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Constructing Enterprises Intellectual Capital Selecting Model A Application of Expert Simulation System

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Abstract

Problem Statement: Past business created perfect operation performance and valuation through using tangible assets. As the knowledge-economic and information era coming, intangible asset becomes the important component of business running. But intangible asset is hard to evaluate. As the coming of the concepts of the intellectual capital, Enterprises have the effective method to enhance operation performance.

Approach: Intellectual capital has proven a powerful tool for strategic planning and communicating strategy that assists in strategy implementation. Successful strategy implementation is based on effective strategic planning. At the stock market, the market value of many enterprises beyond the book value for five times. It shows effective management and evaluation Intellectual Capital could obtain the goals of maximum stockholders-profit.

Results: In a word, this paper build business management and evaluation model of Intellectual Capital by a expert simulation system. This work proposes an integrated approach for the Intellectual Capital tool and benchmarking selection using the analytic hierarchy process (AHP) method.

Conclusions/Recommendations: The empirical also illustrate this model could evaluate business performance through Intellectual Capital indicators and selection benchmarking.

Keywords: Intellectual capital (IC), Human capital, Structural capital, End-customer-relationship capital, Non-end-customer-relationship capital, AHP.

1. Introduction

There was substantial growth in the awareness of intellectual capital (IC) in the 1990s when it was becoming the major value driver for industries. The most critical ingredients of firm resource endowment are not tangible such as financial or physical assets, but are intangible and, thus, rare, valuable, imperfectly imitable and non-substitutable.(Barney, 1991). During the decade of the knowledge economy, businesses have attempted to encode and store their intangible capital, including experience and knowledge. In the process of finding a method for assessing internal intangible assets and intangible production procedures of organizations, intellectual capital can provide a completely new model for observing organizational value.

Although IC is often emphasized more in technological industries, no industry has escaped its touch. IC is fundamental to firms, communities and societies (Edvinsson, 2002). New opportunities in, and threats to, the shipping industry are springing from assets based on knowledge. Such assets are defined as IC. Knowledge economy can be defined as an economy guided and directed by knowledge. Unlike for the traditional economy in which tangible assets leverage the shipping industry, today knowledge is the main driving force behind the shipping industry. Tangible assets like buildings, ships, equipment, etc., will always create value in the shipping industry, but an even greater part of the value in the shipping industry for which customers are willing to pay now comes from IC.

The purpose of this paper is to investigate IC in the shipping industry. After a brief literature review on IC, this paper explores the categories of IC and its flows in the shipping industry; and examines the categories of IC and its flows and impacts on financial performance in Taiwan's shipping industry. It answers managerial questions such as: how efficiently does the Taiwan shipping industry convert the different categories of IC into financial performance?; what is the role of human, structural, end-customer-relationship, and non-end-customer-relationship capital?; which of these IC categories has a stronger and more direct impact on a firm's financial results?; and which flows within the IC categories should be developed more in order to increase a shipping service's value for customers and consequently boost financial performance?

2. Literature Review

There is no universally accepted definition of IC in the literature. Following Edvinsson

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and Malone (1997), IC is “the possession of knowledge, applied experience, organizational technology, customer relationships and professional skills that provide the firm with a competitive edge in the market”. On the other hand, Bontis *et al.* (1999) stressed the importance of IC flows and defined IC as “the collection of intangible resources and their flows”. This definition implies the dynamic nature of IC and its development through time. Lev (2001) says that IC is “a claim to future benefits that does not have a physical or financial embodiment”. There is a widely accepted three-category IC classification into (i) human, (ii) structural, and (iii) customer or relationship capital (Saint-Onge, 1996; Edvinsson and Malone, 1997; Sveiby, 1997; Roos *et al.*, 1997; Stewart, 1999). First, human capital is represented by the intangible assets embodied by individuals. Roos *et al.* (1997) argued that people generate capital through competence (represented by skills and education), their attitude (which covers the behavior of employees towards their work) and their intellectual agility (represented by innovativeness and openness to changes).

