Intellectual capital and business performance in Malaysian industries

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Abstract *The purpose of this empirical study is to investigate the three elements of intellectual capital, i.e. human capital, structural capital, and customer capital, and their inter-relationships within two industry sectors in Malaysia. The study was conducted using a psychometrically validated questionnaire which was originally administered in Canada. The main conclusions from this particular study are that: human capital is important regardless of industry type; human capital has a greater influence on how a business should be structured in non-service industries compared to service industries; customer capital has a significant influence over structural capital irrespective of industry; and finally, the development of structural capital has a positive relationship with business performance regardless of industry. The final specified models in this study show a robust explanation of business performance variance within the Malaysian context which bodes well for future research in alternative contexts.*

Introduction

The global community is being progressively shrunk by technology (Richardson, 1991). The two major forces that Malaysian businesses currently face include the rapid rate of technological change and increasing industrialisation. The rate of change is likely to accelerate in the near future led by developments in the country's multimedia super corridor (MSC). The MSC links the present capital, Kuala Lumpur, with its new Kuala Lumpur International Airport (KLIA) some 50 kilometres away. The MSC is destined to become Malaysia's "Silicon Valley" and its existing palm oil estates are giving way to new industries and research-intensive universities.

Unfortunately, most Malaysian industries are still – for the most part – using traditional financial accounting and performance measurement methods

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which were developed centuries ago for an environment of arm's-length transactions using primarily tangible assets such as buildings and equipment. The knowledge-based business environment that Malaysia and most other countries are currently developing requires a new model and nomenclature that encompass intangible assets. In this case, the intellectual capital (IC) model is receiving increased attention.

Although much IC research has been conducted in a variety of international settings including the UK (Roos *et al.*, 1997), Scandinavia (Edvinsson and Malone, 1997), Australia (Sveiby, 1997), Canada (Bontis, 1996; 1998; 1999), Austria (Bornemann, 1999) and the USA (Stewart, 1997; Bassi and van Buren, 1999), none seems to have been made in Malaysia. There should be no doubt that these intangibles have a value since, when Malaysian businesses are sold, part of their value is also labelled as "goodwill". According to Horibe (1999), goodwill is the difference between a "company's worth" and its "book value". This is often calculated by using the Tobin's *q* ratio (Bontis, 1996). In some businesses, particularly in the services sector where a large proportion of the workforce is employed, goodwill could represent the major asset of the company.

IC management is important even if countries have a lower proportion of their workforce in non-services industries. Horibe (1999) reports that in the manufacturing sector, the value of goodwill based on a company's worth had also increased from 38 per cent in 1982 to 62 per cent in 1992. The Malaysian situation is somewhat different in that the most recent 1999 estimates show that 37.5 per cent of the workforce is in the services sector which is the highest proportion in history (*New Straits Times*, 2000a).

The purpose of this paper is to examine the inter-relationship among intellectual capital measures within the Malaysian business context. As an extension of the Bontis (1998) study, we hope to support a similar set of hypotheses. We propose that there exists a positive relationship between sub-constructs of intellectual capital and business performance regardless of industry.

Literature review

Since there are other sources (Bontis, 1999; Roos *et al.*, 1997) which have extensively reviewed the IC literature, the focus of this paper will efficiently turn to defining the constructs we intend to measure. The following definitions by a variety of researchers summarise some of the highlights of this field:

- IC is elusive, but once it is discovered and exploited, it may provide an organisation with a new resource-base from which to compete and win (Bontis, 1996);
- IC is the term given to the combined intangible assets of market, intellectual property, human-centred and infrastructure – which enable the company to function (Brooking, 1996);
- IC includes all the processes and the assets which are not normally shown on the balance-sheet and all the intangible assets (trademarks,

patents and brands) which modern accounting methods consider ... it includes the sum of the knowledge of its members and the practical translation of his/her knowledge (Roos *et al.*, 1997);

- IC is intellectual material – knowledge, information, intellectual property, experience – that can be put to use to create wealth. It is a collective brainpower or packaged useful knowledge (Stewart, 1997);
- IC is the pursuit of effective use of knowledge (the finished product) as opposed to information (the raw material) (Bontis, 1998); and
- IC is regarded as an element of the company's market value as well as a market premium (Olve *et al.*, 1999).

