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## Intellectual capital and business performance in the Portuguese banking industry

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**Abstract:** Previous empirical studies confirm that intellectual capital has a significant and substantive impact on performance. The purpose of this research is to examine the inter-relationships and interactions among intellectual capital components and business performance in the Portuguese banking industry. The concept of relational capital was extended to include 'stakeholder orientation' items. Model development and hypothesis testing was conducted using PLS on a sample of 253 respondents from 53 organisations. Results show a confirmation of previous studies as it relates to hypothesis testing but a difference in psychometric item evaluation given the unique geographical and sectoral context. Recommendations are then made for researchers and practitioners.

**Keywords:** human capital; intellectual capital; relational capital; structural capital; PLS.

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## **1 Introduction**

With the rise of the ‘innovative era’, knowledge has become the most valuable economic resource (Drucker, 1993; Stewart, 1997; Sveiby, 1997; Bontis, 1999). Only knowledge provides the opportunity to improve the wealth of nations, the growth of organisations and the value of individuals (Bounfour and Edvinsson, 2005; O’Donnell et al., 2006). Accepting knowledge as a resource suggests that knowledge can be transferred, combined and used (Grant, 1996; Spender, 1996) and it may be a potential source of sustainable competitive advantage (Nonaka and Takeuchi, 1995; Edvinsson and Malone, 1997; Bontis, 2002; Choo and Bontis, 2002). In this context, knowing how an organisation creates value, based on its potential of knowledge, becomes a central question in management research (Bontis, 1999). Moreover, value creation resides at the very heart of strategic management literature and it is the primary rationale of intellectual capital (Edvinsson and Sullivan, 1996; Petrash, 1996; Roos and Roos, 1997; Bontis, 2001). There is evidence that the form and context of organisations are in transition and a knowledge perspective holds a more holistic model (Bagozzi and Phillips, 1982). As such, the drivers of value creation have also changed. Inventory and capital cannot create value if they are not activated and combined and even, knowledge is not worth much, if it is not put to productive use along with other resources of the firm. Firms create value, combining different types of resources (tangibles and intangibles) and by supporting the interactions among them, which can provide higher intellectual (Choo and Bontis, 2002) and financial potential (Bontis, 2003).

Intellectual capital is essentially defined as the knowledge assets that can be converted into value (Edvinsson and Sullivan, 1996). This means that excluded are all irrelevant intangibles that have no function over the firm’s future potential. In this sense, intellectual capital is a matter of creating and supporting connectivity between all sets of expertise, experience and competences inside and outside the organisation. Intellectual capital is a phenomenon of interactions and complementarities, meaning that a resource’s productivity may improve through the investments in other resources. Therefore, it is vital to identify which resources are net value creators and which are net value destroyers – sources or sinks in intellectual capital terminology (Chatzkel, 2002). Empirical research (MERITUM, 2002) confirms that it is more important to prove that intellectual capital creates value than to understand how to report it effectively. Thus, our focus is on intellectual capital value drivers and the way its different components interact to generate value.

The banking industry has been undergoing dramatic changes over the last decade, with both structural and technological advances pressing top management to rethink their business strategies. Financial globalisation, intensified competition, Information and Communication Technology (ICT) developments, deregulation and (re)regulation are the principal drivers for change. Following entry into the European Community in 1986, banking reforms transformed the Portuguese financial system into one of the most

competitive and efficient in the European Union. The changing nature of banking, where banks are moving from on-balance to off-balance sheet activities, together with an increased involvement in capital markets, have created a need for skills and transaction systems that are quite different from those of traditional lending. These new technological and organisational challenges have resulted in a demand for new skills. Additionally, the risk profile of banks is changing both in its composition and its complexity, making intellectual capital assessment a vital element in banking strategies.

Sullivan (2000) argues that intellectual capital has its origin in the resource-based view of the firm (Penrose, 1963; Rumelt, 1984; Wernerfelt, 1984; Barney, 1991). The knowledge-based view of the firm suggests that the primary firm's rationale is the creation and application of knowledge (Grant, 1996). Strategically, the notion of intellectual capital is linked to the ability to create and apply the potential of an organisation's knowledge. Reciprocal benefits may arise to both intellectual capital research and strategic management literature. Intellectual capital research provides a theoretical bridge for exploring the linkage between the static notion (i.e. knowledge stocks) and the dynamic notion (i.e. knowledge flows) of the firm's resource-based view. In this sense, whether the resource and the knowledge-based view of the firm are the frameworks for the theoretical development of intellectual capital, it is also true that the intellectual capital literature provides the strategic management a holistic perspective of value creation. Additionally, important insights on interdisciplinary perspectives emerged as an attempt for understanding the intellectual capital field as a whole (Marr, 2005).

A phenomenon as complex as intellectual capital, requires comprehensive theoretical and empirical development. However, some academics simply claim that more rigorous empirical testing is needed (Marr, Gray and Neely, 2003). A consensus exists in the literature that the linkage between theoretical definitions and their corresponding measures is generally weak (Churchill, 1979; Hughes, Price and Marrs, 1986; Straub, 1989; Venkatraman, 1989). The process of construct development and measurement is at the core of theory construction. Linking theory construction (exploratory) to theory testing (confirmatory) is a *sine qua non* condition for the management theory development. Besides, it is vital that researchers be able to compare findings of their studies with those of their projects that differ in settings and time periods. Methodologically, intellectual capital research may learn from other disciplines it is partly related to such as human resources, information technology and marketing (Churchill, 1979; Straub, 1989; Wright, McMahan and McWilliams, 1994).

Previous studies (Bontis, 1998; Bontis, Keow and Richardson, 2000) confirm a very strong and positive relationship between intellectual capital and business performance. However, we recommend that this link should be confirmed in other international settings and in specific industries. The purpose of our study is:

- 1 to examine interrelationships among intellectual capital components and business performance and
- 2 to test interaction effects among intellectual capital components and business performance.

## 2 Conceptualising intellectual capital

It is recognised that intellectual capital is embraced in every facets of economic, sociological, political and managerial development ‘in a manner previously unknown and largely unforeseen’ (Petty and Guthrie, 2000), which turns intellectual capital into a prominent business research topic (Bontis, 1999; Serenko and Bontis, 2004), demanding a rigorous theoretical framework. Other research studies (Brennan and Connell, 2000; Guthrie et al., 2003) provide a thorough understanding of the evolution of the intellectual capital field from its historical roots.

At least three elements of intellectual capital stand out from the literature:

- 1 its intangibility
- 2 the fact that it creates value and
- 3 the growth effect of collective practice.

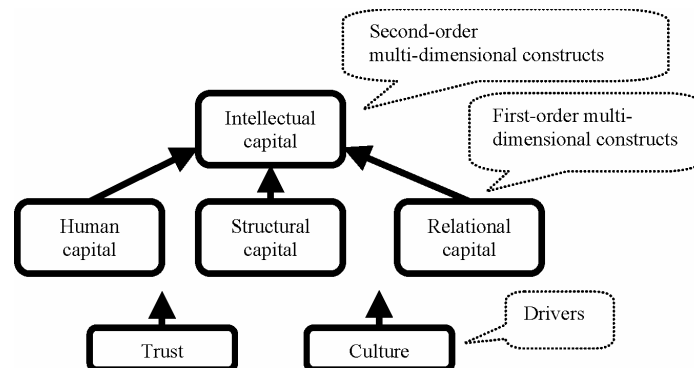
A common taxonomy has emerged in which intellectual capital adopts a tripartite dimension which includes:

- 1 human capital
- 2 structural capital and
- 3 relational capital.

