

Developing Measures of Intellectual Capital for the Venture Capital Industry in Taiwan

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The Taiwanese venture capital industry has played a critical role in the development of the Taiwan IT industry. The purpose of this study is to construct and prioritize the intellectual capital measures of venture capital in Taiwan and to formulate a strategy map based on these measures. A thorough interview was used to collect the data, while the content analysis method and the analytic hierarchy process were used to analyze the data. Intellectual capital can be categorized into three dimensions: Human Capital, Relational Capital and Structural Capital. The research also developed twelve indicators to assess business intellectual capital, as well as a strategy map for the venture capital industry. Measuring intellectual capital can help to formulate business strategies and allocate business resources.

Key Words: venture capital, content analysis method, analytical hierarchy process, strategy map, intellectual capital, human capital, relational capital, structure capital, sustainability

JEL Classification: M13, L15

Introduction

Globalization provides opportunities for international entrepreneurial expansion. Government, corporations and the venture capitalist industry help entrepreneurial ventures. (Sameer and Liu 2005). Venture capital's (VC) success is due to global economic growth and innovation (Gompers and Lerner 2001). Venture capitalists are value-added investors, typically geographically close to their investors and are among the most sophisticated financial intermediaries (Neus and Walz 2005).

Venture capital in Taiwan was introduced by the government in 1984 to improve the technology of products and attain global competitiveness. The government gave support through tax incentives and financial assistance, as well as the help of foreign technology and skills (Choti-geat, Pandey and Kim 1997). Successful high-tech companies apply management models used by venture capitalists to find and fund new ideas (Chen, Chen and Liu 2003). According to Knott and McCarthy (2007)

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Managing Global Transitions 9 (1): 81–100

most foundations have targeted investment and partnered with government, while Wonglimpiyarat (2007) suggests that the Thai government should play a vital role in the venture capital market. Studies show that 'knowledge-intensive' companies have a higher market value than their book value of equity. The value of a company is created by producing new and desirable products, by lowering input costs or realizing production efficiencies (Hansson 1997). Value, however, is not always related to financial performance, as market conditions and regulations may result in increased competition (Porter 1985; Adner and Zemsky 2006). The market value of a company consists of both financial capital and intellectual capital, which are the resources created from internal learning and the development of valuable relationships (Bontis 2002; Pablos 2002). One should consider that there has been little research done on intellectual capital in Taiwan, although it is necessary, and that the performance of the venture capital industry is difficult to measure. Also, a strategy map is constructed using principles of cognitive mapping and shows a series of linked ideas. It has been a useful tool in this study.

Literature Review

EMPIRICAL RESEARCH OF VENTURE CAPITAL

The concept of venture capital is that investors come together to create a venture capital fund. The management and investments of the fund are monitored and the fund invests in portfolio companies and provides investors with a return on their investments. Fund managers are subsequently compensated (Gulinello 2005). The venture capital industry has aided the surge in entrepreneurial activity where capital is provided by investors who contribute to a fund, and venture capitalists participate together to finance companies. Venture capitalists prefer to work with other venture capital companies, as co-investment means more capital. This results in the creation of venture capital company 'cliques' and important social networks (Mintz and Schwartz 1985). Tan, Zhang and Xia (2008) identify five factors (contracting costs, monitoring costs, lost time, resources for the venture capitalists and resources for entrepreneurs) associated with two mechanisms (control and incentive) as determinants for venture capitalists and entrepreneurship in China. In Silicon Valley venture capitalists are influential in shaping clients' organizations and act as management companies who invest in companies at different stages of development.

Harmon's Zero Gravity idea uses personal insight to discuss how to navigate through the venture capital process (Harmon 1999). Venture capitalists use management, recruiting, accounting and legal advice as well as financial resources and have access to a network of professionals in the high technology industry. This network provides support and legitimacy to the investee company and is an example of the Granovetter embeddedness concept (Granovetter 1995; 1985; 1974; Castilla 2003). Di-ochon, Menzies, and Gasse (2005) use a longitudinal study of Canadian entrepreneurs to explore the relationship between start-up activities and new venture emergence. Their results indicate the significance of the role start-up activities play in the sustainability of a company.

