

Developing human capital indicators: a three-way approach

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Abstract: This study aims to develop human capital indicators in the management practices of Taiwanese enterprises. The research design encompassed three stages. First, 56 human capital indicators were drawn from the literature and a questionnaire was implemented regarding the applicability of these indicators. Second, a ground approach asked EMBA executives to provide five key human capital indicators that are valuable and important to his or her company. Third, the empirical human capital indicators that are adopted in relevant top-tier journal papers were compared to the results of the previous two stages. The comparison results in the selection of ten human capital indicators, including employee competence, job accountability, professional tenure, employee commitment, employee cooperativeness, employee skills, employee creativity, employee professional knowledge, organisational tenure and employee education level. Some managerial implications and research suggestions are also proposed.

Keywords: intellectual capital; human capital; human capital indicators; human capital measurement.

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1 Introduction

Human capital is the profit lever for the knowledge economy (Bontis and Fitz-enz, 2002) and is regarded as the fundamental element of intellectual capital. It is the core resource and competence for obtaining competitive advantage in organisations (Lepak and Snell, 1999; Pfeffer, 1994). Numerous empirical studies describe the characteristics of human capital, including education, experience, skill and the qualities of

management that exert a positive effect on organisational performance (Finkelstein and Hambrick, 1996; Huselid, 1995; Pennings et al., 1998; Wright et al., 1995). The employees who possess knowledge, skills and experience constitute the human capital that create value for organisations (Chen, 1999). Building up human capital and retaining intangible assets have become important management issues for modern corporations.

Numerous scholars have focused on human capital research and accumulated a considerable amount of results in the last decade. In the meantime, many corporate executives are concerned with measuring the concepts of human capital. Among all the human capital indicators available today, the Intellectual Capital Report published by the Skandia Intellectual Capital Team in 1994 is, by far, the most notable and comprehensive piece of research. The Skandia group is the most advanced company in the field of intellectual capital reporting/planning among all Scandinavian corporations. Following the Skandia intellectual report, the researchers who became dedicated to empirical studies of human capital include Bontis (1999), Bontis and Fitz-enz (2002), Bukh et al. (2001), Dzinkowski (2000), Edvinsson and Malone (1997), Knight (1999), Roos et al. (1997), Stewart (1997), Sveiby (1997) and Van Buren (1999).

Although many researchers have explored and measured human capital, some problems still exist in its measurement. Friedman et al. (1998) have suggested that there are three sets of challenges to human capital. First, the notion of human capital has remained a vague and ambiguous concept and the traditional financial measurements based on tangible assets are inadequate for intangible human capital. Second, it is difficult for managers to change their views and motives to obtain, manage and enhance human capital as valuable capital rather than expendable resources. Third, it will mislead managers into making improper decisions because of the ignorance of the proper disclosure and sound measurements of human capital. Therefore, it is crucial to delineate the proper human capital measurement and accurate indicators. As Bukh et al. (2001) argued, hardly any human capital literature features a comprehensive discussion of the indicators.

In addition to the statements above, numerous studies have focused on European or US management practices up to now, with little research on Asia. For example, Chen et al. (2004) mentioned that there is limited intellectual capital research related to Chinese enterprises. Whether or not the currently available human capital indicators are suitable for Taiwanese enterprises needs investigation. For these reasons, this study aims to consolidate the existing empirical research results and the viewpoints of business executives to probe a set of good human capital indicators.

The following sections first illustrate and substantiate the concept and measurement of human capital and then introduces a three-stage research design to refine the human capital indicators. Afterwards, the research findings are presented and finalised, with the concluding remarks as references for academics and practitioners.

2 Literature review

2.1 The importance of human capital

From the resource-based view, the strategic assets that are apparently valuable, rare, inimitable and nontransferable can contribute to the competitive advantage of firms (Barney, 1991; Wernerfelt, 1984). Mouritsen (1998) noted that human capital can be regarded as an organisation's important strategic asset. Today's firms continuously create products, services and processes in response to rapidly changing, competitive and dynamic environments and these firms need to achieve their goals through the knowledge, skills and creativeness of the human resources within the organisation (Burud and Tumolo, 2004).

The term 'human capital' came from human capital theory, which refers to the knowledge, attitudes and skills that are developed and valued primarily for their economically productive potential (Baptiste, 2001). The economic value of education means the present value of past investments in the skills of people (Becker, 1964; Schultz, 1961). The continuous investment and development of employee skills and knowledge leads to expected firm productivity. Thus, an organisation should protect its investments in human capital to prevent brain drain.

