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## **Modelling the creation of value from intellectual capital: a Portuguese banking perspective**

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**Abstract:** Despite the widely recognised importance of intellectual capital as a vital source of competitive advantage, there is still little understanding of how organisations actually combine their components to drive value. The purpose of this study is to examine the interrelationships among intellectual capital components within the Portuguese banking context by extending a study completed by Bontis. Several paths are identified that drive towards superior performance. Various models are assessed using a Partial Least Squares (PLS) approach given its advantages in dealing with complex models and its predictive capability. Empirical findings from this study support the proposition that intellectual capital is a driver of organisational value, but only in certain combinations.

**Keywords:** intellectual capital; human capital; structural capital; relational capital; organisational value; partial least squares; PLS; Portugal; banking.

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## **1 Introduction**

The determinants of prosperity and growth of organisations and of national economies, as a whole, are dependent on their effectiveness and efficiency in gathering and utilising knowledge assets to solve current problems and exploit future opportunities (OECD, 1996). The fundamental building material of the modern corporation is the creation and utilisation of knowledge (Lytras and Sicilia, 2005). Unfortunately, this intangible asset is invisible to many companies, making measurement and management difficult for most managers. By understanding the critical components of intellectual capital that do in fact drive value – senior managers will be able to make more effective strategic decisions. Undoubtedly, these new strategic decisions will reflect new forms of working, new models of business and new approaches to management thinking (Sanderson, 1998).

The concept of intellectual capital is still unknown to many because it is difficult to measure in explicit terms (Bontis, 1999; Seetharaman et al., 2002). Chaharbaghi and Cripps (2006, p.30) argue that “it is impossible and undesirable to reduce intellectual capital to a calculable number that establishes whether an organization’s intellectual capital has increased or diminished”. Marr (2005) further argues that different people talk about intellectual capital from different perspectives, using the same language to describe different constructs. What is common among the different perspectives is the belief that intellectual capital is the key driver of organisational performance and the source of sustainable competitive advantage (Bontis, 1996; Cabrita and Vaz, 2006; Ordonez de Pablos, 2005; Roos and Roos, 1997). For the purpose of this research study, intellectual capital is defined as the aggregate of all knowledge-based factors (i.e. resources, capabilities and competences) that are critical to the development of organisational value. This incremental value is a resultant of a set of activities described within the knowledge management literature (Bontis, 2002). The purpose of knowledge

management is to build the intellectual capital of a firm. As such the academic field benefits from a wide variety of perspectives, such as accounting (Bontis, 2003), library science (Lytras et al., 2005), information systems (Lytras and Pouloudi, 2006), project management (Lytras and Pouloudi, 2003) and strategic management (Choo and Bontis, 2002).

It is important to notice that intangible assets seldom affect performance directly. Instead, they work indirectly through complementary and non-linear relationships of cause and effect (Ittner and Larcker, 1998; Kaplan and Norton, 2004). Research on the economics of knowledge-based resources shows that investments in intangible assets not always stimulate productivity and growth without a number of complementary developments (Topkins, 1995). Recent studies have been placing more emphasis on the analysis of interactions and interdependencies of various intellectual capital components (Bollen et al., 2005; Bontis, 1998, 2004; Bontis et al., 2000; Cabrita, 2005; Cabrita and Bontis, forthcoming; Marr et al., 2004; Skoog, 2003; Tsan and Chang, 2005). However, much more detailed and empirically grounded research involving the interrelationships between the different components of intellectual capital is needed to understand how these enable (or impinge upon) value creation. The purpose of this research study is to empirically investigate the interrelationships among different intellectual capital elements and their value creation consequences.

## **2 Literature review**

In a comprehensive meta-review of the literature, Serenko and Bontis (2004) state that the field of intellectual capital has grown dramatically over the last few years with a 50% increase in publications per annum. In fact, they expect there to be 100,000 publications in total by the year 2010. This is quite remarkable for a nascent field with its earliest academic papers dating from the mid-1990s. A Google search on the term 'intellectual capital' yields over one million hits. Even though the field is considered in its embryonic stages, the concept is still referred to as fuzzy (Marr, 2005). Notwithstanding, there exists some convergence of what intellectual capital encompasses. Generically speaking, the extant literature identifies three subcomponents of intellectual capital: human capital, structural capital and relational capital (see Bontis (1999) for a comprehensive review of the literature).

Human capital is defined as the set of intangible resources that are embedded in the individuals of the organisation (Bontis et al., 1999). The productivity of human capital depends on a complex combination of factors related to employee talent, motivation, reward, skill, experience, health and even emotional factors. Ulrich (1998) conceptualises intellectual capital as multiplicative function of competencies and commitment. Competencies are the original ingredient while commitment is the 'copper wire' that transforms competencies into profitable products and services (Viedma, 2003, p.220). In this context, human capital analysis should include an examination of competencies (i.e. skills, experience and know-how) and attitudes (i.e. commitment and values). Consequently, managers should emphasise both the absolute talent of their employees as well as the motivation they have to contribute to the firm's objectives (Carneiro, 2000; Kim and Mauborgne, 1997).

While the concept of human capital is well established in the literature, structural capital is less obvious and requires more careful specification (Carson et al., 2004).

