Is a company’s intellectual capital performance and intellectual capital disclosure practices related?: Evidence from publicly listed companies from the FTSE 100

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Abstract:

This study breaks with the prior literature on intellectual capital disclosure practices in two major ways. First, this study provides a longitudinal examination of intellectual capital disclosure practices of thirty (30) publicly listed companies on the FTSE 100 in their annual reports from 1996 - 2000. Second, this study investigates the potential relationship between the intellectual capital performance and the extent of intellectual capital disclosure. Intellectual capital performance is measured using the Value Added Intellectual Coefficient (VAIC™). A disclosure index and relevant scoring system is utilized to measure the extent and quality of disclosure as provided in the annual reports of the sample firm’s annual reports during the stated period. Results from this study do not indicate a systematic relationship between a United Kingdom publicly listed firm’s intellectual performance and the extent of intellectual capital disclosure. However, results suggest that when a firm’s intellectual capital performance is too high there is a negative impact on the amount of intellectual capital disclosure. The negative association may support the suggestion firms reduce intellectual capital disclosures when intellectual is above a perceived ceiling level for fear of losing a competitive advantage. A firm’s leverage, industry exposure and listing status was also found to have an influence on the amount of intellectual capital disclosure.
“Members of the accounting profession, not otherwise known for their public displays of emotion, have fretted openly about how to inform potential investors of the true worth of enterprises whose value rests in the brains of employees. They have used the term "goodwill" to signify the ambiguous zone on the corporate balance sheets between the company’s tangible assets and the value of its talented people. But as intellectual capital continues to overtake physical capital as the key asset of the corporation, shareholders find themselves on shakier and shakier ground.”

~ Reich (1992) ~

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Part 1: Introduction

During the 1990s there was a swift evolutionary shift in the established paradigm underlying the dominant model for business practices and accomplishment. For over 200 years success of a company was generally based on its efficient use of physical capital. Upon entering the third millennium A.D. intellectual, rather than physical, capital appeared to have become the established cornerstone for a firm’s future viability and success in the “new knowledge economy”. Pulic and Bornemann (1998,p.1), for example, wrote that in “this new economy….intellectual capital has become the one and only competitive advantage of a firm”, becoming the pivotal component for future prosperity, growth and development.

The change in the major underlying pivotal factor of a business and national infrastructure during the 1990s raises several questions about the possible impact on related disclosures practices by firms. Two major questions can be summarized as follows:

1) Did the intellectual capital disclosure practices of firms alter in response to the growing emphasis on management of intellectual in the lead up to the new millennium?

2) Did a firm’s level of intellectual capital performance affect the amount of intellectual capital disclosure provided by firms?

In line with the two questions outlined above, there are two major overarching objectives of this study. The first major objective was to provide a longitudinal investigation of intellectual capital disclosure practices as the new millennium approached. Motivation for this objective arose from several related sources. First, based on an extensive global survey, Taylor and Associates (1998) reported that disclosure on intellectual capital issues was in the top ten information needs of users. It is imperative, therefore, to determine if companies were reactive to the demands of users in meeting their need for information on intellectual capital matters. Research of actual intellectual capital disclosure practices, however, is virtual non-existent, particularly investigations of reporting procedures across an extended period. Second, results from prior research on the relationship between a firm’s performance and different disclosure
issues have been inconclusive and mixed. Findings on the association between a firm’s performance and related disclosure practices, however, have been based on measures of the entity’s returns on physical capital. With the growing change from an assessment of a firm’s performance based on its efficient use of physical capital to that of intellectual capital, research needs to be undertaken to determine if the alteration may also influence the association between performance and disclosure practices. Finally, much of the present mandatory accounting disclosure requirements issued by accounting professions are related to a firm’s physical capital. In the face of a change to intellectual capital as the pivotal factor of an entity, mandatory disclosure requirements related to physical capital will become less important. It is necessary for accounting regulators to determine if firms are disclosing on intellectual capital matters. If empirical research indicates a lack of disclosure accounting regulators may have to decide whether mandatory requirements need to be introduced to protect the interests of users.

This paper’s major contribution to the extant disclosure is fourfold. First, the analysis from this study examines an emerging area of accounting disclosures that is being demanded by stakeholders but has yet to be investigated to any substantial extent. Second, prior research has provided evidence of the association between the performance of a firm in terms of economic, environmental and social matters with disclosure level related to the same themes. Findings from this study assist in determining if there is also a corresponding link between the level of disclosure on intellectual capital and the actual intellectual capital performance of a firm. Also, apart from a firm’s financial performance, this study also assessed the relationship between other key organizational level control factors and the level of intellectual capital disclosure. Finally, there is a current lack of agreement on the measurement of economic performance. A number of intellectual capital measurement models have been proposed. Generally speaking, however, of intellectual capital measurement models that have been suggested have only been applied on a limited basis. Findings from this study could help to define the viability of using the Value Added Intellectual Capital (VAIC™) across a broad spectrum of firms from a number of industry groups. Support for this measure of intellectual capital performance can assist in broadening the scope of future research into this domain.

To meet the objectives of this paper a sample of thirty-one United Kingdom publicly listed companies from the FTSE-100 were randomly selected. The annual reports from the selected companies from 1996 to 2000 were examined. The intellectual capital performance of each firm in the respective years under investigation was measured using the Value Added Intellectual Capital (VAIC™) developed by Pulic (1998). The extent of intellectual capital disclosure was measured using a fifty-item disclosure index an
established content analysis technique. Results indicated that the average intellectual capital performance of the sample companies fluctuated between 1996 and 2000. Conversely, the extent of intellectual capital disclosure increased across each year of the analysis. Empirical tests indicated that intellectual capital performance was a significant negative explanatory variable of the variation in the extent of intellectual capital disclosure in 1996 and 1998 respectively. When intellectual capital performance was lagged this variable was a significant negative determinant of the amount of intellectual capital performance in 1997 and 1999 respectively. Based on the results of this study it was concluded that a firm’s intellectual capital performance would only have a significant impact on the amount of disclosure on this issue when it is perceived to be too high. In this situation the high level of intellectual capital performance led to a reduction in the extent of intellectual capital disclosure. Management may decide to reduce intellectual capital disclosure in response to a high level of intellectual capital performance for fear of a loss in competitive advantage. Amongst the control factors included in the study organization and listing status had a moderate influence on the amount of intellectual capital disclosure.

The remainder of this paper was organized as follows. Part 2 provides an overview of the extant literature on intellectual capital. Specifically, prior research on the disclosure and performance of intellectual capital is addressed. The research method adopted in the paper is then presented in Part 3 followed by the study’s results. In the final part of the paper discussion of the results, conclusions and final remarks are provided. Ideas for future research are also presented in Part 5.

**Part 2: Intellectual Capital**

*Definition and Components of Intellectual Capital*

Empirical findings have illustrated the increasing importance of a firm’s intellectual capital to its value. The Brookings Research Institute, for example, found that in 1962 62% of a company’s value was represented by its physical, or hard, capital. By 1992 the percentage had declined to 38% and continues to fall. Other research showed that on average in 1995 over 75% of the value of companies from the health care and personal services industries was attributed to the entity’s intellectual capital. Luthy (1998) described the growing significance of this factor stating intellectual capital was “becoming the preeminent resource for creating economic wealth. Tangible assets such as property, plant, and equipment continue to be important factors in the production of both goods and services. However, their relative importance has decreased through time as the importance of intangible, knowledge-based assets has increased.”
Intellectual capital is a broad based term that is considered to be synonymous with a firm’s intangible assets. There is, however, no precise agreement on a definition of intellectual capital. Klein and Prusak (in Brooking, 1997, p.12) provided an early definition of intellectual capital stating it is “material that has been formalized, captured, and leveraged to produce a higher-valued asset.” Stewart (1997, p. 67), meanwhile, defined intellectual capital as “packaged useful knowledge.” Brooking (1996, p.12) offered a more comprehensive definition of intellectual capital stating this term is “given to the combined intangible assets which enable the company to function.” Generally speaking, definitions of intellectual capital have described this terminology as comprising:

(a) knowledge, whether it was tacit or explicit;
(b) knowledge transformation processes (such as research and development, knowledge networks, communities of practice and organizational learning); and
(c) the end products of the knowledge transformation processes (such as patent, trademarks and other assets containing intellectual property rights).