Second, structural capital is owned by the firm (Stewart, 1999). Following Bontis (1996), it includes routines and structures. Stewart (1999) stated that culture is also an extensive and valuable element of structural capital. Third, customer capital is owned by every firm that has customers (Stewart, 1999). Customer capital can be broadened to relationship capital, which also includes relationships with other subjects such as business partners, government, local community, competitors, creditors, special interest groups, the media and the public.

The term human capital refers to the knowledge, seniority, mobility rate, skills, and experiences of the entire organization’s staff and management. The term structural capital refers to the general system and procedures of the organization for problem-solving and innovation. It includes assessment of the stored knowledge value, the cycle of liquid capital, as well as accounting of administration expenses. The term relational capital refers to the organization’s establishment, maintenance, and development of public relations matters, including the degree of customer, supplier, and strategic partner satisfaction, as well as the merger of value and customer loyalty.

Organizations often have a competitive advantage or exhibit superior performance over those organizations that do not implement Intellectual capital (Lee and Choi, 2003; Chuang, 2004). Firms that can create and use knowledge effectively are more innovative. Many benefits of knowledge management have been identified in the literature. Basically, these benefits could be measured by both financial and non-financial performance. With regard to financial performance, the benefits included profit growth (Drew, 1997; Lee and Choi, 2003; Choi *et al.*, 2008), revenue growth, market share (Drew, 1997; Lee and Choi, 2003; Choi *et al.*,

2008), and reducing costs (Plessis, 2005; Hult *et al.*, 2006). In contrast, the non-financial or operational performance included increasing productivity (Knapp, 1998), employee satisfaction (Knapp, 1998), and better customer service (Plessis, 2005).

Furthermore, Demarest (1997) argued that the most obvious link between IC and enhanced economic performance is in the area of innovation. Drucker (1993) and Popadiuk and Choo (2006) also pointed out that innovation depends on IC and application. Thus, IC can not only improve the level of performance and productivity but move people and organizations toward innovation (Johannessen *et al.*, 1999; Gold *et al.*, 2001; Grewal and Haugstetter, 2007). Basically, IC can result in innovations in products, process, services, and responsiveness to market change (Gold *et al.*, 2001).

3. Methodology

This part divided two aspects: AHP technique and the four category IC model for the shipping industry

3.1 AHP technique

The AHP method was developed by Saaty (1977, 1991 and 1999). It is a multi-criteria decision-making method (of the third generation which was mentioned in the previous section), and provides for alternative prioritization. The AHP is based on the use of pair-wise comparisons, which lead to a detailed ratio scale. Moreover, the AHP provides for refining of the decision-making process while examining the global coherence of the user's preferences, as it can include the calculation of an overall consistency ratio.

Saaty scales are likely to be used when performing these comparisons. Pair-wise comparisons generate square matrices, the diagonal elements of which are equal to 1 while the other elements verify the fact that, for i different from j , both inferior to the matrix dimension, the i - j element is equal to the inverse of the j - i element. Priorities are then determined, thanks to these matrices; then a global consistency test can be performed to judge of the coherence the user's judgments.

The AHP allows group decision making, where group members can use their experience, values and knowledge to break down a problem into a hierarchy and solve it by the AHP steps. Brainstorming and sharing ideas and insights (inherent in the use of Expert Choice in a group setting) often leads to a more complete representation and understanding of the issues.

3.2 The four category IC model for the shipping industry

We define IC as that asset based on knowledge and developed throughout flows among its different categories. Our IC definition is close to that of Bontis (1999), which also emphasizes the importance of IC flows. The value of a shipping service may be increased

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through flows among IC categories. So far, IC research has focused on three categories of IC: human, structural and relationship or customer capital. In our study, relationship capital was divided into end customer-relationship capital and so-called non-end-customer-relationship capital for the needs of the shipping industry. Such a division from three categories into a four-category model of IC (Figure. 1) provides acknowledgment to the increasing importance of different relationships in the shipping business. End-customer-relationship capital refers to the relations with end-customers only and non-end-customer-relationship capital is divided into two sub-categories: relationships with commercial partners in the private sector, and relationships with other partners such as the ocean-forwarder, associations and nongovernmental organizations. IC sub-categories are shown in Table 1.