Structural capital is typically defined as encompassing all of the non-human storehouses of knowledge in an organisation (e.g. databases, technology, infrastructure, processes, procedures). In this context, structural capital and human capital are mutually exclusive yet interdependent. Without the firm's supporting structure, individuals have no ability to do anything with their ideas. Consequently, structural capital should be designed to maximise the potential of human capital, given the appropriate culture (Schneider, 2000). In sum, structural capital includes all of the intellectual assets of an organisation that usually stay in the office, even if people leave.

Relational capital represents the knowledge resources embedded in the constellation of external relationships a firm has with any stakeholder (Bontis, 2001). Through external relationships firms can access critical and complementary resources. Prahalad and Ramaswamy (2000) suggest that the relational capital embedded in customers can become a new source of competence for the organisation, because they rejuvenate a firm's knowledge base preventing it from obsolescence in a turbulent environment (Gibbert et al., 2001).

Relational capital, in different forms, is a fundamental prerequisite for organisational growth. Moran and Ghoshal (1996) argue that all new resources, including intellectual capital, are created through two generic processes: combination and exchange. Furthermore, Nahapiet and Ghoshal (1998) argue that new intellectual capital is created through combination and exchange of existing intellectual resources.

While relational capital can be measured as a function of longevity (Bontis, 1998), marketing prowess (Håkansson and Snehota, 1995) and customer relationship management (Gummesson, 2002), the concept of relational capital emerges primarily from the research related to 'market orientation' (Kohli and Jaworski, 1990; Narver and Slater, 1990). Market orientation is a broad concept that includes customer's verbalised needs and preferences, and an analysis of exogenous elements that influence those needs and preferences. Although moderated by internal and external variables, evidence exists of a positive relationship between market orientation and:

- 1 business performance (Dawes, 2000)
- 2 new product performance (Ramaseshan et al., 2002)
- 3 innovation (Gatignon and Xuereb, 1997)
- 4 the behaviours of a learning organisation (Slater and Narver, 1995).

Market orientation is also a necessary condition for knowledge management (Darroch and McNaughton, 2002). The study of relational capital also emphasises the importance of other primary stakeholder groups such as suppliers, government, industry associations and partners (Dawes, 2000; Day and Wensley, 1988; Greenley and Foxall, 1997).

### **3 Intellectual capital and value creation**

Intellectual capital is seen as the principal driver of value-creation and sustainable competitive advantage (Prahalad and Hamel, 1990). This suggests evidence of an empirical relationship between intellectual capital and organisational value creation (Marr and Roos, 2005). This link is embedded in a firm's ability to continually build its intellectual capital base by generating new knowledge. Knowledge generation is a process of creating value by recombining previous knowledge through Schumpeterian

innovation (see Aghion and Howitt (1998) for an overview). When this recombination builds on already existing intellectual capital, a transformative positive effect on performance is expected (Narayanan, 2001).

The basic idea is that value is generated through facilitating the flow of knowledge across an organisation (Georgopoulos, 2005; Lee et al., 2005; Ordonez de Pablos, 2006). The resultant knowledge is converted into value in the form of human, structural and relational capital. Therefore, it is important to focus on explaining what is in between the activities (flows) that transforms these resources (stocks) into results. This alignment of this stock-flow process has been shown to be closely related to organisational learning and business performance (Bontis et al., 2002; Choudrie and Selamat, 2005; Lytras et al., 2002; Sicilia and Lytras, 2005).

#### **4 Research design and methodology**

The research design process begins at the conceptual level. Hullan (1999) points out that three issues play a crucial role in causal modelling research:

- 1 conceptual model specification
- 2 construct dimensionality
- 3 distinction between constructs and measures.

Conceptual model specification was based on a review of three previous studies that incrementally built on top of one another (Bontis, 1998; Bontis et al., 2000; Tsan and Chang, 2005). Each of these models focused on analysing the inter-relationships among the three elements of intellectual capital and evaluating the best possible combination of these components in predicting business performance using the same measurement instrument in different contexts.

Construct dimensionality was conducted through an exhaustive literature review of academic research papers and texts. It is now widely accepted that intellectual capital is a multidimensional higher-order level construct whose three subcomponents emerge from related disciplines (human capital – human resources, structural capital – information systems, relational capital – marketing). Therefore, a multiitem scale extracted from various management disciplines was employed. Peter (1981, p.138) argues that this process ‘substantially increases the probability of a validation study’ since the models are specified with constructs that are determined a priori. The nature of the links between constructs and their respective measures, often referred to as epistemology, was taken into account by testing the model within a nomological network. Various statistical tests were also conducted in order to ensure discriminant validity.

The questionnaire utilised for this study was initially developed and administered in Canada (Bontis, 1998) and further refined in Malaysia (Bontis et al., 2000) and Taiwan (Tsan and Chang, 2005). Eight more items were added to reflect the interests of different stakeholders groups.<sup>1</sup> Following Churchill’s (1979) recommendation, the 63 original items were psychometrically revalidated and combined with the new items for a total of 71 items. The revised questionnaire was pretested through personal interviews with eight banking managers. Minor adjustments were then made during translation in order to:

- 1 correct weaknesses in the questionnaire
- 2 identify the most knowledgeable people about the subject
- 3 grasp sector-specific dynamics.