The following reasons may contribute to the positive impact of human capital on firm performance: First, the talent may facilitate enterprises in improving their business processes for better strategic and operational effectiveness (Kaplan and Norton, 1997). Second, under the conditions of increasing global competition, organisation survival depends on the employee's innovative capability. Continuous learning and employee growth facilitates the transformation of knowledge into innovative products or services and cultivates a firm's innovative capability (Becker, 1964; Mincer, 1974). Third, the qualified and preeminent human resources in firms accompany high-quality products and services, maintaining the existing customers and developing new ones (Pennings et al., 1998). It is crucial for firms to retain and strengthen human capital with challenging and satisfying work, opportunities for growth and advancement, the recognition of achievements and fair and competitive compensation (Roberts and Hirsch, 2005).

2.2 The definitions of human capital

Human capital can be classified into national, industrial and organisational levels (Becker, 1964). This present study attempts to explore the contents of human capital from the perspective of organisational management. Most scholars agree that human capital represents the knowledge, competence, technical skill and experiences of the human resources who yield economic value for the organisation (Hitt et al., 2001). Ulrich (1998) expanded the scope of skills, experience and knowledge and argued that human capital is composed of employee competence and commitment, highlighting the employee willingness to contribute.

The fruitful human capital definitions proposed by scholars are in Table 1. After synthesising these definitions, we believe that it is essential to broaden the contents of human capital to contain multiple arguments. We define human capital as the core assets of an organisation, namely knowledge, skills, experience, competence, attitude, commitment and individual personal characteristics. These elements are transformed into intangible assets that create profits and productivity.

2.3 The measurement of human capital

The relevant literature on human capital measurement is continuously growing. Marr et al. (2003) have identified five main reasons why organisations are seeking to measure intellectual capital: to help the organisation formulate strategies, to evaluate the strategy execution, to assist in decision-making for diversification and expansion, to use it as a basis for compensation and finally to communicate measures with external stakeholders. Likewise, human capital is the primary component of intellectual capital. It is essential for firms to measure human capital when evaluating organisational effectiveness and externally disclose human capital to raise the organisation's image, as well as investor confidence.

Bukh et al. (2001) proposed a generic intellectual capital model for its measurement. This model illustrates three closely linked elements: 'what is', 'what is done' and 'what happens'. 'What is' information is connected to the question of 'do we have the right resource portfolio?' These resources typically refer to employees, customers, processes and technology. 'What is done' information focuses on the question of 'are we carrying out the right qualification or upgrade activities?' Training, customer development, processes and technology improvements make qualification activities visible. 'What happens' information is concerned with the question of 'have the activities we carried out worked?' These consequences include employee and customer satisfaction and increases in the firm's added value.

Focused on the measurement of human capital, Bukh et al. (2001) explained that "what is" states the formal qualifications of employees, such as the level of education, work experience, organisational tenure, professional certification and so on. For example, Brooking and Motta (1996) used the level of education, professional licences/qualifications and work-related knowledge to measure human capital. Hitt et al. (2001) measured human capital through the level of education and organisational tenure.

'What is done' refers to the investment activities for human capital that are already done by an organisation, like employee training, leadership and motivational activities. For instance, Edvinsson and Malone (1997) and Sveiby (1997) used the average days of employee training and the average cost of

Table 1 The summary of definitions for human capital

<i>Scholar</i>	<i>Definitions of human capital</i>
Baptiste (2001)	Employee knowledge and skills that produce economic potential for organisations
Becker (1964)	The economic value of education
Bontis and Fitz-enz (2002)	Employee knowledge, competence and experience
Bontis (1999)	Employee implicit knowledge; employee intellect in terms of work
Booth (1998)	Employee skill, training and attitudes
Brooking and Motta (1996)	Human assets are employee experience, knowledge, competence and creativity
Brooking (1997)	Leadership abilities, management skills, professional skills, problem-solving skills and creative abilities
Davis and Noland (2002)	Improvement/accumulation of employee competence through education
Dzinkowski (2000)	Employee know-how, competence, skills and professional knowledge
Edvinsson and Malone (1997)	Competence, knowledge, skills and employee and executive experience
Grantham <i>et al.</i> (1997)	A firm's capacity to solve problems by utilising employee knowledge
Hitt and Ireland (2002)	The pool of knowledge and skills with the value of a company
Horibe (1999)	Knowledge and experience of the people related to work
Hudson (1993)	Genes, education, experience and attitudes towards life and work
Johnson (1999)	Knowledge base of the workforce, employee competence and attitude and the characteristics of leaders and managers
Leliaert <i>et al.</i> (2003)	The skills, competence, reputation and potential of an individual
Luthans <i>et al.</i> (2004)	Personal experience, level of education, professional skills, knowledge and creative ideas

Table 1 The summary of definitions for human capital (continued)

