

Intellectual property and intellectual capital: A new classification model

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Abstract

The purpose of this study is to determine the value of intellectual property (IP) in modeling intellectual capital of knowledge-based organizations. Firstly, a comparison between IP and physical commodities has been made to illustrate the importance of IP and its role in the new economy. Secondly, we propose a model of intellectual capital that, along with its sub-factors and measurement indicators includes the following three key factors: Stock of Knowledge, Flow of Knowledge, and Enablers of Knowledge. This model is a useful tool for managers to identify areas in more need of resources regarding intellectual property.

Keywords: Intellectual Property, Intellectual Capital, Knowledge-Based Organization, Classification

1. Introduction

"In the past decade, academics have paid significant attention to the role of knowledge for global competitiveness in 21st century" (Chang, 2004), so knowledge is recognized as sustainable strategies to acquire and maintain companies' competitive advantage (Barney, 1991; Drucker, 1998; Grant, 1991). In the knowledge-based world, organization capabilities are based on knowledge and managers should understand which capabilities they need in order to maintain their competitive advantages (Barney, 1991; Prahalad and Hamel, 1990). "Many sectors are animated by new economics, where the payoff to managing knowledge astutely has been dramatically amplified, in part because of the phenomena of increasing returns, in part because of new information technology, and in part because of the changing role of intellectual property." (Teece, 1998)

"Current knowledge resource identification and measurement tools (such as patent and citation count) are "crude" and inadequate" (Housel, T. J., Nelson S. K., 2005), so good understanding of the nature of intangible resources and its measurement are the first step for any strategic plan designed to manage these resources. These advantages include the added value of the knowledge that is processed, the learning process included in the measurement of IC (Ross and Roos, 1997), its strategic power (Bontis, 2001), the optimal exploitation of limited resources and its usage as a motivational factor (Edvinson, 1997). "Exploiting these advantages of IC measurement purportedly give companies an edge in a tight competition on the market, which should be reflected in enhanced firm performance" (Bollen *et al.*, 2005). Therefore, "it is critically important that intellectual assets be well understood and properly managed if organizations are to compete successfully in today's word of economy" (Bhartesh K.R *et al.*, 2005).

Although in the last decades many efforts have been done to clarify components of IC in knowledge-based organizations, the IP concepts and its position in IC are not considered enough in the literature. In this paper we introduce IP as a value driver of IC and company effectiveness and will try to illustrate its effects on other parts of intellectual capital.

The remainder of this article is organized as follows. Section 2 discusses the nature of knowledge and the differences between know-how knowledge and physical assets. Section 3 focuses on previous works on modeling IC. Consequently, section 4 presents the proposed classification of IC. Finally, section 5 concludes the article with some general discussions and an agenda for further research.

2. IP and competitive advantage

Structural changes that have occurred in the economies have changed the nature of strategy and strategic issue, and have served to highlight the importance of IP and its management. Liberalization of markets, expansion of what is

tradable, strengthening of IP regimes, the importance of increasing returns, decoupling information flow from the goods and services and ramifications of new communication and information technologies, altogether, indicate a revolution regarding the new digital world of economy.

The term IP is strongly related to its appropriability regime (Teece, 1998). It can be discussed from two perspectives: firstly, how strong the IP regime is in the society, and secondly, how hard is to the inherent characteristics of the product and duplicate it. The protection power over knowledge assets is illustrated in table1.

Table 1 Protection Power over knowledge asset

<i>IP right</i> <i>Inherent Replicability</i>	<i>Loose</i>	<i>Tight</i>
	<i>Easy</i>	<i>Hard</i>
	Weak	Moderate
	Moderate	Strong

Source: Teece (1998)

Gaining more competitive advantages from IP requires more consideration of IP rights and characteristics of products. To utilize IP, it should be hard to copy the product, and IP rights should prevent illegal use of IP in the firm.

