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Measuring intellectual capital with financial figures: Can we predict firm profitability?

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Summary The measurement of intellectual capital (IC) is a highly discussed topic within the field of knowledge management. This paper presents a method for measuring IC to quantitatively assess whether IC supports the knowledge-based view of the firm that explains long-term differences in firm profitability. We systematically examine the landscape of IC valuation methods applied and addressed in the literature, and we extend one model by selecting monetary proxies for human, structural and relational capital. The paper presents a longitudinal panel data regression using 69 publicly traded pharmaceutical and biotechnology companies. The observation period of the panel is determined to last from the fiscal year 2002 until 2009. Our results show that IC-creating expenses indeed generate IC assets in a subsequent year and that an increase in IC is associated with a higher return on assets over time. With our results, we can also show not only that all three factors independently lead to the creation of IC but also, more importantly, their interaction. We present implications for knowledge management theory and practice. This paper presents a new way to assess the IC using easy accessible data and to verify its impact on firm performance. Furthermore, it provides a tool for managers to calculate the value of a company's IC directly and judge its impact on firm performance. This allows managers to allocate resources to knowledge assets critical to IC that may translate into sustained competitive advantage.

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Introduction

According to the resource-based view of the firm, building a sustainable competitive advantage to maintaining above-average profitability requires a company to create and maintain strategic resources (Peteraf, 1993; Wernerfelt,

1984). According to Amit and Schoemaker (1993), the specific type, magnitude and nature of these strategic resources determine a firm's profitability. Barney (1991) argues that a firm's resources must be valuable, rare, difficult to imitate and substitute so that the firm can generate a sustained competitive advantage.

According to this theoretical model, knowledge is perceived as a firm's main resource (Spender & Grant, 1996) and fulfills all the required attributes proposed by Barney

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(1991). This idea led to the extension of the knowledge-based view of the firm (Grant, 1996; Nonaka, 1991), with scholars claiming that how a firm creates, transfers and uses its knowledge impacts its performance and therefore its ability to compete within an industry (Grant, 1996; Nonaka, 1994).

When knowledge is perceived as a firm's main resource (Spender & Grant, 1996) its creation is critical for firm performance and competitive advantage (Nonaka & Takeuchi, 1995) and can be fostered in different ways. First, a company can dedicate significant resources to research and development to create knowledge that can be integrated into a firm's processes (DeCarolis & Deeds, 1999). As Cohen and Levinthal (1990) show, this investment affects a firm's ability to absorb new, external knowledge, including that of alliance partners. Second, an influx of personnel can augment a firm's knowledge (Madsen, Mosakowski, & Zaheer, 2003). Hall (1992) identifies employee expertise and reputation as knowledge resources that significantly contribute to a firm's success. Third, a firm must learn how customers acquire and use the product it wishes to sell (Leslie & Holloway, 2006). To create new products or new manufacturing processes, the process of sales follows a learning curve similar to the R&D process. Learning during the sales process influences not only companies' production but also their marketing and sales strategies. Similarly, Vargo and Lusch (2004) indicate that companies must shift their relationships to customers so that the companies shift from tangible elements (e.g., products) towards intangible elements, such as skills, information, and knowledge, and therefore towards interactivity, connectivity and on-going relationships.

In the context of the knowledge-based view of the firm, assets related to knowledge that are perceived as key drivers for a sustainable competitive advantage are often referred to as intellectual capital (IC) (or intangible/invisible assets) (Curado, Henriques, & Bontis, 2011; Itami & Roehl, 1991; Nahapiet & Ghoshal, 1998; Subramaniam & Youndt, 2005; Teece, 2002).

The field of IC has been conceptualized by various disciplines, including accounting, information technology, sociology, psychology, human resource management and training and development (Bontis, 1999). Scholars from corresponding disciplines (Edvinsson & Malone, 1997; Gu & Lev, 2010; Lev, 2001; Subramaniam & Youndt, 2005) attempt to shed light on the precise definition of IC, how it can be managed and measured.

Several studies have created various definitions and approaches to capture the idea of intellectual capital. Frequently, the underlying definition in the literature (Kim, Kim, Park, Lee, & Jee, 2012; Petrash, 1996; Yang & Lin, 2009) stems from the work of Edvinsson and Malone (1997). The authors divide IC into three categories: human capital, structural (organizational) capital and relational (customer) capital.

Through the contribution of various disciplines, a significant amount of different measurement models have evolved (cf. Sveiby, 2001). This fact shows, that a single valuation model does not easily describe the value of intangible assets such as IC, which makes them even harder to manage. For this purpose, we join the discussions on how to measure IC (cf. Abu Bakar & Yusop, 2012; Andriessen, 2004; Batatineh & Al Zoabi, 2011; Bontis, 2001; Namvar, Fathian, Akhavan,

& Gholamian, 2010). In order to reduce the existing amount of different valuation models, we will try to establish a simple model that uses financial statement data and provides advantages over the existing monetary models (cf. Sveiby, 2001). We ask whether it is empirically evident that IC, the key resource of a company, is responsible for creating a sustainable competitive advantage. In other words, we test whether IC supports the knowledge-based view of a firm. With this approach, the paper makes three important contributions to the literature and to management practice.

First, the paper presents a method for measuring IC to assess whether IC supports the knowledge-based view to explain long-term differences in firm profitability and consequently might create a sustainable competitive advantage (Peteraf, 1993). We achieve this goal by systematically examining the landscape of IC valuation methods currently applied in extant literature (cf. Andriessen, 2004; Bontis 2001; Sveiby, 2001; Wall, Kirk, & Martin, 2003). Based on these established valuation approaches, we select the most appropriate method in accordance to our assumptions. One requirement is that the model should allow us to test the knowledge-based view of the firm. We must be able to calculate the IC of firms in a way that allows us to compare long-term profitability as a proxy for competitive advantage. The second requirement concerns the model's quantitative nature. Since most of the conducted studies on IC, especially with concern to human capital (cf. Crook, Todd, Combs, Woehr, & Ketchen, 2011), are survey based, we intend to provide a valid alternative using financial statement data to show the impact of IC on firm performance. We calculate a proxy for IC in monetary terms to enhance the model's reliability and to increase the sample size. This method would facilitate the proposition of generalized statements. We then extend the selected valuation model to meet the defined scope of IC, and in a final step, we test the correlation between the calculated IC and long-term profitability to answer our hypothesis that IC is responsible for creating a sustainable competitive advantage.

Second, we show that there is a significant positive correlation between the firm's IC over time and their profitability. Our analysis supports the view that companies with more IC tend to be increasingly profitable over time, which indicates a competitive advantage due to strategic knowledge resources reflected in IC (cf. Cater & Cater, 2009). This finding offers valuable implications for the discussion of IC in the form that IC has a significant positive impact on firm performance and should receive corresponding attention from researchers and managers (cf. Cabrita & Bontis, 2008; Chen, Cheng, & Hwang, 2005; Cohen & Kaimenakis, 2007). Thus, this study develops a new and accurate model to capture the impact of intellectual capital on firm performance.

Finally, by extending the valuation model to include standard financial figures that every company reports, managers can calculate the value of a company's intellectual capital directly and judge its impact on firm performance. This approach guides managers in their ability to allocate resources to knowledge assets critical to IC.

The next section introduces the theoretical foundations of intellectual capital in the context of the knowledge-based view of the firm and develops specific extensions to the valuation model. Subsequently, we present the research

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