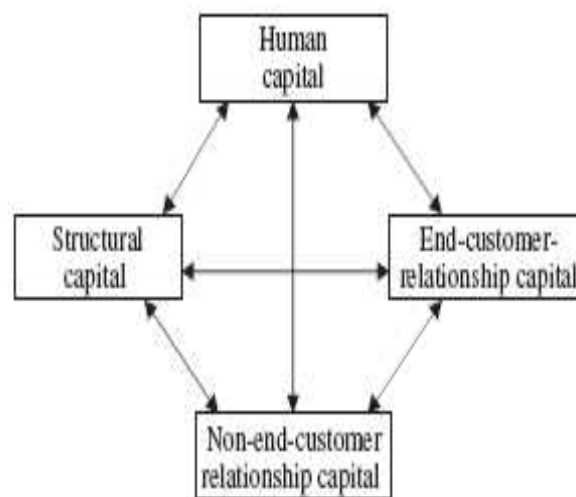


Figure. 1. The four-category IC model. (Nemec Rudež, 2004)

It should be stressed that intermediate customers (such as ocean-forwarder) are categorized as non-customers (and, thus, constitute so-called non-end-customer-relationship capital), since they are not the final customers of the shipping service. In this way, a heterogeneous categorization of all customers has been segmented in two more homogeneous groups that require different treatment and exert influence in different ways. It is not only the categories of IC but the flows between them that influence performance in the shipping industry. They are shown in Table 2. IC flows between pairs of IC categories operate in both directions; therefore the service value is created interactively. IC flows should be developed to serve customers and manifest themselves in a shipping service's value for customers and, consequently, in boosted financial performance.

Table 1. Four categories and sub-categories of IC in the shipping industry

IC categories	IC sub-categories
1. Human capital	(1)Employee competence
	(2)Employee attitudes to work
	(3)Employee innovativeness
2. Structural capital	(1)Culture
	(2)Management philosophy
	(3)Business processes
	(4)Information technology
3. End-customer-relationship capital	(1)Customer satisfaction and loyalty
	(2)Image and brand
	(3)Direct distribution channels
4. Non-end-customer-relationship capital	(1)Relationships with commercial (2)partners
	(3)Relationships with other partners and
	(4)groups (forwarder, government, local community, competitors, creditors, special interest groups, the media and the public)

Source: Nemeč Rudež, 2004

4. Empirical results

Based on findings in the literature and our extended four-category model of IC, three perspectives have been posited. The first perspective claims that pairs of human, structural, non-end-customer-relationship and end-customer-relationship capital in the shipping industry in Taiwan are positively correlated. The second perspective claims that IC positively influences financial performance in the shipping industry. Further, based on the review of IC literature by Saint-Onge (2001) and Stewart (1999), it has been assumed that the category of end-customer-relationship capital has the strongest direct impact on financial performance in shipping industry. In 2009, a survey was undertaken in an attempt to determine the validity of our hypotheses. A five part questionnaire was designed. All items in the questionnaire were derived from a comprehensive review of the existing literature on IC and applied to the shipping industry. The results of experts survey shows as on Table 2.

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Table 2. the results of experts' survey on indicators of Intellectual Capital