<i>Scholar</i>	<i>Definitions of human capital</i>
Lynn (1998)	The stock of knowledge, skills and unique abilities possessed by employees
Molyneux (1998)	Group knowledge, skills, professional technique and employee interpersonal networks
Nelson and Winter (1982)	Tacit knowledge of individuals owned by organisation members
Roos <i>et al.</i> (1997)	Human capital is composed of three dimensions, as follows: <ol style="list-style-type: none"> 1 the ability to compete: employee skills and knowledge 2 work attitude: affected by motive, behaviour and personal ethics 3 quickness in response: ability to innovate, imitate, adapt and integrate
Roos <i>et al.</i> (1998)	Work competence, attitude and quickness in response
Saint-Onge (1996)	Employee attitudes, including assumptions toward matter, values and beliefs
Sandberg (2000)	Human competence at work does not refer to all knowledge and skills, but the ones that people use when working
Stewart (1997)	The ability of employees to solve customer problems; the source of the innovative capacity of an organisation; includes employee attitude, organisational tenure, employee turnover rate, experience and learning
Sveiby (1997)	The ability of employees to create tangible and intangible assets
Tomer (1999)	Certain soft characteristics, such as spirit, leadership style, vision, morals and ethics
Ulrich (1998)	Competence multiplied by commitment
Van Buren (1999)	Knowledge, skills and competence owned by people in an organisation
Wu (2000)	Management team, professional skills, creativity and loyalty

employee training per year. Bukh *et al.* (2001) adopted the ratio of investment in training to the total of the salaries paid and Roos *et al.* (1997) applied the index of leadership to measure human capital.

‘What happens’ represents the effectiveness of these activities on human capital through such measures as job satisfaction, productivity, the level of salary and turnover rate (Bontis and Fitz-enz, 2002; Bukh *et al.*, 2001; Sveiby, 1997; Van Buren, 1999). However, formulating the appropriate human capital measures for ‘what is’, ‘what is done’ and ‘what happens’ depends on the general organisational identity and the specific form of management activities that firms need (Bukh *et al.*, 2001).

Wright and Snell (1991) regarded organisational competitiveness management as an open system, with a Human Resources Management (HRM) system as one of the subsystems. In the HRM system, technical skills and competence were regarded as ‘input’; employee behaviours were in the process of ‘transformation’ and employee satisfaction and job effectiveness were the ‘output’ of the subsystem. The perspective of Wright and Snell (1991) is similar to Bukh *et al.*’s (2001) ‘what is’, ‘what is done’ and ‘what happens’ statements.

‘What is’ and ‘what is done’ information are employees competence and the competence upgrading activities implemented by firms, representing the ‘input’ and ‘process’ dimensions of human capital. Moreover, ‘what happens’ is the ‘output’ dimension of human capital resulting from human resource input and investment. Firms can develop the Input-Process-Output (IPO) framework to measure their own human capital and achieve an integrated and exclusive effectiveness. Nowadays, most human capital indicators can be categorised within the IPO framework of ‘what is’, ‘what is done’ and ‘what happens’ information.

3 Research design

The research design involved three stages in refining the practicable human capital indicators that are fit for Taiwanese enterprises. In the first stage, 56 human capital indicators (see Appendix) were drawn from previous empirical studies and a mailed questionnaire was implemented to enquire from the respondents about the applicability of these indicators. The survey items were measured by a four-point scale, from 'highly inapplicable' to 'highly applicable'. Based on the Taiwan Economic Journal (TEJ) databank, a total of 1574 questionnaires were mailed in 2004 and 251 complete surveys were returned. The response rate was 15.94%. Approximately 80% of the respondents were at the management level and the provided information is more likely to reflect management practices in reality. The proportion of male and female participants was 64% to 36%, respectively. The industry distribution of our sample was composed of the manufacturing industry (45.5%), the information and service industries (20.5%, respectively), the financial industry (7.0%) and others (6.6%).

In the second stage, we adopted a ground approach. Human capital was defined in an open questionnaire and numerous EMBA executives from National Chengchi University were invited to list five human capital indicators that are valuable and important to his or her company. We successfully contacted 122 EMBA executives from October to November 2005 and collected a total of 608 human capital indicators. The survey results were provided by male (57%) and female (43%) respondents. Approximately 75% of the participants were managers. The sample was composed of the service industry (37.7%), the manufacturing industry (21.3%), the information industry (17.2%), the financial industry (12.3%) and others (11.5%).

In the third stage, enfolded the empirical human capital studies used in relevant top-tier journals strengthened the academic and practical value of these human capital indicators. Podsakoff et al. (2005) examined the management journals' influence, using citations from 28 journals over the past 20 years. The findings showed seven top-tier journals accounting for 61% of all of the citations, namely, the Administrative Science Quarterly (ASQ), the Academy of Management Review (AMR), the Academy of Management Journal (AMJ), the Strategic Management Journal (SMJ), the Journal of Applied Psychology (JAP), Personnel Psychology (PerPsych) and Organisational Behaviour and Human Decision Processes (OBHDP).