Though a variety of definitions have utilized the concept of knowledge, Skyrme and Associates (2000a, p.2) argued that intellectual capital was “not merely a part free-floating human brainpower but rather assets that can be identified and is of use to organizations.” It was beyond the scope of this paper to assess the respective merit of the various definitions of intellectual capital. Regardless, for the purposes of this paper intellectual capital was defined as:

*the enhanced value of a firm attributable to assets, generally of an intangible nature, resulting from the company’s organizational function, processes and information technology networks, the competency and efficiency of its employees and its relationship with its customers. Intellectual capital assets are developed from (a) the creation of new knowledge and innovation; (b) application of present knowledge to present issues and concerns that enhance employees and customers; (c) packaging, processing and transmission of knowledge; and (d) the acquisition of present knowledge created through research and learning.*

**Components of Intellectual Capital**

The respective definitions of intellectual capital provided a constructive point for an initial understanding of this concept but lacked the required direction for what may have comprised its specific elements. Several researchers have attempted to bridge this gap by providing classification schemes to describe the major components of intellectual capital. One of the initial classification schemes was provided by Leif Edvinsson the corporate director for Skandia. According to Edvinsson the value of a firm’s intellectual capital was the sum of its human and structural capital (Edvinsson and Malone, 1997). Other researchers, such as Brinker (1997) and Skyrme and Associates (2000b), expanded on the categories identified by
Edvinsson by including a third category of customer capital. Brooking (1996) suggested that intellectual capital was a function of four major asset types: (1) market assets, (2) intellectual property assets, (3) human-centered assets, and (4) infrastructure assets. Draper (1997) provided one of the broadest classification schemes arguing that the major components of intellectual capital comprised six categories. These were: (1) human capital; (2) structural capital; (3) customer capital; (4) organizational capital; (5) innovation capital; and (6) process capital. Table 1 provides a summary of the major classification schemes defined in previous research of the respective components of intellectual capital.

[Take in Table 1]

Consistent with much of the recent literature on intellectual capital such as Brookings, 1996, this study categorized this concept into four major components. These components are termed and described as follows:

1. human resources – cover statements about the employees’ qualifications, the management system’s handling of the human resource development task and the employees’ satisfaction;
2. customers - cover statements about the composition of customers, the company’s efforts to develop the customer relationship and customer satisfaction and loyalty (repeat business and long-term relations);
3. information technology and process - covers the scope and availability of IT systems and an activity-oriented expression of a number of business activities especially favored by the company, e.g. investments in R&D, lead-time, economy and productivity of administrative processes. "Processes" are also an expression of quality, error rate and waiting time towards the surroundings of the company; and
4. intellectual property – covers statements by a company on its investment into and development of creative ideas and items that to which rights have been assigned. The term covers such items as used to refer to that group of rights that include patents, Trade-Marks, copyrights, industrial designs, trade secrets and confidential information.

Disclosure of Intellectual Capital Related Information

During a symposium organized by the Securities Exchange Commission of the United States of America, the then Commissioner, Steven W.H. Wallman predicted that the disclosure of intellectual capital related information would one day become the most central emphasis of a firm’s annual report (Edvisson and Malone, 1997, p.5). A number of surveys have reported an increasing interest and demand amongst investors for companies to report on intellectual capital and non-financial related matters. A report from Ernst and Young (1997) showed financial markets (such as those in the USA and the UK) attached significant importance to intellectual capital matters such as a company’s strategy implementation and quality, management’s trustworthiness, the company’s innovative ability and the quality of the human
resources (see Bontis, 2000). A report from Taylor and Associates (1998) found, based on a 200-item proprietary disclosure index drawn from criteria established by the world's most influential money managers, investors ranked the disclosure of information on intellectual capital in the top ten of their information needs. Taylor and Associates (1998) subsequently stated “institutional investors have, more than ever before, recognized the role of such intangibles as intellectual capital in determining future profit potential. Companies that fail to communicate concrete strategies and tactics for the future seriously jeopardize investor confidence, future financial performance and ultimately share price.”

Some companies have recognized the potential benefits of voluntarily disclosing on intellectual capital in their annual reports or other supportive publications. Skandia AFS, for example, was one of the first corporate proponents for reporting on intellectual capital. Apart from the disclosure on intellectual capital in their annual report, Skandia AFS supplemented these details by providing in 1994 (and since) a separate report entitled “Visualizing Intellectual Capital in Skandia” (Skandia, 1995). Skandia AFS’ underlying justification for the reporting on intellectual capital was that the traditional financial reporting model only presented the past financial information about the firm. Additional information on Skandia AFS’ intellectual capital was needed for investors to understand both an organization's current and future capabilities (Luthy, 1999). Others leading companies voluntarily reporting on intellectual capital include Swedish companies such as Telia and Consultus, Canadian Imperial Bank of Commerce (CIBC) and firms in the United States of America such as US West, Buckman Labs, and Hughes Space and Communications.

Generally speaking, however, there is both a deficiency and inconsistency in current reporting practices of a corporation’s intellectual capital (Abdolmohammadi, Greenlay and Poole, 1999). There is a growing perception, however, that the disclosure on intellectual capital will intensify. The OECD (2000) reporting on an international survey by Artur Andersen (1998) of the measurement and disclosure of intellectual capital provided three major conclusions based on the response of 368 companies from North America, European and Asian companies about intellectual capital reporting in the future. These are described as:

1. Over 75% of the respondents already tracked the measurement of two or more related intellectual capital accounts;
2. The majority of respondents were of the believe that intellectual reporting would increase in the future; and
3. The disclosure of intellectual capital would remain at the discretion of a firm’s management.

Findings from the Arthur Anderson (1998) study have been replicated elsewhere. For example, Bontis (2000) reported on a study by Waterhouse and Svendsen (1998) of Chief Executive Officers and Boards
of Directors from large Canadian organizations. Bontis (2000) reported that Waterhouse and Svendsen (1998) found the executives they surveyed rated the disclosure of intellectual capital was a strategic issue for a firm. Furthermore Boards of Directors felt that intellectual capital matters should be reported regularly.

The current lack of deficiencies and inconsistency in current intellectual capital reporting practices is viewed to arise from point that the understanding of intellectual capital is still within its infancy (Petty and Guthrie, 2000; Manasco, 1999). As noted earlier there is no fully agreed upon definition of intellectual capital and its respective components. Furthermore, measurement of intellectual capital is still the subject of extensive debate and discussion. Consequently, a variety of models on the measurement and reporting on intellectual capital have been put forward (Roos, Roos, Dragonetti and Edvinsson, 1997). It is beyond the scope of this study to assess all the respective models put forward (Bontis, 2000). Nonetheless, some general conclusions on what details these models stress should be reported on intellectual capital can be tentatively drawn. First, information on intellectual capital should illustrate its importance to the company. Second, intellectual capital that establishes a direct link with a given stakeholder group, such as employees, potential employees, customers or the general public must be reported. Third, companies should avoid reporting information on intellectual capital accounts that has anything with direct relevance to competitors. Finally, intellectual capital details reported should describe the company’s general idea of management and general challenges in tomorrow’s information and knowledge society. Ultimately, however, the amount, nature and type of intellectual capital information disclosed will be potentially influenced by a number of factors at various levels of the economic, social and government infrastructures within a nation and around the world. In the next subsection three potential factors at the organizational level that may explain the amount of intellectual capital disclosures in corporate annual reports are discussed.


Various empirical studies of accounting disclosure practices have indicated that despite regulators having established requirements on the disclosure of financial and non-financial information companies frequently reveal more details about their activities than that which is required. Generally speaking, firms will provide voluntary disclosures on emerging issues in advance of any action by regulators to mandate practices. Numerous company directors and executives have recognized that a firm can receive economic benefits from a from the firm’s disclosure policy if managed effectively. Prior research has indicated, for
example, that a firm’s adopting an open disclosure strategy can have a positive influence on its value (see, for example, Lev, 1992; Skinner, 1994; Blacconiere and Patten, 1994; Botosan, 1997). In the case of intellectual capital, for example, management may provide voluntary disclosures on this issue with the view that the reporting of such details will enable investors and other relevant stakeholders to better assess the firm’s future capabilities. As a reward for the voluntary disclosure of intellectual capital the firm may be rewarded with a reduction in the perceived risks associated with the entity. Consequently, its cost of capital would be less.

Despite the potential benefits adoption of an open policy of intellectual capital disclosure, however, is not without possible costs. These costs may take a number of different forms, such as reputational, political, contracting or proprietary. The general driving force behind such cost would be from external stakeholders with no ownership in the entity undertaking actions detrimental to the firm’s future cash flows (Dye, 1985; Karpoff and Lott, 1993). With respect to intellectual capital management may feel reluctant to disclose information on a new knowledge based process it has developed for fear it may attract unwanted political attention. Government regulators may perceive that the process places the firm in a monopolistic position that may have negative externalities on society at large. To enable greater public access to the process government regulators may instruct the firm to sell the process at a given price or market access that ultimately disrupts the firm’s future cash flows.