IP management is every work related to IP creation, protection and utilization. To manage IP thoroughly, having true understanding of IP and its changes regarded to new technology is important; Knowledge could be tacit or codified, observable in use or not observable in use and negative or positive. Tacit knowledge is a kind of face-to-face knowledge which can't be documented easily. Negative knowledge is related to knowing about processes that have been examined in the organization and its wrongness and bad results has been clarified. Knowledge behind the process of the work, for instance, a new innovative method for production, isn't observable knowledge in use. The fact is that transformation from codified knowledge to tacit, from observable knowledge to not observable and from positive knowledge to negative knowledge demands more activities for managing knowledge, and consequently IP. Table 2 makes a comparison between physical commodity and intellectual property.

Table 2 Inherent Tradability of Different Assets

Characteristics	Know-How / IP	Physical Commodity
<i>Recognition of trading Opportunities</i>	Inherent difficulty	Posting frequent
<i>Disclosure of attributes</i>	Relatively difficult	Relatively easy
<i>Property Rights</i>	Limited (patents, trade Secrets, etc.)	Broad
<i>Item of Sale</i>	License	Measurable units
<i>Variety</i>	Heterogeneous	Homogeneous
<i>Unit of consumption</i>	Often Unclear	Weight, volume, etc.
<i>Inherent Tradability</i>	Low	High

Source: Teece (1998)

In conclusion, in this research, there are three phenomena that determine real situation of organizations and their IP-centric activities: firstly, it should be clarified that what is included in the organization's IP. Secondly, the strength of IP rights (IPR) in the firm and in the environment where the products are distributed or created causes critical effects on the increasing return of IP. Finally, IP management inside the organization, for example, making an innovative culture, has a critical role too.

3. Literature review on IC models

Walsh and Ungson (1991) noted that knowledge resides in organizational memory, manifested in "retention facilities," including individuals, culture, transformations, structures and ecology. Dodgson (1993) has mentioned that research on knowledge can focus on outcomes of learning, the processes of learning, and the structures and strategies that enhance

learning. DeCarolis and Deeds (1999) also employed the stock-flow concept, noting that it can be usefully combined with the tacitness of knowledge.

Andriessen (2004) noted that clarification is necessary regarding to three basic questions: why, how and what. The 'why' question refers to the motives for valuing or measuring intellectual capital. The 'how' question refers to the different approaches to valuing or measuring intellectual capital. Finally, the 'what' question pertains to the intellectual capital classification schemes on which this study concentrates. Although a large number of IC methods and models have been developed, few of these methods are proved in any specific industries or organizations (Bontis, 2001; J. Moczydlowska et al., 2007). The reminder of this section is a review of some of the best-known methods and models for intellectual capital measurement.

Brooking (1996) has introduced "*Technology Broker*" to clarify and measure IC in company with four components: market assets, human centered assets, intellectual property assets and infrastructure assets. According to authors, market assets equal the potential an organization has due to market-related intangibles such as brands, customers, repeat business, backlog, distribution channels, contracts and agreements such as licensing and franchises. Human centered assets are the collective expertise, creative and problem-solving capability, leadership, entrepreneurial and managerial skills embodied by employees of the organization. Intellectual property assets contain the legal mechanism for protecting many corporate assets, and infrastructure assets including know-how, trade secrets, copyright, patent and various design rights, trade and service marks. Finally, infrastructure assets equal those technologies, methodologies and processes which enable the organization to function including corporate culture, methodologies for assessing risk, methods of managing a sales force, financial structure, databases of information on the market or customers, and communication systems. (See table 3)

Table 3 Brooking's classification model of IC (Technology broker)

<i>Dimensions</i>	<i>Components</i>
<i>Market asset</i>	The potential asset that a firm has as the result of market-related intangibles like brands, customers, and distribution channels.
<i>Human centered asset</i>	The collective expertise, creative and problem solving capabilities, leadership, and entrepreneurial and skills embodied by the employees of a firm
<i>Infrastructure asset</i>	Technologies, methodologies, and processes whatever bring order, safety, correctness, and quality to an organization
<i>IP asset</i>	Know-how, trade secrets, copyrights, patents, various design, and trade and service marks