Cohen *et al.* (1993) warn that, just like the human body's muscles, IC suffers from "if you do not use it, you lose it". The Gottlieb Duttweiler Foundation (a Swiss think-tank) undertook studies into IC and found that only 20 per cent of knowledge available to an organisation is actually used (Brooking, 1996). It is within this context that the desire to model and measure IC originates. Researchers and practitioners alike are enamoured by the vast opportunity that IC can offer for both knowledge generation and value-added services respectively. Generally, researchers in the field have identified three main constructs of IC that include: human capital, structural capital and customer capital.

Human capital

Quite simply, human capital represents the individual knowledge stock of an organisation as represented by its employees (Bontis *et al.*, 2001 forthcoming). Roos *et al.* (1997) argue that employees generate IC through their competence, their attitude and their intellectual agility. Competence includes skills and education, while attitude covers the behavioural component of the employees' work. Intellectual agility enables one to change practices and to think of innovative solutions to problems. Even though employees are considered the most important corporate asset in a learning organisation, they are not owned by the organisation. Slavery is over after all, but there is still tremendous argument as to whether new knowledge generated by employees belongs to the company or not (i.e. a software programmer develops code while at home on the weekend yet the company still lays claim to the codified knowledge).

Similarly, Hudson (1993) defines human capital as a combination of: genetic inheritance; education; experience, and attitudes about life and business. Bontis (1998) describes human capital as the firm's collective capability to extract the best solutions from the knowledge of its individuals. Unfortunately, people's departure can result in the loss of corporate memory and hence become a threat to the organisation. Another school of thought believes that the departure of some individuals in a firm may be considered good, since it forces the firm to consider fresh new perspectives from replacement employees.

Bontis (1999) argues that human capital is important because it is a source of innovation and strategic renewal, whether it is from brainstorming in a

research lab, daydreaming 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 organisational member.

Structural capital

Structural capital includes all the non-human storehouses of knowledge in organisations which include the databases, organisational charts, process manuals, strategies, routines and anything whose value to the company is higher than its material value. Roos *et al.* (1997, p. 42) describe structural capital as "what remains in the company when employees go home for the night". Structural capital arises from processes and organisational value, reflecting the external and internal focuses of the company, plus renewal and development value for the future. According to Bontis (1998), if an organisation has poor systems and procedures by which to track its actions, the overall intellectual capital will not reach its fullest potential. Organisations with strong structural capital will have a supportive culture that allows individuals to try new things, to learn, and to fail. Structural capital is the critical link that allows IC to be measured at the organisational level of analysis.

Customer capital

The main theme of customer capital is the knowledge embedded in the marketing channels and customer relationships that an organisation develops through the course of conducting business. Customer capital represents the potential an organisation has due to ex-firm intangibles (Bontis, 1999). Although originally conceptualised by Hubert Saint-Onge while at CIBC, more recent definitions have broadened the category to include relational capital which in effect encompasses the knowledge embedded in all the relationships an organisation develops whether it be from customers, from the competition, from suppliers, from trade associations or from the government (Bontis, 1999). One manifestation of relational capital that can be leveraged from customers is often referred to as "market orientation". There is no consensus on a definition of market orientation but Kohli and Jaworski (1990) define it as the organisation-wide generation of market intelligence pertaining to the current and future needs of customers. Ultimately, the dissemination of this intelligence must be done horizontally and vertically within the organisation so that a competency in organisation-wide action or responsiveness to market changes can be developed.

Recent work in the service profit chain has emphasised the causal relationships among employee satisfaction, customer satisfaction, customer loyalty and financial performance (Kaplan and Norton, 1996). For example, we know that rapid delivery satisfies customers (Olve *et al.*, 1999). We also know that companies often have difficulty in retaining employees because they have not put enough time and energy into ensuring that the mission and values are truly shared (Senge, 1990). Further research shows that "customer" loyalty can

be predicted by measuring "employee" loyalty (Horibe, 1999). These studies provide further evidence of the importance that customer capital represents as a unit of an organisation's overall IC.