The relative magnitude of costs associated with the release of intellectual capital details and the firm’s ability to endure them may be influenced by an entity’s intellectual capital condition. Assume, for example, a company whose future is questionable due to a substandard level of intellectual capital capability. The disclosure of its lack of intellectual capital potential or inadequate development of productive knowledge based products, services and other relevant assets may undermine the reputation of the entity as a reliable and trustworthy supplier or debtor in the new “knowledge-based” economy. If the company requires additional capital expenditure in the future in order to improve its intellectual capital base and performance this may be of concern to shareholders, investors, debt-holders and other relevant stakeholders. Disclosure of a poor intellectual capital position may imply a need for the company may to acquire new financing or the diversion of cash flows from current investments or debt repayment. The implication of such action may result in a reduction in future cash flow leading stakeholders to question their relations with the firm. If stakeholders were to remove their support for the firm its legitimacy and, therefore, its future survival would be in question. Pressure groups, such as unions and consumer organizations, may also act on the intellectual capital information reported by the firm. Union bodies,
for instance, may interpret the human resource intellectual capital disclosures of the firm indicates it is not acting in the best interests of the firm’s workers by not investing sufficiently in the intellectual capital well-being of its employees through such activities as education and training. The ability of a company to withstand the actions and pressure from special interest groups will be reduced by the entities intellectual capital position. A company in a poor intellectual capital position will have less resources and potential available to it to meet such challenges. Firms in a sound intellectual capital position, therefore, are more likely to engage in “costly” voluntary disclosure practices on this issue than firms with a poor record since they can withstand the scrutiny and action of various stakeholders whilst benefiting from an increase in its credibility.

It has also been argued in the prior literature that a good financial position intensifies the credibility of information released by a company (see, for example, Hughes, 1986; Scott, 1994; Beaver, 1989). As a result of the increased credibility the value of the company is enhanced (see, for example, Clarkson and Simunic, 1994; Cormier and Magnan, 2000). A good financial position is perceived to add value to information released by a company under such conditions as it has more at stake than a poor performing entity. Credibility of information disclosed adds to the value of the enterprise as the additional details released as it assists in reducing the risk associated with an investor’s decision making process. Based on this line of analysis, therefore, it would be in the interest of a sound intellectual capital performer to release more information on this concept than a company in a poor intellectual position.

**Part 3: Research Design**

*Sample Selection and Source Documentation*

Due to difficulty in acquiring information for private firms it was decided to limit this study to publicly listed companies in the United Kingdom. Given the large number of publicly listed companies in the United Kingdom it was further decided to limit the sample population to those firms continuously listed on the FTSE-100 between December 31, 1995 and December 31, 1999, the allotted time period for this study. The chief reason for establishing membership on the FTSE-100 during the aforementioned time period as a screening criteria was the perception that firms included on the FTSE-100 will have an established set of reliable communication procedures increasing the likelihood the primary source documentation for measuring intellectual capital disclosures could be collected for each year under investigation in this study. Furthermore, given their status on the FTSE-100 index it was perceived the primary source documentation for this study could be collected from alternative sources other than
directly from the company itself if they did not have any remaining copies from the period under investigation. Consistent with previous studies firms from the finance and utilities industry were removed from the sample population given the peculiar reporting practices associated with these two industries that may have adversely affected the results of this study (see, for example, Hossain et al., 1994). From the remaining initial sample population of 64 companies a total of 40 firms were randomly selected for inclusion in this study.

It is acknowledged that a firm has access to a variety of tools for the dissemination of information on intellectual capital. For the purposes of this study, however, it was decided that the extent of intellectual capital disclosure would be measured using annual reports as the source documentation. There is considerable support within the accounting disclosure literature for the analysis of reporting practices using annual reports. Gray, Kouhy and Lavers (1995a; 1995b) argued for the importance of a company’s annual report saying statutory regulations require them to be produced regularly. Due to these requirements annual reports provide a consistent historical picture of an entity. Hines (1988) further argues that annual reports are probably the most important document for constructing the firm’s social image. Tilt (1994) supports this view suggesting firms can symbolically demonstrate values and views to the relevant public through this document. Campbell (2000) provided two further reasons to support the use of annual reports. First, this document is often the most widely distributed of all publicly produced documents of an organization. Second, management has complete editorial control of the discretionary disclosure of information in the document. Finally, Tay and Parker (1990, p.79) stated that “actual reporting practices may be assessed more accurately from annual accounts.”

A number of techniques were used to collect the necessary annual reports from the selected companies and other related details. These included contacting the companies directly, extensive searches of annual report databases and archives and reviews of the Web Sites of the companies. From these procedures 31 full sets of annual reports for the period under investigation were collected. This provided a total of 155 annual reports to be analyzed.

Measure of Intellectual Capital Disclosure

Prior research of disclosure practices in annual reports have been evaluated and analyzed using a number of different approaches. Some studies, such as Andrews et al., (1989), Deegan, Rankin and Voght (2000) and Hackston and Milne (1995), measured the quantity of disclosure on a given issue by counting the
number of words, sentences or pages. An alternative measurement approach has been the application of a disclosure index (see, for example, Cooke, 1989a; Hossain et al., 1994). For the purposes of this study the sample companies included in this study adopt the latter approach to measure the extent of intellectual capital disclosure. As noted above, there is yet no uniformly agreed upon model of factors comprising intellectual capital. A major task, therefore, was to identify the items to be included in the disclosure index. The following steps were taken to construct the disclosure index:

(1) A preliminary list of 71 items was developed from an extensive review of the extant literature on intellectual capital (see, for example, Brookings, 1996; Edvinsson and Malone, 1997; Draper, 1998; Luthy, 1999; Strassmann, 1996a, 1996b; Kelloway and Baring, 2000).

(2) To reduce the possibility of irrelevant and overlapping items the preliminary item list was screened by academic researchers from areas of management and accounting familiar with intellectual capital and disclosure practices. English language academics were also consulted to assist with clarify and understanding of terminology used in describing each item. Seventeen items were removed from the preliminary list after this reviews as they were considered irrelevant or overlapping in their description and nature.

(3) Discussions were held with four practicing accountants from a ‘Big-Five’ firm and five executives of major companies to verify the list. Based on the feedback from these consultations a further four items were removed from the disclosure index.

As a result of the aforementioned steps a disclosure index comprising 50 discretionary intellectual capital disclosure items was formed.

Having constructed the intellectual capital disclosure index the next task was in establishing the measurement of the extent of disclosure. Previous research has indicated a number of techniques that can be used. Wiseman (1982), for example, developed a scheme whereby each disclosure was rated on a scale from zero to four that provided an indication of the qualitative nature of the disclosure. A disclosure rated with a four was considered to provide more value to stakeholders as they contained quantitative or monetary information. Allocation of scores based on such scaling has been criticized, however, due to the fact that it may introduce research bias (see, for example, Gray, Meek and Roberts, 1992; Spero, 1979). An alternative commonly used technique, and the method used in this study, scores a discretionary item when disclosed with a one and zero if no disclosure is observed. It is assumed under this approach each disclosure item is of equal importance. There is support in the literature for this technique with the choice of an unweighted index not producing substantially diverse results over a weighted index (see, for example, Chow and Wong-Boren, 1987; Marston and Shrives, 1991).

To generate a ratio to represent the amount of intellectual capital disclosure for each firm using the scale described above two methods may also be utilized. One method may calculate the ratio as the sum of the scores awarded divided by the maximum possible number of disclosure items appropriate for each
company. This method ignores the potential bias that may arise due to differences in the number of disclosure items within each major category of the disclosure index. For example, there were thirteen disclosure items related to human resources whilst there was only nine items that relate to intellectual capital in customers. As a consequence, it has been suggested that a firm disclosing extensively on the second major category of intellectual capital is scored lower than a firm that focused disclosures on human resources simply because the former had less disclosure items than the latter. In an effort to minimize this potential bias a second method for calculating the eventual disclosure index score, and the technique reported in this paper, may be used. Under this second technique a ratio for each major category of intellectual capital is calculated. These ratios are defined as the actual score awarded in each major category to the maximum possible score appropriate for that company in the category under question. Each category ratio is then divided by the number of major intellectual capital categories in the disclosure index; that is, four. The division is undertaken to ensure each major category carries equal weighting within the final index score. Each resulting category ratio is then summed to give the final disclosure index score for the firm.

To pre-test the disclosure index and scoring system, ten (10) 1998 annual reports from publicly listed companies in the United Kingdom was analyzed. Two individuals assessed each annual report in the pre-testing phase. Despite a detailed description for each category and disclosure item several discrepancies were noted during pre-testing. The discrepancies were resolved after a meeting between the individuals involved in pre-testing without any major difficulties. Consequently, it was decided that there was no need to make any adjustments to the disclosure index and scoring system. A copy the final scoring scheme used in this study can be obtained from the author upon request.