The target population was the 53 affiliated member banks registered by the Portuguese Bankers Association. The survey instrument was first pilot-tested using a sample of 178 employees (which included first, second, third and fourth-level executives). A total of 151 respondents returned the questionnaire for an 84% response for the test pilot phase. The remaining 27 employees argued that they did not have enough information to answer the questions. Preliminary statistical analysis showed that the survey instrument was both reliable and valid during this phase.

The main survey study was not conducted using a random sample, but was based on the 'key informant' approach (Phillips, 1981). An initial sample of 430 executives (i.e. chief level, first level and second level) was drawn from a master list of 1081 bankers registered with the association from all 53 banks. In fact, preliminary interviews with a dozen of these executives allowed us to identify the appropriate employees who possessed the special qualifications (i.e. management level, professional status, experience and specialised knowledge) to answer the questionnaire (Hambrick, 1981).

Following Chin's (1998) recommendations, an analytical sample resulting in a response rate of at least 150 from the target sample of 430 was sought to ensure sufficient statistical power. Two follow-ups in the form of letters, telephone calls and e-mails were carried out in subsequent weeks. A final cut-off time of eight weeks was determined using the 'the latest response rate' method (Huxley, 1980) as depicted in Table 1 using Equation (1):

$$\frac{R_t}{n} = 1 - b^t \quad (1)$$

where  $R_t$  is the number of responses accumulated by the end of week  $t$ ;  $n$  is the number of questionnaires mailed initially;  $t$  is the elapsed time in weeks from initial mailing to the end of week  $t$ ;  $b$  is the parameter representing the degree of 'resistance'.

**Table 1** Resistance factor by the 'latest response rate' method

Weeks ( $t$ )	Cumulative responses	Cumulative response rate ( $n = 430$ ) (%)	Resistance factor ( $b$ )
3	42	9.8	0.966
4	72	16.7	0.955
5	123	28.6	0.935
6	139	32.3	0.937
7	211	49.1	0.908
8	253	58.8	0.895

Consistent with previous studies (Huxley, 1980; Parasuraman, 1982), the resistance factor is relatively high at first and then drops for a short period even before the first follow-up could have any effect. A total of 253 completed surveys from an initial sample of 430 were returned after eight weeks which represented a response rate of 58.8%.

## 5 PLS overview

The model in this research study was estimated using Partial Least Squares (PLS) Graph v.3.00 which is a well known Structural Equation Modelling (SEM) technique. Conceptually, PLS is an iterative combination of principal components analysis relating measures to constructs (outer relations) and path analysis featuring a causal chain system

of constructs (inner relations). PLS estimation does not require assumptions of multinormality (which this data did not satisfy) or independence of observations and is ideally suited to the early stages of theory building and testing. Frequently labelled as 'soft modelling' (Wold, 1982), PLS has been used as a research tool in a variety of management research settings such as market structure (Cool et al., 1989), cooperative ventures (Fornell et al., 1990), global strategy (Johansson and Yip, 1994), geographic diversification (Delios and Beamish, 1999) and mission statements (Bart et al., 2001).

PLS proceeds in two stages. The first stage is to assess the measurement model (i.e. the relationships between the items and the constructs that they measure). The second stage requires the evaluation of the structural model (i.e. to assess the explanatory power of independent variables and examine the size and the significance of path coefficients). The test of the measurement model included estimation of the reliability of measures as well as an examination of the convergent and discriminant validity of the items. As suggested by Nunnally (1978), only items with standardised loadings of 0.7 or more were accepted. However, 'loadings of 0.5 or 0.6 may still be acceptable if there exist additional indicators in the block for comparison basis' (Chin, 1998, p.325).

The test of the structural model included estimating the path coefficients which are interpreted as standardised beta weights and calculating the  $R^2$  which is used to assess the explanatory power of the model. The significance of path coefficients was tested by calculating  $t$ -statistics using the jack-knifing function in PLS (Wildt et al., 1982). PLS has as its primary objective the minimisation of error (or, equivalently, the maximisation of variance explained) in all endogenous constructs. The degree to which any particular PLS model accomplishes this objective can be determined by examining the  $R^2$  values for the dependent (endogenous) constructs. One of the attractive features of PLS is that it can be used to quickly generate and test a variety of different theoretical models.

## 6 Results

Firstly, the reliability of each construct was tested using Cronbach's alpha. The alpha scores exceeded the 0.7 threshold in each case which is considered good for exploratory research (Nunnally, 1978). Secondly, a total of 48 items were retained by examining the loading values on their corresponding construct, as suggested by Hair et al. (1992) and Chin (1998). Finally, the measurement model was assessed by looking at the internal consistency among items intended to measure the same construct. The results of testing for reliability, internal consistency (Fornell and Larcker, 1981) and discriminant validity are shown in Table 2.

