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# A Critical Review of the Intellectual Capital Measurement Approaches

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## Abstract

The purpose of this paper is to review critically the intellectual capital (IC) measurement models found in the literature. In general, there are two broad approaches used in measuring IC: the direct and indirect methods. Each approach is reviewed by discussing the essence of the measurement models and assessing the usefulness and limitation of each approach. As a conclusion, the measurement of IC is still evolving and open for more improvement in the future. This study contributes to the literature by summarizing and synthesizing the IC measurement models used in the management and accounting literature.

**Keywords:** Intellectual capital, measurement model, review

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## 1. INTRODUCTION

Intellectual capital (IC) is defined as a knowledge resource that is used to generate profit and create wealth for an entity (Stewart, 1997). It is believed that IC is very important in the current knowledge-based economy. Therefore, it is crucial for IC resource to be measured accurately and fully in order to be managed effectively. The research on measuring IC has grown rapidly in the academic as well as in the practice (Marr, Gray, & Neely, 2003). It is not only of concerns among the management, but also other stakeholders such as shareholders, government, accounting standard setters and academics.

The purpose of this paper is to review the IC measurement models found in the management and accounting literature. In the review, the author identified the similarities and differences, and evaluated the usefulness and limitation of the IC measurement models. This study contributes to the literature by summarizing and synthesizing the IC measurement models used in not only the management studies, but also in the accounting practice.

The paper is organized as follows: Section 2 broadly discussed the two approaches found in IC measurement studies. Section 3 presented the first approach, i.e. using the direct method, and Section 4 discussed the second approach, i.e. using the indirect method. Section 5 concludes the study.

## 2. APPROACHES TO IC MEASUREMENT

There are two broad approaches to measuring IC in the literature: the direct and indirect methods. The choice of method depends on the identifiability criteria of IC. If the IC is identifiable, i.e. separable from the business as a

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whole in substance or from a legal point of view, IC can be measured directly. Common examples of identifiable IC are patents, trademarks and copyrights. However, if the IC is embedded in other intangible or tangible items, then it can be measured indirectly using approaches such as a scorecard, disclosure index or efficiency ratio. For instances, knowledge resides in employees, databases, customers and R&D activity, and other internally generated goodwill. The following sections discuss each of the methods for measuring IC.

### **3. DIRECT MEASUREMENT METHOD**

IC may exist on its own. It can be identifiable and separable from the business as a whole. It is different from other IC, such as internal goodwill, which is internally generated but not separable from the business as a whole. Identifiable IC usually arises from legal rights or contracts which reflect the firms' ownership and control over the economic benefit of IC. Therefore, IC, that was acquired externally either through a purchase transaction (e.g. purchase of patent, license, or copyright) or a business combination (i.e. goodwill from business combination), is usually separately identifiable. Identifiability criteria is crucial in distinguishing IC that could be recognized as an asset as accordance to the international approved accounting standards Statement of Financial Accounting Standards 142 (Financial Accounting Standards Board [FASB], 2001) and International Accounting Standards 38 (International Accounting Standards Board [IASB], 2001).

According to the Statement of Financial Accounting Standards 142 and International Accounting Standards 38, identifiable IC that is recognized as an asset shall be measured on acquisition at its fair value (Financial Accounting Standards Board [FASB], 2001; International Accounting Standards Board [IASB], 2001). According to International Financial Reporting Standard 13 (IFRS 13) Fair Value Measurement, fair value is defined as 'the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date (International Accounting Standards Board [IASB], 2011).

The fair value of IC can be determined using three approaches: a market approach, an income approach or a cost approach. In the market approach, the quoted price of the IC item or a similar item traded in an active market is used as a basis for determining the fair value. However, such an active market is unlikely to be available for IC since IC tends to be unique (Lev, 2001). In the income approach, the estimated future cash flow that can be derived from such IC is used as the basis for determining fair value. The estimated future cash flow must be based on reasonable assumptions and evidence. Examples of the income approach are valuation techniques such as present value, option pricing models, and earnings multiple methods. The cost approach determines the fair value of IC as the cost of replacing the service capacity of the asset. This approach reflects the assumption that the value of IC does not exceed its replacement cost. Firms can choose any of these approaches as deemed appropriate. IC, that was identifiable and measured using the direct method, is usually recognized as an Intangible Asset and reported in the Statement of Financial Position.