Among these journals, ASQ, AMR, AMJ and SMJ had papers related to the topic of human capital at the organisational level. We searched for empirical studies from these four journals that were related to human capital and that were done in the past decade. We compared the indicators that were adopted in these articles with those of the previous two surveys. The contents of these journal papers will be provided in the next section to avoid redundancy.

4 Results

4.1 An analysis of the applicability survey on human capital indicators

Table 2 reports the selection of ten applicable human capital indicators in the first-stage survey. The 'ratio-type' indicators included organisational tenure and professional tenure. The others were 'degree-type' indicators, such as the level of education, cohesive force of employees, management leadership skills, organisation identification, employee cooperativeness, employee job satisfaction, job accountability and employee competence. Although the education level seems to be the common indicator to value human capital, the results indicate that most Taiwanese enterprises place more emphasis on 'degree-type' indicators.

We further investigated the distribution and differences of the human capital indicators among the industries. The results showed that among the ten applicable indicators, the manufacturing industry adopts 'professional tenure' (47.34%) most often, while the information industry emphasises the 'level of education' (21.43%), the financial and service industries value 'employee cooperativeness' (7.73% and 22.22%, respectively) and 'organisational tenure' (7.43%) is often adopted as human capital measurement

in other industries, like construction and academic research.

Table 2 The top ten applicable human capital indicators in the first stage

<i>Ranking</i>	<i>Items</i>	<i>Frequency</i>	<i>Percentage (%)</i>	<i>Total</i>
1	Level of education	231	92.40	250
2	Cohesiveness of employees	224	89.60	250
3	Leadership skills of the management team	217	87.15	249
4	Organisation identification	215	86.00	250
5	Employee cooperativeness	214	85.94	249
6	Job satisfaction	212	85.83	247
7	Professional tenure	214	85.60	250
8	Employee competence	214	85.60	250
9	Job accountability	210	84.00	250
10	Organisational tenure	209	83.94	249

4.2 An analysis of the ground approach to the human capital indicators

For the ground approach in the second stage, we classified the results of the open questionnaire survey. A total of 16 human capital indicators were derived, as shown in Table 3. According to the top ten rankings of human capital indicators, there were five items that were consistent with the results of the first stage: job accountability, employee competence, professional tenure, employee commitment (the cohesive force of employees and organisation identification were combined in the indicator) and employee cooperativeness. The new additions to the list were employee skills, the personal characteristics of the employees, employee professional knowledge, communication skills and employee creativity. Most of the EMBA executives considered the job accountability of employees as an important indicator; however, the level of education, which ranked first in the previous survey, dropped out of the top ten list.

We explored the variations of these human capital indicators among industries. The human capital indicators that the manufacturing, information, financial, service and other industries deemed as crucial profit levers were as follows: ‘employee cooperativeness’ (29.41%) for manufacturing, ‘employee creativity’ for information and service (26.32% and 47.37%), ‘professional knowledge of employees’ (18.84%) for financial and ‘communication skills’ (16.67%) for other industries, such as medicine and academic research.

The indicators above, based on industry levels, were different from the first survey. The differences between the results could be the following reasons. First, other new indicators appeared in the ground approach, except for the selection of the ten applicable human capital indicators in the first survey. Second, the industry proportion was also unbalanced between the two stages. For example, the proportions of the manufacturing industry in the two stages were 45.5% and 21.3%, respectively. In general, employee cooperativeness was regarded in the survey results as an important human capital factor in the manufacturing, service and financial industries.

Table 3 The distribution of human capital indicators in the second stage

<i>Ranking</i>	<i>Human capital indicator</i>	<i>Frequency</i>	<i>Percentage (%)</i>
1	Job accountability	86	14.1
2	Employee competence	84	13.8
3	Employee skills	74	12.2
4	Professional tenure	72	11.8
5	Personal characteristics of employees	71	11.7
6	Employee professional knowledge	70	11.5
7	Employee commitment*	69	11.4
8	Employee creativity	19	3.1
9	Communication skills	18	3.0
10	Employee cooperativeness	17	2.8
11	Level of education	12	2.0
12	Leadership skills of the management team	9	1.5
13	Job satisfaction	3	0.5
14	Human resource development/planning	2	0.4
15	Physical strength of employees	1	0.2
16	Ages of employees	1	0.2
<i>Total</i>		608	100

Note: * Employee commitment combined with employee cohesiveness and organisation identification.

4.3 A comparison of the human capital indicators in top-tier journal papers to the previous results

The present research used human capital indicators that were adopted from some top-tier journals to identify the differences or consistencies of the previous practical surveys on Taiwanese enterprises. The empirical indicators were derived from ASQ, AMJ and SMJ (after 1997) and the findings are shown in Table 4. These measures, adopted by scholars, contrasted those from the previous two stages, representing eight consistent human capital indicators that include professional tenure, the level of education, employee skills, employee cooperativeness, employee competence, employee commitment, the professional knowledge of the employees and employee creativity. Moreover, the human capital indicators that are most frequently applied by these articles are employee skills, the level of education and professional tenure.