Wen and Huang (2005) investigate the key investment decision-making factors used by Taiwanese venture capitalists in the biotech industry. Their results showed the main concern to be the ability of the management team when evaluating an investment project. Yu and Roger (2006) develop the determinants of entrepreneurial development in China and provide a framework to benchmark with other nations. Cumming (2006) notes that the nature of value added active vc investing requires the use of pecuniary measures of investment costs, proxies for the non-pecuniary costs associated with the changes in portfolio size. There are four main factors which affect portfolio size: characteristics of the vc fund, characteristics of the entrepreneurial companies, characteristics of financing arrangements, and market conditions. Klonowski (2007) proposes a nine-stage model as follows: deal origination, initial screening, feedback from the investment committee, feedback from the supervisory board, pre-approval completions, and formal approvals and due diligence phase II, deal completion, monitoring and exit.

In summary, the domestic market is relatively small and has a range of natural resources. Over the last decade Taiwan's production has moved to mainland China and Southeast Asia, resulting in an effort to enhance the development of the high-tech industry locally. vc companies have facilitated this development and support companies with high growth potential (Lin and Chou 2005).

DEFINITION AND CONTENT OF INTELLECTUAL CAPITAL

The drivers behind sustainable competitive advantage are a focal point of debate in strategy literature. The competitive strategy school (Porter 1980; Ghemawat 1991) is concerned with industry structure and strategy, while the resource-based school is concerned with the value and

uniqueness of resources. The former focuses on companies' external environment, while the latter focuses on the internal environment of companies (Wernerfelt 1984; Barney 1991). Resources are the key focus of the resource-based view, which assesses an organization's resources according to important, rare, unique, and structured categories (Barney 1991). The two are often presented as contrasts. In an environment where intangible resources allow companies to add value, intellectual capital will be key in determining performance. There is a growing consensus that value should be created by and distributed to stakeholders as well as shareholders (Bowman and Ambrosini 2000; Porter 1985; Adner and Zemsky 2006; Hitt, Bierman, Shimizu and Kochhar 2001; Nahapiet and Ghoshal 1998; Donaldson, and Preston 1995; Meek, and Gray 1998). A stakeholder view demands the use of value added (gross or net) for measuring total wealth created (Riahi-Belkaoui 2003).

The concept of core competency was first suggested by Selznick (1957) who used distinctive competency to depict corporate advantage through various value activities (Yang et al. 2006). One of the most known strategic management concepts is certainly that of core competence. The concept was introduced in the early 1990s and is defined as collective learning in the organization with special regard as to how to coordinate diverse production skills and integrate multiple streams of technology (Prahalad and Hamel 1990). Yang, Wu, Shu and Yang (2006) developed the core competency identifying model with the use of value-activity and process oriented approaches. The notion of core competence, as extremely important to organizational renewal and as a significant force behind strategic change, interests both managers and practitioners. It is very difficult to indicate theoretically, to recognize empirically as a phenomenon, and to put into practice (Ljungquist 2007). Therefore, this study adopts the more systematic, measurable concept 'intellectual capital' to conduct empirical investigation.

Nahapiet and Ghoshal (1998) define intellectual capital as an organization's knowledge and knowing capability. Roos et al. (1998) propose that intellectual capital is about both measuring and managing intangibles, while Mouritsen, Larsen and Bukh (2001) suggest that intellectual capital indicators are an integral part of managing knowledge resources. An observation of eleven Swedish companies with long experience in measuring and managing intangibles demonstrates that managerial processes have gradually evolved to ensure the transformation of measurement results into necessary action. While knowledge based resources contribute

to sustained competitive advantage through intellectual capital, they do not register in a company's tangible financial accounts (Guthrie, Petty and Johanson 2001; Pablos 2003).

