



Intellectual capital ROI: a causal map of human capital antecedents and consequents

Intellectual
capital ROI

223

Nick Bontis

*DeGroote School of Business, McMaster University, Hamilton,
Ontario, Canada, and*

Jac Fitz-enz

Saratoga Institute, Santa Clara, California, USA

Keywords *Human capital theory, Knowledge management, Staff turnover, Leadership, Performance*

Abstract *This report describes the results of a ground-breaking research study that measured the antecedents and consequents of effective human capital management. The research sample consisted of 76 senior executives from 25 companies in the financial services industry. The results of the study yielded a holistic causal map that integrated constructs from the fields of intellectual capital, knowledge management, human resources, organizational behaviour, information technology and accounting. The integration of both quantitative and qualitative measures in an overall conceptual model yielded several research implications. The resulting structural equation model allows participating organizations and researchers to gauge the effectiveness of an organization's human capital capabilities. This will allow practitioners and researchers to more efficiently allocate resources with regard to human capital management. The potential outcomes of the study are limitless, since a program of consistent re-evaluation can lead to the establishment of causal relationships between human capital management and economic and business results.*

Introduction

Today's knowledge-based world consists of universal dynamic change and massive information bombardment. By the year 2010, the codified information base of the world is expected to "double every 11 hours" (Bontis, 1999, p. 435). Information storage capacities continue to expand enormously. In 1950, IBM's Rama C tape contained 4.4 megabytes and they were able to store as many as 50 of these tapes together. At that time, 220 megabytes represented the frontiers of information storage. Many of today's standard desktop computers are being sold with 40 gigabytes of hard disk space. It is sobering to remember that full motion video in uncompressed form requires 1 gigabyte per minute and that the 83 minutes of *Snow White* digitized in full colour amount to 15 terabytes of space. Unfortunately, the conscious mind is only capable of processing somewhere between 16 and 40 bits of information (ones and zeros) per second. How do we reconcile this information bombardment conundrum when it seems that human beings are the bottle-neck?

The authors would like to acknowledge the following organizations for their financial support: Accenture, Saratoga Institute and the Institute for Intellectual Capital Research. The authors would also like to highlight the contribution of Vanessa Yeh, who administered the data collection phase of this research.



In the closing years of the last millennium, senior managers have come to accept that “people, not cash, buildings or equipment, are the critical differentiators of a business enterprise” (Fitz-enz, 2000, p. 1). For senior managers to manage the dynamic changes of turbulent economic environments and filter the massive sources of information into knowledge (or, better yet, wisdom), an integrated perspective of human capital management plays a considerable role.

Often, the anthropomorphization of an organization is a difficult conceptual leap for senior managers to make. Can we actually improve the organizational learning capabilities of firms? Furthermore, can we translate knowledge management practices into financial gain?

All the issues above have human capital management at their root. However, the extant literature has yet to integrate the appropriate fields of the literature necessary to uncover the hidden meaning. The purpose of this paper is to integrate constructs from the fields of intellectual capital, knowledge management, human resources, organizational behaviour, information technology and accounting in order to uncover a more holistic perspective of organizational performance.

The five key objectives of this research study are to:

- (1) Reconcile the use of both economic and perceptual measures of human capital management and its antecedents into triangulated indices that have yet to be measured.
- (2) Determine path coefficient relationships between constructs developed from an overall conceptual model based on the academic and practitioner literature.
- (3) Benchmark the relative standing of participating organizations, so that client human resources may be reallocated more effectively.
- (4) Establish a research trajectory that is more advanced and innovative than anything currently being considered in the fields of intellectual capital or knowledge management.
- (5) Set a base line for trending, norming and forecasting human and financial capital links.

Literature review

The following section briefly describes the concepts germane to this study, which include: human capital, structural capital, relational capital, leadership, employee sentiment, turnover and knowledge management.

Human capital is the profit lever of the knowledge economy. An organization’s members possess individual tacit knowledge (i.e. inarticulable skills necessary to perform their functions) (Nelson and Winter, 1982). In order to illustrate the degree to which tacit knowledge characterizes the human capital of an organization, it is useful to conceive the organization as a productive process that receives tangible and informational inputs from the

environment, produces tangible and informational outputs that enter the environment, and is characterized internally by a series of flows among a network of nodes and ties or links (Bontis, 1999).

Human capital has also been defined on an individual level as the combination of these four factors: your genetic inheritance; your education; your experience; and your attitudes about life and business (Hudson, 1993). Human capital is important, because it is a source of innovation and strategic renewal, whether it is from brainstorming in a research lab, day-dreaming at the office, throwing out old files, re-engineering new processes, improving personal skills or developing new leads in a sales rep's little black book. The essence of human capital is the sheer intelligence of the organizational member.

Wright *et al.* (1994), working from a resource-based perspective, argue that in certain circumstances sustained competitive advantage can accrue from "a pool of human capital" which is larger than those groups, such as senior managers and other elites, who are traditionally identified as determining organizational success or failure. This is achieved through the human capital adding value, being unique or rare, imperfectly imitable and not substitutable with another resource by competing firms. Storey supports this focus:

This type of resource [human capital] can embody intangible assets such as unique configurations of complementary skills, and tacit knowledge, painstakingly accumulated, of customer wants and internal processes (1995, p. 4).

A firm is not a passive repository of knowledge. Multiple knowledge nodes of the firm interact and recombine with each other with varying intensity (the tacit knowledge of the collective in the form of organizational culture may interact with the explicit knowledge of the individual or the structural capital of a database), get converted from one form to the other and mobilize, recombine and transform the resources of the firm so as to add value. What results from these re-combinations and conversions is the new knowledge – as organizational learning and/or innovation.

Human capital is also a primary component of the intellectual capital construct (Bontis, 1996, 1998, 1999, 2001a, b, 2002a,b; Bontis *et al.*, 1999; Edvinsson and Malone, 1997; Edvinsson, 2002; Stewart, 1997, 2001; Sveiby, 1997; Bontis and Girardi, 2000). The intellectual capital literature has grown tremendously in the last decade (see Bontis (2002a, b) and Choo and Bontis, (2002) for comprehensive edited volumes). Whereas human capital embodies the knowledge, talent and experience of employees, structural capital represents the codified knowledge bases that do not exist within the minds of employees (e.g. databases, filing cabinets, organizational routines). Furthermore, relational capital represents the knowledge embedded in the organizational value chain. That is, the knowledge embedded in the relationships that the firm has with suppliers, customers and any entity outside the boundaries of the firm. Although there is general agreement on the aforementioned description of these three constructs, empirical research has been minimal (see Bontis (1998) for an exception). Most importantly, however,

there is still no clear empirical validation as to which construct drives organizational performance directly or whether or not a combination of each is required.

The behaviours exhibited by senior management are an important variable to consider when examining how an organization leverages its human capital. Lyles and Schwenk (1992) suggest that the cognitive maps of top management members closely represent core aspects of all organizational members. Leaders such as “boundary spanners” (Michael, 1973) and “technological gatekeepers” (Allen, 1977) have an important role in facilitating value alignment in support of an organization’s innovative capability. Managerial leadership acts as a catalyst to fuel learning in firms. The leader’s support cast is also very important. After all, although organizational learning requires a champion, it also needs subordinates and followers (Pedler *et al.*, 1996). Organizations must emphasize that leaders will have “learning paths”, not “jobs” (Wilson *et al.*, 1994).