Measure of Intellectual Capital Performance

A study of intellectual capital measurement, reporting and accounting of Danish and Swedish companies attached significant importance to decentralization and employee involvement and motivation as the underlying factor in the development of intellectual capital accounts. The Danish Trade and Industry Development Council Taskforce (1996), headed Professor Jan Mouritsen, stated that the pivotal factor in the future was the effective organization of the firm’s intellectual capital “organized around the employees’ application of different types of technology requiring thoughtfulness and adaptability.” Measurement, accounting and disclosure practices of companies, therefore, “reported must demonstrate the company’s intention to be a state-of-the-art company in need of employees with personal, professional
and social qualifications.” Other studies have also expressed the emphasized the importance of employees in intellectual capital. Strassmann (1996a; 1996b; 1998) argued that the development and failure of a firm in creating and adding value to its intellectual capital relies upon the management of the company. Pulic (1998), whilst agreeing somewhat with the perception of Strassmann (1996a; 1996b; 1998), felt the entire employee structure of a company was responsible for the development of intellectual capital. Pulic (2000, p.2) wrote that depending upon the capabilities of the majority of firm’s labor is now tied “to knowledge and it is the ability of these employees to transform it into profitable action.” Pulic (1998, p.8) went further to state that in a “knowledge based economy the responsible party for the achieved market results are definitely the employees.”

Given the central emphasis of employees in the organization, arrangement and management of intellectual capital accounting this study sought a measure for intellectual capital that utilized this factor within its analysis. A measure of intellectual capital that emphasizes such a relationship is the Value Added Intellectual Coefficient (VAIC™). Also known as the Austrian Approach, VAIC™ is considered a “universal indicator showing abilities of a company in value creation and representing a measure for business efficiency in a knowledge based economy” (Pulic, 1998, p.9). Apart from the fact that VAIC™ places an emphasis on the value of employees there are several other reasons to support the selection of this model as an appropriate proxy to measure intellectual capital and its performance. Schneider (2000), for example, stated that VAIC™ was an effective method of measuring intellectual capital because:

(a) VAIC™ enabled the collection of evidence of intellectual capital leverage to key success processes;
(b) VAIC™ was easy to calculate using information already accounted for by a firm and reported in annual reports thus minimizing any additional costs to the preparer and stakeholder; and
(c) the methodology used in the calculation of VAIC™ is relative straightforward that enable greater cognitive understanding.

Measure of Organizational Level Control Variables

Prior research has suggested that organizational level factors may influence the amount of voluntary disclosure practices. There is little empirical research that may indicate which organizational level factors may be determinants of intellectual capital disclosure levels. For the purposes of this study, therefore, five organizational level control factors are included in this study based on the strength of previous research into voluntary disclosure practices. These five organizational level factors are: (1) organizational size; (2) industry type; (3) listing status; (4) physical capital financial performance; and (5) leverage. These factors and the proxies used to measure them are described below.
Organizational Size

A number of theoretical studies have proposed a positive relationship between organizational size and the extent of voluntary size (see, for example, Dye, 1985; Craswell and Taylor, 1992; Watts and Zimmerman, 1986). The majority of empirical studies have supported such a relationship (see, for example, Chow and Wong-Boren, 1987; Cooke, 1989a, 1991; Roberts, 1992). Larger firms are likely to be under greater scrutiny from the various stakeholder groups with an interest in intellectual capital such as employees, customers, unions and the general public at large. In addition, larger firms may have more stakeholder parties interested in how it manages its intellectual capital whilst also having access to more formal channels of communication through which intellectual capital related information can be related to interested parties. To control for potential organizational size effects on the quantity of intellectual capital disclosure this control factor was measured using the natural log of the firm’s average total assets.

Industry Type

Verrechia (1983) suggested proprietary costs, such as competitive disadvantage and political costs, vary across industries. The oil and gas industry, for example, may be more sensitive to its competitors and the scrutiny of the general public and special interest groups than certain other industries due to the nature of its products, exploration and research and development. In terms of intellectual capital it has been suggested that firms from the so-called new economy industries, such as telecommunications and software development, are likely to be more sensitive to scrutiny than older established industries. Research into the effect of industry type on intellectual capital is still within its infancy. As a consequence there is a lack of agreement of which industries may or may not be classified as intellectual capital intensive. Commentary on the new “knowledge-based” economy, however, has suggested research and development will be an essential factor in the creation of intellectual capital. Upon this basis, therefore, this study initially controlled for industry type effects by measuring the ratio of research and development expenditure to firm sales as a proxy for industry influence. Due to multicollinearity problems an alternative technique was used. It was concluded that firms separately reporting their research and development expenditure did so as this expense was material. Consequently, the firm was considered to be research-intensive and was coded with a one (1). If expenditures were not reported separately then this was considered immaterial and the company not research-intensive. Such firms were coded with a zero (0). This technique was consistent with prior research such as Wruck (1993) and Sanders and Carpenter (1998).
Listing Status

Recent empirical research has identified a positive relationship between a firm’s foreign listing status and its extent of voluntary disclosure (see, for example, Cooke, 1991; Leftwich, Watts and Zimmerman, 1991; Malone, Fries and Jones, 1993). It has been argued that as a firm lists on more foreign exchanges then it will be exposed to the scrutiny of a wider set of stakeholder groups. In reference to intellectual capital, therefore, as interest in this concept has expanded globally firms listed on foreign exchanges are likely to be subject to the demands of a wider set of intellectual capital interest groups for information. To meet the needs of this wider set of stakeholders the firm is likely to disclose more details on intellectual capital relative to entities that are only domestically listed. A dummy variable was used to measure this control factor with a firm having a multiple listing being scored with a one and those domestically listed only a zero.

Physical Capital Financial Performance

Despite the growing significance of intellectual capital to shareholders and other stakeholder groups traditional measures of a firm’s performance based on its physical capital, such as return on assets and return on equity, still remains an important feature of a firm’s profile. As a consequence, firms will not wish to be seen as being perceived as a “lemon” in terms of its physical capital financial performance. Prior research has suggested firms with a sound physical capital financial performance level will have a variety of incentives compelling them to distinguish themselves from less profitable entities. One such incentive may be a desire to reduce a firm’s cost of capital. One mechanism to distinguish themselves from not so profitable companies is through voluntary disclosures (Foster, 1986). Thus, based on previous research it is suggested that physical capital financial performance will lead to an increase in voluntary disclosures including those related to intellectual capital. To control for this factor the firm’s return on assets for each year was calculated.

Leverage

The final control factor included in this study related to the firm’s leverage. Jensen and Meckling (1976) argued that there is the potential for transfers of wealth from bondholders to shareholders amongst highly leveraged firms. In an effort to protect their own self-interests debt covenants restrictive debt covenants
could be constructed within the debt contracts. In an effort to reduce monitoring costs a company’s management may voluntarily disclose more information, including that related to intellectual capital. Leverage was measured as the firm’s long-term debt to shareholders’ equity ratio.

**Multiple Regression Analysis Model**

To analyze the possible relationship between intellectual capital performance and intellectual capital disclosure the following multiple regression model was derived:

$$QIC \text{ Disclosure in Each Year (1996 – 2000)} = a_1 + \alpha_1 \text{OS} + \alpha_2 \text{IT} + \alpha_3 \text{LS} + \alpha_4 \text{ROA} + \alpha_5 \text{LEV} + \alpha_6 \text{VAIC}^\text{™} + \epsilon$$

Where:

- **QIC Disclosure** = Intellectual capital disclosure score per firm.
- **Organizational Size (OS)** = Natural log of average total assets.
- **Industry Type (IT)** = Dichotomous variable with coded one (1) if a company was highly knowledge based and coded zero (0) if otherwise.
- **Listing Status (LS)** = Dichotomous variable with coded one (1) if a company is multi-listed coded zero (0) if otherwise.
- **Return on Assets (ROA)** = Net income + Interest Expense (1 – Tax Rate)/Total Average Assets
- **Leverage (LEV)** = Average debt to shareholder’s equity.
- **Value Intellectual Capital Coefficient (VAIC™)** = Measure of firm’s intellectual capital performance during the year.

