THE HAI MODEL TO ASSESS THE INTELLECTUAL CAPITAL: AN EMPIRICAL STUDY FROM JORDAN

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ABSTRACT

This paper presents the Hierarchical Assessment Index (H.A.I.) as a suitable holistic model for the assessment of intellectual capital. The HAI model considers the strategic assets of a company and its competitive context, to assess intellectual capital characteristics and the economic value it generates. The model is based on the Analytic Hierarchy Process (A.H.P.) approach to assess the quantitative and qualitative features of a company and to establish priorities among the main strategic assets with respect to the company's performance targets. The main aim of the model is to obtain a global index to express the aggregated results achieved by the organizational strategies. In addition, the model is empirically applied to provide a validation of its peculiarity.

Keywords: Intellectual Capital; Assessment Model; Value driver; Measurement indicators; Analytic Hierarchy Process.

1. Introduction

Recently, Intellectual Capital (IC) attracted a great interest in many countries of the Arab region (Bontis, 2004). IC has been recognized as a basic economic factor which drives growth to face the worldwide competition.

In particular, Jordan has been ranked as the second highest IC index in the Arab state (Bontis, 2004). This is due to the fact that Jordanian ICT companies are knowledge-intensive and strongly based on IC sources In spite of this; however, Jordanian managers do not have the right methods of evaluation to asses IC and are not able to recognize the IC added value to business performance. The paper presents a model to assess the IC and provides an answer to each of the following research questions:

- How to assess the organizational IC by considering the context, the sector and the company environment?
- How to support the managers in the IT sector, in understanding the value of the IC and in determining the appropriate indicators to be used in the evaluation process?

The paper is presented as follows. Section 2 discusses the literature about IC and traditional evaluation methods. Section 3 illustrates the Hierarchical Assessment Index (H.A.I.) model. Section 4 describes the assessment process of the model. Section 5 presents an empirical study in which the H.A.I is applied to data from a Jordanian ICT firm and reports and discusses the results of the aforementioned study. Section 6 concludes the paper.

2. Literature Review

Many researchers and academics agreed on the need to move forward in shaping the IC definition (Stewart, 1997; Edvinsson and Malone, 1997, Sveiby, 1997). The majority of these definitions were mostly spin and emerged from the term of intangible assets that has been formalized, captured and managed to Influence the company's assets via enriching and increasing its market value (Stewart,

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1997), approved with other definitions by Bonitis (1999), Edvinsson and Malone, (1997); Roos et al., (1997); Sveiby, (1997). The IC classification found in the literature refers to taxonomy, which recognizes three kinds of capital: Relational, Structural, and Human. This classification has been adopted and will be explained in the third paragraph.
Though CEOs from different sectors consider IC as an important strategic asset, which constitutes the source of competitive advantages and financial performance, IC assessment is still under exploration and a general and recognized methodology has not yet been defined.
With regard to the IC, numerous evaluation models have been proposed. However, most of these models have now become outdated. Most of them rely on standard financial techniques for IC assessment, which can provide data on the present market value (PMV) of the evaluated company. The main methods are "Technology Broker" (Brooking, 1996), "Balanced Scorecard" (Kaplan and Norton, 1996), "Intangible Asset Monitor" (Sveiby, 1997), The "Skandia Business Navigator" (Edvinsson and Malone, 1997), "the Intellectual Capital Index" (Roos et al., 1998) and the "Fuzzy Intellectual Capital Index" (Kale, 2009).
Furthermore, experience has demonstrated that, in addition to listing and classifying companies' intangible assets, it is necessary to determine the characteristics which influence companies' performance and their positive e and negative trends.
Since a firm's intangible asset development is strictly related to its competitive strategy, Zack (1999) recognized the importance of adopting a strategy reflecting the management decision on how to respond to external reality. To do this, managerial perceptions should shape the way knowledge resources are used and it should be a value of intangible assets to the organization. Thus, managers' opinions and experiences should be taken into account for the achievement of the desired performance not only with regard to the actual state of the company's performance, but also with regard to its development over time. Reasonably, the choice of intangible assets to be developed by an organization is strictly dependant on its capability to make this choice fit for the business strategy of the company (Johansson et al., 2001); not secondarily, it is relevant to understand on what specific areas the organization needs to focus and what knowledge assets of human resources need to be leveraged within each specific area (Andreou et al., 2007).

3. The Hierarchical Assessment Index Structure

The "Hierarchical Assessment Index" (HAI) model is based on the previous study held by Grimaldi and Cricelli (2009). The HAI classifies all the intangible assets in successive levels so that each of them directly influences the performance measurement (Figure 1).
The model has the capability to show a balanced image of the intangible assets of the firm, as each asset can be allotted a priority that gives the measure of the influence on the performance. The definition of these priorities is based on a process which assembles managers' thoughts and experiences through the Analytic Hierarchy Process (Saaty, 1980).
The first level of the hierarchical structure encompasses the organization's goals and, therefore, holds the highest degree of significance. This global value includes all of the second level elements (value drivers), which specify contents and meaning of the company's goal; the tangible and intangible assets referring to each element of the second level are grouped into the elements of the third level (characteristics); at the last level, the measurement indicators are provided.