Edmondson (1996) also argues that leadership is an important antecedent for human capital development. She claims that it is not enough for leaders to design appropriate organizational structures and continue to make well-reasoned decisions; instead, organizations must be characterized at all levels by a “leading attentiveness” to changing conditions.

Another important antecedent to human capital development rests with general employee sentiment. Employee sentiment can be defined as the inter-relationship between employee satisfaction, commitment and motivation. Of course, these all relate with an organization’s overall culture. Organizations that have a culture that supports and encourages cooperative innovation should attempt to understand what it is about their culture that gives them a competitive advantage and develop and nurture those cultural attributes (Barney, 1986). Culture constitutes the beliefs, values and attitudes pervasive in the organization and results in a language, symbols and habits of behaviour and thought. Increasingly it is recognized as the conscious or unconscious product of the senior management’s belief (Hall, 1992). Barney discussed the potential for organizational culture to serve as a source of sustained competitive advantage. He concluded that “firms that do not have the required cultures cannot engage in activities that will modify their cultures and generate sustained superior performance, because their modified cultures typically will be neither rare nor imperfectly imitable” (1986, p. 656). Human capital development, as it relates to culture can be managed, if the organizational membership is relatively stable. This task becomes much more difficult when there is mobility in the employee base. This transient change in an organization’s employee profile – also called turnover – is a significant challenge when attempting to leverage human capital.

Turnover is the rotation of workers around the labour market; between firms, jobs and occupations; and between the states of employment and unemployment (Abassi and Hollman, 2000). This workforce activity segments into two categories, voluntary and involuntary. Involuntary turnover refers

to the dismissal of employees, whereas voluntary turnover occurs when employees resign. While many studies have clustered these two distinct classifications, this study is aiming to examine voluntary turnover specifically. Since management cannot control voluntary turnover, these are fertile grounds for research, and by examining the implications of this phenomenon, such research asserts the need to establish preventive measures for minimizing collateral damage.

Voluntary turnover often results in departing employees migrating to competing firms, creating an even more critical situation, since this knowledge can now be used against the organization. Voluntary turnover has in fact been accelerating over the past decade, as recent studies have shown that employees on average switch employers every six years (Kransdorff, 1996). This situation demands senior management to consider the repercussions of voluntary turnover, and immediately create contingency plans. Otherwise, senior management may be caught unprepared, if (or when) their best performers leave. Recent research supports the notion that organizations generally do not manage their turnover effectively, as it relates to knowledge management (see Stovel and Bontis (2002) in this issue).

Knowledge management behaviours include three primary activities: knowledge generation – which describes the way employees improvise and organizations innovate; knowledge integration – which describes how employees transform their tacit knowledge into explicit knowledge by codifying their ideas into the systems of the organization and knowledge sharing – which describes the socialization process through which employees share knowledge with one another (Nonaka and Takeuchi, 1995). Ultimately, the goal of knowledge management is to leverage the intellectual capital that is currently resident in the organization and to convert that knowledge into sustainable competitive advantage through increased business performance.

Conceptual model

The purpose of this study is to model and measure the antecedents and consequents of effective human capital management. The general quantitative antecedents of human capital include management's ability to continue to invest in human capital, while defending the organization from human capital depletion (see Figure 1).

Proxies of human capital investment and depletion include turnover rates and training and development expenditures respectively. The outcome of human capital valuation is the positive impact human capital management has on effectiveness, which can be measured using revenue and profit per employee. The data collection phase of this study was used to operationalize this model.

Methodology

A total of 25 companies in the financial services industry were targeted for this study (see Table I). These companies averaged \$8.5 billion in revenues with

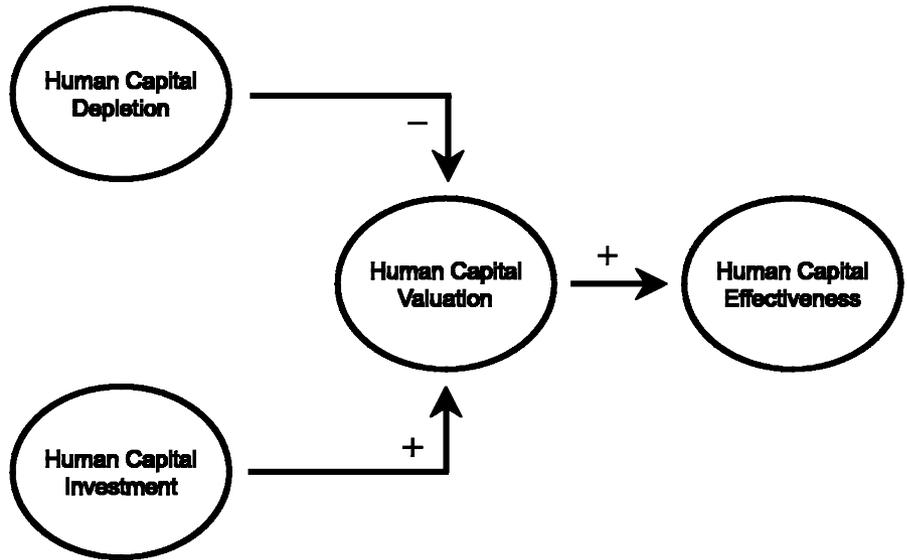


Figure 1.
Conceptual model

ABN AMRO North America Inc.	Hartford Financial Services
Allstate Insurance Company	Hewitt Associates, LLC
AMP Australia	Intermountain Health Care
AMP UK	International Monetary Fund
Andersen Consulting	Merrill Lynch
Aon	National City Corp.
AXA Client Solutions	Northwestern Mutual Life
Blue Cross Blue Shield of Florida	Penn National Insurance
Blue Cross Blue Shield of Illinois/Texas	PNC Bank
Blue Cross Blue Shield of North Carolina	Savings Bank of Utica
CNA Commercial Insurance	United Health Group
Equitax	Zurich US
Farmers Insurance Group	

Table I.
Participating
companies (25)

over 16,000 employees and spent over \$45 million training a workforce that collected \$1 billion in compensation (see Table II).

Research data were collected in two phases. The objective of the first phase was to collect all quantitative information from each company including revenue, profit, number of employees, turnover and training information, which was secured from the accounting and HR departments. A survey was administered in the second phase to collect all the qualitative information. The second survey consisted of perceptual items based on Likert-type scales that required respondents to note their level of agreement to certain items. These items were developed from scales previously published by the Institute for Intellectual Capital Research. Items for certain constructs were further edited by a design team, which consisted of representatives from the Saratoga Institute and Accenture.

Full-time regular employees	13,149	Part-time regular employees	676
Regular employees	13,795	Contingency employees	1,820
Total headcount	16,353	Total full-time equivalents	21,006
Headcount: executive	3.2%	Headcount: supervisor	12.7%
Headcount: professional	41.7%	Headcount: administrative	42.3%
Average age: executive	48 years	Average age: supervisor	42 years
Average age: professional	38 years	Average age: administrative	38 years
Tenure: executive	15 years	Tenure: supervisor	11 years
Tenure: professional	8 years	Tenure: administrative	7 years
Total compensation cost	\$998,173,818	Average year of incorporation	1902
Total workforce trained	12,823	Total training cost	\$45,582,889
Revenues	\$8,534,652,304	Operating expenses	\$7,510,438,534
Net profit after tax	\$659,560,770	Return on assets	4.86%

Table II.
Descriptive statistics

The survey sample consisted of 76 respondents from the 25 organizations. The respondents were the most senior executives in the company (e.g. CEO, CFO and Senior VP HR), who represented the overall views of the organization (Hambrick and Mason, 1984). A brief covering letter explained the importance of the research and options for response (i.e. by fax, mail or e-mail).