**Part 4: Results**

**Descriptive Statistics**

Descriptive statistics of the survey sample with respect to the extent of intellectual capital disclosure, intellectual capital performance and organizational level factors for each of the year investigated are shown in Table 2. The breakdown in Table 2 suggests that between 1996 and 2000 the average amount of voluntary disclosure on intellectual capital tended to increase annual during the survey period. Analysis of the extent of disclosure related to the four major categories of intellectual disclosure described in this paper suggests the increase in total disclosure on this concept was due to increases in all four major categories of this concept. In relative terms, however, the largest increase in the extent of disclosure was related to intellectual capital in intellectual property. For this category the average amount of disclosure increased 242.08% from 1996 to 2000. The next largest percentage increase was for intellectual capital in information technology and processes at 57.46%. The percentage increase in average disclosures for
intellectual capital in customer and intellectual capital in human resources were 23.61% and 16.05% respectively.

[Take in Table 2]

Across the survey period there does not appear to be any distinguishable trend associated with the average amount of intellectual capital performance amongst the survey sample. In absolute terms there appears to be little difference between the average amount of intellectual capital performance in the years 1996, 1998 and 2000 respectively. Between 1996 – 1997 and 1998 – 1999, however, there were declines in the average amount of intellectual capital performance before a rising again. The decline in 1996-1997 appears more substantial than in 1998 – 1999. Based on a comparison of the upward trend in intellectual capital disclosures and random movement in intellectual capital performance results suggest there does not appear to be any correlation between the two.

With regard to the organizational level characteristics of the survey sample, there was a general upward trend in the average amount of total assets. The relative increase in terms of the average amount of total sales between 1996 and 2000 was more substantial than that for the average amount of total assets. Unlike for the average amount of total assets, however, the average amount of total sales for the survey sample did not follow a consistent upward trend between each year. Between 1996 and 1997 there was a decline in the average amount of sales. This was followed by a slight increase between 1997-1998 and larger increases in the next couple of year brackets. The physical capital financial performance of the survey sample, as measured by the return on assets, exhibited a gradual and steady decline between all years covered by this survey. The average amount of leverage, however, followed a random path.

To examine if the changes in the average amount of intellectual capital disclosure and intellectual capital performance each year was significant two tests, one non-parametric (Wilcoxon matched-pair sign rank test) and one parametric (Paired sample t-tests), were performed. Results related to these tests are shown in Table 3.

[Take in Table 3]

One pragmatic reason for performing the Wilcoxon matched-pair signed rank is that it shows the number of companies that increased their intellectual capital disclosure and intellectual capital performance levels
between the respective years under investigation. This test indicates that in terms of intellectual capital performance the number of companies that had an increase was generally close to the number of decreases for each year pairing. In contrast, the raw number of firms that increased their level of intellectual capital disclosure was generally more substantial than the number recording a decrease. In terms of significant differences between the years, Wilcoxon matched-pair signed test and Paired t-test results indicate that the change in intellectual capital performance was not significant between any of the consecutive years during the survey period. Results related to the average amount of intellectual capital disclosure, however, suggested the changes between each of the paired years were in fact statistically significant.

Table 4 reports the results from regression equations investigating the association between the extent of intellectual capital disclosure and intellectual capital performance and organizational level control factors for each year covered by this study. The explanatory power of each model varies from a high for the year 1998 of 31.6% to a low in 1996 of 22.0%. Overall the explanatory power of the model in each year is considered to be comparable to findings in other studies on disclosure practices that have included the organizational level control factors from this study. Concentrating on the results related to intellectual capital performance, results detailed in Table 4 indicate the coefficient for this independent variable was only statistically significant in explaining variations in intellectual capital disclosure levels in 1996 and 1998 respectively. A result of importance, however, related to this independent variable is that the directional sign on the coefficient was negative in each year, a finding contradictory to expectations.

[Take in Table 4]

 Contributing to the explanatory power of the model in each year was the significance of some of the organizational level control variables. In 1996, for example, the coefficient for a firm’s listing status was found to be statistically significant. This factor was also significant in explaining the variation in intellectual capital disclosures in 1997 though the level of significance was only marginal. The directional sign for the coefficient related to listing status was as predicted in all annual regression models. Industry type and leverage also contributed to the explanatory power of the 1997 regression model. These two organizational level control factors were also significant explanatory variables of the variation in intellectual capital disclosures in 1998, 1999 and 2000 respectively. Directional signs on the coefficients related to industry type and leverage were as predicted in all annual regression models. It is interesting to note that in the case of leverage the statistical significance of this factor appears to become greater with
each year. Contradictory to expectations, and findings from prior literature, none of the coefficients related to organizational size and physical capital financial performance were statistically significant in any of the years under investigation. Further contrary to expectations, the directional sign on the coefficient for physical capital financial performance in 1996 and 1999 was negative rather than positive as expected.

Some prior research has suggested that a firm’s performance may have a lagged affect on it disclosure practices. Both in line with this prior research and in an effort to further extent the application of this study, the relationship between a firm’s lagged intellectual capital performance and intellectual capital disclosure practices is examined. Results from the respective annual regressions are shown in Table 5.

[Take in Table 5 ]

The explanatory power of the models including a lagged term for intellectual capital performance was less than tests conducted without this independent variable being lagged. The range of the adjusted R-squared value for the lagged intellectual capital performance models was from a high of 27.5% to a low of 17.3%. This compared to a range of 31.6% (high) to 22.0% (low) when the independent variable was not lagged. The coefficients on the lagged intellectual capital performance variable is found to only be statistically significant, and only marginal at best, in explaining variations in intellectual capital disclosures in 1997. Again, the directional sign on the coefficient related to lagged intellectual capital performance was contrary to expectations. Patterns of significance and directional signs for coefficients related to the organizational level control variables followed similar patterns as described above for models that did not have intellectual capital performance lagged.

Section 5 Conclusions and Future Research

The determinants of a firm’s disclosure practices has been at the forefront of prior research for a number of years. A variety of theoretical papers have proposed that a firm’s financial performance may be one such factor that could influence a firm’s disclosure practices. Empirical research, however, have found inclusive evidence to either confirm or reject this relationship. Suggestions of the link between performance and disclosure practices, and the subsequent empirical research, has defined performance largely in terms of an entity’s ability to generate returns on is physical capital. In the last decade of the 20th Century, however, the business environment went through a dramatic revolution as underlying
factors of wealth-creation (energy and capital) for the past 200 years has been replaced by knowledge and information technology. Within the new “knowledge-based” economy intellectual capital, and not physical capital, has become the pivotal factor for future prosperity, growth and development. There is growing evidence of the interest and demand amongst stakeholders for information from a firm related to its intellectual capital. Taylor and Associates (1998), for example, concluded that based on survey of investors information on intellectual capital ranked in the top ten of their information needs. Despite growing important and interest in intellectual capital there has been very limited research of intellectual disclosure practices and factors that may influence the extent of disclosure. This study sought, in part, to rectify this gap in the literature by conducting a longitudinal investigation from 1996 – 2000 of the intellectual capital disclosure practices of 31 publicly listed companies in the United Kingdom listed on the FTSE-100. In addition, this study examines the relationship between intellectual capital performance and the extent of intellectual capital disclosure during the aforementioned period.

One of the objectives of this study was to determine if there had been an increase in the amount of intellectual capital disclosures amongst publicly listed companies in the United Kingdom between 1996 and 2000 as interest and demand for information on this issue has increased. Based on the results of this study, it is concluded that between 1996 and 2000 the average amount of intellectual capital disclosure of the publicly listed companies from the United Kingdom included in this study increased. The major category of intellectual capital in which disclosure levels increased was in relation to intellectual capital in intellectual property. This was followed by disclosures related to intellectual capital in information technology. These findings provide some anecdotal evidence that implies that as interest and demand for intellectual capital has intensified companies have responded by providing more information. Despite suggesting the increase in intellectual capital disclosure was in response to demands by stakeholders for such information this paper does acknowledge that other factors may have also contributed to the increase. For instance, the increase may have been a proactive rather than reactive action by a firm. The Year 2000 (Y2K) problem, for example, was one significant external event in the lead up to the new millennium that could have prompted firms to increase disclosure on intellectual capital to protect the company’s image and self-interests and reduce possible interventionalist action by regulators. Disclosure of Y2K related information, that may have included intellectual capital related information, may have been a mechanism adopted by publicly listed companies in the United Kingdom in the run up to the new millennium to prevent social unrest and action by the government to avoid social chaos. It was beyond the scope of this study to have determined the respective impetuses for the increase in the amount of
information disclosed on intellectual capital by publicly listed firms in the United Kingdom. The study, however, has provided important insights into this area and a foundation for future research.