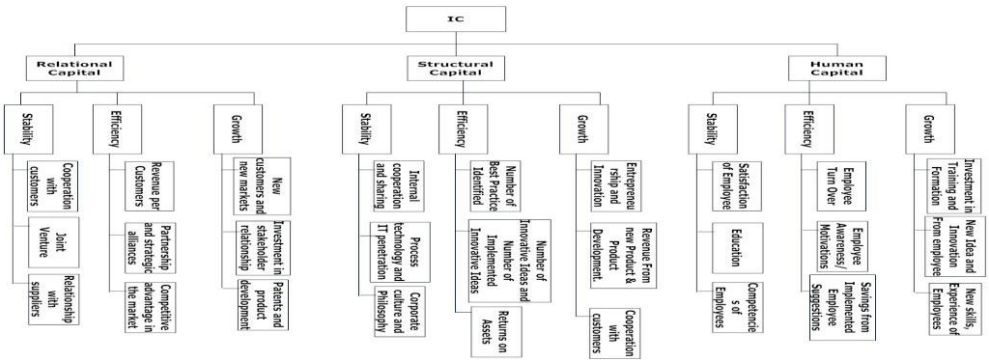

Figure 1. The H.A.I. Hierarchy

3.1 The Value drivers

The Human Capital, Organizational Capital, and Relational Capital have been introduced in literature as part of IC structural taxonomy (Edvinsson and Sullivan, 1996; Roos and Roos, 1997).
Human capital refers to the contribution of human capital to the IC. Sveiby's (1997) refers to human capital as individuals' - usually employees - contributions to the organization in the form of knowledge, ideas, innovations, patent, and much more, which makes competence an intangible asset.
Structural capital concerns all the organizational process, polices, functions, procedures, technology and organizational structure as an important part of the IC taxonomy. (Edvinsson and Malone ,1997; Stewart, 1997; Roos et al., 1998).
Relational capital contains the organizational knowledge in terms of the relational structure with external parties, from customers, suppliers, partners; joint ventures (Stewart, 1997). The relational structure enhances employees' knowledge, experiences and contributes to the organization's IC.

3.2 The Characteristics

Stability, Efficiency, and Growth: these characteristics refer to specific aspects of each value driver by means of properly defined performance indicators.
Stability represents the endowment of the company in terms of material and immaterial talents and capabilities examined at a precise time ("As Is" condition).
Efficiency is intended as the capacity of obtaining the desired performance by means of the available tangible and intangible assets.
Growth answers the demand for controlling company development and the positive trend of its continuous improvement. The analysis of growth studies the ("To Be" condition) of the variables.

3.3 The Measurement Indicators

Measurement indicators vary from an organization to another and depend on the typology of industry and on the dimension of the firm.
Measurement indicators have been identified by reviewing the literature (Klock & Megna, 2000; ACS, 2002; Carlucci et al, 2004; Lee, Lee, & Kang, 2005; Capello & Faggian, 2005; Marr, 2005; Bozbura & Beskese, 2007; Carlucci & Schiuma, 2007; Unger et al, 2009; Nevine & Tony, 2010). In addition, the identified measurement indicators (Fig. 1) have been selected by studying the competitive environment of Jordanian IT Companies. Finally, the proposed measurement indicators have been classified into three value drivers and divided into three characteristics.

4. The Assessment process

The assessment process begins with establishing the degree of importance (priority) with regard to the totality of the assets in achieving the company's prefixed goals: x_{ijk}.
In order to do this, the AHP is used to determine the degree of importance of each element of the hierarchical structure and to calculate its overall priority. In order to establish the priorities of the elements in the hierarchy, the elements are compared pair-wise against the forefather element. This comparison is achieved using the AHP comparison scale (Saaty, 1980), in which comparison is expressed verbally, and these verbal comparisons are then represented numerically. In particular, the pair-wise comparison process starts at the top of the hierarchy to select the value driver with the highest priority. Then, at the level immediately below, the priorities of the value drivers are divided by the weighting process among their descendant, and so on. In order to obtain the set of overall priorities all the results of the pair-wise comparison need to be synthesized. The overall priority of an element is the degree of importance of that element with regard to all the other elements in the hierarchical structure and represents its significance with respect to the whole of the company's performance.
Therefore, the overall priority of every measurement indicator is expressed by x_{ijk}, where:

- i value refers to the value driver and run from 1 to 3 (Human Capital, Organizational Capital, Relational Capital);
- j value refers to the 3 characteristics of each value driver; it runs from 1 to 3 (Stability, Efficiency, and Growth);
- k value refers to the measurement indicators that relates to each value driver and to each characteristic; it runs from 1 to the total number of the selected indicators.