More recently, a fourth component has been proposed. Rothberg and Erickson (2002) propose competitive capital as an important intellectual capital element, while Davies and Magowan (2002) elect social capital, arguing that intellectual capital is created on exchange and combination of knowledge that emerges from social relationships.

A consensus exists that none of the dimensions is alone valuable. Value is created and nurtured through the effective interaction of the three dimensions of intellectual capital. Our study follows the conceptualisation adopted by Bontis (1999). Intellectual capital is a second-order multi-dimensional construct, identified by three components (human capital, structural capital and relational capital) and two drivers (trust and culture) in Figure 1.

**Figure 1** Conceptualisation of intellectual capital



Source: Bontis (1999).

### 2.1 *Human capital*

Human capital is considered the primary element of intellectual capital and the most important source of sustainable competitive advantage (Nonaka and Takeuchi, 1995; Edvinsson and Malone, 1997; Sveiby, 1997; Seleim, Ashour and Bontis, 2004). Surely, this is nothing new. Economists have long recognised that human capital is an important part of the wealth of nations, where investment in human beings improves markedly the quality of work, which is the major source of economic growth (Schultz, 1961). Organisations operating in different contexts (Ordóñez de Pablos, 2002) elect human capital indicators as the most important to be reported.

A macroeconomic perspective recognises human capital as the driver of national economic activity, competitiveness and prosperity (OECD, 1996). On individual level, human capital is viewed as a combination of four elements:

- 1 genetic inheritances
- 2 education
- 3 experience and
- 4 attitudes about life and business (Hudson, 1993).

Bontis (1998), emphasising the organisational perspective, refers to human capital as ‘the source of innovation and strategic renewal’. However, human capital must be combined with relational and structural elements in the organisation, to create value.

Given that human capital comprises the individual’s education, skills, values and experiences, these elements cannot be permanently housed in an organisation. Ulrich (1998), argues that employees’ competence and commitment (intellectual capital = competence × commitment) would likely predict other positive outcomes as customer loyalty, productivity and job performance. On the other hand, some authors (Becker et al., 1996) found that commitment to supervisors’ goals and values – e.g. via leadership, socialisation and team building – was more positively related to performance than was commitment to organisations. Bontis and Fitz-enz (2002) found a strong positive link between employee commitment and business performance. According to the authors, general employee sentiment in an organisation which is described as a function of employee satisfaction, commitment and motivation positively impacts the sharing and generation of knowledge, retention of key people and ultimately, business performance. So, firms should attract qualified employees, manage professional intellect (Quinn, Anderson and Finkelstein, 1996) and make their knowledge more productive, by turning intellectual capital into customer value through collaboration (Chauhan and Bontis, 2004).

Increased training of employees may lead to higher productivity and enhanced creativity (Stovel and Bontis, 2002), resulting in satisfied and loyal clients. Team work is believed to increase innovation, productivity and speed-to-market (Henderson and Cockburn, 1994). Therefore, knowledge transfer is closely connected to motivation. Managing motivation, namely balancing intrinsic and extrinsic motivation is an important and hard-to-imitate source of competitive advantage (Osterloh and Frey, 2000). However, sharing and generating knowledge is primarily a voluntary act, always depending on the willingness of its owners.

Banks rely on stable and long lasting relationships with their clients. This largely depends on employees. In this context, employees' performance is a critical differentiator in bank performance (i.e. the quality of bank relationships depends on the calibre of the employees and their ability to satisfy client needs). Besides, profits in the banking industry are seen to result more from superior execution, than from structural competitive barriers (Bhide, 1986). Additionally, product innovations are quickly copied, resulting in managerial innovation playing a crucial role in performance differentiation. Hence, interaction between human capital and relational capital is a crucial strategic issue in the banking industry.

## *2.2 Structural capital*

Structural capital is a valuable strategic asset, which is comprised of non-human assets such as information systems, routines, procedures and databases. It is the skeleton and the glue of an organisation because it provides the tools and architecture for retaining, packaging and moving knowledge along the value chain.

However, the banking industry has recently changed. Globalisation, deregulation and internationalisation have created new business challenges. In the past, banks sought to improve their balance sheet and asset growth, thereby increasing their scale and hopefully profitability. But since the Basle II Accord<sup>1</sup>, the emphasis has focused on asset productivity, capital efficiency and revenue growth. In January 2001, the Basle Committee on Banking Supervision proposed a new capital adequacy framework to respond to deficiencies in the 1988 Basle I Accord on credit risk. As an outcome of the Basle Accords, ICT has been used to reduce costs and increase efficiency (e.g. reducing levels of risk exposure, improving investment decision, transforming the nature of retail banks). The most advanced banking institutions already employ sophisticated systems to assess risk management. However Andreou and Boone (2002) observed that information quality is more related to improvements in work environment (e.g. staff morale, more interesting work) than to ICT investment or firm size. Within this context, efficiency and innovation become the drivers of banking performance. Furthermore, the authors argue that other factors such as leadership and management style must also complement any ICT investment. This supports the idea that structural and human capital are interdependent and 'go together' in the creation of intellectual capital. Edvinsson (2002) calls this the IC multiplier, i.e. multiplying the human capital potential with its surrounding structural capital.

## *2.3 Relational capital*

Relational capital is the knowledge embedded in relationships with customers, suppliers, industry associations or any other stakeholder that influence the organisation's life. Recognising the importance of all knowledge flows generated from outside to inside and vice-versa, Bontis (1999) expanded the concept of client capital to include all external relationships (e.g. suppliers, trade associations and joint-ventures). Bontis also argues that relational capital can be measured as a function of longevity and defends that its conceptualisation emerges from the 'market orientation' (Kohli and Jaworski, 1990; Narver and Slater, 1990).

Market orientation is defined as the organisation-wide generation, dissemination and responsiveness to market intelligence. Market intelligence is a broad concept that

includes customer's verbalised needs and preferences and analysis of exogenous elements that influence those needs and preferences. Although moderated by internal and external variables, there exists evidence of a positive relationship between market orientation and:

- 1 business performance (Dawes, 2000)
- 2 new product performance (Ramaseshan, Caruana and Pang, 2002)
- 3 innovation (Gatignon and Xuereb, 1997) or
- 4 learning organisation (Narver and Slater, 1995). Furthermore, Darroch and McNaughton (2002) demonstrate that market orientation is a necessary condition to knowledge management orientation.