We made a comparison of the three sets of human capital indicators in Table 5. Four indicators were consistent through all of the three stages (employee competence, professional tenure, employee commitment and employee cooperativeness). We figured that 80% of the human capital indicators that were valued by Taiwanese enterprises (in the first and second stages) were the same as those in academic research. Eventually, we obtained ten practicable human capital indicators, including employee competence, job accountability, professional tenure, employee commitment, employee cooperativeness, employee skills, employee creativity, the professional knowledge of the employees, organisational tenure and the education level of the employees.

According to the IPO framework with the issues of ‘what is’, ‘what is done’ and ‘what happens’, the final ten practicable human capital indicators were examined based on the three issues above. Table 6 reveals that five human capital indicators belong to ‘what is’, two indicators belong to ‘what is done’ and five indicators fall into ‘what happens’. Employee skills and employee professional knowledge simultaneously fall into ‘what is’ and ‘what is done’, because skills and professional knowledge can be

gained before the employees enter the firm or are enhanced via comprehensive development within the firm.

Table 4 A comparison of the human capital indicators in top-tier journals from previous surveys

<i>Author(s)</i>	<i>Journal</i>	<i>Items of human capital</i>	<i>Human capital indicators from the surveys</i>
Gimeno <i>et al.</i> (1997)	ASQ	Similar industrial experience	Professional tenure
		Relevant work experience	Professional tenure
		Level of education	Level of education
Hatch and Dyer (2004)	SMJ	Does an employee need to have a degree in technical education?	Level of education
		Is a technical test used in recruitment?	Employee skills
		What is the level of employee training?	Employee skills
		How much does an employee participate in teamwork?	Employee cooperativeness
		How much time does an employee spend on solving problems?	Employee competence
		How much previous industrial experience does an employee have?	Professional tenure
		How high is the employee turnover rate?	Employee commitment
Hitt <i>et al.</i> (2001)	AMJ	Quality of alma mater	Level of education
		Experience accumulated in the organisation	Organisational tenure
Skaggs and Youndt (2004)	SMJ	Compared to our competitors, our company:	
		• spends more money on employee training	Employee skills
		• spends more time training employees	Employee skills
		• hires employees with rich work-related experience	Professional tenure
		• hires employees with previous training in relevant fields	Employee skills
• hires employees with high levels of education	Level of education		
Subramaniam and Youndt (2005)	AMJ	Our employees are highly skilled	Employee skills
		Our employees are widely considered the best in our industry	Level of education
		Our employees are creative and bright	Employee creativity
		Our employees are experts in their fields	Employee professional knowledge
		Our employees develop new ideas and knowledge	Employee creativity

Table 5 A comparison of the human capital indicators based on the three stages' results

<i>First stage: Applicability survey</i>	<i>Second stage: Ground approach</i>	<i>Third stage: Indicators in top-tier journal papers</i>
Employee competence	Employee competence	Employee competence
Job accountability	Job accountability	
Professional tenure	Professional tenure	Professional tenure
Cohesive force of employees	Employee commitment	Employee commitment
Organisation identification		
Employee cooperativeness	Employee cooperativeness	Employee cooperativeness
Leadership skills of the management team	Employee skills	Employee skills
Job satisfaction	Employee creativity	Employee creativity
	Employee professional knowledge	Employee professional knowledge
Organisational tenure	Communication skills	Organisational tenure
Level of education	Personal characteristics of employees	Level of education

Table 6 The linkage of human capital indicators to measurement issues

<i>Human capital indicator</i>	<i>Human capital measurement issues</i>
Employee competence	Output – what happens
Job accountability	Output – what happens
Professional tenure	Input – what is
Employee commitment	Output – what happens
Employee cooperativeness	Output – what happens
Employee skills	Input – what is, Process – what is done
Employee creativity	Output – what happens
Employee professional knowledge	Input – what is, Process – what is done
Organisational tenure	Input – what is
Level of education	Input – what is

5 Conclusion

5.1 Establishing down-to-earth human capital indicators for Taiwanese enterprises

The current study delineates down-to-earth human capital, which are valuable and applicable for Taiwanese firms, through a comprehensive three-stage investigation. In addition, the research findings may guide future reviews of the empirical studies on human capital. This present study found that the human capital indicators that are applicable to enterprises in Taiwan are employee competence, job accountability, professional tenure, employee commitment, employee cooperativeness, employee skills, employee

creativity, professional knowledge of employees, organisational tenure and the education level of employees.