Edvinsson and Malone (1997) developed a dynamic and holistic IC reporting model called the *Navigator* with five areas of focus: financial, customer, process, renewal and development, and human capital. According to this model the hidden factors of human and structural capital when added together comprise intellectual capital. Consequently, Structural capital includes customer capital and organizational capital, which is a combination of innovation capital and process capital. The authors considered both financial and non-financial building blocks that combine to estimate the company's market value. "This conceptualization achieved a balance for Skandia [the company which conducted this research] in trying to represent both financial and non-financial reporting, uncovering and visualizing its intellectual capital, tying its strategic vision to the company's core competencies, reflecting knowledge-sharing technology and knowledge assets beyond intellectual property, and reflecting better its market value" (Bontis, 2001). (See table 4)

Table 4 Edvinsson and Malone's model of IC (Navigator)

<i>Dimensions</i>			<i>Components</i>
<i>Human capital</i>			Knowledge, skills and experiences held by individual
<i>Structural capital</i>	<i>Customer capital</i>		The strength and loyalty of customer relations wither within or outside of organization
	<i>Organizational capital</i>	<i>Innovation capital</i>	IP which are protected commercial rights such as copyrights and trademarks and intangibles assets
		<i>Process capital</i>	Techniques, procedures, and programs that implement and enhance the delivery of goods and services

Ross et al. in 1997 proposed *Intellectual Capital-Index* as "second generation" practices that attempt to consolidate all the different individual indicators into a single index. Second generation practices still tries to improve the visualization of the value creating processes of the company so that they can be managed comprehensively in effect creates a bottom-line for IC (Ross et al. 1997). "This synthesis allows managers to assess the IC situation of a company holistically, whereas the first generation practices give information only on the single components of intellectual capital" (Bontis, 2001). (See table 5)

Table 5 Ross et al.'s classification model of IC (Intellectual capital-index)

<i>Dimensions</i>			<i>Components</i>
<i>Human capital</i>	<i>Competence</i>		Individual employees' knowledge, skills, talents, and know-how
	<i>Attitude</i>		"Covers the value generated by the behavior of the employee on the workplace", influenced by motivation, behavior, and conducts
	<i>Intellectual agility</i>		Personal innovation, adaptation, and the ability to use knowledge from one context in another
<i>Structural capital</i>	<i>Relationships</i>		Connections with customers, suppliers, alliance, partners, shareholders, and stakeholders
	<i>Organization</i>		Intangible infrastructure, intellectual property, processes, and culture
	<i>R & D</i>		"The intangible side of anything and everything that can generate value in the future...but has not manifested that impact yet"

Sveiby in 1997 proposes a conceptual framework based on three families of intangible assets: external structure (brands, customer and supplier relations); internal structure (the organization: management, legal structure, manual systems, attitudes, R&D, software); and individual competence (education, experience). "While efficiency of the internal structure or "operational efficiency" of an organization has historically been part of most traditional accounting measurement, the other two intangible assets in his model are not" (Bontis, 2001). (See table 6)

Table 6 Sveiby's classification model of IC

Dimension	Components
<i>External structure</i>	brands, customer and supplier relations
<i>Internal structure</i>	the organization management, legal structure, manual systems, attitudes, R&D, software
<i>Individual competence</i>	education, experience

4. New Classification model

Regarding the fact that direct IC methods and scorecard methods lead to context and company specific tool-kits (Sveiby, 2002), those two methods are chosen for the measurement of IC. According to Bollen *et al.* (2005) "companies within same industry have similar needs, structures, etc. and that, as a consequence, a conceptual measurement tool can therefore be developed and applied to an entire industry".