Summary

A comparison of the elements of IC based on studies by Annie Brooking, Göran Roos, Thomas Stewart and Nick Bontis can be found in Table I. Although definitions and conceptualisations are not entirely identical., the field is starting to see a convergence of what IC encompasses. All four authors emphasise strongly the importance of human capital. Brooking, in particular, feels that managerial skills and leadership styles are the important components of human capital. Brooking also points out that structural capital can be divided into two components: namely, infrastructure assets and intellectual property (IP). In the case of infrastructure assets, Brooking has included all the technologies and processes which enable a company to function. Roos has added the importance of culture. Stewart, however, classifies information technology under this category. Brooking, Roos and Stewart have included trademarks and patents whereas Bontis, however, has excluded intellectual property stating that IP is a protected asset and has a legal definition (unlike

Annie Brooking (UK)	Göran Roos (UK)	Thomas Stewart (USA)	Nick Bontis (Canada)
Human-centred assets Skills, abilities and expertise, problem-solving abilities and leadership styles	*Human capital* Competence, attitude, and intellectual agility	*Human capital* Employees are an organisation's most important asset	*Human capital* The individual-level knowledge that each employee possesses
Infrastructure assets All the technologies, processes and methodologies that enable company to function	*Organisational capital* All organisational, innovation, processes, intellectual property, and cultural assets	*Structural capital* Knowledge embedded in information technology	*Structural capital* Non-human assets or organisational capabilities used to meet market requirements
Intellectual property Know-how, trademarks and patents	*Renewal and development capital* New patents and training efforts	*Structural capital* All patents, plans and trademarks	*Intellectual property* Unlike IC, IP is a protected asset and has a legal definition
Market assets Brands, customers, customer loyalty and distribution channels	*Relational capital* Relationships which include internal and external stakeholders	*Customer capital* Market information used to capture and retain customers	*Relational capital* Customer capital is only one feature of the knowledge embedded in organisational relationships

Table I. Comparison of IC conceptualisations among authors

the other components of IC). All four authors include customers, their loyalty and the market intelligence as part of customer assets.

Development of hypotheses

Malaysian researchers in particular argue that, in their business world, "knowledge is a necessity and can be used as a strategic tool against competitors" (Naquiyuddin *et al.*, 1992, p. 72). The number of knowledge workers and new knowledge-based opportunities is expected to increase dramatically in the next few years. This new demand will force employers to further develop employees' competencies (Rischer and Fay, 1995). In Malaysia, the production-based economy of the 1970s and 1980s led to a focus on computing activities which forced employers to update the skills of the workforce in that context. The current emphasis on knowledge-based economies has prompted the move towards a new skills development initiative that strives to position Malaysia as a world leader in telecommunications, multimedia and the Internet (*New Straits Times*, 2000b).

The aim of this paper is to investigate the inter-relationships among the independent variables, human capital, structural capital and customer capital and the dependent variable, business performance. These variables are defined and conceptualised based on the literature. As an extension of the hypotheses tested by Bontis (1998), this study aims to examine the following relationships for both service and non-service industries to see if the results hold true in the Malaysian context. Based on the final specified model developed by Bontis (1998), the following hypotheses are tested:

H1: Human capital (HC) is *positively* associated with customer capital (CC).

H2: Human capital (HC) is *positively* associated with structural capital (SC).

H3: Customer capital (CC) is *positively* associated with structural capital (SC).

H4: Structural capital (SC) is *positively* associated with business performance (PERF).

Data collection

The IC questionnaire developed by Bontis (1997) and originally administered in Canada (Bontis, 1998) was re-administered to 107 respondents in Malaysia. The respondents were all part-time MBA students from Kuala Lumpur and Seremban. The questionnaire contained 63 statements to which respondents indicated the extent of their agreement on a seven-point Likert scale (1 = strongly disagree and 7 = strongly agree). See Table II for a summary of these items.

Respondents were encouraged to ask questions about the purpose of the survey and to make sure that the meanings of the questions were clear. All such questions were answered during the administration of the survey. Very few concerns regarding the meanings of the questions were reported. About 60 per cent of the respondents were from service industries (e.g. financial services,