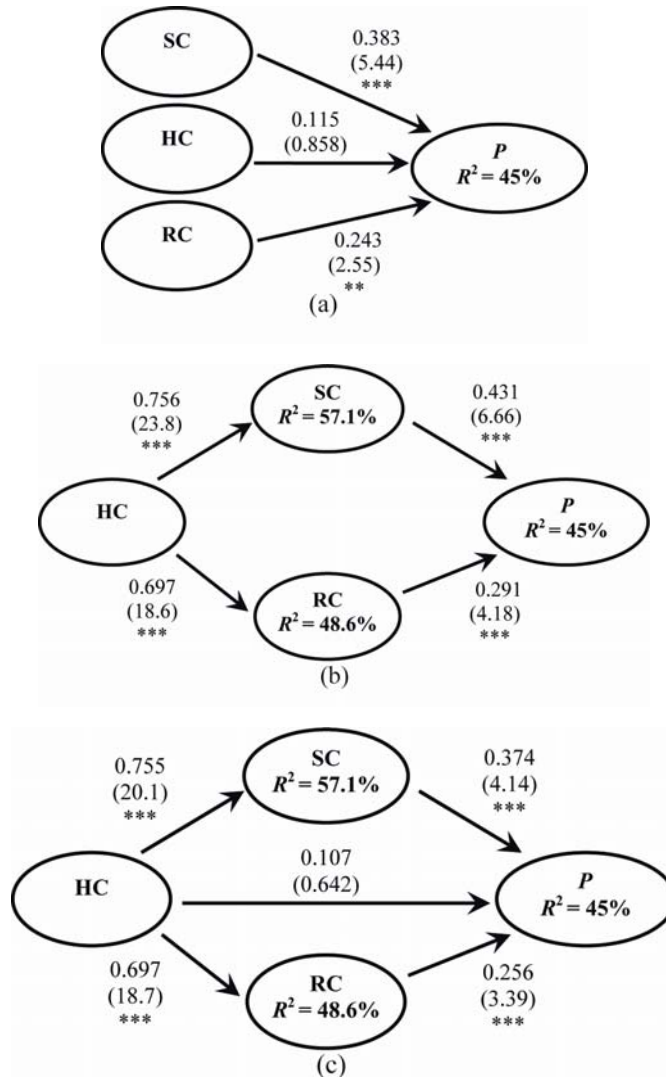
**Table 2** Measurement model results

Constructs	Number of items	Cronbach's alpha ( $\alpha$ )	Internal consistency (Fornell and Larcker, 1981)	Discriminant validity (Correlation of constructs)			
				HC	SC	RC	P
HC	14	0.9505	0.9319	0.783			
SC	10	0.9406	0.9498	0.755	0.809		
RC	14	0.9501	0.9563	0.697	0.700	0.782	
P	10	0.9416	0.9507	0.568	0.634	0.592	0.812

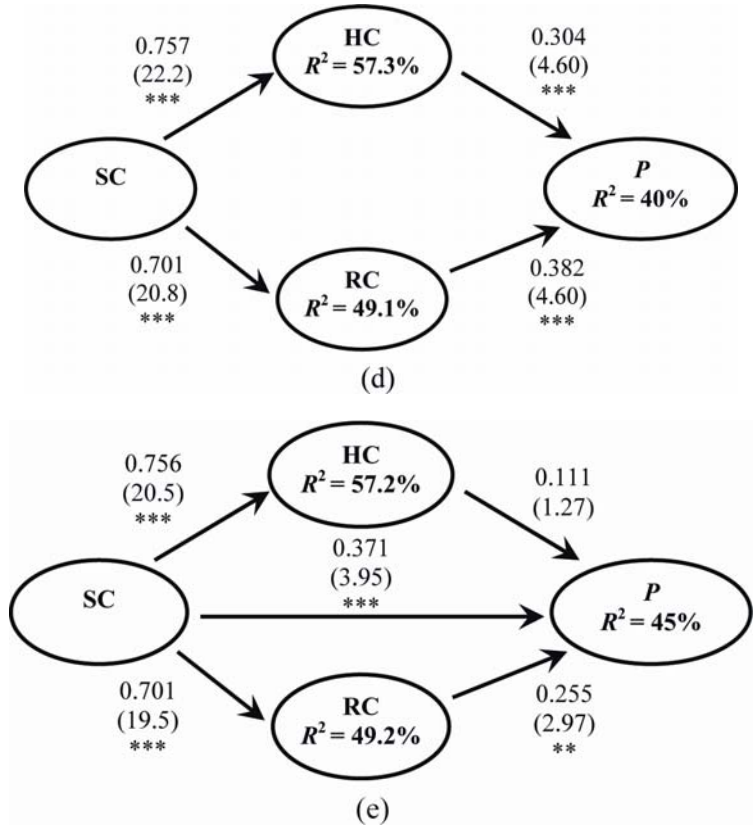
The discriminant validity of the model was assessed by calculating the average variance extracted for each construct (Fornell and Larcker, 1981). The diagonal italics figures within the last column of Table 2 show the square root of the variance extracted. For acceptable discriminant validity, the diagonal values should be greater than all other entries in the same row and column, as is the case here.

A primary purpose of this study is to test models that represent different configurations of intellectual capital components driving organisational performance. Figure 1 highlights five (5) different configurations with their corresponding explanatory power values ( $R^2$ ) and the significance of their path coefficients (see Table 3 for detailed results).

**Figure 1** Model specifications (a) Model A (Simplistic Specification); (b) Model B (Diamond Specification, HC antecedent); (c) Model C (Diamond Specification, HC direct); (d) Model D (Diamond Specification, SC antecedent) and (e) Model E (Diamond Specification, SC direct)



**Figure 1** Model specifications (a) Model A (Simplistic Specification); (b) Model B (Diamond Specification, HC antecedent); (c) Model C (Diamond Specification, HC direct); (d) Model D (Diamond Specification, SC antecedent) and (e) Model E (Diamond Specification, SC direct) (continued)



\*\**p*-value < 0.05.