5.2 Developing the input-process-output framework of human capital measurement

Firms can develop the IPO framework of 'what is', 'what is done' and 'what happens' to measure their own human capital, achieving an integrated and exclusive effectiveness. From these research findings, Taiwan puts more emphasis on the input and output dimensions of human capital, but invests less in the process dimension. This indicates that firms tend to recruit market talent to boost organisational effectiveness. However, the continuous investment and development of human capital is even more beneficial to raise the value of corporations.

Therefore, we suggest that the managers and executives of Taiwanese enterprises further reinforce human resource development practices and continuously cultivate their employees while continuing to recruit high-quality talent and emphasise the economic benefits embedded in human resources.

5.3 Integrate industrial and general indicators into bundles of human capital measures

Besides the examination of the practicable human capital indicators, we explored the variations among the industries. It is reasonable for firms to adopt different bundles of human capital indicators to fit industry characteristics. For example, our results indicate that companies in the service industry take more account of employee creativity. Thereby, the bundles of human capital indicators should contain general and industrial indicators.

General human capital indicators are applicable to organisations in all industries and might include employee personal characteristics of faith and integrity and the job accountability of employees. Industrial human capital indicators should be measured on the industry level. For instance, the financial industry may focus on the professional knowledge of employees, but the cultural and creative industries may consider the execution of creativity as highly important.

In conclusion, we suggest that future research should attempt to measure human capital based on the concept of bundles that contain general and industry-specific indicators. Moreover, the impact on firm performance between general and industry-specific human capital measurement should be investigated.

References

- Baptiste, I. (2001) 'Educating long wolves: pedagogical implications of human capital theory', *Adult Education Quarterly*, Vol. 51, No. 3, pp.184–201.
- Barney, J. (1991) 'Firm resources and sustained competitive advantages', *Journal of Management*, Vol. 17, No. 1, pp.99–120.
- Becker, G.S. (1964) *Human Capital*, New York: Columbia University Press.
- Bontis, N. (1999) 'Managing organizational knowledge by diagnosing intellectual capital: framing and advancing the state of the field', *Int. J. Technology Management*, Vol. 18, Nos. 5–8, pp.433–462.
- Bontis, N. and Fitz-enz, J. (2002) 'Intellectual capital ROI: a causal map of human capital antecedents and consequents', *Journal of Intellectual Capital*, Vol. 3, No. 3, pp.223–247.
- Booth, R. (1998) 'The measurement of intellectual capital', *Management Accounting*, Vol. 76, No. 10, pp.26–28.
- Brooking, A. (1997) 'The management of intellectual capital', *Long Range Planning*, Vol. 30, No. 3, pp.364–365.
- Brooking, A. and Motta, E. (1996) 'A taxonomy of intellectual capital and a methodology for auditing it', 17th Annual National Business Conference, McMaster University, Hamilton, Canada, pp.24–26.
- Bukh, P.N., Larsen, H.T. and Mouritsen, J. (2001) 'Constructing intellectual capital statements', *Scandinavian Journal of Management*, Vol. 17, No. 1, pp.87–108.
- Burud, S. and Tumolo, M. (2004) *Leveraging the New Human Capital: Adaptive Strategies, Results Achieved and Stories of Transformation*, Palo Alto, CA: Davies-Black Publishers.