However, some IC generally does not exist on its own (Lev, 2001; Stewart, 1997). It is difficult to determine the fair value of unidentifiable IC. It is, for example, hard to assign an accurate value to human capital represented by the knowledge and experience gained by employees in the course of their employment, or the value of structural capital resulting from R&D activity, internal operating processes, or marketing activity. Furthermore, there is no active market for such IC items, so there is no reliable external basis available for measuring the value of the items. Therefore, unidentifiable IC, which is mostly internally generated, typically cannot be measured using the direct method. The accounting treatment for unidentifiable IC is to treat it as an expense (FASB, 2001; IASB, 2001).

### **4. INDIRECT METHOD**

In the absence of identifiability criteria of IC resource, it is difficult to measure IC directly using the fair value. Therefore, for internally generated IC such as employee competence, research and development activity, and customer relationship, various indirect measurement methods have emerged in the management literatures to assess IC. There are scorecard method, disclosure index and efficiency ratio.

#### **4.1 Scorecard method**

The essence of these methods is the construction of a scorecard based on internal IC information. Examples of IC measurement models using this approach are Knowledge Audit<sup>1</sup> (Brooking, 1996); the Balanced Scorecard<sup>2</sup>

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<sup>1</sup> Knowledge Audit is a method of auditing various types of IC resources based on indicators of market-oriented assets, human centred assets, infrastructure assets, and intellectual property assets.

(Kaplan & Norton, 1996); the Intangible Asset Monitor<sup>3</sup> (Sveiby, 1997); the Skandia Navigator<sup>4</sup> (Edvinsson & Malone, 1997); Intellectual Capital Index<sup>5</sup> (Roos, Roos, Dragonetti, & Edvinsson, 1997); the Weightless Wealth<sup>6</sup> (Andriessen & Tissen, 2000); and the Value Chain Scoreboard<sup>7</sup> (Lev, 2001). The examples given are selective, rather than exhaustive.

In scorecard methods, the value of IC is determined according to each firms' own unique indicators. Human capital can, for example, be measured by the number of employees, salaries, education levels, or training hours of employees. Structural capital can, for example, be measured by the number and cost of patents, trademarks, and copyrights, the number of computers per employee, the volume of R&D activity, the number of databases or software developed, the list of key customers, customer satisfaction level, or the organizational chart. Often the indicators used are not publicly available.

The Balanced Scorecard, Intangible Asset Monitor, and Skandia Navigator are the common methods used by firms (Petty & Guthrie, 2000). Studies focusing on IC intensive firms have found that the Balanced Scorecard method is frequently used in measuring and managing IC within firms (Kerssens-van Drogelen & Cook, 1997; Wu, 2005).

The scorecard method, however, is based on unique and non-repeatable measures, which impede comparative analysis across firms (Firer & Williams, 2003). Furthermore, the information is accessible by management but not by external parties such as investors, suppliers, creditors, customers and authoritative bodies. Thus, the scorecard method works for internal users such as the management, but not for external users such as shareholders and government in measuring the value of IC.

#### **4.2 Disclosure index**

Another indirect method for measuring IC is to use the IC information disclosed by firms to external users. In this approach, the extent of IC information disclosed is used to indicate the value of IC. This method is more feasible for external users than the scorecard method because the information can be derived from the annual report which is publicly available. The method involves use of a disclosure index.

IC disclosure index can be developed based on various IC frameworks developed by, for example, Brooking (1996), Kaplan and Norton (1996), Sveiby (1997), Edvinsson and Malone (1997), or Roos, et al. (1997). The data for the IC disclosure index is collected from corporate documents such as the annual report using content analysis techniques (Guthrie & Petty, 2000). The data could range from words to paragraphs, and quantitative or qualitative, as long as it contains IC information.

Studies have found that the disclosure level of IC information in the financial statements and annual reports from IC intensive firms is high (Abdolmohammadi, 2005; White, Lee, Yuningsih, Nielsen, & Bukh, 2010). This suggests that IC intensive firms use voluntary IC disclosure as a means of reducing information asymmetry and communicating the importance of IC investment to value in the future.