There are three sub-phenomena which constitute intellectual capital: human, relationship and organizational capital. Human capital is the knowledge stock of an organization as represented by employees (Bontis 2002; Bontis, Crossan and Hulland 2002). Relational capital is the relationships with internal and external stakeholders, and organizational capital is the knowledge which stays with a company at the end of the work day and includes databases and strategies (Roos et al. 1998; Bontis, Chong and Richardson 2000). Organizational capital can be further broken down into innovation capital and structure capital. While innovation capital refers to the explicit result of innovation, such as protected commercial rights and intellectual capital, structure capital is the combined value of value-creating and non-value-creating processes (Stewart 1994). Stovel and Bontis (2002) suggest that intellectual capital can be divided into three categories: human capital, structure capital and customer capital. Human capital includes the tacit knowledge of employees, while structural capital is the support mechanism by which employees may achieve optimum job performance. Relational capital is the interpersonal rapport which exists within an organization (Choo and Bontis 2002; Hudson 1993; Bontis 1998; Stovel and Bontis 2002).

The components of intellectual capital are indications of a company's future value (Stewart 1994). Roos et al. (1998) state that intellectual capital is new research development, and the theory comes from two streams of research: strategy and measurement. Strategy focuses on knowledge creation, acquisition, diffusion, capitalization, conversion, transfer and storage, while measurement focuses on measuring intellectual capital. The second stream has advanced towards building on international standards of measuring and reporting (Pablos 2003). The second stream, measuring and reporting on intellectual capital, is the focus of this research. This study uses a systematic approach to formulate and prioritize the measures of intellectual capital of venture capital industry from practitioners' perspectives.

STRATEGY MAP

A strategy map is constructed using the principles of cognitive mapping and represents an individual's thoughts regarding a problem. Strategy mapping is useful, but ironically, can be a difficult tool to implement and

there is no step-by-step process for delivering a strategy map initiative. The following is a useful framework for developing and understanding a strategy map:

1. Choose the overriding objective.
2. Select the appropriate value proposition.
3. Determine general financial strategies.
4. Determine customer-focused strategies.
5. Decide how internal processes will support the execution of strategies chosen.
6. Implement the skills and employee programs required (Scholey 2005)

Methods

For this research I gathered data from thirteen senior managers from ten venture capital companies. In-depth interview, content analysis, and analytical hierarchy processes were used to collect and analyze data.

Sample

This research uses the purposive sampling method, and those interviewed were qualified by three conditions:

1. Has ten years or more related work experience.
2. Must be in top management or hold a senior position.
3. Must have been to China or abroad a few times.

An open-ended questionnaire was delivered which asked about the determinants of competitive advantage of companies in the long and short term. The participants ranged in age from 40 to 62, with a mean of 49. Thirty-one percent of participants were female, while sixty-nine percent were male. All participants held master's degrees.

CONTENT ANALYSIS METHOD

Content analysis is a research method that facilitates the examination of written and oral communication. It is a valid way to measure underlying decision processes (Berelson 1952; Insch, Moore and Murphy 1997; Wino-gard 1983). Holsti (1969) defines it as any technique for making inference by objectively and systematically identifying specified characteristics of messages. April, Bosma and Deglon (2003) use content analysis with a

TABLE 1 Research samples of this study

Code	Job Title	Sex	Age	Tenure	Education	Principal/Agent
A	Chief Secretary	Female	45	16	Master degree	Third-party
B	President	Male	52	25	Master degree	Agent
C	Executive Vice President	Male	46	15	Master degree	Agent
D	Vice President	Male	48	17	Master degree	Agent
E	President	Male	52	16	Master degree	Principal/Agent
F	Executive Vice President	Male	54	26	Master degree	Agent
G	Vice President	Female	46	14	Master degree	Agent
H	President	Male	48	16	Master degree	Principal/Agent
I	Board Director, President	Female	52	22	Master degree	Principal
J	Vice President	Male	40	12	Master degree	Agent
K	Chairwoman	Female	62	30	Doctorate candidate	Principal
L	President	Male	45	15	Master degree	Agent
M	Vice President	Male	48	22	Master degree	Agent

framework consisting of 24 indicators across the categories of internal, external and human capital.