Perspectives	sub-categories (priority)	IC indicators	Priority
Human capital	Employee competence (0.4354)	Employees have at least 2 years of experience in the field.	0.6574
		Employees have good qualifications for their work.	0.3426
	Employee attitudes to work (0.3587)	Employees are proud to work in the firm.	0.5786
		Employees have chances of promotion.	0.4214
	Employee innovativeness (0.2059)	Employees adapts to market changes well.	0.7542
		Employees effectively imitate innovations.	0.2458
Structural capital	Management philosophy (0.2563)	Customers are put in first place.	0.8524
		Staff is stimulated to take initiatives.	0.1476
	Culture (0.4762)	Knowledge increase is well supported.	0.5743
		Employees have chances of promotion.	0.4257
	Business processes (0.4852)	We continuously improve the quality of our service.	0.7452
		We successfully solve the complaints of our guests.	0.2548
	Information technology (0.2177)	IT considerably contributes to the quality of our services.	0.6216
		Our firm is well connected with its environment through IT.	0.3784
End-customer-relationship capital	Customer satisfaction and loyalty (0.7426)	Overall, customers are satisfied with our service.	0.5000
		Customer loyalty is improving.	0.5000
	Image and brand (0.2465)	The image of our firm is improving.	0.5126
		Our brand is valued by customers better than competitors'.	0.4874
	Direct distribution channels (0.0109)	Our firm constantly develops new direct distribution channels	0.5020
		Our firm develops the RFID better	0.4980
Non-end-customer-relationship capital	Relationship with commercial partners (CP) (0.5000)	Relationships with CPs are very important for our firm.	0.6518
		Co-operations with our CPs are very successful.	0.3482
	Relationships with other partners and groups (0.5000)	Our firm does not have bad relationships with its financiers.	0.5122
		Our firm has a good relationship with the media.	0.4878

Statements regarding the proportion of seasonal workers, the formality of communication, and the bureaucracy of relationships with commercial partners were reverse coded. This study's chosen Intellectual Capital indicators are defined using the modified Delphi method. Business administrators (such as director-general, shipping industry high-level officers) and government officers (port expert) altogether from ten expert areas were chosen. Then they were issued a preliminary expert questionnaire in which four IC's perspectives evaluation criteria based on IC framework were incorporated. (see Table 3.)

Table 3. The priority item for four IC categories applying AHP technique

Human capital – sub-categories	Structural capital– sub-categories
<ul style="list-style-type: none"> ● Employee competence 1. Employees have at least 2 years of experience in the field. 2. Employees have good qualifications for their work. ● Employee attitudes to work 1. Employees are proud to work in the firm. 2. Employees have chances of promotion. ● Employee innovativeness 1. Employees adapts to market changes well. 2. Employees effectively imitate innovations. 	<ul style="list-style-type: none"> ● Management philosophy 1. Customers are put in first place. 2. Staff is stimulated to take initiatives. ● Culture 1. Knowledge increase is well supported. 2. Employees have chances of promotion. ● Business processes 1. We continuously improve the quality of our service. 2. We successfully solve the complaints of our guests. ● Information technology 1. IT considerably contributes to the quality of our services. 2. Our firm is well connected with its environment through IT.
End-customer-relationship capital – sub-categories	Non-end-customer-relationship capital – sub-categories
<ul style="list-style-type: none"> ● Customer satisfaction and loyalty 1. Overall, customers are satisfied with our service. 2. Customer loyalty is improving. ● Image and brand 1. The image of our firm is improving. 2. Our brand is valued by customers better than competitors'. ● Direct distribution channels 1. Our firm constantly develops new direct distribution channels. 2. Our firm develops the RFID better than competitors. 	<ul style="list-style-type: none"> ● Relationship with commercial partners (CP) 1. Relationships with CPs are very important for our firm. 2. Co-operations with our CPs is very successful. ● Relationships with other partners and groups 1. Our firm does not have bad relationships with its financiers. 2. Our firm has a good relationship with the media.

5. Conclusion and discussion

Saaty (1999) presented an AHP method which provides a rational decision-making process while examining the indicators' coherence of the user's preferences; including the determination of an overall consistency ratio. This paper presents the development of a

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four-category IC model for the shipping industry that distinguishes between human, structural, end-customer-relationship and non-end-customer-relationship capital by AHP technique. The novelty of this IC model is the division of relationship capital into end-customer-relationship and non-end-customer-relationship capital. Such a model enables us to study the importance of end customers separately, as well as the importance of other firms' relationships with business and other indirect commercial partners such as the government, local authorities and other associations, the media and the general public.

This study incorporates the application of IC and AHP to a shipping industry. In addition, it would be interesting to further divide relationship capital and separate commercial relations that refer to relations with business partners, such as ocean-forwarders and agents from noncommercial relations, such as with public and non-governmental sectors and media. Also of interest would be the extension of theoretical and empirical IC research to other sectors of the shipping industry.

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