The direct IC measurement and scorecard methods used in this article are based on the best-known methods and models for intellectual capital measurement (Skandia navigator (Edvinsson and Malone, 1997), Technology broker (Brooking, 1996) Intellectual Capital-Index (Ross *et al.* 1997), Intangible assets monitor (Sveiby, 1997)). Nevertheless, in order to find the position of IP in other components of IC, our approach has classified intellectual capital in an innovative model, which includes Stocks of Knowledge, Flows of Knowledge and Enablers of Knowledge.

Stocks of Knowledge is the existing level of knowledge at a point in time. Argote and Ingram (2000) noted that knowledge is held in three basic "reservoirs" or elements of organizations - Members, Tools and Tasks, as well as their connections and networks. Fiol (1985) discussed the under-rated importance of retiring knowledge that has outlived its usefulness. Six measures of Human Capital, which is a component of stocks of knowledge in the proposed model, are knowledge, experience, innovation capabilities, skill, attitude and leadership power of employees. There is an extra measure regarding Boudreau and Ramstad (1997) for overall knowledge of company which is being hold in organizational memory. Finally, there are two measures to evaluate amount of IP and its usage within organization. (See table 7)

Table 7 components of Stocks of Knowledge

Measures	References
<i>Knowledge of employees</i>	Ross <i>et al.</i> (1997), Brooking (1996), Edvinsson & Malone (1997), Sveiby (1997), Stewart (1997), Bounfour (2003)
<i>Experience of employees</i>	Ross <i>et al.</i> (1997), Brooking (1996), Edvinsson & Malone (1997), Sveiby (1997), Stewart (1997)
<i>Innovation capabilities of employees</i>	Ross <i>et al.</i> (1997), Brooking (1996)
<i>Skills of employees</i>	Ross <i>et al.</i> (1997), Brooking (1996), Edvinsson & Malone (1997), Sullivan (2001)
<i>Leadership power of employees</i>	Brooking (1996)
<i>Attitude of employees</i>	Ross <i>et al.</i> (1997), Brooking (1996), Sveiby (1997)
<i>Amount of IP</i>	Ross <i>et al.</i> (1997), Brooking (1996), Edvinsson & Malone (1997), Sveiby (1997), Stewart (1997)
<i>Organizational memory</i>	Boudreau (2002)
<i>Market value of IP</i>	Teece (1998)

Flows of Knowledge is movement of knowledge between entities, including individuals, organizations or organization levels. This includes notions of knowledge transfer, organizational learning, group interaction, and

information flow through networks. Nahapiet and Goshal (1998) noted that the nature of knowledge transfer mechanisms, including social networks, must be considered as part of an organization's knowledge resources. Connor and Prahalad (1996) mentioned that knowledge acquisition, transfer and use are significant reasons for the existence of firms. Fiol (1998) suggested that knowledge flow should be conceived not only as "pipelines" that reflect traditional movement of disembodied knowledge, but also as "rivers" that reflect the myriad personal and social inflows and outflows, and the unpredictability of its flow patterns. Though the river metaphor is much less common in research and practice, according to Boudreau (2002), we will describe measures of such social and personal processes, including elements of the "community" that nurtures knowledge. Referring to Moon and Kym (2006), there are three dimensions for relationship capital in the company: customers, partners and communities, but based on Boudreau and Ramstad (1997) relationships between employees must, also, be considered to visualize company's flow of knowledge. (See table 8)

Table 8 components of Flows of Knowledge

Measures	References
<i>Relationship among employees</i>	Sullivan (2001), Boudreau (2002)
<i>Relationship with Customers</i>	Ross <i>et al.</i> (1997), Brooking (1996), Edvinsson & Malone (1997), Sveiby (1997), Stewart (1997), Sullivan (2001), Bounfour (2003)
<i>Relationship with Partners</i>	Ross <i>et al.</i> (1997), Sullivan (2003), Moon & Kym (2006)
<i>Relationship with Suppliers</i>	Ross <i>et al.</i> (1997), Sveiby (1997), Stewart (1997), Sullivan (2001)
<i>Relationship with Stockholders</i>	Ross <i>et al.</i> (1997), Sullivan (2001)
<i>Interaction with communities</i>	Boudreau (2002)

Enablers of Knowledge is investments, processes, structures and activities established by organizations aimed at changing or maintaining stocks of knowledge, or influencing flows of knowledge. Totally, there are nine measures referring to these components.

