) (logarithmic transformed).

All variables are as defined in Table 2.