Competitive intelligence is a market orientation dimension focusing on the competition defined as an understanding of the strengths, weaknesses, capabilities and strategies of competitors and their actions (Kohli and Jaworski, 1990; Narver and Slater, 1990). Although marketing literature recognises the importance of this dimension, little research has tested its association with performance within the intellectual capital framework. However, Day and Wensley (1988) defend that it is difficult to exclude competitors when studying market orientation because they directly or indirectly affect client preferences. Dawes (2000) also found that, the components of a market orientation, a competitor's orientation emerges as the variable with the strongest association with the performance. In fact, competitive intelligence be a source of innovation and new product development (Dawes, 2000; Rothberg and Erickson, 2002). Besides, by understanding competitors' strengths and strategies, organisations benefit from knowing which products to avoid or launch in the marketplace.

Some researchers (Greenley, 1995; Greenley and Foxall, 1996, 1997) have emphasised the importance of including stakeholder groups within the concept of market orientation. In theory, there is a general assumption that companies must address the individual interests of all stakeholder groups in order to be successful and that these orientations will be positively associated with performance, however, there is a little empirical evidence to support this (Greenley and Foxall, 1997). A possible reason for this fact is the complexity of the phenomenon, given the wide range of conflicts that typically exist in complex organisations. The stakeholder concept requires an organisation to acknowledge the needs of those who affect it and those affected by it. However, many organisations, even small ones, have so many stakeholders that it is difficult to satisfy all of them. Thus, it is important to identify key stakeholders. The highlights within the extant literature of stakeholder orientation include and understanding of the interests of different groups in term of research, management judgment, corporate culture, corporate mission and order of priority.

Finally as it relates to relational capital, there is empirical evidence of employees' satisfaction, motivation and commitment having a positive influence in customer satisfaction, loyalty and retention, leading to higher firm's productivity (Kaplan and Norton, 1996; Horibe, 1999). Researchers generally agree that the rejuvenation of intellectual capital inside the firm, requires a sense of alignment with relational to protect the organisation from market obsolescence (Håkansson and Snehota, 1995; Gibbert, Leibold and Voelpel, 2001).

In a competitive and turbulent environment, banks recognise that most existing interaction depends on ICT. Banks and their customers have become more flexible and

more communicative, partly owing to new technology and partly due to a higher level of education and greater competence. In addition to reducing costs, ICT helps improve quality through the provision of real-time operations, constant updating of customer information, reduced delays, increased reliability of outputs and standardization of decision-making. Customer creation-value does no longer lie in a single transaction. It is nurtured and developed over a lifetime. Consequently, dynamic interaction between structural capital and relational capital is a fundamental goal for banks.

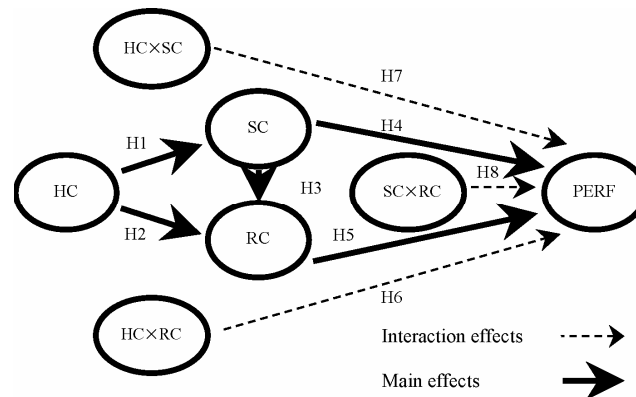
#### 2.4 Culture and trust

Culture is the glue that holds together the firm. It evolves over time, from the deep knowledge of the organisation's internal capabilities, vision, traditions and values. A culture, in which people feel comfortable with failure encourages cooperation and promotes innovation. Trust is a fundamental construct to organisational life (Rousseau et al., 1998). Trust has been discussed in the literature as a prerequisite for knowledge sharing (Rolland and Chauvel, 2000). Additionally, in highly competitive industries, such as financial services sector, trust has a vital importance in the development of online banking relationships due to the lack of physical interaction between bank personnel and customer (Mukherjee and Nath, 2003).

### 3 Proposed model and hypotheses

As an extension of the aforementioned conceptualisation of intellectual capital, we present a model (see Figure 2) which comprises of the interrelationships and the interactions among intellectual capital components and business performance.

**Figure 2** Research model



Embedded in this model are the following hypotheses (H1–H2) that we intend to test:

- H1.* Human capital is positively associated with structural capital.
- H2.* Human capital is positively associated with relational capital.
- H3.* Structural capital is positively associated with relational capital.

*H4.* Structural capital is positively associated with business performance.

*H5.* Relational capital is positively associated with business performance.

*H6.* Relational capital positively moderates the relationship between the human capital and business performance.

*H7.* Structural capital positively moderates the relationship between the human capital and business performance.

*H8.* Relational capital positively moderates the relationship between the structural capital and business performance.

## **4 Research methodology**

There is very little empirical research as it relates to the Portuguese financial services sector and virtually no structural equation models that have tested intellectual capital in this context in particular. According to Venkatraman (1989), we follow a ‘variance perspective’, defined as exploratory research which aims to address operational measures and instrument validation.

### *4.1 Measurement instrument*

We extended the original survey instrument developed by Bontis (1997), administered in Canada and Malaysia (Bontis, 1998; Bontis, Keow and Richardson, 2000), with eight more items reflecting ‘competitor orientation’ and ‘stakeholder orientation’ concepts. The questionnaire was translated into Portuguese and back into English and reviewed by two independent bilingual translators. With a total of 71 items and a cover letter explaining the concept of intellectual capital, the questionnaire was eight pages in length including space for comments. It was administered with a targeted cover letter from the President of the Portuguese Institute of Banking Management explaining the aims of the study, its academic purpose and assuring respondent confidentiality. The ten performance items were reworded from the original in accordance with standard banking system accounting measures reflecting a more familiar financial language. Respondents were asked to state how their bank’s performance compared relative to their competitors.

Considering that each stakeholder group has its own expectations, needs and values and that key stakeholders need to be identified in line with organisational values, we followed Freeman’s (1984) suggestion, using a ‘stakeholder map’, where respondents select the five most important stakeholders groups. Greenley and Foxall (1997) also used five stakeholder groups to study ‘stakeholder orientation’ in UK companies. The order of priority for the most important stakeholders groups was: clients, employees, competitors, sector associations (domestics and Europeans) and associates in other countries.

### *4.2 Data collection*

While a multi-industry sample would permit an examination of inter-industry effects and potentially broaden the study’s generalisation as recommended by Bontis (1998), we believe that it would be critical to do an in-depth review of this particular sector given its prominence as a relatively new but important EU region.

Data were collected from a sample of 53 banks, given an entire population of 62 banks operating in all of Portugal. All 53 banks are affiliated members of the Portuguese Bankers Association. Banking has been recognised as one of the most competitive and efficient sectors in Portuguese economy and highly respected within the European Union (Banco of Portugal, 2003; Canhoto and Dermine, 2003). A range of key informants was sought, including CEO's, regional directors and the directors of marketing, finance, human resources, training and development and information systems. Despite the limitations of the 'key informant' methodology (Phillips 1981; Kumar, Stern and Anderson, 1993), we use this method of data collection because the organisational characteristics we intend to measure are only known by a small select set of members in the upper echelons of a bank (John and Reve, 1982). Besides, given the strategic nature of the intellectual capital topic, researchers recommend the collection of data from respondents who are at least managers or directors within the organisation (Bontis, 1998; Bukh, Larsen and Mouritsen, 1999).