The second major objective of this study was to investigate the potential relationship between intellectual capital performance and the extent of intellectual capital disclosure. From the findings in this paper it is concluded that there may indeed be some form of association between a firm’s intellectual capital performance and related disclosure practices. The association, however, is not as predicted in this paper. Rather, from the findings it is suggested intellectual capital disclosure levels may only be affected by intellectual capital performance when the level of performance is considered to be “too high”. Intellectual capital performance was only found to be have had statistically significant affect on the amount of intellectual capital information reported in the years 1996 and 1998. The average amount of intellectual capital performance in these years were the highest recorded across the five year time period of this study. The negative association between the two concepts may suggest that when intellectual capital is perceived to be too high by management this could be seen as an advantage to the company and something that should not be disclosed for fear of signaling competitors to the advantage and opportunity achieved by the entity. It has been suggested in the literature that various aspects of intellectual capital, such as key employees and information technology innovations, can be transferred not only nationally but internationally with relative ease and enormous speed. Firms having achieved a high level of intellectual capital performance may fear that given the ease and speed of transferability of intellectual capital excessive intellectual capital disclosure could in fact place it at a disadvantage by indicating to its competitors markets, employees and processes they could utilize in their own operations. For example, a company may have achieved a high level of intellectual capital performance through innovations introduced by key employees. If the firm disclosed such details this may entice a competitor to attempt to acquire the services of the noted employees for their own needs. If successful the original company’s position may be threatened. To maintain its advantage, therefore, a high intellectual capital performing company may refrain from disclosing information so as to protect its intellectual capital assets. Further supporting the proposition that intellectual capital performance may have a negative influence on disclosure when the level of performance is considered to be too high comes from the significance of the lagged term on 1997 results. Caution should be applied, however, in considering the impact of intellectual capital performance when this factor is lagged because the association is only marginally significant. In conclusion, therefore, based on the results of this study it would appear management appear to reduce intellectual capital disclosure in the immediate year in which intellectual capital performance is perceived to be too high. In the year following that in which a high level of intellectual capital performance was
achieved the level of disclosure may also be reduced. This latter association, however, is considered to be tentative.

Contributing to the explanatory power of the various annual regression models were some of the organizational level control factors. The significance of these factors, however, were not consistent across all the years covered in this study. Listing status, for example, was only of statistically significant 1996 and 1997 respectively. The declining influence of this factor on the amount of intellectual capital disclosure provided by publicly listed companies in the United Kingdom in their annual reports may indicate the growing understanding of this concept in that nation throughout the 1990s. As noted above, intellectual capital, though not a completely new idea, only began to gather prominence from the start of the 1990s emerging initially in such nations as the United States and Sweden. Comprehension and understanding of intellectual capital, therefore, may not have been as prominent in the United Kingdom prior to the mid-1990s. As a consequence domestically listed companies may not have been subjected to demands for information on this concept than United Kingdom publicly listed companies that were listed on foreign stock exchanges, such as the United States, where knowledge and demand for intellectual capital related details was greater. With the transfer of knowledge intellectual capital grew to become an established topic and objective for the United Kingdom economy. At the start of the new millennium the government in the United Kingdom issued a white paper concerning the importance of intellectual capital and how the United Kingdom was to be transferred into a new “knowledge-based” economy. As the concept of intellectual capital became more prominent in the United Kingdom, therefore, domestic listed companies may have begun to face the same demands for related information as faced by multi-listed entities had during the earlier years of the decade. With a narrowing in the information demand gap the significance of listing status would appear to have declined as shown by the results of this study.

The growing significance of industry type and leverage may also be associated with growing understanding and prominence of intellectual capital in the United Kingdom during the latter half of the 1990s. In the case of industry type, for example, with greater understanding of the concept of intellectual capital there would have been a better comprehension of which industry groups were more reliant upon the appropriate use and development of intellectual capital assets for its success and expansion. As a consequence, such intellectual capital dependent industries, such as telecommunications and high-tech, would have come under greater pressure from stakeholders, special interest groups and the government. In response to this pressure and demand for information on intellectual capital firms such industries may have adopted a more open disclosure policy on intellectual capital to build and maintain the entity’s
image and self-interests whilst minimizing any interventionalist action. With respect to leverage, debtholders may not have considered intellectual capital as a key factor within their decision-making processes prior to the mid-1990s. Again, as this concept became more accepted within business and the economy in the United Kingdom and became viewed as the pivotal factor in terms of future wealth-creation the views of debtholders may have also altered. As a consequence of the possible change in views publicly listed companies in the United Kingdom may have felt an increased need to release information on intellectual capital to meet these demand needs and protect their own self-interests.

Results from this study indicated that organizational size and physical capital financial performance were not associated with the amount of intellectual capital information disclosed by publicly listed companies. The lack of an association between organizational size and the amount of disclosure is somewhat contrary to previous research into accounting disclosure practices. There are no clear reasons for the lack of an association reported in this paper concerning organization size and the extent of intellectual capital disclosure. It is proposed, however, that lack of an association could be due to several reasons. First, the total sample included in this paper is quite small such that the variation in organization size may not be substantial to derive any significant effects. Second, the publicly listed companies in this study were from the FTSE-100. Collectively, companies comprising the FTSE-100 generally include the larger publicly listed firms from the United Kingdom. As a consequence the sample surveyed in this may have included firms of a similar size that did not fully enable the potential impact of organizational size to be exhibited. Finally, contrary to some previous empirical results physical capital financial performance was found not to be associated with greater disclosure. Again, there is no clear reasoning from the prior literature for the lack of an association between the extent of intellectual capital disclosure and physical capital financial performance. The literature on intellectual capital, however, has indicated that intellectual capital and physical capital are two separate concepts. Due to the separation between these two concepts management may not feel that the amount of intellectual capital disclosure is dependent upon the firm’s physical capital financial performance.

As with previous research, there are several limitations with this study. Empirical tests performed in this study have included on a relatively small sample of a greater magnitude of publicly listed companies in the United Kingdom. This small sample may limit the generalizability of the findings to some extent. Furthermore, while an extensive effort was made to develop an accurate proxy for intellectual capital performance measurement of intellectual capital is still very much within its infancy. As such there is some potential debate that the proxy selected may not be completely representative of a firm’s intellectual
capital performance. Data constraints, however, limit the application of other potential measures. Thus, despite possible questions about construct validity VAIC™ is considered an appropriate proxy for intellectual capital performance given the available data. Finally, given the complex nature of the business environment and the concept of intellectual capital there are various inherent limits on the ability of empirical research to capture all of the potential dimensions that could have an impact on intellectual capital decision making and reporting strategies.

Despite the limitations of this study it has provided a number of valuable insights and contributions to the current literature and debate on intellectual capital. Nonetheless, these insights also provide a number of ideas for future research. First, as noted above, this study used a relatively small sample. Future research should expand on this study by examining the intellectual capital disclosure practices of a larger number of publicly listed, and potential private, firms in the United Kingdom. Second, this study has only examined the intellectual capital disclosure practices in one nation. Intellectual capital, however, is a global phenomenon. Future research should attempt to investigate the intellectual capital disclosure practices of publicly listed and private companies in other nations and factors affecting practices in other nations. Finally, as acknowledged above, proxies included in this study did not capture all of the variations in intellectual capital disclosure practices. Further research may be undertaken to consider the influence the impact of other possible determinants such as the extent of information technology within a society or a nations education standards.
**Table 1:** Summary of major classification schemes of the major intellectual capital components.

<table>
<thead>
<tr>
<th>Study</th>
<th>Intellectual Capital Component</th>
<th>Description of Component as Defined by Researcher</th>
<th>Example of Respective Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edvinsson</td>
<td>Human Capital</td>
<td>Combined knowledge, skill, innovativeness and ability of the company’s individual employees to meet the task at hand.</td>
<td>Company Values</td>
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<td></td>
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<td></td>
<td>Company Philosophy</td>
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<td></td>
<td></td>
<td></td>
<td>Organizational Culture</td>
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<tr>
<td></td>
<td>Structural Capital</td>
<td>The firm’s infrastructure that supports an employee’s productivity.</td>
<td>Software</td>
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<td></td>
<td></td>
<td></td>
<td>Databases</td>
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<td></td>
<td></td>
<td></td>
<td>Patents</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Trademarks</td>
</tr>
<tr>
<td>Brinker (1997)</td>
<td>Structural Capital</td>
<td>Infrastructure that supports the human capital component of intellectual capital.</td>
<td>Information Technology Systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Company Image</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Organizational Concept and Documentation</td>
</tr>
<tr>
<td></td>
<td>Human Capital</td>
<td>Capability of employees to provide solutions to customers, to innovate and to renew. Also includes the dynamics of an intelligent (learning) organization in a changing competitive environment, its creativity, and innovativeness.</td>
<td>Tacit Knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Explicit Knowledge</td>
</tr>
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<td></td>
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<td></td>
<td>Training Programs</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Recruitment</td>
</tr>
<tr>
<td></td>
<td>Customer Capital</td>
<td>Relationships with people with whom a company does business.</td>
<td>Long-term Contracts</td>
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<td></td>
<td></td>
<td></td>
<td>Customer Satisfaction</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Customer Profile</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Customer Success (renewal of contracts)</td>
</tr>
</tbody>
</table>
Table 1: Summary of major classification schemes of the major intellectual capital components (continued).

