



An ANP-multi-criteria-based methodology to link intangible assets and organizational performance in a Balanced Scorecard context

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ABSTRACT

In the current knowledge society, both intangible assets (IAs) and intellectual capital (IC) are considered some of the key drivers of value creation and competitive advantage generation for organizations by both researchers and practitioners. A wide range of models and methods have been developed from the 90s, with different approaches and from diverse management perspectives, with the objective of measuring and managing these two concepts. However, only a few of them are integrated in a performance measurement system context and analyze the relationships among the intangible assets and the strategic objectives defined within this context. This paper aims to develop a methodology for identifying, measuring and managing the relevance of intangible assets in the achievement of an organization's strategic objectives as defined in the Balanced Scorecard context. Within the methodology, the Analytic Network Process (ANP) is applied as a useful tool for both the representation of the relationships between the intangible assets and the strategic objectives and the evaluation of the impact of the intangible assets on the attainment of the strategic objectives. The proposed methodology was applied in a university research center in order to confirm the benefits that it provides in the management of intangible assets.

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1. Introduction

In the current global competitive environment, organizations must face new challenges in order to create value for their customers and to keep their competitive advantage. Companies create value when they implement strategies that respond to market opportunities by exploiting their internal resources and capabilities [1,2]. Therefore, managers need to understand what the key resources and drivers of value are in their organizations in order to maintain and even increase their market position [3]. So, one of these challenges is to recognize that physical (tangible) resources (land, machines or financial capital) are no longer their drivers of value creation. Nowadays, intangible resources have become a company's key resources and source of competitive advantages due to the characteristics of the present economy [4–12]. Intangible resources are identified by researchers under the concept of "Intellectual Capital" (IC) or "Intangible Assets" (IAs).

The growth of the importance of IC has caused the need to measure and manage it in order to understand better how it contributes to value creation. Companies that learn to measure and manage their IC can improve significantly their performance in a competitive market [13]. Several models have been developed by both researchers and practitioners with different approaches to measure and manage the IC [14]. There are

some IC models that link intangible assets to diverse elements of the organization (critical internal processes, objectives, mission, vision, etc.), but from these only a few analyze the relationships between them and the intangible assets. In order to assess the influence of intangible assets on the accomplishment of strategic objectives, a Multi-Criteria Decision Analysis (MCDA) method has been chosen because it is a powerful tool for solving problems involving multiple criteria and several agents [15–18]. Different researchers have applied MCDA methods to measure IC [19–28]. Most of the works focus on the prioritization of the IC measurement indicator using the Analytic Hierarchy Process (AHP) [29,30], which has been widely proved as a useful tool to weigh indicators [31–33].

Among the different MCDA methods, the Analytic Network Process (ANP) [34,35] was selected because it permits the representation of the identified relationships between intangible assets and strategic objectives as a network with inner and outer dependences and not as a hierarchy. This is an advantage because the relationships among those elements are not hierarchical and this is one condition for the application of other MCDA methods. Furthermore, ANP is suitable for solving quantitative and qualitative problems and that is also important, as most of the elements considered in the network are intangible. Moreover, the influence of intangible assets on the achievement of strategic objectives has a strong subjective component, which is reduced by the application of ANP.

The aim of the paper is the development of an innovative methodology that will allow organizations to discover the impact of intangible assets on the achievement of their strategic objectives defined within the

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Balanced Scorecard (BSC) application, among other objectives. This proposed methodology also maps, by means of several graphics, the different interrelationships identified between intangible assets and strategic objectives.

Within the methodology two analyses are provided, each of them with a different approach: The Global Analysis identifies the most important intangible resources, intangible outputs and strategic objectives for the organizations. By means of this analysis, the management is aware of which the most important strategic objectives to achieve are, which the most important intangible resources to hold for the achievement of the strategic objectives are, and which the most important intangible outputs generated as a result of the achievement of the strategic objectives are. On the other hand, the Strategic Objectives Concatenations Analysis allows the management to know whether it is necessary to achieve previously some strategic objectives in order to enhance the accomplishment of the Key Strategic Objectives (KSOs) or not.

The structure of this paper is as follows. First, a literature review regarding IC measurement and management models and the relationship between IC and the BSC is conducted. Second, the proposed methodology is described. Then, application of the methodology to a case study is presented. Finally, conclusions are presented.