- Chen, J., Zhu, Z. and Xie, H.Y. (2004) 'Measuring intellectual capital: a new model and empirical study', *Journal of Intellectual Capital*, Vol. 5, No. 1, pp.195–212.
- Chen, Y.L. (1999) *Accumulation of Human Capital within the Organization – The Perspective of Intellectual Capital Management* [in Chinese], Graduate School of Human Resource Management, National Central University.
- Davis, H.D. and Noland, B.E. (2002) 'Understanding human capital through multiple disciplines: the educational needs index', *Social Indicators Research*, Vol. 61, pp.147–174.
- Dzinkowski, R. (2000) 'The measurement and management of intellectual capital: an introduction', *Management Accounting*, Vol. 78, No. 2, pp.32–36.
- Edvinsson, L. and Malone, M.S. (1997) *Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Brainpower*, New York: HarperBusiness.
- Finkelstein, S. and Hambrick, D. (1996) *Strategic Leadership*, St. Paul: West.
- Friedman, B., Hatch, J. and Walker, D. (1998) *Delivering on the Promise: How to Attract, Manage and Retain Human Capital*, New York: Simon and Schuster Inc.
- Gimeno, J., Flota, T.B., Cooper, A.C. and Woo, C.Y. (1997) 'Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms', *Administrative Science Quarterly*, Vol. 42, No. 4, pp.750–783.
- Grantham, C.E., Nichols, L.D. and Schonberger, M. (1997) 'A framework for the management of intellectual capital in the health care industry', *Journal of Health Care Finance*, Vol. 23, No. 3, pp.1–19.
- Gu, Q.X. and Zhou, Z. (2004) 'Human capital evaluation indicators of domestic enterprise managers – study on different views of domestic and foreign enterprises' [in Chinese], http://www.chinahrd.net/zhi_sk/jt_page.asp?articleid=37779.
- Hatch, N.W. and Dyer, J.H. (2004) 'Human capital and learning as a source of sustainable competitive advantage', *Strategic Management Journal*, Vol. 25, No. 12, pp.1155–1178.
- Hitt, M.A., Bierman, L., Shimizu, K. and Kochhar, R. (2001) 'Direct and moderating effects of human capital on strategy and performance in professional service firms: a resource-based perspective', *Academy of Management Journal*, Vol. 44, No. 1, pp.13–28.
- Hitt, M.A. and Ireland, R.D. (2002) 'The essence of strategic leadership: managing human and social capital', *Journal of Leadership & Organizational Studies*, Vol. 9, No. 1, pp.3–14.
- Horibe, F. (1999) *Managing Knowledge Workers: New Skills and Attitudes to Unlock the Intellectual Capital in Your Organization*, Toronto: John Wiley & Sons.
- Hudson, W. (1993) *Intellectual Capital: How to Build It, Enhance It, Use It*, New York: John Wiley.
- Huselid, M.A. (1995) 'The impact of human resource management practices on turnover, productivity and corporate financial performance', *Academy of Management Journal*, Vol. 38, pp.635–672.
- Johnson, W.H. (1999) 'An integrated taxonomy of intellectual capital: measuring the stock and flow of intellectual capital components in the firm', *Int. J. Technology Management*, Vol. 18, Nos. 5–8, pp.562–575.
- Kaplan, R.S. and Norton, D.P. (1997) 'Why does business need a balanced scorecard?', *Journal of Cost Management*, Vol. 11, No. 3, pp.5–11.
- Knight, D.J. (1999) 'Performance measure for increasing intellectual capital', *Strategy & Leadership*, Vol. 27, No. 2, pp.22–27.
- Leliaert, P.J.C., Candries, W. and Tilmans, T. (2003) 'Identifying and managing IC: a new classification', *Journal of Intellectual Capital*, Vol. 4, No. 2, pp.202–214.
- Lepak, D.P. and Snell, S.A. (1999) 'The human resource architecture: toward a theory of human capital allocation and development', *Academy of Management Review*, Vol. 24, No. 1, pp.31–48.
- Luthans, F., Luthans, K.W. and Luthans, B.C. (2004) 'Positive psychological capital: beyond human and social capital', *Business Horizons*, Vol. 47, No. 1, pp.45–50.
- Lynn, B.E. (1998) 'Performance evaluation in the new economy: bridging the measurement and evaluation of intellectual capital into the management planning control system', *Int. J. Technology Management*, Vol. 16, Nos. 1–3, pp.162–176.
- Marr, B., Gary, D. and Neely, A. (2003) 'Why do firms measure their intellectual capital?', *Journal of Intellectual Capital*, Vol. 4, No. 4, pp.441–464.
- Mincer, J. (1974) *Schooling, Experience, and Earnings*, New York: Columbia University Press.
- Molyneux, A. (1998) 'IC and the ASCAP: seeking competitive advantage', *Australian CAP*, Vol. 68, No. 5, pp.27–28.
- Mouritsen, J. (1998) 'Driving growth: economic value added versus intellectual capital', *Management Accounting Research*, Vol. 9, No. 4, pp.461–483.
- Nelson, R. and Winter, S. (1982) *An Evolutionary Theory of Economic Change*, Cambridge, MA: Belknap Press.