Table 9 components of Enablers of Knowledge

Measures	References
<i>Technology</i>	Ross <i>et al.</i> (1997), Brooking (1996), Edvinsson & Malone (1997), Sveiby (1997), Stewart (2001)
<i>Process</i>	Ross <i>et al.</i> (1997), Brooking (1996), Edvinsson & Malone (1997), Stewart (1997)
<i>Culture</i>	Ross <i>et al.</i> (1997), Sveiby (1997)
<i>Educational programs</i>	Boudreau (2002)
<i>Absorptive capacity of organization</i>	Boudreau (2002)
<i>R & D</i>	Ross <i>et al.</i> (1997), Brooking (1996), Edvinsson & Malone (1997), Sveiby (1997)
<i>Innovative culture</i>	Ross <i>et al.</i> (1997), Brooking (1996), Edvinsson & Malone (1997), Sveiby (1997)
<i>Legal mechanism</i>	Sveiby (1997), Teece (1998), Brooking (1996)
<i>Protection power over IP</i>	Teece (1998), Brooking (1996)

Argote and Ingram (2000) suggest that knowledge about the network (e.g., who knows whom, which members can use what tools, etc.) is likely to be important, and that collective knowledge can be measured through task sequences, software, and production processes. Thus, knowledge could be measured through enabling mechanisms, which include

organization design, alliances, network design, transitive memory, regional clustering, absorptive capacity, research and development and human resource (HR) practices. Dimensions dealing with Enablers of Knowledge are culture and organizational process. Besides, two measures for assessment of IP rights systems within organization and society. (See table 9)

5. Conclusion

This research was aimed at pointing out importance of IP as a valuable asset of companies, and to increase the awareness among management for having an IP-centric view to improve areas in the most need of resources.

This research was established based on the insights gained from an analysis of IC measurement methods, as well as on knowledge about the IP, IP rights and IP management. Measures referring to all other components of IC were included too. In order to achieve the optimal procedure firms should assign importance to those aspects included in the scales for each of those components. Several implications have been resulted from this study which help to improve IP and consequently enhance company's performance.

First of all, with IP-centric strategy in organization, reforming the stocks of knowledge is necessary. Human capital, the most important dimension of it, should be motivated to create, protect and utilize IP. Not only having human resources with authorized certificate and knowledge of their work is essential, but also employee's sustainability and satisfaction is critical. Organizational memory, second part of stocks of knowledge, is a conceptual database which holds more intangible parts of IP, consisting of trade secrets, know-how, etc. This part of IC should, also, be preserved and utilized as well as other more tangible parts.

Second of all, flows of knowledge with the respect to IP would be revised to satisfy creation and utilization of IP. As a result, relationship between employees should aim at building a creative environment. Beside, some joint venture could be directed to create and utilize new products in collaboration with partner. In addition, customer's awareness of brand, citation, copyright, licenses, etc. would be one of the goals of customer relationship management.

Finally, concerning enablers of knowledge in IP-centric strategy, corporate culture has to be generally supportive and particularly positive. Beside, sufficient technologies, processes and methods have to be included.

Future research on the effects of IP on market value and IC of companies could be directed in some approaches to eliminate limitations of this study. Firstly, regarding essential role of IP, it could be considered as new element in the classification of intellectual capital in order to study its relationship with other elements. Secondly, statistical analysis with large number of respondent could be used to evaluate relationship within each component of stocks of knowledge, flows of knowledge and enablers of knowledge. Finally, because of broadness of the notion of IC, it is necessary to evaluate the indices proposed for each factor of IC in specific industry.

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