The measurement instrument was pre-tested through personal interviews with eight banking managers. To prevent further ambiguity and semantic issues, two independent academic experts also reviewed the questionnaire's wording. The survey instrument was then administered as a test pilot to evaluate the validity of the instrument. A convenience sample of 178 employees of one organisation (including first, second, third and fourth-level executives) was targeted. A total of 151 respondents returned the questionnaires for an 84% response rate for the test pilot phase. The remaining 27 employees explained that they did not have enough information to answer the question. This reinforced our perception that, even at various levels, not all managers have enough 'strategic awareness' (Hambrick, 1981) to complete the questionnaire.

Given that the test pilot assured our confidence in the translated survey instrument, it was now ready for the main study and hypothesis testing. Respondents were not chosen at random for the main study to secure high quality data. Instead, preliminary interviews 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; Bontis, 1998). An initial sample of 430 executives (i.e. chief level, first and second level) was drawn from a master list of 1081 bankers registered with the association. Questionnaires were personally delivered (54) or sent by mail (376). After 3 weeks, 42 completed answers were returned. A total of 253 completed surveys were returned after 8 weeks which represented a response rate of 59%. Of the 253 completed surveys, 176 were returned by mail and 77 were collected in person.

### *4.3 PLS overview*

The hypotheses were tested using Partial Least Squares (PLS), specifically, PLSGRAPH v.3.00. PLS is a structural equation modelling technique sometimes described as an example of 'second generation multivariate analysis' (Fornell, 1987). Structural equation modelling techniques allow researchers to model and examine a series of relationships simultaneously, which has advantages over first-generation techniques where relationships are examined one at a time. For this reason, PLS is considered a powerful tool in social and behavioural sciences where theories are formulated in terms of hypothetical constructs, which are theoretical and cannot be observed or measured

directly. It is a common methodological approach in intellectual capital research (O'Regan et al., 2001; Bontis, Crossan and Hulland, 2002).

The basic distinction between PLS and alternative methodologies, such as LISREL, rests on the researcher's objectives (Barclay, Thompson and Higgins, 1995). LISREL is parameter-oriented, best suited for testing theory (i.e. in a confirmatory sense), while PLS is prediction-oriented best suited for the construction of theory (i.e. in an explanatory sense). PLS is an appropriate research tool in situations where theory is weak or when the available measures do not conform to a rigorously specified model. Under the PLS approach all measured variance is useful variance to be explained, the primary concern being the prediction of dependent endogenous variables (e.g. business performance).

Conceptually, PLS is an iterative combination of principal components analysis relating measures to constructs (i.e. outer relations) and path analysis allowing a causal chain system of constructs (i.e. inner relations). PLS estimation does not require assumptions of normality or independence of observations. Besides, it works well with small samples and is better suited to exploratory work. For this reason, Wold (1982) labelled this approach as 'soft modelling'. Because PLS considers all path coefficients simultaneously (i.e. allowing analysis of direct, indirect and spurious relationships) and estimates multiple individual item loadings in the context of a theoretically specified model, rather than in isolation, it allows the researcher to avoid biased and inconsistent parameter estimates for these equations. These advantages have encouraged PLS applications in an increasing number of fields (e.g. marketing, information systems, strategic management and knowledge management), including intellectual capital. However, its use demands careful thought to:

- 1 the set of measures used to represent the constructs
- 2 the relationship between the constructs
- 3 the nature of relationships between constructs and measures (Hulland, 1999).

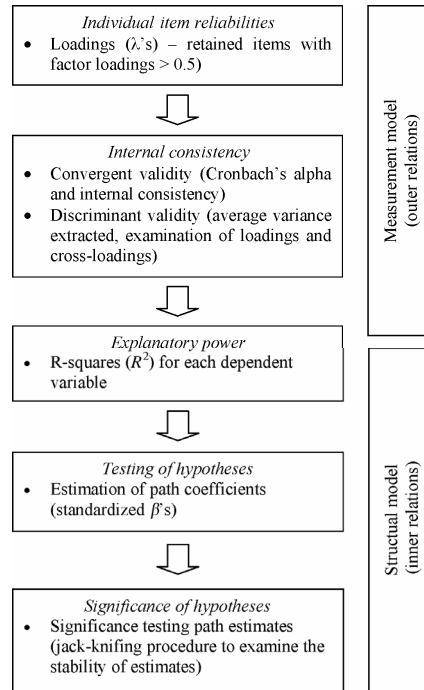
Although PLS estimates parameters for both the links between measures and constructs (i.e. loadings) and the links between the constructs in the model (i.e. path coefficients), at the same time, PLS proceeds in two stages. The first stage is to assess the measurement model (i.e. the relationships between the constructs and the indicators used to measure them). The second stage requires the evaluation of the structural model (i.e. to assess the explanatory power of independent variables and examining the size and the significance of path coefficients) (Chin, 1998). We report in Figure 3 the paths for evaluating the measurement and the structural models.

The nature of the links between constructs and measures are referred to as epistemic relationships or 'rules of correspondence' (Bagozzi, 1984). Two basic types of epistemic relationships are considered relevant to causal modelling: reflective indicators and formative indicators. In the first case, indicators are viewed as reflecting the unobserved construct, with the construct 'causing' the observed variables. In contrast, formative indicators define or 'cause' the construct. A defined construct is determined by a linear combination of its indicators. In our case, all indicators were specified as 'reflective' indicators, implying that our variables 'reflect' or are manifestations of the constructs. In causal sense, it means that the constructs precede the indicators.

The 'rule of thumb' for sample size requirements suggests that it will be equal to the larger of the following:

- 1 10 times the scale with the largest number of formative indicators (scales with reflective indicators can be ignored) or
- 2 10 times the largest number of antecedent constructs leading to an endogenous construct. In our study we applied the second requirement as all indicators are reflective. The final full test with interaction effects would have 5 constructs. Therefore, a minimum of 50 ( $5 \times 10$ ) would be required. Our sample size is 253.

Figure 3 Methodological approach to testing research hypotheses



## 5 Data analysis

### 5.1 Pilot test results

The pilot test was used to validate the survey instrument. We inspected the reliability of measures using Cronbach's alpha. The reliabilities for each of the four constructs were greater than 0.93, exceeding the minimum threshold level of 0.7, considered good for exploratory research (Nunnally, 1978). We then used principal component analysis to select items with loadings of at least 0.5 on their corresponding construct (Hair et al., 1992). To confirm our factor findings, we used PLS to assess individual item reliabilities. We retained loadings of 0.5 or greater, as recommended by Chin (1998) who argues that 'at early stages of scale development, loadings of 0.5 or greater may be acceptable if there exists additional indicators for describing the latent construct'. Other authors (Birkinshaw, Morrison and Hulland, 1995) have also followed this criterion in

exploratory studies. Table 1 outlines the results of both PLS and principal component analysis on all the items.