Quantitative results

The quantitative metrics used in this study tap into four constructs:

- (1) Human capital effectiveness;
- (2) Human capital valuation;
- (3) Human capital investment;
- (4) Human capital depletion.

The hypothesized relationships among these four constructs can be found in Figure 1.

Descriptive statistics for quantitative metrics

In order to compare the quantitative results of the organizations in this sample with other companies, each quantitative metric was benchmarked against the results of the *Human Resource Financial Report* as published by the Saratoga Institute. The results of Saratoga's report encompass a sample of 753 companies in over 29 industry groups. The metrics are benchmarked against Saratoga's overall sample as well as the means of each specific industry group. Since the study focused on financial services organizations, results were benchmarked against Saratoga's results for banking, insurance (all lines), insurance (health, property), casual and personal as well as non-bank financial groups.

Human capital effectiveness

Human capital effectiveness is the dependent component of the conceptual model. In other words, the other antecedent constructs are used to predict it. The construct comprises four measures: revenue factor, expense factor, income factor, and human capital ROI. The revenue factor metric is a basic measure of human capital effectiveness and is the aggregate result of all the drivers of human capital management that influence employee behaviour. Revenue factor is calculated by taking the total revenue and dividing it by the total headcount of the organization. Although the Saratoga Institute argues that FTE (full-time equivalents) should be used in this calculation instead of headcount, a significant number of respondents did not provide the FTE value, so the headcount measure was used instead. Typically, the headcount value is lower than the FTE measure, so we should expect an overestimate compared to the Saratoga sample (see Figure 2 for benchmark of this sample versus Saratoga Institute database).

The results show that the sample had an average revenue factor of over \$600,000 per employee, which was significantly higher than any of the Saratoga benchmark values, as expected. The expense factor metric is calculated by taking the total operating expenses and dividing it by the total headcount of the organization. Once again, the Saratoga Institute argues that FTE (full-time equivalents) should be used in this calculation instead of headcount. The sample had an average expense factor of over \$526,000 per employee, which was significantly higher than any of the Saratoga benchmark values, as expected. Income factor is calculated by taking the total operating income and dividing it by the total headcount of the organization. The sample had an average income factor of over \$36,000 per employee, which was significantly lower than most of the Saratoga benchmark values. Human capital ROI calculates the return on investment on a company's employees ($HC\ ROI = (\text{revenue} - (\text{expenses} - \text{compensation}))/\text{compensation}$). This is equivalent to calculating the value added of investing in the organization's human assets. The numerator in this metric is profit-adjusted for the cost of people (the Saratoga measure also includes benefit costs). The results show that the organizations in this study had a human capital ROI of 2.70, which was significantly higher than the Saratoga sample. The 2.7 value means that, for every \$1.00 spent on employees, the organization realizes \$2.70 in return.

Human capital valuation

Human capital valuation is the mediating construct that predicts human capital effectiveness. Compensation figures are used to act as proxies for the value of human capital in organizations. The construct comprises five measures: compensation revenue factor, compensation expense factor, compensation factor, executive compensation factor, and supervisory compensation factor. The compensation revenue factor metric describes how much was paid to employees as a percentage of sales. Over time, this measure shows if your organization is obtaining more or less return on every dollar it invests in its people. The results

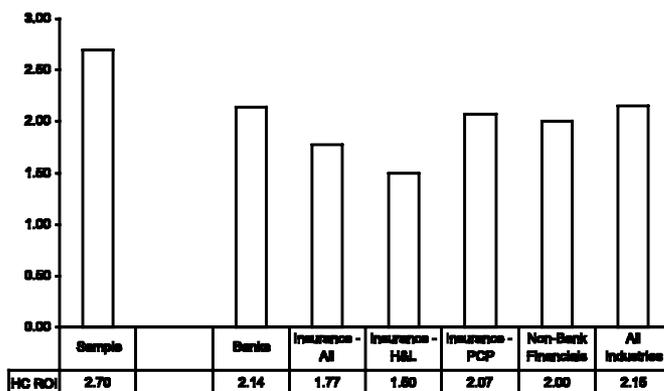
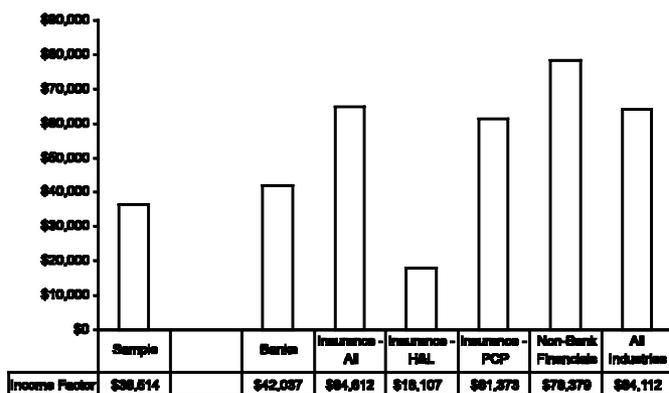
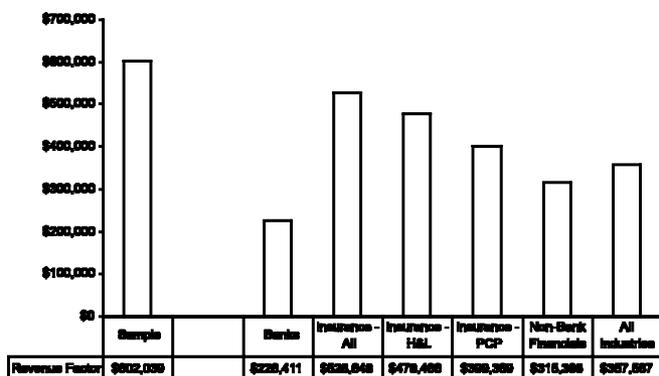


Figure 2.
Revenue factor, income
factor and human
capital ROI

show that organizations in the sample spent over 13 percent of their revenues on compensation, which was in line with the Saratoga sample (see Figure 3). The compensation expense factor metric describes how much was paid to employees as a percentage of overall operating expenses. This measure shows the compensation cost structure of an organization. The results show that organizations in the sample spent over 15 percent of their costs on compensation, which was in line with the Saratoga sample. The compensation factor metric measures the average compensation paid to each employee in the organization. This measure is typically used by HR departments to determine the relative standing of salary levels within an industry. The results show that organizations in the sample had a compensation factor of over \$54,000, which was higher than the Saratoga sample. The executive compensation factor metric describes how much was paid on average to executives. Executives were defined as individuals at the VP level or higher. The results show that executives from the organizations in the sample were paid an average of \$290,000 per annum, which was significantly higher than the Saratoga sample. The supervisory compensation factor metric describes how much was paid on average to supervisors. Supervisors were defined as individuals at the management and director level with supervisory roles that were not VPs. The results show that supervisors from the organizations in the sample were paid an average of \$71,000 per annum, which was in line with the Saratoga sample.

Human capital investment

Human capital investment is hypothesized to have a positive influence on human capital management. Organizations invest in human capital primarily through training and development expenditures. The construct comprises three measures: development rate, training investment, and training cost. The development rate describes how well an organization provides access to training programs for its workforce. As the workforce talent pool becomes more shallow, organizations are forced to design and provide training programs that increase the level of overall intellectual capital from within. The results show that organizations in the sample had a development rate of 82 percent, which was higher than the Saratoga sample (see Figure 4). The training investment metric identifies the average dollar amount spent on training for each employee, whether they were trained or not. This measure is typically used to compare against industry competitors. The results show that organizations in the sample spent an average \$1,693 per employee on training, which is significantly higher than the Saratoga sample. The training cost factor measures the average dollar amount spent on training for each employee that was trained. This measure is typically higher than the training investment metric. The results show that organizations in the sample spent \$2,083 per employee trained, which is significantly higher than the Saratoga sample.