	Human capital		
H1	Competence ideal level	H11	Employees perform their best
H2	Succession training programme	H12	Recruitment programme comprehensive
H3	Planners on schedule	H13R	Big trouble if individuals left
H4	Employees cooperate in teams	H14R	Rarely think actions through
H5R	No internal relationships	H15R	Do without thinking
H6	Come up with new ideas	H16	Individuals learn from others
H7	Upgrade employees' skills	H17	Employees voice opinions
H8	Employees are bright	H18	Get the most out of employees
H9	Employees are best in industry	H19R	Bring down to others' level
H10	Employees are satisfied	H20	Employees give it their all
	Customer capital		
C1	Customers generally satisfied	C10	Meet with customers
C2	Reduce time to resolve problem	C11	Customer info disseminated
C3	Market share improving	C12	Understand target markets
C4	Market share is highest	C13R	Do not care what customer wants
C5	Longevity of relationships	C14	Capitalize on customers' wants
C6	Value added service	C15R	Launch what customers don't want
C7	Customers are loyal	C16	Confident of future with customer
C8	Customers increasingly select us	C17	Feedback with customer
C9	Firm is market-oriented		
	Structural capital		
S1	Lowest cost per transaction	S9	Develops most ideas in industry
S2	Improving cost per revenue $	S10	Firm is efficient
S3	Increase revenue per employee	S11	Systems allow easy info access
S4	Revenue per employee is best	S12	Procedures support innovation
S5	Transaction time decreasing	S13R	Firm is bureaucratic nightmare
S6	Transaction time is best	S14	Not too far removed from each other
S7	Implement new ideas	S15	Atmosphere is supportive
S8	Supports development of ideas	S16R	Do not share knowledge
	Performance		
P1	Industry leadership	P6	After-tax return on assets
P2	Future outlook	P7	After-tax return on sales
P3	Profit	P8	Overall response to competition
P4	Profit growth	P9	Success rate in new product launch
P5	Sales growth	P10	Overall business performance

Note: R – reverse coded items

Table II.
Summary of survey items

entertainment, software) and the remaining 40 per cent were from non-service industries (e.g. construction, production, mechanical engineering). Respondents came from seven universities within the Malaysian Peninsula. See Table III for descriptive information.

The questionnaire was eight pages in length and was accompanied by a covering letter from the university which introduced the concept of IC. The items were originally developed to encompass the underlying meaning of their

Universities	NTU	CSU	HMC	HW	UH	DU	UPM	Total
Non-service industries								
Chemical/electrical/ mechanical engineering	1	1	–	1	–	1	9	13
Production	5	1	–	3	–	6	5	20
Construction/building	–	–	–	2	–	–	8	10
Sub-total:	6	2	–	6	–	7	22	43 (40.2%)
Service industries								
Government	–	–	–	1	–	–	4	5
Financial services	–	3	–	–	1	–	12	16
Entertainment/hospitality/ tourism/transportation	1	1	2	–	–	–	2	6
Private education	4	1	1	1	1	–	5	13
Computer and software	–	1	–	–	–	–	4	5
Professional services	4	5	1	3	–	1	5	19
Sub-total:	9	11	4	5	2	1	32	64 (59.8%)
Total:	15	13	4	11	2	8	54	107
Gender								
Male	11	9	3	10	1	8	44	86 (80.4%)
Female	4	4	1	1	1	–	10	21 (19.6%)
Total:	15	13	4	11	2	8	54	107
Age								
Below 30 years	1	2	–	2	–	2	17	24 (22.4%)
31-40 years	4	3	4	6	–	4	34	55 (51.4%)
Above 40 years	10	8	–	3	2	2	3	28 (26.2%)
Total:	15	13	4	11	2	8	54	107
Years of managerial experience								
Below 5 years	2	4	3	3	–	4	24	40 (37.4%)
Above 5 years	13	9	1	8	2	4	30	67 (62.6%)
Total:	15	13	4	11	2	8	54	107

Notes:
NTU – Northern Territory University
CSU – Charles Sturt University
HMC – Henley Management College
HW – Heriot-Watt University
HU – University of Hull
DU – Dubuque University
UPM – Universiti Putra

Table III.
Description of respondents

respective latent constructs and were not altered from their original form. The business performance items remained the same as well. Research has shown that perceived measures of business performance can be:

- a reasonable substitute for objective measures of performance (Dess and Robinson, 1984); and
- have a significant correlation with objective measures of financial performance (Hansen and Wernerfelt, 1989).

The covering letter asked respondents to "take on the role as their employer's representative" and to respond to items from an overall company perspective. In effect, each respondent acted as a proxy respondent for their whole organisation. The covering letter also encouraged respondents to provide feedback on the questionnaire items (i.e. if they were difficult to understand). No such feedback was received.