**Table 1** Loadings and principal component analysis

<i>Items</i>	<i>PLS loadings &gt; 0.50</i>	<i>Principal component analysis</i>			
		<i>Human capital (H)</i>	<i>Relational capital (R)</i>	<i>Structural capital (S)</i>	<i>Performance (P)</i>
H1	0.8212	0.788	–	–	–
H3	0.8526	0.731	–	–	–
H5R	0.6345	0.631	–	–	–
H6	0.8633	0.750	–	–	–
H7	0.7780	0.763	–	–	–
H8	0.8893	0.820	–	–	–
H9	0.8381	0.729	–	–	–
H10	0.8688	0.785	–	–	–
H11	0.9027	0.797	–	–	–
H12	0.8707	0.772	–	–	–
H15R	0.7472	0.662	–	–	–
H17	0.8190	0.683	–	–	–
H18	0.8009	0.701	–	–	–
H20	0.8147	0.707	–	–	–
R6	0.7980	–	0.552	–	–
R8	0.8326	–	0.531	–	–
R9	0.8315	–	0.571	–	–
R10	0.7976	–	0.537	–	–
R11	0.8300	–	0.532	–	–
R14	0.7739	–	0.573	–	–
R16	0.7790	–	0.593	–	–
R17	0.8294	–	0.673	–	–
R18	0.7047	–	0.597	–	–
R19	0.7138	–	0.668	–	–
R20	0.5301	–	0.589	–	–
R21	0.5057	–	0.688	–	–
R22	0.5819	–	0.676	–	–
R23	0.5929	–	0.722	–	–
S2	0.6822	–	–	0.631	–
S3	0.7019	–	–	0.634	–
S6	0.7741	–	–	0.795	–
S7	0.7903	–	–	0.709	–
S8	0.8281	–	–	0.741	–

**Table 1** Loadings and principal component analysis (continued)

Items	PLS loadings > 0.50	Principal component analysis			
		Human capital (H)	Relational capital (R)	Structural capital(S)	Performance (P)
S9	0.7659	–	–	0.731	–
S10	0.8293	–	–	0.705	–
S11	0.7745	–	–	0.598	–
S12	0.7651	–	–	0.580	–
S15	0.7454	–	–	0.555	–
P1	0.8051	–	–	–	0.757
P2	0.8481	–	–	–	0.664
P3	0.7896	–	–	–	0.864
P4	0.7809	–	–	–	0.771
P5	0.8145	–	–	–	0.713
P6	0.8503	–	–	–	0.786
P7	0.8062	–	–	–	0.777
P8	0.8060	–	–	–	0.579
P9	0.7804	–	–	–	0.510
P10	0.8710	–	–	–	0.676

In the principal component analysis, the items were forced into four factors (human capital, structural capital, relational capital and performance), a VARIMAX rotation was used and the output was sorted and ranked based on a 0.5 loading cut-off. Item R12 (Employees in the firm generally understand our targeted market segments and customer profiles.), had a loading of 0.6082 (in the PLS analysis), but cross-loaded on two factors (0.482 in human capital and 0.333 in relational capital) when we examined the principal component analysis. As a result, we dropped this item. Item R4 (Our market share is the highest in the sector). loaded incorrectly at 0.684 for the performance construct and loaded poorly (0.350) in its corresponding construct when we used PLS techniques. It was dropped as well. This left us with 14 indicators for the human capital construct; 14 indicators for relational capital; 10 indicators for structural capital and; 10 items to measure performance. We also compared our results with the studies administered in Canada and Malaysia and confirmed that 15 items were reliable in all three studies and 18 were reliable in at least two contexts (see Table 2).

## 5.2 Final test

Although the measurement and structural parameters are estimated together, a PLS model is analysed and interpreted in two stages:

- 1 the assessment of the reliability and validity of the measurement model and
- 2 the assessment of the structural model.

This sequence ensures that we have reliable and valid measures of constructs before attempting to draw conclusions regarding the relationships among the constructs.

**Table 2** Reliable items – comparing studies in Canada, Malaysia and Portugal

<i>Canada</i>	<i>Malaysia</i>	<i>Portugal</i>	<i>Canada</i>	<i>Malaysia</i>	<i>Portugal</i>
	<i>Human capital</i>			<i>Structural capital</i>	
H6	H3	H1	S1	S7	S2**
H8	H8	H3*	S2	S9	S3**
H9	H10	H5R	S3	S10	S6**
H11	H11	H6**	S4	S11	S7*
H15R	H20	H7	S5	S12	S8
H18		H8***	S6		S9*
H20		H9**	S10		S10***
		H10*			S11*
		H11***			S12*
		H12			S15
		H15R**			
		H17			
		H18**			
		H20***			
	<i>Relational capital</i>			<i>Performance</i>	
C1	C5	R6***	P2	P2	P1
C5	C6	R8**	P3	P3	P2***
C6	C7	R9**	P4	P4	P3***
C8	C10	R10*	P5	P5	P4***
C9	C14	R11	P6	P6	P5***
C14	C16	R14***	P7	P7	P6***
C15	C17	R16*	P8	P8	P7***
		R17*	P9	P9	P8***
		R18	P10	P10	P9***
		R19			P10***
		R20			
		R21			
		R22			
		R23			

\*reliable measures in the Malaysian and Portuguese contexts.

\*\*reliable measures in the Canadian and Portuguese contexts.

\*\*\*reliable measures in all three studies.

**New items added in this study**

- R18 If a competitor launches an intensive campaign targeted at our customers, we implement a response immediately.
- R19 We frequently discuss strengths and weaknesses of our competitors.
- R20 We maintain regular contact with the sector associations – domestic and non-domestic – aiming to share sector's information.
- R21 Information from sector associations is considered important.
- R22 Information from sector associations is considered in our strategic decisions.
- R23 Our bank's culture supports the sharing of information from sector associations.
- R24 Information about competitors is shared across the bank.
- R25 Our competitors are considered a source of innovation.

*5.3 Testing the measurement model*

The following statistical tests were executed to assess the measurement model (outer model), using SPSS: Kolmogorov-Smirnov test for normality; and Cronbach's alpha test for reliability. Using the PLS approach we assessed the adequacy of the measurement model through the examination of: individual item reliabilities; convergent validity; discriminant validity.

We diagnosed the normality of the data by graphical methods and Kolmogorov-Smirnov test. None of the variables were found to follow the normal pattern. We attempted to transform the variables<sup>2</sup> in order to obtain new variables with normal distribution. Only 9 variables fulfil the conditions for the transformation. However, the Cronbach's alpha coefficients for the four constructs were all >0.94.

Individual item reliabilities were assessed by examining the loadings of the measures with their respective construct (see Table 3). All loadings had values >0.707. Convergent validity was assessed using the internal consistency measure developed by Fornell and Larcker (1981). All values, for the four constructs, exceeded the 0.7 threshold recommended by Nunnally (1978).

As proposed by Chin (1998), in the PLS context, we can use two criteria for assessing the discriminant validity:

- 1 Adequate discriminant validity is that a construct should share more variance with its measures than it shares with other constructs in the model. This can be shown in Table 3, where the correlation matrix, including the correlations among various constructs in the lower left off-diagonal elements of the matrix are lower than the square root of the average variance extracted values calculated for each of the constructs along the diagonal.
- 2 Another criterion is that no item should load more highly on another construct than it does on the construct it intends to measure. We examine the matrix of loadings and cross-loadings and found that each block of indicators loaded higher for its respective constructs than indicators for other constructs.