Human capital depletion

Human capital depletion is hypothesized to have a negative influence on human capital management. Organizations suffer from human capital depletion primarily through turnover, as intellectual capital walks out of the

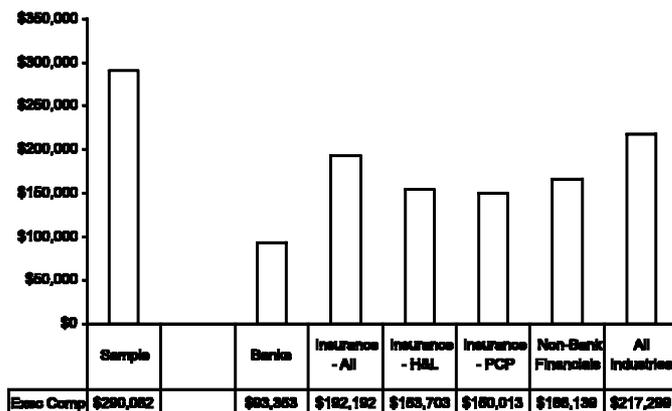
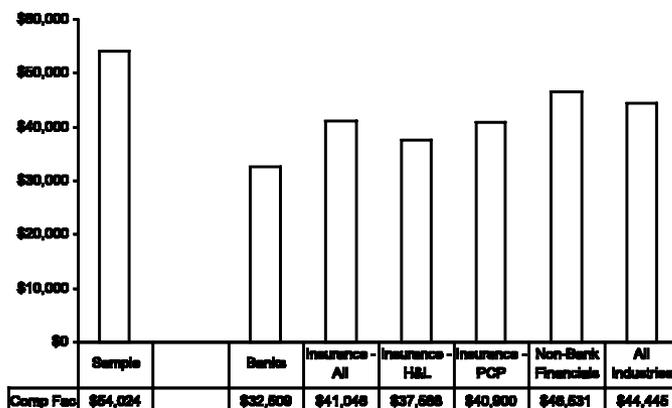
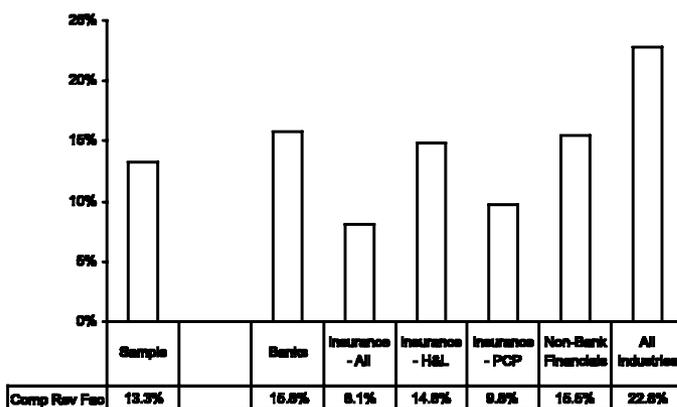


Figure 3.
Compensation revenue
factor, compensation
factor and executive
compensation factor

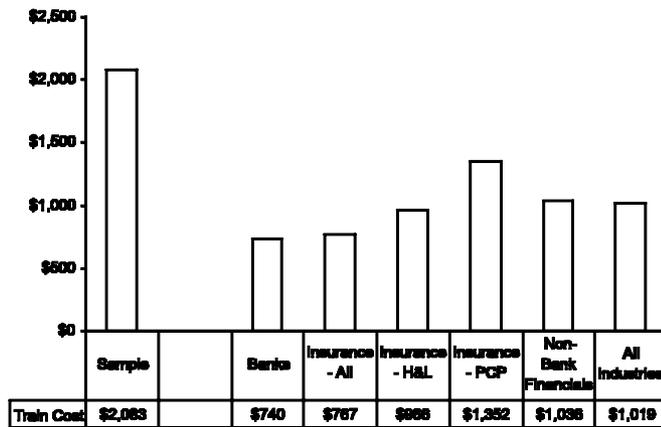
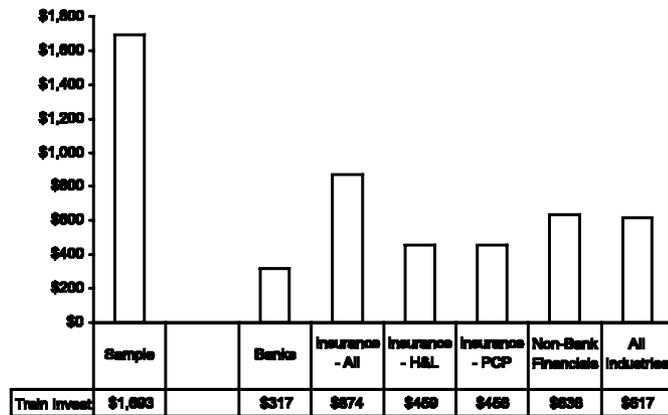
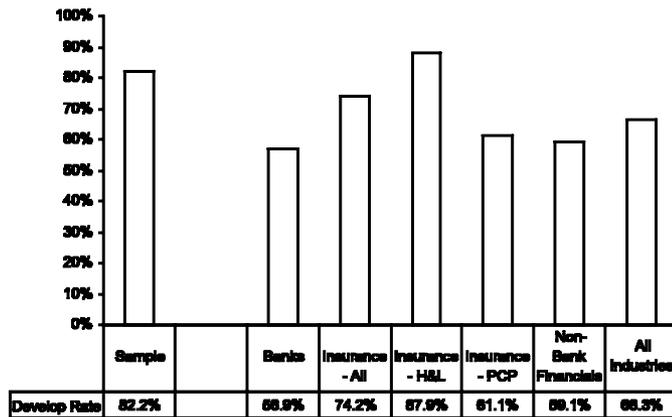


Figure 4.
Development rate,
training investment and
training cost

door. The construct comprises three measures: voluntary turnover, involuntary turnover, and total separation rate. The voluntary turnover rate describes the percentage of individuals that leave an organization by choice. This measure has a significant negative impact on human capital management, since it demonstrates an employee vote for leaving an organization due to potentially better circumstances elsewhere. The results show that organizations in the sample had a voluntary turnover rate of 13 percent, which was in line with the Saratoga sample (see Figure 5). The involuntary turnover rate describes the percentage of individuals who were terminated without choice. This measure describes individuals that were dismissed, laid off, disabled or died. The reasons for this rate may include poor hiring practices but typically reflect economic conditions. The results show that organizations in the sample had an involuntary turnover rate of 4 percent, which was lower than the Saratoga sample. The total separation rate describes the percentage of individuals who were terminated without choice as well as the individuals who left of their own accord. This measure is a combination of the two previous metrics and represents the whole rate of human capital depletion regardless of reason. The results show that organizations in the sample had a total separation rate of 17 percent, which was lower than the Saratoga sample.

Correlations among quantitative measures

Pearson's correlations were calculated using all the available quantitative measures in the sample (see Table III). The results show that, for human capital effectiveness, revenue factor was positively and significantly correlated with the average tenure of supervisors and administrative staff. This shows that, as employees develop years of experience in an organization, more revenue can be generated from each individual at those levels. Interestingly, the same was not true (i.e. statistically significant) for professionals and executives.