However, there are several limitations on using IC disclosure. First, IC information is mostly qualitative in nature (Brennan & Connell, 2000) which impairs comparability. Second, the studies which have measured IC disclosure have used a non-standardized IC disclosure index (Bontis, 2001; Bukh, Nielsen, Gormsen, & Mouritsen, 2005; Guthrie, Petty, Yongvanich, & Ricceri, 2004). Thirdly, the source of information used is generally not audited and verified by an independent party. Lastly, not all firms choose to disclose IC information because of the fear of losing the strategic advantage from the IC information disclosed- often referred to as 'proprietary cost'. For example, Williams (2001) found evidence indicating that large profitable firms have a lower level of IC disclosure. The lack of standardized IC reporting standards hampers an objective and reliable measurement of IC and comparison across firms.

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<sup>2</sup> Balanced Scorecard is a performance measurement tool that is based on indicators of four aspects: financial perspective, customer perspective, learning and growth perspective, and internal perspective.

<sup>3</sup> Intangible Asset Monitor is framework for measuring the value of IC based on indicators of employee competence, internal structure and external structure, and emphasizes the growth, efficiency and stability of such indicators over time.

<sup>4</sup> Skandia Navigator is an IC measurement method that is based on five groups of indicators: financial (focus on the past), customer, human and process (focus on the present), and renewal and development (focus on the future).

<sup>5</sup> Intellectual capital index is an IC measurement method that is based on the combination of all IC indicators into one single indicator.

<sup>6</sup> Weightless Wealth is an IC measurement tool that focuses on IC as the core competencies of a firm in creating value.

<sup>7</sup> Value Chain Scorecard focus on the indicators of innovativeness displayed in the discovery and learning stage, implementation stage, and commercialization stage of the business model.

### 4.3 Efficiency ratio

Another way of measuring IC indirectly is to focus on the efficiency in utilizing IC. This approach indicates the ability of the IC resources to generate value for the firms. The Value Added Intellectual Coefficient (VAIC) model developed by Ante Pulic (1998; 2000) is an example of this approach.

The VAIC model addresses two problems: lack of a direct measure and lack of a basis for comparison. The VAIC model is developed on the basis of determining the value creation ability of a firm from intellectual ability and tangible resources. The VAIC model uses standardized data from financial statements to infer the value of IC indirectly (Williams, 2001).

The VAIC model measures the IC value indirectly by calculating aggregate IC efficiency (VAIC) via three elements: human capital efficiency (VAHU), structural capital efficiency (VAST), and tangible capital efficiency (VATA). The elements represent indexes of the efficiency in utilizing human capital, structural capital and tangible capital in the value creation process. The higher the VAIC value, the better the utilization of the IC and tangible resources (Pulic, 1998; 2000). VAIC is calculated as follows:

$$\begin{aligned} \text{Aggregate IC efficiency (VAIC)} \\ &= \text{Human capital efficiency (VAHU)} \\ &+ \text{Structural capital efficiency (VAST)} \\ &+ \text{Tangible capital efficiency (VATA)} \end{aligned}$$

The VAIC model has received increasing attention in recent years because of the ease and ready availability of data acquisition, the ease of calculation (Firer & Williams, 2003), and because it makes possible the comparison of IC across firms. This measurement model may assist investors in valuing IC of firms. Many studies have used the VAIC model to measure IC at the firm level (Celenza & Rossi, 2014; Chen, Cheng, & Hwang, 2005; Clarke, Seng, & Whiting, 2011; Firer & Williams, 2003; Ismail & Kareem, 2011; Pulic, 2000; Stahle, Stahle, & Aho, 2011; Zeghal & Maaloul, 2010).

Despite the advantages and popularity of the VAIC model, it has been subject to critical review recently. It is argued that the concept and measurement of structural capital applied in the model is contradicted to the commonly accepted concept of structural capital found in IC literature (Iazzolino & Laise, 2013; Stahle, et al., 2011). Several attempts have been made to improve the model by replacing structural capital components with customer capital (Nazari & Herremans, 2007; Vishnu & Gupta, 2014), process capital (Nazari & Herremans, 2007) and innovation capital (Chang & Hsieh, 2011; Nazari & Herremans, 2007; Vishnu & Gupta, 2014).

## 5. CONCLUSION

There are various models available to measure IC. However, none of the model is without any limitation in measuring IC accurately and fully. A suitable IC measurement model depends on the identifiability of the IC resource and the availability of data. To date, the measurement of IC is still evolving and open for more opportunities for improvement in the future. It is hope that this study contributes to the literature by summarizing and synthesizing the IC measurement models used in the management studies as well as in the accounting practice.

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