**Table 3** Measurement model results

Constructs	Number of items	Cronbach's Alpha	Internal consistency	Discriminant validity (*) (correlation of constructs)				R <sup>2</sup> (%)		
				H	S	R	P			
Human	14	0.9505	0.9319	0.783						
Structural	10	0.9406	0.9498	0.755	0.809			57.0		
Relational	14	0.9501	0.9563	0.697	0.700	0.782		55.0		
Performance	10	0.9416	0.9507	0.568	0.634	0.592	0.812	44.5		
<i>Loadings</i>										
Human	H1	H3	H5R	H6	H7	H8	H9	H10	H11	
	0.7769	0.7848	0.7958	0.7893	0.7592	0.7768	0.7604	0.7538	0.8210	
	H12	H15R	H17	H18	H20					
	0.7702	0.8127	0.7552	0.7766	0.8287					
Structural	S2	S3	S6	S7	S8	S9	S10	S11	S12	S15
	0.8389	0.8665	0.7954	0.7743	0.8483	0.8028	0.8469	0.7703	0.7901	0.7488
Relational	R6	R8	R9	R10	R11	R14	R16	R17	R18	
	0.7608	0.7272	0.8003	0.7646	0.7489	0.7280	0.8464	0.8433	0.8710	
	R19	R20	R21	R22	R23					
	0.7984	0.7214	0.7445	0.7658	0.8010					
Performance	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
	0.7897	0.8555	0.7593	0.7594	0.7986	0.8292	0.8165	0.8350	0.7795	0.8854

\*Diagonal elements are the square roots of average variance extracted.

**Table 4** PLS path analysis results (standardised beta coefficients and *t*-values)

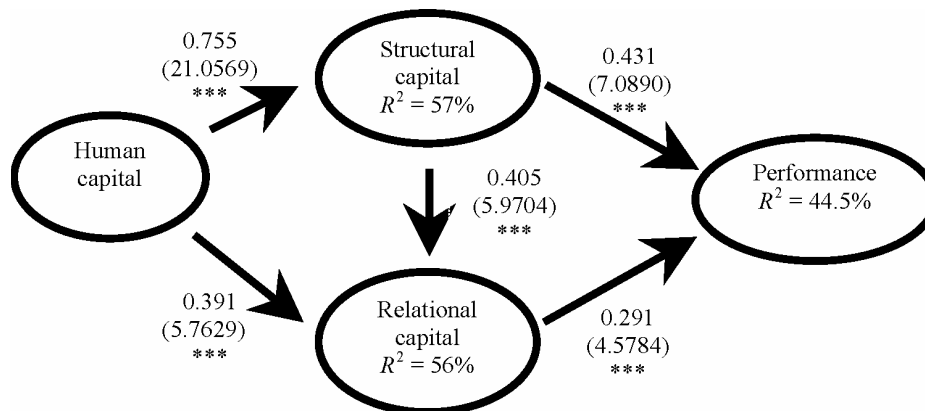
Path	Hypotheses	$\beta$ -path	<i>t</i> -value	Sig.	Support	Direction
H → S	H1	0.755	21.057	*	✓	+
H → C	H2	0.391	5.763	*	✓	+
S → R	H3	0.405	5.970	*	✓	+
S → P	H4	0.431	7.089	*	✓	+
R → P	H5	0.291	4.578	*	✓	+
H × R → P	H6	0.047	0.438	n.s.	✗	+
H × S → P	H7	0.047	1.078	n.s.	✗	+
S × R → P	H8	0.033	0.507	n.s.	✗	+

\*Significant at *p*-value <0.001; \*\*Significant at *p*-value <0.05.

To assess the statistical significance of the loadings and the path coefficients (i.e. standardized betas), a jackknife analysis was performed. In this case 126 sub-samples were created by removing two cases from the total data set. PLS estimates the parameters for each sub-sample and calculate the 'pseudovalues', applying the jackknife formula (Table 4). The five paths proved to be significant at the *p*-value <0.001 level. Results indicate that the explanatory power ( $R^2$ ) for our main effects model is 44.5%.

Next, we ran our model with interaction constructs (i.e.  $H \times S$ ,  $H \times R$ ,  $S \times R$ ), in addition to the main effects. We first ran the model without interactions and saved the construct scores to get each interaction construct (Chin, Marcoline and Newsted, 1996). These construct scores are created by multiplying each standardized indicator with their respective weight provided from PLS. Then, we multiplied the construct scores, creating a single item interaction. Figure 4 depicts the results for our overall structural model, comprising of main and interaction effects. The explanatory power ( $R^2$ ) for our model II is 45.4%.

**Figure 4** Model I (main effects)

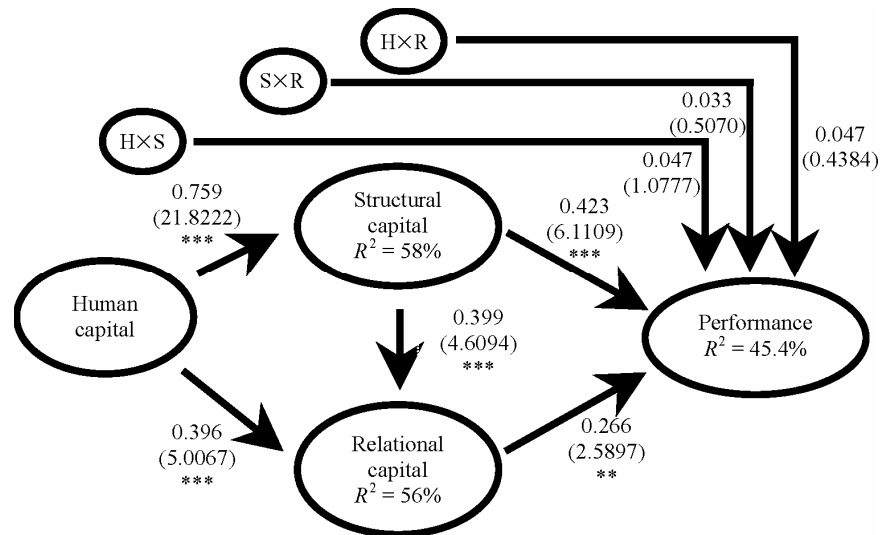


Note: Top number is path,  $t$ -values in brackets, \*\*\*Significant at  $p$ -value  $< 0.001$ .

The results indicate that the three constructs that make up intellectual capital really affect one another. The explanatory power of the models were relatively, plus all of the main effects' paths were substantive, significant and in the expected direction. Ultimately, human capital is the most important construct in the context of the model given its substantive beta value.