\*\*\**p*-value < 0.001.

**Table 3** Model's comparative analysis

<i>Paths</i>	<i>Significance</i>	<i>Direct effects</i>	<i>Indirect effects</i>	<i>Total effects</i>	<i>R<sup>2</sup>%</i>
Model A					
SC → P	<i>p</i> -value < 0.001	0.383	–	0.383	45.2
HC → P	n.s.	0.115	–	0.115	
RC → P	<i>p</i> -value < 0.05	0.243	–	0.243	
Model B					
HC → SC	<i>p</i> -value < 0.001	0.756	–	0.756	44.5
HC → RC	<i>p</i> -value < 0.001	0.697	–	0.697	
RC → P	<i>p</i> -value < 0.001	0.291	–	0.291	
SC → P	<i>p</i> -value < 0.001	0.431	–	0.431	

**Table 3** Model's comparative analysis (continued)

<i>Paths</i>	<i>Significance</i>	<i>Direct effects</i>	<i>Indirect effects</i>	<i>Total effects</i>	<i>R<sup>2</sup>%</i>
Model C					
HC → SC	<i>p</i> -value < 0.001	0.755	–	0.755	
HC → RC	<i>p</i> -value < 0.001	0.697	–	0.697	
RC → P	<i>p</i> -value < 0.001	0.256	–	0.256	45.0
SC → P	<i>p</i> -value < 0.001	0.374	(0.755 × 0.374)	0.374	
HC → P	n.s.	0.107	+ (0.697 × 0.256) = 0.460	0.567	
Model D					
SC → HC	<i>p</i> -value < 0.001	0.757	–	0.757	
SC → RC	<i>p</i> -value < 0.001	0.701	–	0.701	40.0
HC → P	<i>p</i> -value < 0.001	0.304	–	0.304	
RC → P	<i>p</i> -value < 0.001	0.382	–	0.382	
Model E					
SC → HC	<i>p</i> -value < 0.001	0.756	–	0.756	
SC → RC	<i>p</i> -value < 0.001	0.701	–	0.701	
HC → P	n.s.	0.111	–	0.111	45.0
RC → P	<i>p</i> -value < 0.05	0.255	–	0.255	
SC → P	<i>p</i> -value < 0.001	0.371	(0.756 × 0.111) + (0.701 × 0.255) = 0.263	0.634	

In line with Bontis' (1998) earlier work in Canada, the relationship between human capital and business performance is not significant, though positive for Model A which represents the simplistic specification. Following Bontis' (1998) model reconfiguration from the simplistic to the diamond specification, Model B maintains its relatively strong explanatory power ( $R^2 = 44.5\%$ ) while also resulting in substantive and significant paths ( $p$ -value < 0.001).

Model C extends Bontis' earlier work by positing a direct link from the antecedent construct within the diamond specification. In this case, human capital (once again) proves not significant. A further reconfiguration is conducted by replacing human capital with structural capital. In Model D, although all paths are substantive and significant ( $p$ -value < 0.001), the explanatory power ( $R^2 = 40\%$ ) is the lowest of the five models. In Model E the direct effect of structural capital to business performance is added and despite an increase in explanatory power ( $R^2 = 45\%$ ), the direct relationship between human capital and business performance is not significant once more.

The model reconfiguration process shows that although human capital has a positive influence on business performance, this relationship is substantive and significant only when it inter-relates with the two other components of intellectual capital. In other words, human capital is worthless (see Model A) without the coordinated integration of both structural and relational capital.

The results of this study conclude that Model B is the best specification since it reflects a high degree of explanatory power and all path coefficients are

substantive and significant. These results are in line with those of previous studies which were conducted in different contexts.

## **7 Conclusion**

The purpose of this research study was to empirically investigate the interrelationships among different intellectual capital elements and their value creation consequences. By extending previous research conducted in different contexts, a generalisable statement regarding the subcomponents of intellectual capital can be comfortably made.

The three constructs that make up intellectual capital are known to affect each other. Deficiencies in any of these factors can affect overall business performance. Organisations cannot generate sustainable performance without the ideas, skills, attitudes and talent of knowledge workers. However, talented employees (human capital) are practically useless without the supportive structure of an organisation (structural capital) that can utilise and service client needs (relational capital).

Another important point that emerges from this study is the importance of human capital as the model's causal antecedent. Obviously, it is the employees of any organisation that get the work done. Human capital is definitely necessary but not sufficient in the drive for sustainable performance. There must exist a constant interplay among human, structural and relational capital for an organisation to leverage its overall intangible value. As mentioned by Bontis (1998), isolated stocks of knowledge that reside in the employees' minds that are never retained into organisational knowledge will never positively affect business performance. Talent (human capital) must be coordinated (structural capital) for the common goal of the customer (relational capital) in order to create value.

The principal limitation in this study is that data collection focused on one sector in one country at one point of time. However, given that this research extends prior work that took place years earlier, in different sectors and in different countries, this limitation is mitigated.