For this study, content analysis was used to identify the heuristics used by venture capital companies and to determine how cognitive biases affect decision processes. I have followed the four-step process to ensure reliability and valid coding of determinants, and then repeated the coding process to determine each participant’s level of certainty (Manimala 1992; Haley and Stumpf 1989; Winograd 1983). Plant (2007) takes a grounded theoretical approach in examining the relationship between venture capitalist clusters and company migration, and this study follows this process to formulate concepts. With code pioneering, I considered product documentation and the managers’ interview statements.

First, we decided on the size of the text units to analyze and found that the smaller the units, the more reliable is the coding, but the greater the potential to miss the point of interest. Individual sentences or groups of sentences contained discrete ideas. Second, we developed a preliminary list of determinants based on new production literature. We then matched interview text units to the preliminary list of determi-

nants of long and short term competitive advantages to clarify classification decisions, which became the basis for coding rules. Third, we used these coding rules to practice coding independently with a different 'hold-out' sample and obtained nearly identical results. We discussed each coding unit to eliminate ambiguity in the coding rules, and found the coding taxonomy to be reliable. Finally, we coded each interview independently and recoded the transcripts in a different order, to eliminate text unit order or time frame based biases. The study then followed the four-step procedure and coding discrepancies were resolved through discussion.

CATEGORIES OF ANALYSIS

This study used both concepts from literature and interview records from thirteen participants. There are three factors developed as a conceptual framework (see figure 1). Human capital represents a combination of four factors: genetic inheritance, education, experience, and attitudes regarding life and business; and in this study it includes the group's tacit and professional understanding, leadership, and work teams (Wu, and Hung 2008; Hsu 2007; Choo, and Bontis 2002; Rourke, and Anderson 2004). Structural capital is the area in which value added by nonlinearities of the knowledge creation process is assumed to reside. Structural capital also encompasses all knowledge which is not supported by humans, such as organizational routine and databases. It includes the law and regulatory and risk management processes, the internal decision making quality and the external control system. Relational capital is knowledge linked to external relationships, such as government (Cardwell 2008; Hung, Chung and Lien 2007; Pablos 2004; Smith 2008; Wong, Leung, Hung and Ngai 2007; Liu and Chen 2006; Chaminade and Johanson 2003). The elements of structural capital used in this study include internal standard operational procedures and the external operational process.

RELIABILITY AND VALIDITY

The accuracy of the pretest coding requires a check of the sample test coding to ensure that classification rules are applied. The researcher should also assess the reliability of the pretest and the results (Insch, Moore and Murphy 1997). This study used theme as a unit of measurement, and according to the aforementioned categories, we have 60. A pretest was used to take a random sampling of 20 themes, and after interviews with