Expense factor was also positively correlated with average tenure for all levels of employees except professionals. Most interesting was that income factor was positively correlated with the average tenure of supervisors only. This suggests that the experience of supervisors clearly plays the most critical role in generating operating income per individual.

The only statistically significant relationship in this category was between compensation factor and headcount percentage breakdown of executives. In other words, as the total number of executives in an organization increases, so does the average salary per employee. This is an intuitive hypothesis.

The training cost per trained employee is negatively related to the average age of executives and the average age of professionals. This means that as executives and professionals get older, less money is spent on training them. The training cost per trained employee is negatively related to the average tenure of professionals. This means that, as professionals spend more time with an organization, their training expenditure is less. As the amount of time spent in an organization increases for administrative staff, the voluntary turnover rate increases. Interestingly, this correlation is not statistically significant for other levels such as professionals, supervisors and executives.

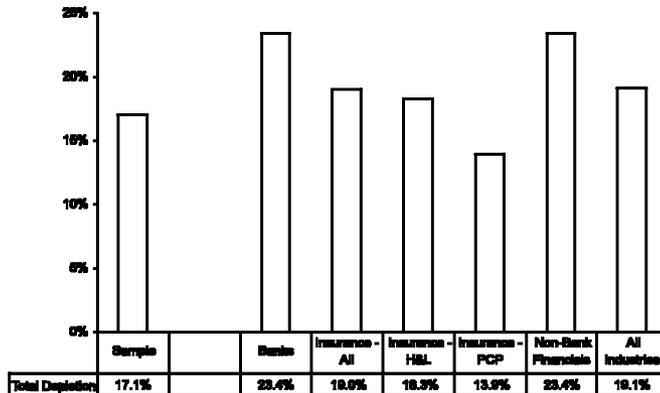
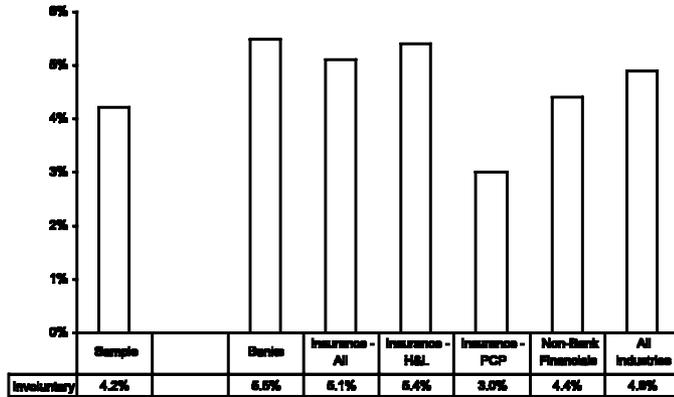
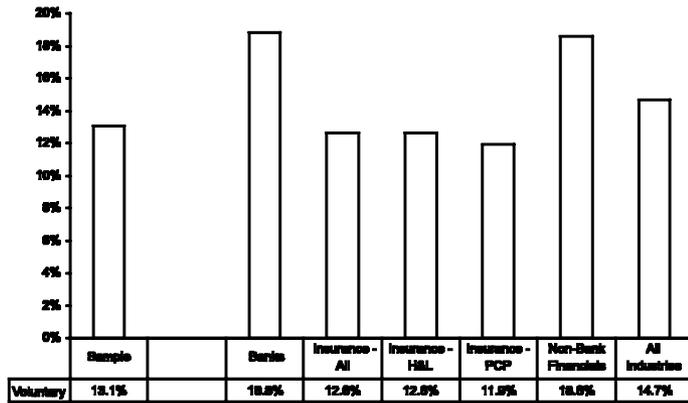


Figure 5.
Voluntary turnover,
involuntary turnover
and total separation rate

1st measure and 2nd measure		Pearson
<i>Human capital effectiveness</i>		
Revenue factor	Average tenure at company of supervisors	0.696**
Revenue factor	Average tenure at company of administrative staff	0.670**
Expense factor	Average tenure at company of executives	0.632**
Expense factor	Average tenure at company of supervisors	0.624**
Expense factor	Average tenure at company of administrative staff	0.647**
Income factor	Average tenure at company of supervisors	0.640**
<i>Human capital valuation</i>		
Compensation factor	Headcount percentage breakdown of executives	0.686**
<i>Human capital investment</i>		
Training cost per trained employee	Average age of executives	-0.847**
Training cost per trained employee	Average age of professionals	-0.942**
Training cost per trained employee	Average tenure of professionals	-0.895**
<i>Human capital depletion</i>		
Voluntary turnover	Average tenure at company of administrative staff	-0.705**

Intellectual
capital ROI

237

Table III.
Significant Pearson
correlations

Qualitative results

The perceptual survey instrument used in this study described 15 latent constructs as follows:

- (1) employee satisfaction;
- (2) employee motivation;
- (3) human capital;
- (4) management leadership;
- (5) knowledge sharing;
- (6) employee commitment;
- (7) value alignment;
- (8) structural capital;
- (9) process execution;
- (10) knowledge integration;
- (11) training;
- (12) retention of key people;
- (13) relational capital;
- (14) knowledge generation; and
- (15) business performance.

These constructs were selected based on a review of the intellectual capital, organizational learning and knowledge management literatures. The items from these constructs were based on established scales, as published by the Institute for Intellectual Capital Research. Each construct and item was reviewed by a team of representatives from the Saratoga Institute and Accenture for clarity, conciseness and face validity.

Areas of concerns

Each of the 76 respondents was asked to select only three of the 15 constructs as areas of most concern or challenge. The results show that the three most common areas of concern with regard to human capital management as selected by the respondents, are: management leadership, business performance, and the retention of key people. These three constructs play an important role in the conceptual model that follows, since they were assigned as endogenous constructs.

Perceptual means: lowest and highest

A total of 82 items were measured in the perceptual survey with a potential range of responses from 1 (strongly disagree) to 7 (strongly agree). The lowest ten items consisted primarily of issues relating to process and technology. Three of these items belong to the structural capital construct, three others belong to the knowledge integration construct, while another two belong to the process execution construct. The highest ten items generally describe employee capabilities and competencies. Four of these top ten belong to the human capital construct.

The data seem to illustrate that, while the respondents work for organizations that have adequate human capital resources – “Our employees generally have the intelligence and aptitude to succeed”, their structural capital does not leverage the talent to its fullest – “Information systems include employee knowledge”.

Item statistics

The perceptual items went through a rigorous psychometric evaluation. The statistical results of this study were based on the methodological recommendations made by Bontis (1998). First, a “Cronbach’s alpha” test was used to evaluate the reliability of the measures, as suggested by Nunnally (1978). Churchill (1979) suggests that this calculation should be the first measure one uses to assess the quality of the instrument. Since a rigorous psychometric evaluation of the instrument had already been conducted in previous studies, this test was used to confirm those results. Cronbach’s alpha can be considered an adequate index of the inter-item consistency reliability of independent and dependent variables (Sekaran, 1992). Nunnally (1978) suggests that constructs have reliability values of 0.7 or greater. There were only a few cases where a loading value was less than 0.7 and, in those extreme cases, the item was removed from further analysis. Only two out of the 82 items

did not reflect their underlying construct adequately enough, since they received low loading values and were therefore removed.