An important benefit of the PLS methodology is that it makes it possible to disentangle direct and total effects of the variables included in the model. As can be seen in Figure 5, the total effects of a variable include various indirect 'chain' effects among the variables included in model. Decomposition of effects reveals that Human Capital (HC) has important effects on both structural capital (0.755) and relational capital (0.391). Human capital influences relational capital not only directly (0.391) but also indirectly through the structural capital ( $0.755 \times 0.405 = 0.306$ ), giving a total effect of 0.697. Moreover, human capital also influences business performance indirectly  $HC \rightarrow RC \rightarrow Perf$  ( $0.391 \times 0.291$ );  $HC \rightarrow SC \rightarrow Perf$  ( $0.755 \times 0.431$ ) and  $HC \rightarrow SC \rightarrow Perf$  ( $0.755 \times 0.405 \times 0.291$ ).

Some evidence of moderation exists when the set of interaction terms account for a significant residual variance in the dependent variable (e.g., business performance). The explanatory power ( $R^2$ ) of model II slightly increased from 44.5 to 45.4%, giving some (albeit relatively small) indication that intellectual capital components interact to influence business performance (Figure 5).

**Figure 5** Model II (main and interaction effects)

Note: Top number is path, *t*-values in brackets, \*\*Significant at *p*-value <0.05; \*\*\*Significant at *p*-value <0.001.

## 6 Research implications

It seems that the present study has a number of implications for research and practice. The multi-dimensional and diverse nature of intellectual capital poses many challenges as well as immense opportunities for interdisciplinary and cross-functional learning.

This study clearly intends to contribute to the measurement stream of intellectual capital research by further developing and validating a set of operational measures with strong support in terms of their psychometric properties. We encourage other researchers to use these measures for further theory testing, model development and instrument refinement. Another important conclusion in this study is that the results of the Portuguese study confirm similar results found by Bontis in Canada and Bontis et al. in Malaysia. The test for interaction effects also expanded prior research. We believe that intellectual capital is a phenomenon of interactions, combinations and transformations and thus encourage future researchers to test inter-relationships and interactions in other industries and geographical contexts to generalize these results.

A second contribution of this study relates to the marketing literature. Integrating the 'market orientation' concept into the intellectual capital phenomenon may also provide a better understanding of the 'market orientation' antecedents as it relates to relational capital. Moreover, a number of marketing resources and capabilities fall under intellectual capital resources, such as customer relationships, negotiation skills and market orientation. We argue that a view of the firm based on its intellectual capital can help visualise the importance of marketing and the value it generates.

The third contribution of this study relates to human resource management. We suggest that defining human capital as part of intellectual capital helps organisations understand how employees create value. As individuals, employees do not meet the

requirements of a strategic asset because they easily transfer from one organisation to another. Moreover, when tacit knowledge is not used in the interest of the firm, it does not contribute any value to the firm. Employee productivity depends on a complex combination of factors (e.g. motivation, reward, skill level, experience and even emotion) and organisational support. We recommend that practitioners recognise that although HR (human capital), IT (structural capital) and marketing (relational capital) departments of banks are typically disparate units that often do not integrate their services, they must attempt to reconcile their divergent views and coordinate their budgetary allocations so that a more holistic perspective on the intangible value (intellectual capital) of the firm can be more readily realized.

The fourth contribution of this study relates specifically to information systems management. IT departments of banks cannot create a sustainable competitive advantage because of their eventual imitability by rivals. The true value of information in an organisation depends on its capacity to be leveraged for business purposes. This means that a bank's information systems must help transform its native human capital into organisational capability. It is not just good enough to collect reams and reams of data and produce automated reports of analysis. Information systems must provide business intelligence so that these reports provide critical insight and decision-making frameworks for managers.

Finally, we argue that the intellectual capital is a critical discipline within the field of strategic management and an important area of research in the innovation era. According to the resource-based view, value is generated as a function of the way scarce resources are managed. An increasing number of financial services organisations are trying to understand their resource structure to direct their strategy formulation towards new business models. In this sense, intellectual capital models can help unearth explanations and suggestions for the management of intangibles. The Portuguese banking industry has moved away from traditional 'spread-based' revenue generation (e.g. deposits and loans) towards higher added-value 'fee-based' business models (e.g. mutual funds and estate management). We recommend that managers embrace an intellectual capital perspective of the firm which may provide insight into how intangible resources and their configurations contribute to a sustainable competitive advantage. This more holistic view of the firm's resources can help visualise the importance of strategic assets and the value they create thus providing avenues for innovative new business models.

For practitioners, especially bank managers, our work provides empirical evidence of the interrelationships among intellectual components with positive influence on performance. Given the increased number of mergers and acquisitions in this sector, this study provides bank managers with a better understanding of how intellectual resources develop and drive performance. We recommend that senior bankers utilise an intellectual capital framework when evaluating the assets of a potential target. We also argue that a thorough understanding of the strategic importance of intellectual capital may also encourage banks to financially support the growth of Portuguese knowledge intensive industries.

### *6.1 Directions for future research*

Further research is needed to investigate whether these findings generalise to other countries and other industries. There is some confidence in knowing that the models and items used thus far have been robust enough to work in three different settings.

Interesting relationships may also be detected by examining various international contexts and Hofstede's (1978) cultural dimensions since some authors (Chaminade and Johanson, 2003) argue that cultural diversity has a significant impact on intellectual capital developments at both the firm and national level analysis (Bontis, 2004).

It would also be desirable to see whether an alternative approach to measurement leads to similar results. For instance, it would be interesting to apply the same model principles using VAIC method (Pulic, 2005) or ICBS methodology (Viedma, 2002). Finally, future research should also compare our perceptual results with objective performance measures. A longitudinal study should be undertaken to determine if the associations identified in this paper hold over time.