Results

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 be the first measure one uses to assess the quality of the instrument. Since a rigorous psychometric evaluation of the IC 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. The reliabilities for each of the four constructs in both the service and non-service contexts were adequate since the Cronbach alpha values for each were significantly greater than the prescribed 0.7 threshold. The values varied from 0.7384 ("non-service" human capital) to 0.9680 ("non-service" performance), showing that the instrument is sufficiently reliable.

Partial least squares (PLS) is a structural equation modelling 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). 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 IC model within its nomological network. The four 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. Bontis (1998) reports the benefits of using PLS for such studies:

> The objective in PLS is to maximise the explanation variance. Thus, R^2 (r-squared) and the significance of relationships among constructs are measures indicative of how well a model is performing. The conceptual core of PLS is an iterative combination of principal components analysis relating measures to constructs, and path analysis permitting the construction of a system of constructs. The hypothesising of relationships between measures and constructs, and constructs and other constructs is guided by theory. The estimation of the parameters representing the measurement and path relationships is accomplished using ordinary least squares (OLS) techniques. The first step in PLS is for the researcher to explicitly specify both the structural model and the construct-to-measures relationships in the measurement model. The exogenous constructs are consistent with the idea of independent variables (antecedents). Similarly, the endogenous constructs are consistent with the idea of dependent variables (consequents). The constructs can be specified as "formative" indicators or "reflective" indicators. Formative indicators imply a construct that is expressed as a function of the items (the items form or cause the construct). Reflective indicators imply a construct where the observable items are expressed as a function of the construct (the items reflect or are manifestations of the construct). One looks to theory to decide on which type of epistemic or construct-to-measure relationship to specify. In this case, all constructs were "reflective" indicators. Once specified, the measurement and structural parameters are estimated using an iterative process of OLS, simple and multiple regressions. The process continues until the differences in the component scores converge within certain criteria (Bontis, 1998, p. 69).

In this study, the sample size of 107 respondents is high enough for PLS. One of the key benefits of using PLS as a structural modelling technique is that it may work with smaller samples. In general, the most complex regression will involve:

(1) the indicators on the most complex formative construct; or

(2) the largest number of antecedent constructs leading to an endogenous construct.

Sample size requirements become at least ten times the number of predictors from (1) or (2), whichever is greater (Barclay *et al.*, 1995). There were no formative indicators, so it is the second requirement that must be met. The largest number of antecedent constructs leading to an endogenous construct is three (3 * 10 = 30). Thirty is well below the total sample size of 107 or either of the sub-samples (service industries: $n = 64$, non-service industries: $n = 43$).

The face validity of measures was assessed by examining the loadings, or simple correlations, of the measures with their respective construct. A rule of thumb is to accept items with loadings of 0.7 or more, which implies more shared variance between the construct and its measures than error variance (Carmines and Zeller, 1979). All of the remaining items in Table IV had loadings over the 0.7 threshold.

To assess the statistical significance of the path coefficients, which are standardized betas, a jack-knife analysis was performed using a programme developed by Fornell and Barclay (1983). The use of jack-knifing, as opposed to traditional *t*-tests, allows the testing of the significance of parameter estimates from data which are not assumed to be multivariate normal.

H1 tested the relationship between human capital and customer capital. The results in Table V show a positive, substantive and significant beta coefficient of 0.798 ($p < 0.01$) for the service sample and 0.799 ($p < 0.01$) for the non-service

Table IV. Statistical highlights

Human capital (HC)				Structural capital (SC)				Customer capital (CC)				Performance (PERF)			
Service		Non-service		Service		Non-service		Service		Non-service		Service		Non-service	
Cronbach's alpha test for reliability															
0.7984		0.7384		0.8429		0.8289		0.9152		0.8411		0.9487		0.9680	
Remaining items with loading values > 0.7															
H3	0.7916	H6	0.8359	S7	0.7464	S7	0.8305	C5	0.8752	C1	0.7029	P2	0.7489	P1	0.7962
H8	0.8094	H7	0.7600	S9	0.7009	S8	0.7456	C6	0.7374	C10	0.8971	P3	0.8888	P2	0.8070
H10	0.7613	H10	0.8458	S10	0.7778	S9	0.7987	C7	0.8119	C11	0.8615	P4	0.8926	P3	0.9317
H11	0.7493	H11	0.8577	S11	0.7512	S10	0.7117	C10	0.7815	C14	0.7364	P5	0.8822	P4	0.8910
H20	0.8271	H20	0.7443	S12	0.8460	S15	0.7160	C11	0.7145			P6	0.8375	P5	0.9414
								C14	0.7819			P7	0.9091	P6	0.9238
								C16	0.8447			P8	0.7961	P7	0.9173
								C17	0.7779			P9	0.8158	P8	0.9046
												P10	0.8549	P9	0.8482
														P10	0.8310