Once the test for content validity was complete, items were reviewed for construct validity. This test examines whether or not the item is closely related to the underlying construct it purports to measure. The item to total construct correlation was calculated for this test. Typically, a score of 0.5 or greater is required and was met by every item. Finally, the reliability of each construct was calculated by using the Cronbach alpha measure. Constructs are deemed to be reliable, when alpha values are 0.7 or greater. Each construct had a Cronbach alpha value of greater than 0.8, which means that respondents can answer these items over and over again with a high probability of receiving similar scores for the underlying construct.

Correlation matrix of constructs

A factor score was calculated for each of the perceptual constructs based on their underlying items. A correlation matrix was then calculated for the constructs (see Table IV).

It is important to note that, for the three areas of most concern as identified by the respondents (i.e. management leadership, business performance, and retention of key people), the highest correlation values were with the following two constructs each:

- (1) *Management leadership* – value alignment (0.771), retention of key people (0.722).
- (2) *Business performance* – employee motivation (0.566), employee commitment (0.560).
- (3) *Retention of key people* – employee commitment (0.724), management leadership (0.722).

Management leadership was most highly correlated with value alignment and the retention of key people. These results are to be expected, since employees look up to their senior managers for guidance as to what values they should possess. Retention of key people is also related to senior management's leadership capability, since exit interviews typically show that poor relationships with supervisors tend to explain why an employee has left an organization. It is also important to note which relationships were not statistically significant in their correlations.

Integrating the qualitative and quantitative measures

One of the key objectives of this study was to integrate both qualitative and quantitative measures, so that a more holistic and comprehensive understanding of human capital management could be realized. The perceptual items were joined with their respective quantitative metrics by associating respondents with their corresponding organizational membership.

Table IV.
Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Employee satisfaction	1.000	0.725	0.447	0.781	0.714	0.571	0.585	0.419	0.381	0.599	0.535	0.500	0.663	0.438
2 Employee commitment	0.725	1.000	0.500	0.771	0.628	0.724	0.696	0.357	0.270	0.553	0.436	0.515	0.635	0.424
3 Education	0.447	0.500	1.000	0.459	0.600	0.507	0.691	0.317	0.184	0.502	0.339	0.358	0.474	0.524
4 Employee motivation	0.781	0.771	0.459	1.000	0.649	0.673	0.734	0.420	0.388	0.678	0.481	0.548	0.727	0.464
5 Value alignment	0.714	0.628	0.600	0.649	1.000	0.715	0.565	0.429	0.423	0.771	0.428	0.615	0.712	0.547
6 Retention of key people	0.571	0.724	0.507	0.673	0.715	1.000	0.650	0.339	0.413	0.722	0.382	0.515	0.670	0.583
7 Human capital	0.585	0.696	0.691	0.734	0.565	0.650	1.000	0.335	0.275	0.526	0.421	0.515	0.615	0.609
8 Structural capital	0.419	0.357	0.317	0.420	0.429	0.339	0.335	1.000	0.288	0.526	0.574	0.625	0.470	0.356
9 Relational capital	0.381	0.270	0.184	0.388	0.423	0.413	0.275	0.288	1.000	0.374	0.318	0.379	0.356	0.483
10 Management leadership	0.599	0.553	0.502	0.678	0.771	0.722	0.526	0.526	0.374	1.000	0.399	0.615	0.709	0.515
11 Process execution	0.535	0.436	0.339	0.481	0.428	0.382	0.421	0.574	0.318	0.399	1.000	0.704	0.506	0.450
12 Knowledge generation	0.500	0.515	0.358	0.548	0.615	0.515	0.515	0.625	0.379	0.615	0.704	1.000	0.609	0.486
13 Knowledge sharing	0.663	0.635	0.474	0.727	0.712	0.670	0.615	0.470	0.356	0.709	0.506	0.609	1.000	0.590
14 Knowledge integration	0.438	0.424	0.524	0.464	0.547	0.583	0.609	0.356	0.483	0.515	0.450	0.486	0.590	1.000
15 Business performance	0.394	0.560	0.307	0.566	0.379	0.401	0.501	0.483	0.321	0.396	0.523	0.536	0.497	0.290

Notes:

> 0.307 correlation is significant at the 0.01 level (two-tailed)

> 0.270 correlation is significant at the 0.05 level (two-tailed)

Structural equation model (causal map)

Partial least squares (PLS) is a structural equation modeling technique typically chosen for handling relatively small data samples. PLS has been used as a research tool in a variety of settings such as business disciplines (Hulland and Kleinmuntz, 1994); cooperative ventures (Fornell *et al.*, 1990); global strategy (Johansson and Yip, 1994); risk-return outcomes (Cool *et al.*, 1989); geographic scope (Delios and Beamish, 1999) and in intellectual capital research (Bontis, 1998; Bontis *et al.*, 2000). Although not so well-known a modeling technique as LISREL, for instance, PLS has as its primary objective the minimisation of error (Hulland, 1999). The degree to which any particular PLS model accomplishes this objective can be determined by examining the *R*-squared values for the dependent (endogenous) constants. PLS was used to test the model within its nomological network. The 15 latent constructs in this study derive their meaning from both their underlying measures and their antecedent and consequent relations, giving a researcher the benefit of examining the constructs in an overall theoretical context.

A partial least squares structural equation (PLS) conceptual model was developed, so that both constructs and measures could be simultaneously examined within their nomological network. The final conceptual model was developed by exploring a variety of potential configurations among constructs until statistically significant paths were reached and the explanatory power of the causal map was maximized. The final conceptual model depicts a comprehensive collection of relationships among constructs that are all statistically significant at the 0.05 level (see Figure 6).

The values along each path are identified as the direct structural relationship between two constructs and can range from a value of -1.00 to $+1.00$ (these values are more accurate than correlations, since they account for mediating and indirect causal paths). For example, there is a statistically significant and direct path of 0.506 magnitude from managerial leadership to retention of key people. Values underneath key constructs are equivalent to *R*-squared scores, which depict the explanatory power of the model. For example, the *R*-squared value of human capital effectiveness is 28.5 percent, which means that this model can explain over 28 percent of the variance in that construct.

From the final conceptual model generated in PLS a total of five key research findings have been uncovered.

Research implication I: managerial leadership is the key antecedent

Managerial leadership is the foremost antecedent construct in human capital management. It has a substantive and significant direct path to both the retention of key people ($+0.506$) and value alignment ($+0.751$). Value alignment in turn has a path to the reduction of human capital depletion (-0.233) via knowledge sharing ($+0.285$).