The main implication for practicing managers is that they must consider all elements of intellectual capital when developing a strategy to harvest intangible assets for sustainable performance. In particular, bank managers must evaluate their relatively large investment in information and communications technology in the context of how such an investment complements the human resources of the organisation. Indeed, Bontis and Fitz-enz (2002) argue that an uncoordinated investment in structural capital without the requisite coordination of how it will be used by employees for the purposes of satisfying clients puts undue negative pressure on financial resources.

There are two ways in which future research emanating from this study could be directed. Firstly, this current can be extended by replicating the administration of the survey instrument in other sectors and geographical settings. This may also lead to alternative proxies and measures for related constructs. Secondly, because intellectual capital measures are often used in coordination with financial outcomes, a longitudinal approach could yield better modelling. If the same set of firms can be surveyed over a multiyear period, a strong more comprehensive model can be tested.

## References

- Aghion, P. and Howitt, P. (1998) *Endogenous Growth Theory*, Cambridge, MA: MIT Press.
- Bart, C., Bontis, N. and Taggar, S. (2001) 'A model of mission statements and firm performance', *Management Decision*, Vol. 39, No. 1, pp.19–35.
- Bollen, L., Vergauwen, P. and Schnieders, S. (2005) 'Linking intellectual capital and intellectual property to company performance', *Management Decision*, Vol. 43, No. 9, pp.1161–1185.
- Bontis, N. (1996) 'There's a price on your head: managing intellectual capital strategically', *Ivey Business Journal (formerly Business Quarterly)*, Summer, pp.40–47.
- 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, Nos. 5–8, pp.433–462.
- Bontis, N. (2001) '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. (2002) *World Congress of Intellectual Capital Readings*, Boston: Elsevier Butterworth Heinemann KMCI Press.
- Bontis, N. (2003) 'Intellectual capital disclosure in Canadian corporations', *Journal of Human Resource Costing and Accounting*, Vol. 7, Nos. 1/2, pp.9–20.
- Bontis, N. (2004) 'National intellectual capital index: a United Nations initiative for the Arab region', *Journal of Intellectual Capital*, Vol. 5, No. 1, pp.13–39.
- Bontis, N. and Fitz-enz, J. (2002) 'Intellectual capital ROI: a causal map of human capital antecedents and consequents', *Journal of Intellectual Capital*, Vol. 3, No. 3, pp.223–247.
- Bontis, N., Crossan, M. and Hulland, J. (2002) 'Managing an organizational learning system by aligning stocks and flows', *Journal of Management Studies*, Vol. 39, No. 4, pp.437–469.
- 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.
- Bontis, N., Keow, W.C. and Richardson, S. (2000) 'Intellectual capital and business performance in Malaysian industries', *Journal of Intellectual Capital*, Vol. 1, No. 1, pp.85–100.
- Cabrita, M.R. (2005) 'Using partial least squares (PLS) to study interrelationships and interactions among intellectual capital components: an approach to evaluate "market orientation" antecedents', in T. Aluja, J. Casanovas, V.E. Vinzi, A. Morineau and M. Tenenhaus (Eds). *PLS and Related Methods Proceedings of the PLS'05 International Symposium*, Barcelona, Spain, 7–9 September, pp.307–314.
- Cabrita, M.R. and Bontis, N. (forthcoming) 'Intellectual capital and business performance in the Portuguese banking industry', *International Journal of Technology Management*.
- Cabrita, M.R. and Vaz, J.L. (2006) 'Intellectual capital and value creation: evidencing in Portuguese banking industry', *Electronic Journal of Knowledge Management*, Vol. 4, No. 1, pp.11–19.
- Carneiro, A. (2000) 'How does knowledge management influence innovation and competitiveness?' *Journal of Knowledge Management*, Vol. 4, No. 2, pp.87–98.
- Carson, E., Ranzijn, R., Winfield, A. and Marsden, H. (2004) 'Intellectual capital: mapping employee and work group attributes', *Journal of Intellectual Capital*, Vol. 5, No. 3, pp.443–463.
- Chaharbaghi, K. and Cripps, S. (2006) 'Intellectual capital: direction, not blind faith', *Journal of Intellectual Capital*, Vol. 7, No. 1, pp.29–42.
- Chin, W.W. (1998) 'The partial least squares approach to structural equation modelling', in G.A. Marcoulides (Ed). *Modern Methods for Business Research*, Mahwah, NJ: Lawrence Erlbaum Associates.