Path from → to	Human capital → Customer capital	Human capital → Structural capital	Customer capital → Structural capital	Structural capital → Performance	Average R-squared for model
Model 1 Service industries	0.798 (17.93) ***	0.304 (1.25)	0.496 (2.51) **	0.262 (2.34) **	32.1%
Model 2 Non-service industries	0.799 (12.43) ***	0.525 (4.87) ***	0.441 (3.50) ***	0.105 (1.79) *	37.3%
Comparison (see Figure 1)	Virtually identical	Lower for service industries	Almost similar	Higher for service industries	Similar explanatory power

Notes:
Top number is standardised beta coefficient
t-stat in brackets
* significant at $p < 0.10$; ** significant at $p < 0.05$; *** significant at $p < 0.01$

Table V.
Path coefficients

sample. *H2* tested the relationship between human capital and structural capital. The results show a positive (but not significant) beta coefficient of 0.304 for the service sample and a positive and significant beta coefficient of 0.525 ($p < 0.01$) for the non-service sample. *H3* tested the relationship between customer capital and structural capital. The results show a positive, substantive and significant beta coefficient of 0.496 ($p < 0.01$) for the service sample and 0.441 ($p < 0.01$) for the non-service sample. Finally, *H4* tested the relationship between structural capital and business performance. The results show a positive and significant beta coefficient of 0.262 ($p < 0.05$) for the service sample and 0.105 ($p < 0.1$) for the non-service sample. Furthermore, the explanatory power for both models was relatively strong at 32.1 per cent for the service sample and 37.3 per cent for the non-service sample.

Discussion

The results from this research study are largely as expected but importantly encouraging. The results related to *H1* clearly show that the positive relationship between human capital and customer capital is important regardless of industry type. The beta coefficients for this relationship shown in Figure 1 clearly indicate that this path is robust for both Model 1 (service industries) and Model 2 (non-service industries). This relationship was by far the strongest overall in the model. This is an encouraging result because it implies that senior managers – regardless of industry sector – must realise the full potential of their organisation's human capital in order to establish a strong market orientation for their customers. In other words, the more competent an