- Penning, J.M., Lee, K. and Witteloostuijn, A.V. (1998) 'Human capital, social capital and firm dissolution', *Academy of Management Journal*, Vol. 41, pp.425–440.
- Pfeffer, J. (1994) *Competitive Advantage Through People: Unleashing the Power of the Workforce*, Boston: Harvard Business School Press.
- Podsakoff, P.M., MacKenzie, S.B., Bachrach, D.G. and Podsakoff, N.P. (2005) 'The influence of management journals in the 1980s and 1990s', *Strategic Management Journal*, Vol. 26, No. 5, pp.473–488.
- Roberts, R. and Hirsch, P. (2005) 'Evolution and revolution in the twenty-first century: revolutionary new rules for organizations and managing human resource', in M. Losey, S. Meisinger and D. Ulrich (Eds.) *The Future of Human Resource Management*, Virginia: John Wiley & Sons, pp.134–143.
- Roos, J., Roos, G., Dragonetti, N.C. and Edvinsson, L. (1997) *Intellectual Capital: Navigating in the New Business Landscape*, London: Macmillan Business.
- Roos, J., Roos, G., Edvinsson, L. and Dragonetti, N.C. (1998) *Intellectual Capital: Navigating in the New Business Landscape*, New York: New York University Press.
- Saint-Onge, H. (1996) 'Tacit knowledge: the key to the strategic alignment of intellectual capital', *Strategy & Leadership*, Vol. 24, No. 2, pp.10–14.
- Sandberg, J. (2000) 'Understanding human competence at work: an interpretative approach', *Academy of Management Journal*, Vol. 43, pp.9–25.
- Schultz, T.W. (1961) 'Investments in human capital', *American Economic Review*, Vol. 51, March, pp.1–17.
- Skaggs, B.C. and Youndt, M.A. (2004) 'Strategic positioning, human capital, and performance in service organization: a customer interaction approach', *Strategic Management Journal*, Vol. 25, No. 1, pp.85–99.
- Stewart, T.A. (1997) *Intellectual Capital: The New Wealth of Organizations*, New York: Doubleday.
- Subramaniam, M. and Youndt, M.A. (2005) 'The influence of intellectual capital on the types of innovative capabilities', *Academy of Management Journal*, Vol. 48, No. 3, pp.450–463.
- Sveiby, K.E. (1997) *The New Organizational Wealth: Managing and Measuring Knowledge-based Assets*, San Francisco, CA: Berrett-Koehler Publishers.
- Tomer, J. (1999) *The Human Firm: A Socio-economic Analysis of Its Behavior and Potential in a New Economic Age*, New York: Routledge.
- Ulrich, D. (1998) 'Intellectual capital = competence × commitment', *Sloan Management Review*, Winter, pp.15–26.
- Van Buren, M.E. (1999) 'A yardstick for knowledge management', *Training & Development*, May, pp.71–78.
- Wernerfelt, B. (1984) 'A resource-based view of the firm', *Strategic Management Journal*, Vol. 5, No. 2, pp.171–180.
- Wright, P.M., Smart, D.L. and McMahon, G.C. (1995) 'Matches between human resource and strategy among NCAA basketball teams', *Academy of Management Journal*, Vol. 38, pp.1052–1074.
- Wright, P.M. and Snell, S.A. (1991) 'Toward an integrated view of strategic human resource management', *Human Resource Management Review*, Vol. 1, pp.203–225.
- Wu, S.H. (2000) *Intellectual Capital Research Project [in Chinese]*, Institute for Information Industry.

Note

- 1 These indicators were synthesised and drawn from the studies of Bontis (1999), Bontis and Fitz-enz (2002), Bukh et al. (2001), Dzinkowski (2000), Edvinsson and Malone (1997), Gu and Zhou (2004), Knight (1999), Roos et al. (1997), Stewart (1997), Sveiby (1997), Van Buren (1999) and Wu (2000).

Appendix

The survey items on the applicability of human capital indicators

- Average training hours per employee in the three most recent years
- Average amount of professional certifications per employee
- Average years in organisation per employee (organisational tenure)
- Average years of professional areas per employee (professional tenure)
- Average age of employees

- Education level of employees
- Total number of employees
- Average employee turnover rate in the three most recent years
- Average rate of employee retention in the three most recent years
- Average amount of new ideas for new products proposed in the three most recent years
- Average amount of new ideas for new products that were accepted in the three most recent years
- Total annual training and education expenses
- Total annual personnel expenses
- Total company sales in the last year
- Average salary of employees
- Average salary of managers
- Average sick leave per year
- Average employee attendance each year
- Average overtime per week
- Compare the staff salaries of your company to similar businesses
- Have a complete recruitment plan in your company
- Invest in employee training expenditures
- Have complete training programmes for employees in your company
- Added value of each employee (surplus/number of employees)
- Ratio of new employees with less than two years of experience
- The industry's opinion of the company's employees
- Employee departure will cause great impact on the organisation
- Your company is attractive to employees with high potential

The survey items on the applicability of human capital indicators (continued)

- Level of employees' proposals being realised
- Employee creativity
- Your company has an innovative culture
- Informal interaction among employees
- Social ability of employees
- Frequency of messaging among employees
- Level of learning orientation of employees
- Your company has a learning culture
- Employee voices are heard well
- Rate of employee participation in company activities
- Level of voluntary extension of work time

- Loyalty of employees
- Level of employee identification
- Level of employees believing and accepting company goals and values
- Level of employees willing to invest efforts for the company
- Level of employees willing to maintain their identity as a member of the company
- Morale of employees
- Level of delegation in your company
- Number of teams delegated in your company
- Level of employee job accountability
- Level of employee competence
- Level of employee job satisfaction
- Level of cooperativeness among organisation members
- Level of employees' positive and proactive attitudes
- Leadership skills of the management team
- Number of members in the management team
- Number of female members in the management team
- The executives share their management experiences