2. Literature review

In the literature a range of definitions of IC and IAs can be found [36]. For instance, [4] states that IA assets are invisible assets that include a wide range of activities such as technology, consumer trust, brand image, corporate culture and management skills. IAs are described as those assets that have no physical existence but are still of value to the company [37]. Furthermore, IC is considered as the invisible asset of the organizations, which includes: employee competence (skills, education and experience) and their capacity to act in a wide variety of situations; internal structure (management, structure patents, concepts, models, research and development capability and software); and external structure (image, brands, customers and supplier relations) [38]. According to [39], IC can be defined as all non-monetary and non-physical resources that are fully or partly controlled by the organization and that contribute to the organization's value creation. However, despite researchers' interest in this topic, there is not one widespread accepted definition of IC or IAs [14,40].

2.1. IC measurement and management models

In the last few decades, multiple models have appeared in specialized literature, which deal with the management and measurement of intangible assets from different approaches. Some of these models assert that intangible assets explain the difference between the market value and the book value of firms: Skandia Navigator [41], Technology Broker Model [42], IC-Index Model [43] and Intangible Assets Model [44]. However, other works affirm that IC management increases and improves knowledge of the organizations: Dow Chemical Model [45], Canadian Imperial Bank of Commerce Model [46] and InCas Project [47]. Finally, there is substantial research that proposes managing and measuring as intangible assets because they are considered nowadays the most important resources for value creation and competitive advantage generation: Western University Ontario Model [48], ICMS Model [49], NOVA Model [50], MERITUM Project [51] and INTELLECTUS Project [52]. All of these works agree that intangible assets contribute within an organization by creating value and also by generating competitive advantages, business success, knowledge and economic benefits.

Most of the works highlight that intangible assets must be aligned with the strategy of the organization (Dow Chemical Model, ICMS Model, INTELLECTUS Model and InCas Project) and they have to be coherent with the organization's vision (MERITUM Project and InCas Project). Furthermore, the Canadian Imperial Bank of Commerce

Model proposes aligning the intangible assets with organizational learning.

Although both the Dow Chemical and Technology Broker models and the MERITUM and InCas projects suggest that intangible assets should be aligned with strategic objectives, only the MERITUM Project links both elements directly to one another. The MERITUM Project proposes identifying the critical intangibles that might help a firm to attain its strategic objectives. The critical intangibles are classified into Intangible Resources and Intangible Activities, according to their static or dynamic character. Intangible Resources (static notion) are the stock or current value of a given intangible at a certain moment in time. They may or may not be expressed in financial terms. Intangible Activities (dynamic notion) imply an allocation of resources aimed at: developing internally or acquiring new intangible resources, increasing the value of existing ones, or evaluating and monitoring the results of the former two. However, the MERITUM Project provides neither a method nor a tool to identify the critical intangibles or to assess the influence of each Intangible Resource and each Intangible Activity on the achievement of strategic objectives.

2.2. Relationships between IC and the BSC

There are several works within the literature that deal with identifying the relationship between IC and the BSC [53–55] and they conclude that the BSC and IC are complementary to each other. Different authors state that the BSC and IC are strategic management methods, which help to identify and elevate intellectual resources in organizations in the knowledge economy [56–58]. The BSC and IC are both integrated performance management systems, but they differ in four aspects: strategy, organization, management and indicators [59]. However, other works have suggested that BSC is an important tool for measuring and managing IC [60–64]. It is also suggested that the BSC can solve the measurement problem of IC [62].

The BSC states that the Learning and Growth perspective defines the intangible assets needed to enable organizational activities and customer relationships to be performed at higher levels of performance. Therefore, the Learning and Growth perspective contains the intangible assets of the organization, which refer to internal skills and capabilities that are necessary to support the value-creating internal process [65].

However, the BSC only focuses on the IC of the Learning and Growth perspective [66,67]. Based on the BSC, the tool called Strategic Map was also developed by Kaplan and Norton [57]. This tool charts how intangible assets are converted into tangible outcomes and shows that intangible assets influence a company's performance by enhancing the most critical internal processes to create value for the customers and shareholders [63,64]. Nevertheless [66] emphasized that the classification in the Strategic Map of intangible assets into human capital, information capital and organization capital just added to the confusion and the concept of relationship capital is completely missing. However, the works, which attempted to integrate the BSC and IC, analyze neither the relationships between intangible assets and strategic objectives nor the influence between them. Although some authors such as [63] and [64] have emphasized how to align the IC with the enterprise strategy, they only focus on the relationships between intangible assets and the critical internal processes of the Internal Process perspective and do not assess the influence of intangible assets on the achievement of the critical internal processes. The proposed methodology covers this gap by identifying directly the relationships between intangible assets and strategic objectives.

2.3. ANP and the BSC to measure intangible assets in organizational performance

Many works have dealt with the topic of measuring organizational performance by combining ANP and BSC [68–73]. However, none of them takes the approach of the current paper regarding the links

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