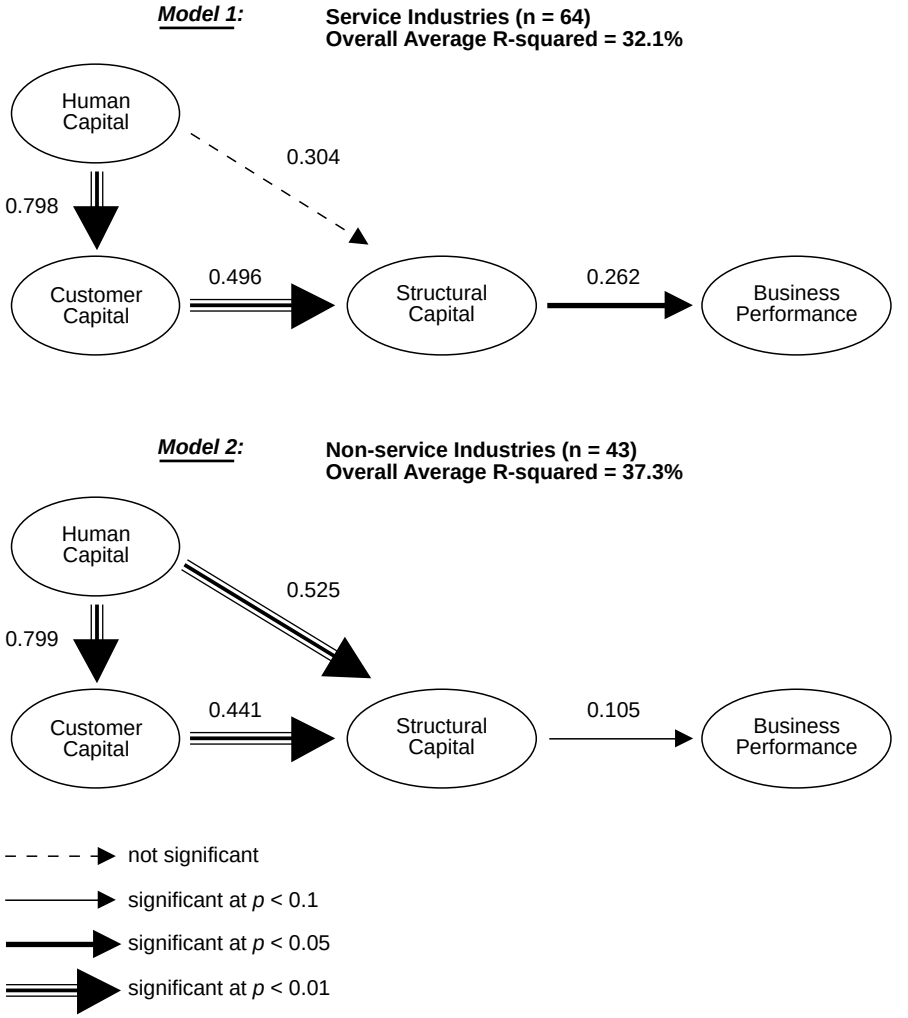

Figure 1.
Service and non-service models

organisation's employees, the better they will understand customers' needs and develop customer capital to retain their loyalty.

The results related to *H2* show that the relationship between human capital and structural capital differs depending on the industry sector. The beta coefficients for this relationship shown in Figure 1 indicate that this path is positive but not significant for Model 1 (service industries) but substantive and significant for Model 2 (non-service industries). This result implies that organisations in non-service industries have a better capability for transforming individual employee knowledge into non-human knowledge. In other words, much of the intellectual capital in non-service industries is absorbed in the large capital outlays (i.e. machinery and equipment) found in construction and other manufacturing-intensive industries. The non-significant

path between human and structural capital in service industries implies that there still remains an enormous challenge for knowledge-intensive organisations (i.e. entertainment and software) to codify or externalise (Nonaka and Takeuchi, 1995) much of the tacit resident in employees' minds.

The results related to *H3* show that the relationship between customer capital and structural capital is consistent across industry sectors. The beta coefficients for this relationship indicate that this path is positive, substantive and significant for both Model 1 (service industries) and Model 2 (non-service industries). This result implies that all organisations regardless of industry which invest heavily in becoming customer-focused and market-driven will ultimately create efficient organisational routines and processes that service their clientele well.

Finally, the results related to *H4* show that the relationship between structural capital and business performance is important regardless of industry. The beta coefficients for this relationship indicate that this path is positive and significant for Model 1 (service industries) but only less substantive and significant for Model 2 (non-service industries). This result implies that organisations' efforts to codify organisational knowledge and thereby further develop their structural capital ultimately yield a sustainable competitive advantage. This advantage translates itself into relatively higher business performance.

Another important implication for senior managers is that there must exist a constant interplay among human, structural and customer capital for an organisation to leverage its complete knowledge base (Bontis, 1998). The results from this Malaysian study confirm similar results found by Bontis in other research settings. Isolated stocks of knowledge that reside in employees' minds that are never codified into organisational knowledge will never positively affect business performance. In other words, it is not enough for an organisation to hire and promote the brightest individuals it can find. An organisation must also support and nurture bright individuals into sharing their human capital through organisational learning and externalisation into information systems.

Conclusion

The results of this research programme should be very beneficial to both academics and practitioners. Academics in the policy and accounting areas have traditionally been very interested in how intangible assets reflect on the performance of firms. The first phase of this study thus far has shown that intellectual capital has a significant and substantive relationship with business performance regardless of industry sector. Future research may show that this link can be generalized to other countries and virtually all industries. Furthermore, a training tool that is gaining widespread use by senior managers and CKOs (chief knowledge officers) alike (Bontis, 2000; Mitchell and Bontis, 2000) is the TANGO simulation developed by Karl-Erik Sveiby. Research has shown that this simulation game significantly improves the perceived importance of developing intellectual capital metrics among its participants

(Bontis and Girardi, 2000) and could prove to be quite useful in further enhancing the intellectual capital management skills of Malaysian managers.

It is further concluded that the IC instrument (Bontis, 1997) used in this study is appropriate for this kind of research in Malaysia which can pave the road for future administrations in other multinational settings. The next phase of this ongoing research will use the same methodology with a larger sample drawn from various countries and more industries.

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