<table>
<thead>
<tr>
<th></th>
<th>Market Assets</th>
<th>Potential of an organization with respect to its market-related intangibles.</th>
<th>Repeat Business Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual Property Assets</td>
<td>The know-how, copyright, patent, semiconductor topography rights, and various design rights of the company.</td>
<td>Reputation of Intellectual Property Developed</td>
<td></td>
</tr>
<tr>
<td>Human-Centred Assets</td>
<td>Collective expertise, creative capability, leadership, entrepreneurial and managerial skills embodied by the employees of the organisation. Also includes the psychometric data and indicators on how individuals perform under situations such as high stress.</td>
<td>Dist. Employees by Gender, Age and Seniority</td>
<td></td>
</tr>
<tr>
<td>Infrastructure Assets</td>
<td>Technologies, methodologies and processes enabling the organization to function</td>
<td>Methodologies for Assessing Risk</td>
<td></td>
</tr>
<tr>
<td>Draper (1998)</td>
<td>Structural Capital</td>
<td>The value of what is left when the human capital-the employees-has gone home.</td>
<td>Information Systems</td>
</tr>
<tr>
<td>Human Capital</td>
<td>Accumulated value of investments in employee training, competence and future.</td>
<td>Employee Satisfaction</td>
<td></td>
</tr>
<tr>
<td>Customer Capital</td>
<td>Value of the customer base, customer relationships, and customer potential.</td>
<td>Customer Contract Renewal</td>
<td></td>
</tr>
<tr>
<td>Organizational Capital</td>
<td>Systematized and packaged competence combining systems for leveraging the company's innovative strength and value-creating organizational capability.</td>
<td>Organizational Philosophy</td>
<td></td>
</tr>
<tr>
<td>Innovation Capital</td>
<td>Renewal strength in a company, expressed as protected commercial rights, intellectual property, and other intangible assets and values.</td>
<td>Commercial Rights</td>
<td></td>
</tr>
<tr>
<td>Processing Capital</td>
<td>The combined value of value-creating processes.</td>
<td>Time for processing of Orders</td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Descriptive statistics of the sample for the six years.

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Intellectual Capital Disclosure Practices</strong></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Overall Total Disclosure</td>
<td>0.2363</td>
<td>0.2744</td>
<td>0.2187</td>
<td>0.3187</td>
<td>0.3537</td>
<td>0.3709</td>
</tr>
<tr>
<td>Human Resource Capital</td>
<td>0.2423</td>
<td>0.2398</td>
<td>0.2630</td>
<td>0.2795</td>
<td>0.2812</td>
<td>0.1062</td>
</tr>
<tr>
<td>Customer Capital</td>
<td>0.3414</td>
<td>0.3709</td>
<td>0.3884</td>
<td>0.4086</td>
<td>0.4220</td>
<td>0.1462</td>
</tr>
<tr>
<td>Information Technology Capital</td>
<td>0.2473</td>
<td>0.2855</td>
<td>0.3273</td>
<td>0.3787</td>
<td>0.3894</td>
<td>0.1287</td>
</tr>
<tr>
<td>Intellectual Property Capital</td>
<td>0.1143</td>
<td>0.2013</td>
<td>0.2961</td>
<td>0.3480</td>
<td>0.3910</td>
<td>0.1602</td>
</tr>
<tr>
<td><strong>Intellectual Capital Performance (VAIC™)</strong></td>
<td>7.3485</td>
<td>2.3263</td>
<td>7.4980</td>
<td>5.0013</td>
<td>5.565</td>
<td>4.8980</td>
</tr>
<tr>
<td><strong>Organizational Level Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Total Assets (in millions of pounds sterling)</td>
<td>30,200</td>
<td>35,600</td>
<td>38,400</td>
<td>47,400</td>
<td>52,000</td>
<td>93,008</td>
</tr>
<tr>
<td>Average Total Sales (in millions of pounds sterling)</td>
<td>7,500</td>
<td>6,510</td>
<td>6,740</td>
<td>8,870</td>
<td>9,780</td>
<td>9,300</td>
</tr>
<tr>
<td>Physical Capital Financial Performance</td>
<td>12.78%</td>
<td>11.55%</td>
<td>11.39%</td>
<td>10.68%</td>
<td>10.45%</td>
<td>7.26%</td>
</tr>
<tr>
<td>Leverage</td>
<td>9.12%</td>
<td>12.92%</td>
<td>10.17%</td>
<td>8.07%</td>
<td>12.92%</td>
<td>11.61%</td>
</tr>
</tbody>
</table>
Table 3: Disclosure scores for the sample by year and disclosure category.

<table>
<thead>
<tr>
<th></th>
<th>Wilcoxon Matched-Pair Signed Rank Tests</th>
<th>Paired Sample t-Tests</th>
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<tr>
<td></td>
<td>Decrease</td>
<td>Increase</td>
</tr>
<tr>
<td><strong>Intellectual Capital Performance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996 – 1997 Change</td>
<td>N= 17</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>(13.35) Λ</td>
<td>(19.21)</td>
</tr>
<tr>
<td>1997 – 1998 Change</td>
<td>N= 18</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>14.97</td>
<td>16.29</td>
</tr>
<tr>
<td>1998 – 1999 Change</td>
<td>N= 16</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>(16.56)</td>
<td>(15.40)</td>
</tr>
<tr>
<td>1999 – 2000 Change</td>
<td>N= 14</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>(15.14)</td>
<td>(16.71)</td>
</tr>
<tr>
<td><strong>Weighted Disclosure Score</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996 – 1997 Change</td>
<td>N= 12</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>(9.92)</td>
<td>(19.22)</td>
</tr>
<tr>
<td>1997 – 1998 Change</td>
<td>N= 3</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>(16.33)</td>
<td>(15.41)</td>
</tr>
<tr>
<td>1998 – 1999 Change</td>
<td>N= 7</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>(7.64)</td>
<td>(18.44)</td>
</tr>
<tr>
<td>1999 – 2000 Change</td>
<td>N= 7</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>(15.93)</td>
<td>(15.37)</td>
</tr>
</tbody>
</table>

Legend:
Λ = Mean Rank Change
α = p < 0.001
β = p < 0.050
δ = p < 0.100
Table 4: Multiple regression results of impact of same year intellectual capital performance.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>t</td>
<td>p-value</td>
<td>t</td>
<td>p-value</td>
<td>t</td>
</tr>
<tr>
<td><strong>Intellectual Capital Disclosure</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAIC™</td>
<td></td>
<td>-1.975</td>
<td>0.062**</td>
<td>1.015</td>
<td>0.321</td>
<td>-2.283</td>
</tr>
<tr>
<td><strong>Control Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organizational Size</td>
<td></td>
<td>1.577</td>
<td>0.130</td>
<td>0.873</td>
<td>0.392</td>
<td>0.812</td>
</tr>
<tr>
<td>Industry Type Exposure</td>
<td></td>
<td>-0.358</td>
<td>0.724</td>
<td>1.832</td>
<td>0.081**</td>
<td>2.383</td>
</tr>
<tr>
<td>Listing Status</td>
<td></td>
<td>3.142</td>
<td>0.005*</td>
<td>1.777</td>
<td>0.090**</td>
<td>1.504</td>
</tr>
<tr>
<td>Physical Capital Financial Performance</td>
<td></td>
<td>-0.926</td>
<td>0.365</td>
<td>0.458</td>
<td>0.644</td>
<td>1.226</td>
</tr>
<tr>
<td>Leverage</td>
<td></td>
<td>1.554</td>
<td>0.135</td>
<td>1.730</td>
<td>0.098**</td>
<td>1.874</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>1.903</td>
<td>0.071</td>
<td>1.809</td>
<td>0.085</td>
<td>2.135</td>
</tr>
<tr>
<td><strong>Model Summary</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-Squared</td>
<td></td>
<td>45.4%</td>
<td>47.9%</td>
<td>52.1%</td>
<td>45.5%</td>
<td>49.3%</td>
</tr>
<tr>
<td>Adjusted R-Squared</td>
<td></td>
<td>22.0%</td>
<td>25.5%</td>
<td>31.6%</td>
<td>22.1%</td>
<td>27.6%</td>
</tr>
<tr>
<td>F-Statistic</td>
<td></td>
<td>1.942</td>
<td>2.144</td>
<td>2.540</td>
<td>1.945</td>
<td>2.268</td>
</tr>
<tr>
<td>Significance of F-Statistic</td>
<td></td>
<td>0.101</td>
<td>0.072**</td>
<td>0.038*</td>
<td>0.101</td>
<td>0.059**</td>
</tr>
</tbody>
</table>

Legend: * = significant at p<0.05; ** = significant at p<0.10.
Table 5: Multiple regression results of impact of lagged year intellectual capital performance.