Research Implication I: The development of senior management's leadership capabilities is the key starting ingredient for the reduction of turnover rates

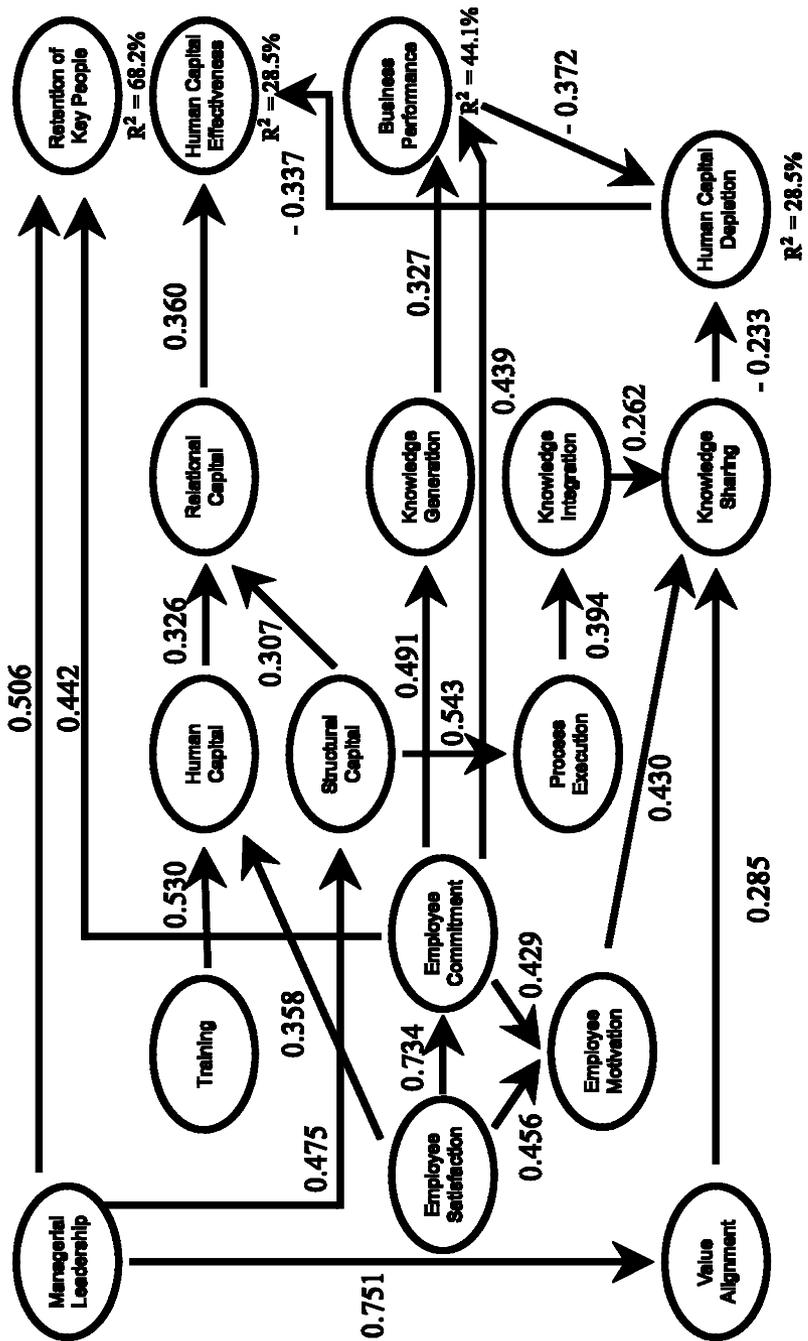


Figure 6.
Human capital
causal map

and the retention of key employees. Effective management leadership acts as a spark for organizational knowledge sharing, which in turn allows senior management to align values throughout the organization.

Research implication II: intellectual capital management yields HC ROI

Recall that human capital effectiveness was measured with four metrics: revenue factor, expense factor, income factor, and HC ROI. This variable is a key outcome of the overall model. In essence, organizations constantly strive to generate more revenue and income per employee. One predictor of this construct is the reduction of human capital depletion (-0.337), which makes intuitive sense, since lower turnover rates will yield a higher base of organizational knowledge and less deterioration of experiential learning (*note*: the key factors predicting human capital depletion were discussed above). The other predictor of human capital effectiveness comes from a collection of constructs that emanate from the intellectual capital literature. The intellectual capital literature states that there exist three primary components of intellectual capital: human capital, structural capital, and relational capital. Research conducted at the Institute for Intellectual Capital has shown that these three constructs are interdependent in their positive effects. This model bears out the same result. Note that human capital has a positive effect on relational capital ($+0.326$) and that structural capital also has a positive effect on relational capital ($+0.307$). Relational capital is the key determinant of human capital effectiveness ($+0.360$).

Many of these sub-models are interdependent as well. Note that training ($+0.530$) and employee satisfaction ($+0.358$) have positive effects on human capital, which is to be expected. Structural capital also has a positive influence on process execution ($+0.543$), which is a natural deduction as well.

Research implication II: The effective management of intellectual capital assets will yield higher financial results per employee. The development of human capital is positively influenced by the education level of employees and their overall satisfaction.

Research implication III: employee sentiment drives many factors

There are three constructs that describe general employee sentiment in an organization: employee satisfaction, employee commitment, and employee motivation. As expected, these constructs positively reinforce one another. Satisfaction leads to both commitment ($+0.734$) and motivation ($+0.456$) and commitment further influences motivation ($+0.429$). Interestingly, these three variables play important roles in other sub-models as well. Satisfaction leads to human capital ($+0.358$), as described above. Employee motivation leads to knowledge sharing ($+0.430$), which basically means that employees who are motivated to work will also tend to share their knowledge among their peers, as opposed to hoarding it. Finally, employee commitment is a very important

predictor of three different variables: the retention of key people (+ 0.442), knowledge generation (+ 0.491), and ultimately business performance (+ 0.439).

Research implication III: employee sentiment, as defined by satisfaction, motivation and commitment, has far-reaching positive impacts on intellectual capital management, knowledge management and ultimately business performance.

Research implication IV: knowledge management is a critical initiative

Knowledge management activities encompassed three constructs: knowledge generation, knowledge integration, and knowledge sharing. The model outlines the importance of coupling knowledge management activities with general HR policy. Employee commitment has a positive influence on knowledge generation (+ 0.491). Knowledge integration is preceded by process execution (+ 0.394) and is followed by knowledge sharing (+ 0.262). Finally, knowledge sharing will occur, if value alignment (+ 0.285) is evident, and this can lead to a reduction of human capital depletion. In other words, individuals will be more prone to improvisation, creativity and knowledge generation, if they are committed to an organization. An organization can integrate this new knowledge into its systems, if the execution of its technological processes is efficient. Finally, if employees' values are aligned so that they are motivated to share knowledge, turnover will decrease.

Research implication IV: Knowledge management initiatives can decrease turnover rates and support business performance, if they are coupled with HR policies.

Research implication V: business performance has a feedback cycle

There are three antecedents to business performance in the model: two being positive relationships with employee commitment (+ 0.439) and knowledge generation (+ 0.327). In effect, an organization will sustain levels of strong performance, if its employees are committed to success and it continually innovates and renews itself. The third intriguing path to business performance is actually in reverse and is a negative feedback loop to human capital depletion (− 0.372). In other words, a strongly performing organization can influence human capital depletion by reducing turnover rates and thus positively affecting individual employee financial contributions (− 0.337).

Research implication V: business performance is positively influenced by the commitment of its organizational members and their ability to generate new knowledge. This favourable level of performance subsequently acts as a deterrent to turnover, which in turn positively affects human capital management.

Finally, the endogenous constructs, as specified by the senior executives, all had significant and substantive *r*-squared values, denoting a model with high explanatory power. The *r*-squared values ranged from 28.5 percent for human

capital depletion and effectiveness, to 44.1 percent for business performance and as high as 68.2 percent for retention of key people.

Conclusion

All in all, these results suggest that the measuring and modelling of human capital are critical. This view can be attributed to the growing strategic importance of intellectual capital management and the need for HR managers to establish their credibility by making the function more accountable in financial terms.

The difficulties of human resource managers in achieving this should not be underestimated. It is perceived that they do not have the necessary expertise to carry out appropriate measurement and that many of the measures used lack precision and are too difficult.