In the following step, a qualitative value, which expresses the numerical value of the performance of each indicator, is calculated: p_{ijk}. In this process, it is necessary to take into account both the temporal variations of the indicators and the expectations by managers for the improvement of their performance. To fulfil this objective, it is necessary to make use again of the A.H.P., but in a different application from that previously implemented. A pair-wise comparison is made using three elements for each indicator:

- The value of the performance calculated for the time period "T" (P_T);
- The value of the performance calculated for the time period immediately preceding the time period "T", that is "T-1" (P_{T-1});
- The desired performance ($P_{Desired}$).

The three element matrix of the pair-wise comparison is represented in Table 1. The three values are derived as it follows: $P_{(T-1;\ T)}$ is the numerical ratio between the value of the performance of the indicator calculated for the time period "T" (P_T) and that calculated for the time period "T-1"; $P_{(T-1;\ Desired)}$ is inferred from the opinion of the manager about his expectation for the value of that indicator ($P_{Desired}$); $P_{(T;\ Desired)}$ is determined by simply substituting one relation into the other, so as to obtain a numerical value. This particular procedure helps to avoid the inconsistency that could emerge from the fact that one of the three terms of comparison derives from subjective considerations ($P_{Desired}$) and, also, that some measurement indicators derive from qualitative data.

Table 1. The pair-wise comparison matrix of each measurement indicator

	P_{T-1}	P_T	$P_{Desired}$
P_{T-1}	**1**	$\mathbf{P_{(T-1;\ T)}}$	$\mathbf{P_{(T-1;\ Desired)}}$
P_T		**1**	$\mathbf{P_{(T;\ Desired)}}$
$P_{Desired}$			**1**

By means of the same procedure as the one used to find the priorities of the pair-wise comparison matrix, the normalized values of the priorities for each of P_T, P_{T-1}, and $P_{Desired}$ are obtained. The priority of P_T is the weight of the performance of the measurement indicator, calculated for the time period "T" with respect to its correspondent value for "T-1" and to its desired performance.

Reiterating the aforementioned procedure for each of the indicators, supplies an evaluation of performance (p_{ijk}), where the indexes *i*, *j*, and *k* are the same as for the value range and connotation of the quantitative value x_{ijk}.

For each indicator, the value of p_{ijk} is comprised between 0 and 0.5. This follows from the fact that the sum of the three weights of P_T, P_{T-1}, and $P_{Desired}$ must be unitary and that the value of $P_{Desired}$ must be higher than those of P_T and P_{T-1}, in consequence of managers' expectations. It is demonstrable that the weights of P_T and P_{T-1} cannot assume values either negative or higher than 0.5.

At this point, for each indicator, it is possible to combine the weights of the performance (p_{ijk}) with their overall priorities (x_{ijk}). The sum of the products of p_{ijk} and x_{ijk} of each measurement indicator results in a unique index, the H.A.I.:

$$H.A.I. = \sum_i \sum_j \sum_k x_{ijk} \cdot p_{ijk}$$

The value of H.A.I. is comprised between 0 and 0.5, in consequence of the fact that every p_{ijk} cannot assume a value which is either negative or higher that 0.5 and that every x_{ijk} cannot assume a value either negative or higher than 1.

5. Model Applications

The paper presents an empirical study from Jordan, whereby the HAI model has been applied on ICT startup projects Investment Company. Oasis 500 is a regional early-stage fund and entrepreneurship. The goals of Oasis 500 are to enable early stage companies in ICT industry and to transform ideas into viable businesses, by concentrating on the transformation of ICT, mobile and digital media ventures. The researchers used an AHP-based questionnaire to collect data from managers working at Oasis 500. The empirical study was carried out using the Expert Choice v.11 (EC) software package, which allows the synthesis of values, as described in Figure 3.

Referring to the obtained results, "Employee Turnover" provided the highest contribution to HAI. This indicates that the company pays great attention to their human capital, especially as a

consequence of the reduction of turnover. In fact, high rate of employee turnover has a negative effect on performance, as it implies losing substantial numbers of experienced and knowledgeable employees for the company.
Moreover, the "Satisfaction of Employee" offered the second highest contribution to HAI. This indicates that employee satisfaction and financial performance is indisputably based on simple human resource management role that says; the satisfied employees lead to providing better customer services and satisfaction, which creates long-term relationships that lead customers to spend more money and generating high financial performance.
The third and fourth contributions to HAI were the "Returns on assets", which indicates high efficiency of the company's structural capital, and "Revenue from new product and product development", which indicates the high growth under company structural capital. It is important to consider that the priority of these aspects is very high, but the performance is not adequately recognized. This should suggest investing much more on these topics.