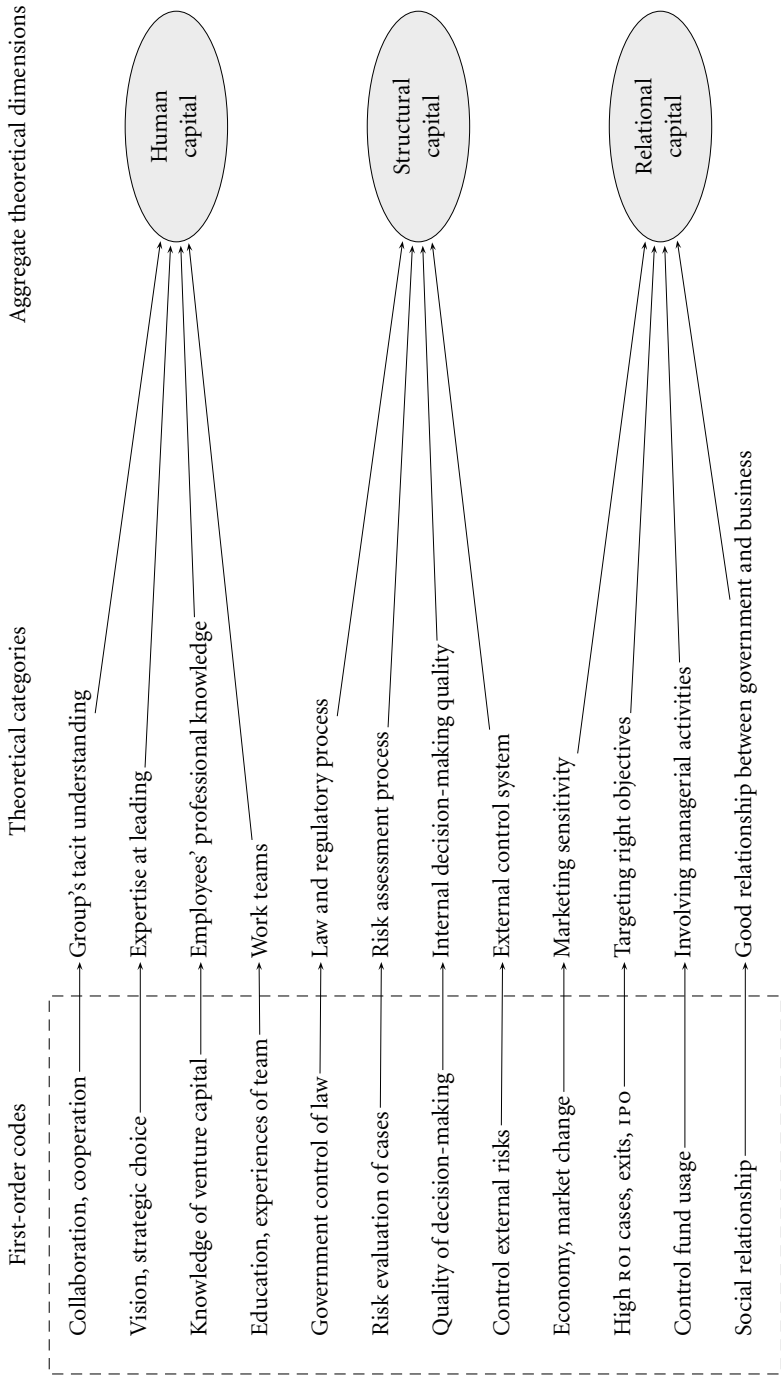


FIGURE 1 Data of structure

TABLE 2 Pretest the degree of mutual agreement in three dimensions

	Researcher	Coder 1	Coder 2
Coder 1	0.76		
Coder 2	0.78	0.74	

TABLE 3 Coding results of mutual agreement in three dimensions

	Researcher	Coder 1	Coder 2	Coder 3	Coder 4	Coder 5
Researcher	—					
Coder 1	0.80	—				
Coder 2	0.64	0.76	—			
Coder 3	0.80	0.76	0.64	—		
Coder 4	0.76	0.76	0.68	0.68	—	
Coder 5	0.64	0.64	0.64	0.80	0.76	—

two venture capitalists and a university professor, the results showed a consensus.

We sampled 20 out of 60 themes to analyze the degree of mutual agreement by three coders. We used the formula $[2M/(N + O)]$; M: all agree numbers, N: coder 1 agree, O: coder 2 agree] to get the degree of mutual agreement.

In 60 themes of three factors, the mutual degree of researcher and coder 1 was 0.76, coder 2 was 0.78; coder 1 and coder 2 was 0.74. I used a formula of reliability being $[n/1 + (n - 1)]$. The pretest reliability of this study was 0.90 $[(3 \times 0.76)/(1 + 2 \times 0.76)]$, which was acceptable. We coded all themes to get the mutual degree and reliability from a total of six coders (table 3).

The average mutual degree of this study by six coders was 0.7173. So, the acceptable reliability of this study was 0.938 $[(6 \times 0.7173)/(1 + (6 - 1) \times 0.7173)]$. The reliability of these 60 themes in this study was acceptable.