- Choo, C.W. and Bontis, N. (2002) *The Strategic Management of Intellectual Capital and Organizational Knowledge*, New York: Oxford University Press.
- Choudrie, J. and Selamat, M.H. (2005) 'Managing organisational learning through continuous information systems development: tacit knowledge diffusion and meta-abilities perspectives', *International Journal of Knowledge and Learning*, Vol. 1, No. 4, pp.342–356.
- Churchill, G.A. (1979) 'A paradigm for developing better measures of marketing constructs', *Journal of Marketing Research*, Vol. 16, No. 2, 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.507–522.
- Darroch, J. and McNaughton, R. (2002) 'Developing a measure of knowledge management', in N. Bontis (Ed). *World Congress on Intellectual Capital Readings*, Boston, MA: Butterworth-Heinemann.
- Dawes, J. (2000) 'Market orientation and company profitability: further evidence incorporating longitudinal data', *Australian Journal of Management*, Vol. 25, No. 2, pp.173–200.
- Day, G.S. and Wensley, R. (1988) 'Assessing advantage: a framework for diagnosing competitive superiority', *Journal of Marketing*, Vol. 52, No. 2, pp.1–20.
- Delios, A. and Beamish, P. (1999) 'Geographic scope, product diversification, and the corporate performance of Japanese firms', *Strategic Management Journal*, Vol. 20, pp.711–727.
- Fornell, C. and Larcker, D.F. (1981) 'Evaluating structural equation models with unobservable variables and measurement error', *Journal of Marketing Research*, Vol. 18, No. 1, pp.39–50.
- 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.1246–1255.
- Gatignon, H. and Xuereb, J-M. (1997) 'Strategic orientation of the firm and new product performance', *Journal of Marketing Research*, Vol. 34, pp.77–90.
- Georgopoulos, N. (2005) 'Knowledge management as an integral part of strategic management in e-business era', *International Journal of Knowledge and Learning*, Vol. 1, No. 4, pp.373–387.
- Gibbert, M., Leibold, M. and Voelpel, S. (2001) 'Rejuvenating corporate intellectual capital by co-opting customer competence', *Journal of Intellectual Capital*, Vol. 2, No. 2, pp.109–126.
- Greenley, G.E. and Foxall, G.R. (1997) 'Multiple stakeholder orientation in UK companies and the implications for company performance', *Journal of Management Studies*, Vol. 35, No. 3, pp.377–398.
- Gummesson, E. (2002) *Total Relationship Marketing*, 2nd edition, Oxford: Butterworth-Heinemann.
- Hair, J., Anderson, R., Tatham, R. and Black, W. (1992) *Multivariate Data Analysis with Readings*, 3rd edition, New Jersey: Prentice-Hall International, Inc.
- Håkansson, H. and Snehota, I. (1995) *Developing Relationships in Business Networks*, London: Routledge.
- Hambrick, D.C. (1981) 'Strategic awareness within top management teams', *Strategic Management Journal*, Vol. 2, No. 3, pp.263–279.
- Hulland, J. (1999) 'Use of partial least square (PLS) in strategic management research: a review of four recent studies', *Strategic Management Journal*, Vol. 20, No. 2, pp.195–204.
- Huxley, S.J. (1980) 'Predicting response speed in mail surveys', *Journal of Marketing Research*, Vol. 17, pp.63–68.
- Ittner, C. and Larcker, D. (1998) 'Are non-financial measures leading indicators of financial performance? An analysis of customer satisfaction', *Journal of Accounting Research*, Vol. 36, Supplement, pp.1–35.
- Johansson, J. and Yip, G. (1994) 'Exploiting globalization potential: US. and Japanese strategies', *Strategic Management Journal*, Vol. 15, No. 8, pp.579–601.
- Kaplan, R.S. and Norton, D.P. (2004) 'Measuring the strategic readiness of intangible assets', *Harvard Business Review*, Vol. 82, No. 1, pp.52–63.

- Kim, W.C. and Mauborgne, R. (1997) 'Fair process: managing in the knowledge economy', *Harvard Business Review*, Vol. 75, No. 4, pp.65–75.
- Kohli, A.K. and Jaworski, B.J. (1990) 'Market orientation: the construct, research propositions and managerial implications', *Journal of Marketing*, Vol. 54, No. 4, pp.1–18.
- Lee, D., Simmons, J. and Druen, J. (2005) 'Knowledge sharing in practice: applied storytelling and knowledge communities at NASA', *International Journal of Knowledge and Learning*, Vol. 1, Nos. 1/2, pp.171–180.
- Lytras, M. and Pouloudi, A. (2003) 'Project management as a knowledge management primer: the learning infrastructure in knowledge-intensive organizations: projects as knowledge transformations and beyond', *The Learning Organization*, Vol. 10, No. 4, pp.237–250.
- Lytras, M. and Pouloudi, A. (2006) 'Towards the development of a novel taxonomy of knowledge management systems from a learning perspective: an integrated approach to learning and knowledge infrastructures', *Journal of Knowledge Management*, Vol. 10, No. 6, pp.64–80.
- Lytras, M. and Sicilia, M. (2005) 'Knowledge society a manifesto for knowledge and learning', *International Journal of Knowledge and Learning*, Vol. 1, No. 1, pp.1–11.
- Lytras, M., Pouloudi, A. and Poulymenakou, A. (2002) 'Knowledge management convergence – expanding learning frontiers', *Journal of Knowledge Management*, Vol. 6, No. 1, pp.40–51.
- Lytras, M., Sicilia, M., Davies, J. and Kashyap, V. (2005) 'Digital libraries in the knowledge era: knowledge management and semantic web technologies', *Library Management*, Vol. 26, Nos. 4/5, pp.170–175.
- Marr, B. (2005) 'Introduction', in B. Marr (Ed). *Perspectives on Intellectual Capital – Multidisciplinary Insights into Management, Measurement and Reporting*, Oxford: Butterworth-Heinemann, pp.13–18.
- Marr, B. and Roos, G. (2005) 'A strategy perspective on intellectual capital', in B. Marr (Ed). *Perspectives on Intellectual Capital – Multidisciplinary Insights into Management, Measurement and Reporting*, Oxford: Butterworth-Heinemann, pp.28–41.
- Marr, B., Schiuma, G. and Neely, A.D. (2004) 'The dynamics of value creation: mapping your intellectual performance drivers', *Journal of Intellectual Capital*, Vol. 5, No. 2, pp.312–325.
- Moran, P. and Ghoshal, S. (1996) 'Value creation by firms', in J.B. Keys and L.N. Dosler (Eds). *Academy of Management Best Paper Proceedings*, Southern University, Statesboro, GA.
- Nahapiet, J. and Ghoshal, S. (1998) 'Social capital, intellectual capital and the organizational advantage', *Academy of Management Review*, Vol. 23, No. 2, pp.242–266.
- Narayanan, V.K. (2001) *Managing Technology and Innovation for Competitive Advantage*, Englewood Cliffs, NJ: Prentice Hall.
- Narver, J.C. and Slater, S.F. (1990) 'The effect of a market orientation on business profitability', *Journal of Marketing*, Vol. 54, No. 5, pp.20–35.
- Nunnally, J. (1978) *Psychometric Theory*, 2nd edition, New York: McGraw-Hill.
- Ordonez de Pablos, P. (2005) 'Intellectual capital statements: what pioneering firms from Asia and Europe are doing now', *International Journal of Knowledge and Learning*, Vol. 1, No. 3, pp.249–268.
- Ordonez De Pablos, P. (2006) 'Knowledge flows and learning at interorganisational level: implications for management in multinational corporations', *International Journal of Knowledge and Learning*, Vol. 2, Nos. 1/2, pp.58–72.
- Organisation for Economic Co-operation and Development (OECD) (1996) *Measuring What People Know: Human Capital Accounting for the Knowledge Economy*, Paris: OECD.
- Parasuraman, A. (1982) 'More on the prediction of mail survey response rates', *Journal of Marketing Research*, Vol. 19, pp.261–268.