Nò	NAME OF THE MEASUREMENT INDICATORS	x*p
1	Employee Turn Over	0.1695
2	Satisfaction of employee	0.0522
3	Returns on assets	0.0206
4	Revenue from new product and product development.	0.0182
5	Competencies of employees	0.0182
6	Entrepreneurship and innovation	0.0167
7	Corporate culture and philosophy	0.0166
8	Number of best practice identified	0.0153
9	Cooperation with customers	0.0138
10	Process technology and IT penetration	0.0117
11	New Idea and innovation from employee	0.0064
12	Education	0.0057
13	Number of innovative ideas and number of implemented ideas.	0.0050
14	Joint venture	0.0041
15	New skills, experience of employees	0.0032
16	IT and KMS Expenditure	0.0032
17	New customers and new markets	0.0027
18	Internal cooperation and sharing	0.0023
19	Competitive advantage in the market	0.0019
20	Relationship with suppliers	0.0016
21	Employee awareness / motivations	0.0016
22	Investment in tranining and fromation	0.0015
23	Saving from implemented employss suggesttions	0.0014
24	Patents and product development	0.0009
25	Revenue per Customers	0.0005
26	Investment in stakeholder relationship	0.0003
27	Partnership and strategic alliances	0.0002
	Total	0.3950

Figure 3. Measurement Indicators classification according to the value driver & characteristics

In addition, a sectional analysis can be performed on successful or unsuccessful actions at every level of the structure (Figure 4). It is possible, in fact, to focus the attention on the performance and on the weights of the indicators for each value driver, separately. RC, SC, and HC have a global contribution of 0.0259, 0.1095, and 0.2596, respectively. This means that the RC generated the lowest performance indicators among the 27 characteristics. This can be explained by the fact that Oasis 500 focuses on start-up ICT projects and companies. As a consequence, these phases require a strong investment on HC and SC, rather than on RC.
Finally, the HAI index value is 0.3950 which indicates a high performance of the company. Indeed, the closer value of the H.A.I. to 0.5, which is the maximum value that H.A.I. can assume, the more advantageous the utilization of the available assets by the company. On the other hand, the margin of divergence from 0.5 will indicate the measure of the relevance of corrective strategies.

No	Relational Capital	x*p	Strctural Capital	x*p	Human Capital	x*p
1	Revenue per Customers	0.0005	Number of innovative ideas and number	0.0050	Employee Turn Over	0.1695
2	Partnership and strategic alliances	0.0002	Number of best practice identified	0.0153	Employee awareness / motivations	0.0016
3	Competitive advantage in the market	0.0019	Returns on assets	0.0206	Saving from implemented employss sug	0.0014
4	New customers and new markets	0.0027	Entrepreneurship and innovation	0.0167	Investment in tranining and fromation	0.0015
5	Investment in stakeholder relationship	0.0003	Revenue from new product and product	0.0182	New Idea and innovation from employee	0.0064
6	Patents and product development	0.0009	IT and KMS Expenditure	0.0032	New skills, experience of employees	0.0032
7	Cooperation with customers	0.0138	Internal cooperation and sharing	0.0023	Satisfaction of employee	0.0522
8	Joint venture	0.0041	Process technology and IT penetration	0.0117	Education	0.0057
9	Relationship with suppliers	0.0016	Corporate culture and philosophy	0.0166	Competencies of employees	0.0182
	Total of RC Value	0.0259	Total of SC Value	0.1095	Total of HC Value	0.2596

Figure 4. Measurement Indicators classified according IC taxonomy

This means that a HAI value of Oasis 500 generated a high performance value of the available intangible assets. However, Oasis 500 could improve its performance by giving more attention to the relational capital to insure a higher H.A.I. index value in the future.

6. Conclusions

In the proposed model, the H.A.I. identifies the sources of added value and competitive advantage in each business context and singles out those assets which can improve the performance. Firstly, it

supports the assessment of IC, starting by a global sight of the obtained results. Secondly, it analyzes and measures each single value driver quantitatively. Lastly, the model enables the management to check the behavior of a particular indicator, and whether the company's performance is affected, positively or negatively, by it. In this way, the management is solicited to identify and promptly adopt corrective strategies. Finally, by means of the empirical studies, the HAI model has been tested and validated, since the obtained results confirm the expectations of the interviewed manager.

In the empirical study presented here, 27 indicators have been suggested. However, a point that must be addressed regards the fact that these indicators depend on the environment and sector in which the HAI model is applied. Future studies will be carried out by analyzing wider samples of companies from Jordan to ensure validation of the HAI model.

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