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Assessing Intellectual Capital efficiency and productivity: An application to the Italian yacht manufacturing sector

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ABSTRACT

In this paper we evaluate the efficiency and productivity of Intellectual Capital (IC) through the assessment of Bests Practices, that have successfully implemented strategies of Intellectual Capital management. The techniques selected for appraising the productivity of intangibles are the Data Envelopment Analysis (DEA) and the Malmquist Productivity Index (MPI). This approach allows a direct comparison between firms of the same industry in the perspective of improvement through benchmarking. It overcomes one of the main limitations of the current intangibles metrics comparing enterprises on the basis their Intellectual Capital management.

The paper gives both academic and practical insights that could be used for the operational and strategic Intellectual Capital management. Actually, the outcome of the application gives to inefficient companies some directions for progress, that should constitute the basis for the formulation of future Intellectual Capital management strategies. Finally, we apply the analysis to the Italian yacht manufacturing sector in order to offer yachting companies guidelines for Intellectual Capital management.

1. Introduction

Nowadays companies productivity and business performance depend in great measure on an efficient management of their Intellectual Capital, making the evaluation of the return on Intellectual Capital investments a critical obstacle to turning those investments into sources of competitive advantage. In fact, most firms are not able to assess how much they spend on Intellectual Capital, let alone how much they receive from those investments, and consequently many of them either under-invest or make ineffective investments (Zambon, 2003).

The analysis of intangibles as economic growth factors needs conceptual and analytical tools taking into account their unique characteristics and economic significance. This applies not only to the theoretical aspects, but also to the associated measurement and evaluation efforts. At firm level, the most relevant phenomenon, is the value of intangible assets increasingly outgrowing that of tangible assets, particularly, for knowledge intensive firms.

Actually, traditional accounting models of evaluation are not enough to determine the competitiveness of an organization and nothing can say about its strategic effectiveness in the Intellectual Capital management. There is the necessity of new approaches allowing to assess the factor over which the competition is currently played: Intellectual Capital management and exploitation (Lev, 2003a, 2003b). To answer this need, numerous and innovative methods of measure and management of intangibles have been elaborated. However, these methods are not widely adopted due both to their subjectivity and to the delay of the business culture into accepting these knowledge-based tools of management.

Above all, the analysis of the current methods for the measurement of intangible assets and Intellectual Capital put in evidence the lack of an explicit connection between Intellectual Capital investments and management, and their effects on business performance. This suggests a need for an investigation into the link between Intellectual Capital management and business performance (Carlucci & Schiuma, 2006; Chin, Lo, & Leung, 2010). The importance of such study is strengthened by contemporary economy being indeed a knowledge-based or knowledge economy. Moreover, an analysis of Intellectual Capital efficiency and productivity in terms of business performance should provide both academic and practical insights that could be used for Intellectual Capital operational and strategic management (Chen, Cheng, & Hwang, 2005; Cheung, Lee, Wang, Chu, & To, 2003; Meenakshi & Smith, 2002).

2. Intellectual Capital management and business performance

Intellectual Capital is described, in one of its numerous and most famous definitions, as the economic value of the combination of three categories of intangibles (Bontis, Dragonetti, Jacobsen, & Roos, 1999):

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- the "human capital" refers to the abilities, the competences, the know-how of human resources;
- the "structural capital" defines the organizational knowledge, mainly contained in business processes, procedures and systems;
- the "relational capital" takes account of the knowledge embedded in business networks, which includes connections outside the organization such as customer loyalty, goodwill, and supplier relations.

The necessity of companies to understand better the cause-effect relationship between investments in Intellectual Capital and business performance drove academics and practitioners to the creation of methodological approaches and tools to identify, classify and evaluate knowledge and intangible assets within a company. The interest on the topic has favoured, in the last years, the proliferation of models and methodologies studied for assessing all the factors, tangible and intangible, that have influence on business performance. In fact, traditional accounting practice partially overlook the identification and measurement of intangible assets Intellectual Capital in organizations. In particular, financial statements include some information on intangible assets as licenses, trademarks and patents, but there are no data on personnel competences, customer loyalty and satisfaction and many other intangible assets which have no formal place in traditional accounting statements (Zambon, 2003).