- Peter, J.P. (1981) 'Construct validity: a review of basic issues and marketing practices', *Journal of Marketing Research*, Vol. 18, pp.133–145.
- Phillips, L.W. (1981) 'Assessing the measurement error in key informant reports: a methodological note on organizational analysis in marketing', *Journal of Marketing Research*, Vol. 18, pp.395–415.
- Prahalad, C.K. and Hamel, G. (1990) 'The core competence of the corporation', *Harvard Business Review*, May–June, pp.79–91.
- Prahalad, C.K. and Ramaswamy, V. (2000) 'Co-opting customer competence', *Harvard Business Review*, January–February, pp.79–87.
- Ramaseshan, B., Caruana, A. and Pang, L.S. (2002) 'The effect of market orientation on new product performance: a study among Singaporean firm', *Journal of Product and Brand Management*, Vol. 11, No. 6, pp.399–409.
- Roos, G. and Roos, J. (1997) 'Measuring your company's intellectual performance', *Long Range Planning*, Vol. 30, No. 3, pp.413–426.
- Sanderson, S.M. (1998) 'New approaches to strategy: new ways of thinking for the millennium', *Management Decision*, Vol. 36, No. 1, pp.9–13.
- Schneider, W.E. (2000) 'Why good management ideas fail: the neglected power of organizational culture', *Strategy and Leadership*, Vol. 28, No. 1, pp.24–29.
- Seetharaman, A., Sooria, H.H. and Saravanan, A.S. (2002) 'Intellectual capital accounting and reporting in the knowledge economy', *Journal of Intellectual Capital*, Vol. 3, No. 2, pp.128–148.
- Serenko, A. and Bontis, N. (2004) 'Meta-review of knowledge management and intellectual capital literature: citation impact and research productivity rankings', *Knowledge and Process Management*, Vol. 11, No. 3, pp.185–198.
- Sicilia, M. and Lytras, M. (2005) 'The semantic learning organization', *The Learning Organization*, Vol. 12, No. 5, pp.402–410.
- Skoog, M. (2003) 'Visualizing value creation through the management control of intangibles', *Journal of Intellectual Capital*, Vol. 4, No. 4, pp.487–504.
- Slater, S. and Narver, J. (1995) 'Market orientation and the learning organisation', *Journal of Marketing*, Vol. 59, No. 3, pp.63–74.
- Topkins, M. (1995) 'The economics of modern manufacturing', *American Economic Review*, Vol. 85, No. 4, pp.991–995.
- Tsan, W-N. and Chang, C-C. (2005) 'Intellectual capital system interaction in Taiwan', *Journal of Intellectual Capital*, Vol. 6, No. 2, pp.285–298.
- Ulrich, D. (1998) 'Intellectual capital = competence X commitment', *Sloan Management Review*, Vol. 39, No. 20, pp.15–26.
- Viedma, J.M. (2003) 'In search of an intellectual capital general theory', *Electronic Journal on Knowledge Management*, Vol. 1, No. 2, pp.213–226.
- Wildt, A.R., Lambert, Z.V. and Durand, R.M. (1982) 'Applying the jackknife statistics in testing and interpreting canonical weights, loadings and cross-loadings', *Journal of Marketing Research*, Vol. 19, pp.99–107.
- Wold, H. (1982) 'Systems under indirect observation using PLS', in C. Fornell (Ed). *A Second Generation of Multivariate Analysis*, NY: Praeger, pp.325–347.

## Note

- <sup>1</sup>A copy of the questionnaire can be requested from the corresponding author or downloaded at <http://www.NickBontis.com/Research.htm>.