There are two kinds of validity relevant to this study: face and content. Face validity is the subjective assessment of the correspondence between individual items and the concept through rating by expert judges. A measure is considered to have face validity if items are related to the perceived purpose of the measures (Issac, Rajendran and Anantharaman 2004; Hair, Anderson, Tatham and Black 1998; Kaplan and Scauzzo 1993). Content validity is ensured if the items representing the various constructs of an instrument are substantiated by a comprehensive review of the rele-

vant literature (Issac, Rajendran and Anantharaman 2004). The face and content validity for this study were rendered acceptable by the aforementioned experts.

ANALYTIC HIERARCHY PROCESS

The analytical process (AHP) was used in this study to analyze data. Saaty (1994) claims that AHP combines logic and intuition and is a technique widely used in decision-making (Sarkins and Sundarraaj 2003; Easley, Valacich and Venkataraman 2000; Liberatore and Miller 1995). Makipelto (2009), Liu (2005; 2006), Liu and Wang (2007) use the process to develop e-government, intellectual capital and digital capital measures in various industries, while Palliam (2005) uses the process to calculate predicted capital costs in financial markets. Forman and Selly (2001) mention that software implementation of AHP, such as Expert Choice, was adopted, while Saaty (1980) proposes ranking the options as given by the values of the maximum eigenvector of the paired comparison matrix as the best option. The accuracy of the obtainable hierarchical ranking is dependent on the congruence with which the judgments are formulated in the paired comparison matrix. The judgment inconsistency index is produced along with the weights and it should be under 0.1.

Results

DEVELOPING AND PRIORITIZING THE INTELLECTUAL CAPITAL

According to the results, the priority of sequencing in the first level is: relational capital, structural capital and human capital. Relational capital is an accumulation of social networks, and thus increases access to information about investment cases. Venture capital companies should take structural capital seriously and set up internal and external standard operation procedures to improve efficiency. The human element has grown in importance (Grant 1996) and company performance may be improved by the way in which human resources are used in the development and implementation of strategies (Wright, Smart and McMahan 1995).

STRATEGY MAP OF THIS STUDY

A well-understood and describable strategy is a framework which has proved useful for organizations. The objective for this process is to maximize organizational value, and complete customer-focused strategies and internal process. This study developed a strategy map of the venture capitalist industry in Taiwan (see figure 2).

TABLE 4 Priority and sequence for level 1 and level 2 of intellectual capital

Criterion	Items	Priority weight	Ranking
	Human Capital	0.292	3
	Structure capital	0.320	2
	Relational Capital	0.388	1
	Inconsistency index: 0.00		
Human capital	Group's tacit understanding	0.062	4
	Expertise at leading	0.160	3
	Employees' professional knowledge	0.208	2
	Work teams	0.570	1
	Inconsistency index: 0.04		
Structural capital	Law and regulatory process	0.077	4
	Risk assessment process	0.285	2
	Internal decision-making quality	0.384	1
	External control system	0.254	3
	Inconsistency index: 0.04		
Relational capital	Market sensitivity	0.211	2
	Targeting right objectivities	0.510	1
	Involving managerial activities	0.147	3
	Good relationship between gov. and business	0.132	4
	Inconsistency index: 0.07		

NOTES Inconsistency index in first level is 0.00.

Conclusion and Suggestions

This study explores the value of the venture capital industry from a managerial perspective. Intellectual capital is a popular issue world-wide and while there are many discourses published abroad, the industry is just beginning in Taiwan. We have explored the construction of intellectual capital indicators and found that the intellectual capital of the venture capital industry is categorized into three concepts. We have also developed 12 indicators for the business intellectual capital assessment model through the venture capital industry in Taiwan, and the results are similar to Cumming's (2006), who suggests four points:

1. Fund-raising and the number of funds operated by the vc company have a positive impact on the company's portfolio size. vc funds sponsored by government have larger portfolios, and corporate and