On this account, the debate on intangible assets and Intellectual Capital is proceeding with developments both in practice and in theory and the traditional financial statement has shown its inadequacy dealing with the issue of intangibles, as testified by the increasing discrepancy between a firm market capitalization and its book value. This justify the rise of corporate intangible-oriented reporting systems and the creation of new methods for measuring Intellectual Capital (Sveiby, 2001–2010). These methods of measurement are based on different or even conflicting perspectives (monetary or not monetary, aggregate at firm level or not, etc.), but they all try to identify the essential contribution of intangible assets to the business competitiveness in the knowledge-economy (Lev, 2003b).

Although there are several methods for measuring Intellectual Capital, we must take into account that the measured value of intangible assets is not accurate in an absolute way. However, it is an excellent reference for benchmarking as a measure of the potential business evolution of a company over time (Lev, 2003a). Many of the existing methods are difficult to apply, require too much information or are not clearly described, while other ones are not numerical and they can only provide a reference to managers and decision-makers.

Even though several studies have attempted to deal with the issue of how Intellectual Capital investments can create value for the organization, current methodologies show a lack of an explicit identification of the effects of Intellectual Capital management on business performance. The effects of Knowledge Management projects on business performance have been analysed focusing on the quantitative measures of this impact (Firestone, 2001; Kingsley, 2002; Wen, 2009). Moreover, the return of Intellectual Capital investments is surely based on the analysis of the causal relationship between Intellectual Capital management strategies and the company business performance improvements that follow their implementation (Chen et al., 2005; McKeen, Zack, & Singh, 2006).

In this paper we want to emphasize the importance of measuring the results of Intellectual Capital management in order to test and to validate the effectiveness of Intellectual Capital management strategies, and to identify the most critical knowledge assets to be managed for achieving performance improvements. For these reasons, we apply a methodology based on the Data Envelopment Analysis (DEA) and the Malmquist Productivity Index (MPI). This analysis allows to estimate the cause-effect relationship between the efficient Intellectual Capital management and a successful business performance, while comparing companies that belong the same sector in the perspective of improvement through benchmarking.

3. The context of the analysis

This paper adopts a methodology that is based on the assessment of Bests Practices, that have successfully implemented strategies of Intellectual Capital management, and the comparison with other, less efficient, business realities. This approach can be applied both to companies of great dimensions, generally interested in the strategic importance of Knowledge Management, and to SMEs, typical of the Italian economic reality, that should not neglect the management of their Intellectual Capital (Campisi & Costa, 2008).

In order to evaluate the efficiency and the productivity of Intellectual Capital we combine Data Envelopment Analysis (DEA) and Malmquist Productivity Index (MPI): both techniques are based on linear programming and estimates the efficiency of homogeneous operational unity (DMU – Decision Making Units), in this case the companies under study (Banker, Charnes, & Cooper, 1984; Charnes, Cooper, Golany, Seiford, & Stutz, 1985; Charnes, Cooper, & Rhodes, 1978; Coelli, Prasada Rao, & Battese, 1998). In this analysis, inputs and outputs must be correlated to the components of the Intellectual Capital, allowing to determine the relative efficiency and the productivity of the enterprises about their ability to manage their knowledge assets, compared to other enterprises and to the Bests Practices of the same business sector.

Moreover, this study adopt DEA and MPI to evaluate the impact of Intellectual Capital management on competitive advantage (Liu & Wang, 2008; Lu, Wang, Tung, & Lin, 2010; Wu, Tsai, Cheng, & Lai, 2006). The analytical results reveal if the enterprises under analysis achieve efficiency in Intellectual Capital management and, if not, how much they have to improve their Intellectual Capital management.

This approach offers the advantage of allowing a direct comparison between firms of the same industry, with the aim of achieving improvement through benchmarking. It overcomes one of the main limitations of the current intangible assets metrics allowing a comparison between enterprises regarding their management of intangibles.

In particular, in this paper we analyze the management of Intellectual Capital of a particular set of enterprises: Italian leisure boat manufacturers. We investigate the Italian yacht building sector because it is one of the most competitive in the Italian industry and it is constituted in great part by SME characterized by a high content of specialized knowledge. Moreover, Italy is one of the biggest world manufacturers of luxury yachts in the world.

4. The research models

4.1. The Data Envelopment Analysis

DEA is a method that allows management analysts to measure the relative productive efficiency of each member of a set of comparable organizational units based on a theoretical optimal performance for each organization (Banker et al., 1984; Charnest et al., 1978). For this purpose, the organizational units under analysis are designated as *Decision Making Units* (DMUs). These DMUs can be separate firms or institutions, or they can be separate sites or branches of a single firm or agency (Sexton, 1986). DEA evaluates relative efficiencies of DMUs without any assumption about the functional relationship between inputs and outputs. For all these