<table>
<thead>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Variable</td>
<td>T</td>
<td>p-value</td>
<td>T</td>
<td>p-value</td>
<td>t</td>
</tr>
<tr>
<td>Intellectual Capital</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disclosure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAIC™</td>
<td>1.571</td>
<td>0.131</td>
<td>-1.728</td>
<td>0.091**</td>
<td>0.233</td>
</tr>
<tr>
<td>Control Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organizational Size</td>
<td>1.586</td>
<td>0.128</td>
<td>0.775</td>
<td>0.447</td>
<td>1.025</td>
</tr>
<tr>
<td>Industry Type Exposure</td>
<td>-0.230</td>
<td>0.820</td>
<td>2.113</td>
<td>0.047*</td>
<td>2.453</td>
</tr>
<tr>
<td>Listing Status</td>
<td>2.908</td>
<td>0.008*</td>
<td>1.730</td>
<td>0.098**</td>
<td>1.386</td>
</tr>
<tr>
<td>Physical Capital Financial Performance</td>
<td>-0.548</td>
<td>0.589</td>
<td>0.597</td>
<td>0.557</td>
<td>1.286</td>
</tr>
<tr>
<td>Leverage</td>
<td>1.295</td>
<td>0.209</td>
<td>1.669</td>
<td>0.099**</td>
<td>2.063</td>
</tr>
<tr>
<td>Constant</td>
<td>1.841</td>
<td>0.080**</td>
<td>1.849</td>
<td>0.079**</td>
<td>2.185</td>
</tr>
<tr>
<td>Model Summary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-Squared</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R-Squared</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-Statistic</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Significance of F-Statistic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend: * = significant at p<0.05; ** = significant at p<0.10.
### Appendix A: Summary of major intellectual capital measurement models currently proposed and used.

<table>
<thead>
<tr>
<th>Name of Measure</th>
<th>Major Proponents</th>
<th>Approach</th>
<th>Description of the Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skandia Navigator</td>
<td>Edvinsson and Malone (1997)</td>
<td>Component-by-Component</td>
<td>Intellectual capital is measured through the analysis of up to 164 metric measures (91 intellectually based and 73 traditional metrics) that cover five components: (1) financial; (2) customer; (3) process; (4) renewal and development; and (5) human.</td>
</tr>
<tr>
<td>IC-Index</td>
<td>Roos, Roos, Dragonetti and Edvinsson (1997)</td>
<td>Single Condensed Index based on a Component-by-Component View</td>
<td>Consolidates all individual indicators representing intellectual properties and components into a single index. Changes in the index is then related to changes in the market.</td>
</tr>
<tr>
<td>Technology Broker</td>
<td>Brooking (1996)</td>
<td>Component-by-Component</td>
<td>Value of intellectual capital of a firm is assess based on diagnostic analysis of a firm’s response to twenty questions cover four major components of intellectual capital.</td>
</tr>
<tr>
<td>Intangible Asset Monitor</td>
<td>Sveiby (1997)</td>
<td>Component-by-Component</td>
<td>Management select one or two indices, based on the strategic objectives of the firm, to measure three major components of intellectual capital: (1) growth and renewal; (2) efficiency; and (3) stability.</td>
</tr>
<tr>
<td>Tobin’s q</td>
<td>Stewart (1997) Bontis (1999)</td>
<td>Organizational Level</td>
<td>The &quot;q&quot; is the ratio of the market value of the firm (share price x number of shares) to the replacement cost, or book value, of its assets. Technology and human capital assets are typically associated with high &quot;q&quot; values. Changes in “q” provides a proxy for measuring effective performance or not of a firm’s intellectual capital.</td>
</tr>
<tr>
<td>Economic Value Added (EVA)</td>
<td>Stewart (1997)</td>
<td>Organizational Level</td>
<td>Calculated using the formula: Net Sales – Operating Expenses –Taxes – Capital Charges. If EVA is assumed to be related to intellectual capital changes in EVA will provide and indication of whether the firm’s intellectual capital is productive or not.</td>
</tr>
<tr>
<td>Citation-Weighted Patents</td>
<td>Bontis (1996) Dow Chemical Hall, Jaffe and Tratzenberg (1999)</td>
<td>Quasi-Semi Component-by-Component</td>
<td>A technology factor is calculated based on the patents developed by a firm. Intellectual capital and its performance is measured based on the impact of research development efforts on a series of indices, such as number of patents and cost of patents to sales turnover, that describe the firm’s patents.</td>
</tr>
</tbody>
</table>
### Appendix A: Summary of major intellectual capital measurement models currently proposed and used. (Continued)

<table>
<thead>
<tr>
<th>Model</th>
<th>Authors/References</th>
<th>Level</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance Score Card</td>
<td>Kaplan and Norton (1992) Huseman and Goodman (1999)</td>
<td>Component-by-Component</td>
<td>Extent of intellectual capital and its performance is measured based on the relationship of firm’s organizational vision and strategies from indices that cover four major focus perspectives: (1) financial perspective; (2) customer perspective; (3) internal business perspective; and (4) learning and growing perspective.</td>
</tr>
<tr>
<td>Human Resource Accounting</td>
<td>Hermanson (1964)</td>
<td>Organizational Level</td>
<td>Intellectual capital is measured by calculation of the contribution human assets held by the company divided by capitalized salary expenditures.</td>
</tr>
<tr>
<td>Austrian Approach - Value Added Intellectual Coefficient (VAIC™)</td>
<td>Pulic (1997) Schneider (1998) Bornemann (1998)</td>
<td>Organizational Level</td>
<td>Measurement of how much and how efficiently intellectual capital and capital employed create value based on the relationship to three major components: (1) capital employed; (2) human capital; and (3) structural capital. The measure considers value of employees as the most appropriate proxy to represent creation, development and addition of value to intellectual capital.</td>
</tr>
<tr>
<td>Market-to-Book Value</td>
<td>Stewart (1997) Luthy (1998) (Abdolmohammadi, Greenlay and Poole, 1999)</td>
<td>Organizational Level</td>
<td>Intellectual capital is considered to be the difference between the firm’s market capitalization value and the company’s book value.</td>
</tr>
<tr>
<td>Calculated Intangible Value</td>
<td>Stewart (1997) Luthy (1998) (Abdolmohammadi, Greenlay and Poole, 1999)</td>
<td>Organizational Level</td>
<td>Calculates the excess return on hard assets then uses this figure as a basis for determining the proportion of return attributable to intangible assets.</td>
</tr>
</tbody>
</table>
References:


Endnotes:

1 Explicit knowledge refers to the transmission of knowledge to others through formal and systematic language (Polyani, 1966). Tacit knowledge was used to describe knowledge that is embedded in individual experience. Tacit knowledge, therefore, is difficult to communicate with others (Kelloway, 2000, p.9).

2 Two of the major components of intellectual capital as described in this paper related to human resources and customers. As a consequence, it is reasonable to presume that pressure groups interested in human resource and customer issues will be interested in the intellectual capital activities of a company related to these areas.

3 Only 40 companies were randomly selected because of resource constraints and other limiting time factors. Nonetheless, given the five year time period for this study the collection of a maximum of 200 annual reports from a representative sample that exhibited variation in respective organizational level factors such as industry type was considered sufficient evidence to observe and draw conclusions on intellectual capital disclosure practices in the United Kingdom between 1996 and 2000.

4 For five other companies four of the five annual reports sought could be collected. The missing annual reports for these companies, however, were not the same. In addition, the missing annual report was such that four consecutive year period could not be established. Of the remaining four companies the three latest annual reports could be collected leaving those for years 1996 and 1997 missing. To provide consistency with the analysis it was decided to only include the annual reports of those companies for which all five annual reports could be collected.

5 The annual reports used in the pre-testing phase not included in the final analysis of this study.

6 The Y2K problem is considered to be significant to intellectual capital particularly in the areas of information technology and processing and intellectual property. The Y2K problem, for example, may have forced companies to serious review its procedures and processes. As a result of this examination the processing activities of the firm may have been enhanced increasing the value and potential of the company. Y2K may have also have had significant negative affects such as the need to reallocate research and development funding to the purchase of needs systems to ensure compliance.