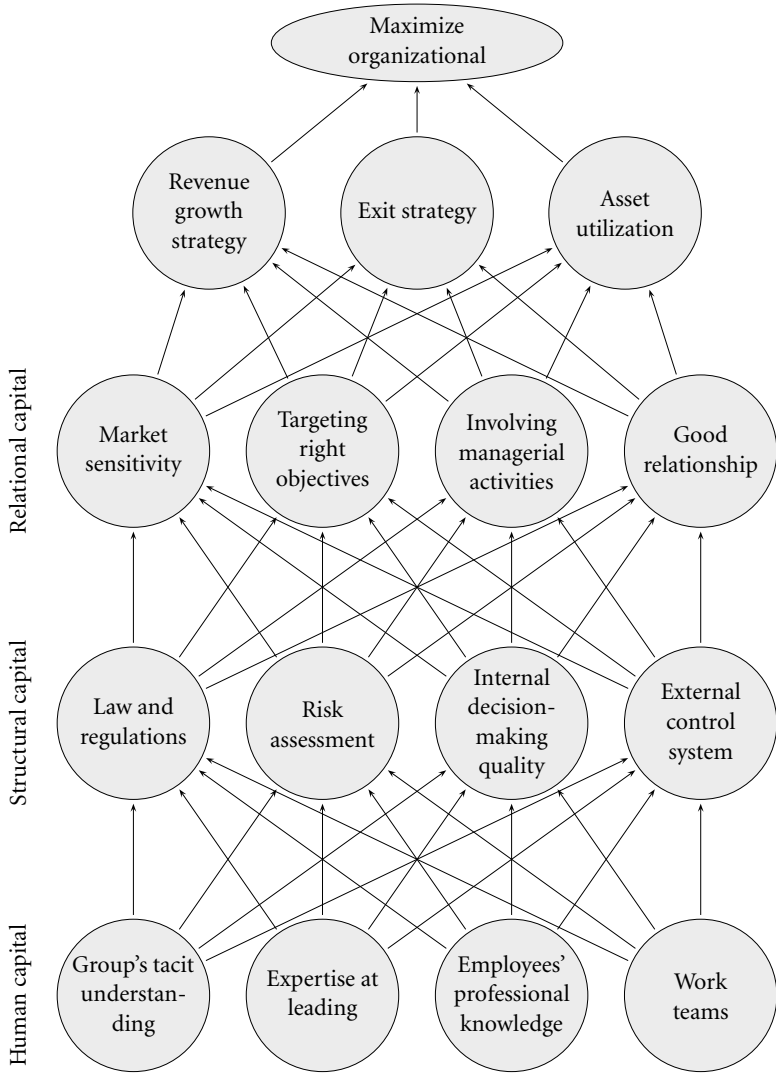


FIGURE 2 The sustainable strategy map of the venture capital industry in Taiwan

private independent limited partnerships have smaller portfolios. vc funds with more vc managers have larger portfolios (relational capital and human capital).

2. Portfolio size is affected by the composition of the portfolio in terms of high-tech and early-stage investments (structural capital).
3. Portfolio size is affected by the nature of financing arrangements,

including capital structure, staging, syndication, and the amount of vc capital invested in the entrepreneurial company relative to capital from other investors (structural capital).

4. Portfolio sizes are larger when formed during boom periods (Cumming 2006).

Intellectual capital is complex and intangible, and errors due to subjectivity are inevitable. This study is the first attempt to investigate the intellectual capital reporting practice of the venture capital industry in Taiwan and is exploratory. Further work should include using a larger sample to include the analytical hierarchy process model and to extend analysis longitudinally to monitor the progress of the practices. Measuring intellectual capital can help formulate business strategies, and these measures provide an evaluation for venture capitalists abroad and allocate resources for the sustainability of venture capitalist companies (Marr, Gray and Neely 2003).

The results have important implications for future research. The author has attempted to construct the intellectual capital of the venture capital industry, but future analysis should extend to other economic sectors and institutions. A network approach can help social scientists and policy makers to understand the nature of the relationship between social networks of investors and regional development (Castilla 2003).

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