Nevertheless different measurement approaches are used. Whether they are actually providing information that establishes the importance of human capital in financial terms or its credibility is a moot point. The difficulties are made more difficult by the attitudes of others in the organization, particularly those accounting and finance managers who are less likely to see the importance of such measurement. Nevertheless the importance of measuring human capital is established. Fitz-enz describes the future as follows:

The accounting function does a fine job of telling the state of our past and present financial health. But it says nothing about the future. Additionally, it does not speak to human capital issues. To see the future, we need leading indicators. These indicators tell us the state of our human capital, as we prepare for the future (2000, p. 249).

The benefit of establishing a causal map of human capital management is clear. Senior management can visually comprehend the antecedents and consequents of various quantitative and qualitative proxies of human capital, thus making clear executive management decisions with expected outcomes.

References

- Abassi, S.M. and Hollman, K.W. (2000), "Turnover: the real bottom line", *Public Personnel Management*, Vol. 2 No. 3, pp. 333-42.
- Allen. T. (1977), *Managing the Flow of Technology*, MIT Press, Boston, MA.
- Barney, J.B. (1986), "Organizational culture: can it be a source of sustained competitive advantage?", *Academy of Management Review*, Vol. 11 No. 3, pp. 656-65.
- Bontis, N. (1996), "There's a price on your head: managing intellectual capital strategically", *Business Quarterly*, Summer, pp. 40-7.
- Bontis, N. (1998), "Intellectual capital: an exploratory study that develops measures and models", *Management Decision*, Vol. 36 No. 2, pp. 63-76.
- Bontis, N. (1999), "Managing organizational knowledge by diagnosing intellectual capital: framing and advancing the state of the field", *International Journal of Technology Management*, Vol. 18 No. 5-8, pp. 433-62.
- Bontis, N. (2001a), "Assessing knowledge assets: a review of the models used to measure intellectual capital", *International Journal of Management Reviews*, Vol. 3 No. 1, pp. 41-60.

- Bontis, N. (2001b), "CKO wanted – evangelical skills necessary: a review of the chief knowledge officer", *Knowledge and Process Management*, Vol. 8 No. 1, pp. 29-38.
- Bontis, N. (2002a), "The rising star of the chief knowledge officer", *Ivey Business Journal*, Vol. 66 No. 4, pp. 20-5.
- Bontis, N. (2002b), *World Congress on Intellectual Capital Readings*, Butterworth-Heinemann KMCI Press, Boston, MA.
- Bontis, N. and Girardi, J. (2000), "Teaching knowledge management and intellectual capital lessons: an empirical examination of the TANGO simulation", *International Journal of Technology Management*, Vol. 20 No. 5-8, pp. 545-55.
- Bontis, N., Chua, W. and Richardson, S. (2000), "Intellectual capital and the nature of business in Malaysia", *Journal of Intellectual Capital*, Vol. 1 No. 1, pp. 85-100.
- Bontis, N., Dragonetti, N., Jacobsen, K. and Roos, G. (1999), "The knowledge toolbox: a review of the tools available to measure and manage intangible resources", *European Management Journal*, Vol. 17 No. 4, pp. 391-402.
- Choo, C.W. and Bontis, N. (2002), *The Strategic Management of Intellectual Capital and Organizational Knowledge*, Oxford University Press, New York, NY.
- Churchill, G. (1979), "A paradigm for developing better measures of marketing constructs", *Journal of Marketing Research*, Vol. 16, pp. 64-73.
- Cool, K., Dierickx, I. and Jemison, D. (1989), "Business strategy, market structure and risk-return relationships: a structural approach", *Strategic Management Journal*, Vol. 10 No. 6, pp. 507-22.
- Delios, A. and Beamish, P. (1999), "Geographic scope, product diversification, and the corporate performance of Japanese firms", *Strategic Management Journal*, Vol. 20, pp. 711-27.
- Edmondson, A. (1996), "Three faces of Eden", *Human Relations*, Vol. 49 No. 5, pp. 571-95.
- Edvinsson, L. (2002), *Corporate Longitude*, Bookhouse, Stockholm.
- Edvinsson, L. and Malone, M. (1997), *Intellectual Capital*, Harper Business, New York, NY.
- Fitz-enz, J. (2000), *The ROI of Human Capital*, Amacom, New York, NY.
- Fornell, C., Lorange, P. and Roos, J. (1990), "The cooperative venture formation process: a latent variable structural modeling approach", *Management Science*, Vol. 36 No. 10, pp. 1246-55.
- Hall, R. (1992), "The strategic analysis of intangible resources", *Strategic Management Journal*, Vol. 13, pp. 135-44.
- Hambrick, D. and Mason, P. (1984), "Upper echelons: the organization as a reflection of its top executives", *Academy of Management Review*, Vol. 9 No. 2, pp. 193-206.
- Hudson, W. (1993), *Intellectual Capital: How to Build it, Enhance it, Use it*, John Wiley, New York, NY.
- Hulland, J. (1999), "Use of partial least squares (PLS) in strategic management research: a review of four recent studies", *Strategic Management Journal*, Vol. 20, pp. 195-203.
- Hulland, J.S. and Kleinmuntz, D.N. (1994), "Factors influencing the use of internal summary evaluations versus external information in choice" *Journal of Behavioral Decision Making*, Vol. 7 No. 2, pp. 79-102.
- Johansson, J. and Yip, G. (1994), "Exploiting globalization potential: US and Japanese strategies", *Strategic Management Journal*, Vol. 15 No. 8, pp. 579-601.
- Kransdorff, A. (1996), "Succession planning in a fast-changing world", *Management Decision*, Vol. 34 No. 2, pp. 30-4.
- Lyles, M. and Schwenk, C. (1992), "Top management, strategy, and organizational knowledge structures", *Journal of Management Studies*, Vol. 29 No. 2, pp. 155-74.
- Michael, D. (1973), *On Learning to Plan – and Planning to Learn*, Jossey-Bass, San Francisco, CA.

-
- Nelson, R. and Winter, S. (1982), *An Evolutionary Theory of Economic Change*, Belknap Press, Cambridge, MA.
- Nonaka, I. and Takeuchi, H. (1995), *The Knowledge-Creating Company*, Oxford University Press, New York, NY.
- Nunnally, J.C. (1978), *Psychometric Theory*, McGraw-Hill, New York, NY.
- Pedler, M., Burgoyne, J.G. and Boydell, T. (1996), *The Learning Company*, McGraw-Hill, Maidenhead.
- Sekaran, V. (1992), *Research Methods for Business*, Wiley, New York, NY.
- Stewart, T. (1997), *Intellectual Capital: The New Wealth of Organizations*, Currency Doubleday, New York, NY.
- Stewart, T. (2001), *The Wealth of Knowledge*, Currency Doubleday, New York, NY.
- Storey, J. (1995), "HRM: still marching on, or marching out?", in Storey, J. (Ed.), *Human Resource Management: A Critical Text*, Routledge, London.
- Stovel, M. and Bontis, N. (2002), "Voluntary turnover: knowledge management – friend or foe?", *Journal of Intellectual Capital*, Vol. 3 No. 3, pp. 303-22.
- Sveiby, K.E. (1997), *The New Organizational Wealth: Managing and Measuring Knowledge-Based Assets*, Berrett-Koehler, New York, NY.
- Wilson, J., George, J., Wellins, R. and Byham, W. (1994), *Leadership Trapeze*, Jossey-Bass Publishers, San Francisco, CA.
- Wright, P.M., McMahan, G.C. and McWilliams, A. (1994), "Human resources and sustained competitive advantage: a resource-based perspective", *International Journal of Human Resource Management*, Vol. 5 No. 2, pp. 301-26.