## References

- Andreou, A.N. and Boone, L.W. (2002) 'The impact of information technology and cultural differences on organizational behaviour in the financial services industry', *Journal of Intellectual Capital*, Vol. 3, pp.248–261.
- Bagozzi, R.P. and Phillips, L.W. (1982) 'Representing and testing organizational theories: a holistic construal', *Administrative Science Quarterly*, Vol. 27, pp.459–489.
- Bagozzi, R.P. (1984) 'A prospectus for theory construction in marketing', *Journal of Marketing*, Vol. 48 pp.11–29.
- Banco Portugal (2003) 'O Sistema Bancário Português: Evolução e Comparação Internacional' ('The financial banking system: Evolution and international comparison') *Boletim Económico Trimestral*, Vol. 9, pp.47–60.
- Barclay, D., Thompson, R. and Higgins, C. (1995) 'The Partial Least Squares (PLS) approach to causal modelling', *Technology Studies*, Vol. 2, pp.285–309.
- Barney, J.B. (1991) 'Firm resources and sustained competitive advantage', *Journal of Management*, Vol. 17, pp.99–120.
- Becker, T.E., Billings, R.S., Eveleth, D.M. and Gilbert, N.L. (1996) 'Foci and bases of employee commitment: implications for job performance', *Academy of Management Journal*, Vol. 39, pp.464–482.
- Bhide, A. (1986) 'Hustle strategy', *Harvard Business Review*, Vol. 64, pp.59–65.
- Birkinshaw, J., Morrison, A. and Hulland J. (1995) 'Structural and competitive determinants of a global integration strategy', *Strategic Management Journal*, Vol. 16, pp.637–655.
- Bontis, N. (1997) *Intellectual Capital Questionnaire*. Hamilton, Canada: Institute for Intellectual Capital Research Inc.
- Bontis, N. (1998) 'Intellectual capital: an exploratory study that develops measures and models', *Management Decision*, Vol. 36, pp.63–76.
- Bontis, N. (1999) 'Managing organizational knowledge by diagnosing intellectual capital: framing and advancing the state of the field', *Int. J. Technology Management*, Vol. 18, pp.433–462.
- Bontis, N. (2001) 'Assessing knowledge assets: a review of the models used to measure intellectual capital', *Int. J. Management Reviews*, Vol. 3, 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, pp.9–20.
- Bontis, N. (2004) 'National intellectual capital index: a united nations initiative for the arab region', *Journal of Intellectual Capital*, Vol. 5, 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, 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, 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, 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, pp.85–100.
- Bounfour, A. and Edvinsson, L. (2005) *Intellectual Capital for Communities*. Oxford: Butterworth-Heinemann.
- Brennan, N. and Connell, B. (2000) 'Intellectual capital: current issues and policy implications', *Journal of Intellectual Capital*, Vol. 1, pp.206–240.
- Bukh, P.N., Larsen, H.T. and Mouritsen, J. (1999) 'Developing intellectual capital statements: lessons from 23 Danish firms. Paper presented at the *International Symposium Measuring and Reporting Intellectual Capital: Experiences, Issues and Prospects*. June, Amsterdam. In proceedings.
- Canhoto, A. and Dermine, J. (2003) 'A note on banking efficiency in Portugal: new vs. old banks', *Journal of Banking and Finance*, Vol. 27, pp.2087–2098.
- Chaminade, C. and Johanson, U. (2003) 'Can guidelines for intellectual capital management and reporting be considered without addressing cultural differences?', *Journal of Intellectual Capital*, Vol. 4, pp.437–455.
- Chatzkel, J. (2002) 'A conversation with Göran roos', *Journal of Intellectual Capital*, Vol. 3, pp.96–117.
- Chauhan, N. and Bontis, N. (2004) 'Organizational learning via groupware: a path to discovery or disaster?', *Int. J. Technology Management*, Vol. 27, pp.591–610.
- Chin, W.W. (1998) 'The partial least squares approach to structural equation modelling', In G.A. Marcoulides (Ed.), *Modern Methods for Business Research*, (pp.295–336) NJ: Lawrence Erlbaum Associates.
- Chin, W.W., Marcoline, B.L. and Newsted, P.R. (1996) 'A partial least squares latent variable modeling approach for measuring interaction effects: results from a Monte Carlo simulation study and voice mail emotion/adoption study', Paper presented at the *17th International Conference on Information Systems*, Cleveland, Ohio, December. In proceedings.
- Choo, C.W. and Bontis, N. (2002) *The Strategic Management of Intellectual Capital and Organizational Knowledge*. New York: Oxford University Press.
- Churchill Jr, G.A. (1979) 'A Paradigm for developing better measures of marketing constructs', *Journal of Marketing Research*, Vol. 16, pp.64–73.
- Darroch, J. and McNaughton, R. (2002) 'Developing a measure of knowledge management', In N. Bontis (Ed.), *World Congress on Intellectual Capital Readings*, (pp.226–242) Boston, MA: Butterworth-Heinemann.
- Davies, C.A. and e Magowan, J. (2002) 'An examination of the transfer of intellectual capital across cultures', In N. Bontis (Ed.), *World Congress on Intellectual Capital Readings*. (pp.356–373) Boston, MA: Butterworth-Heinemann.
- Dawes, J. (2000) 'Market orientation and company profitability: further evidence incorporating longitudinal data', *Australian Journal of Management*, Vol. 25, pp.173–200.
- Day, G.S. and Wensley, R. (1988) 'Assessing advantage: a framework for diagnosing competitive superiority', *Journal of Marketing*, Vol. 52, pp.1–20.
- Drucker, P. (1993) *Post-Capitalist Society*. Oxford: Butterworth-Heinemann.
- Edvinsson, L. (2002) *Corporate Longitude: What you Need to Know to Navigate the Knowledge Economy*. Prentice Hall.
- Edvinsson, L. and Malone, M. (1997) *Intellectual Capital: Realising your Company's True Value by Finding its Hidden Brainpower*. New York: Harper Collins.

- Edvinsson, L. and Sullivan, P. (1996) 'Developing a model for managing intellectual capital', *European Management Journal*, Vol. 14, pp.356–364.
- Fornell, C. (1987) 'A second generation of multivariate analysis: classification of methods and implications for marketing research', In M.J. Houston (Ed.), *Review of Marketing*. (pp.407–450) Chicago: American Marketing Association.
- Fornell, C. and Larcker, D. (1981) 'Evaluating structural equation models with unobservable variable and measurement error', *Journal of Marketing Research*, Vol. 18, pp.39–50.
- Freeman, R.E. (1984) *Strategic Management: A Stakeholder Approach*. Massachusetts USA: Pitman Publishing Company.
- 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.
- Gibbert, M. Leibold, M. and Voelpel, S. (2001) 'Rejuvenating corporate intellectual capital by co-opting customer competence', *Journal of Intellectual Capital*, Vol. 2, pp.109–126.
- Grant, R.M. (1996) 'Toward a knowledge-based theory of the firm', *Strategic Management Journal*, Vol. 17, pp.108–122.
- Greenley, G.E. (1995) 'Forms of market orientation and company performance', *Journal of Management Studies*, Vol. 32, pp.47–66.
- Greenley, G.E. and Foxall, G.R. (1996) 'Consumer and non-consumer stakeholder orientation in UK companies', *Journal of Business Research*, Vol. 35, pp.105–116.
- 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, pp.377–398.
- Guthrie, J., Johanson, U., Bukh, P.N. and Sánchez, P. (2003) 'Intangibles and the transparent enterprise: new strands of knowledge', *Journal of Intellectual Capital*, Vol. 4, pp.429–440.
- Hair, J. Anderson, R., Tatham, R. and Black, W. (1992) *Multivariate Data Analysis With Readings* (3rd ed.). NY: Macmillan Publishing Company.
- 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, pp.263–279.
- Henderson, R. and Cockburn, I. (1994) 'Measuring competence? exploring firm effects in pharmaceutical research', *Strategic Management Journal*, Vol. 37, pp.63–84.
- Hofstede, G. (1978) 'Value systems in 40 countries', Paper presented at the *4th International Congress of the Association for Cross-Cultural Psychology*. In proceedings.
- Horibe, F. (1999) *Managing Knowledge Workers – New Skills and Attitudes to Unlock the Intellectual Capital in your Organisation*. Toronto: John Wiley & Sons.
- Hudson, W. (1993) *Intellectual Capital: How to Build it, Enhance it, Use it*. NY: John Wiley & Sons.
- Hughes, M.A., Price, R.L. and Marrs, D.W. (1986) 'Linking theory construction and theory testing: models with multiple indicators of latent variables', *Academy of Management Review*, Vol. 11, pp.128–144.
- 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.195–204.
- John, G. and Reve, T. (1982) 'The reliability and validity of key informant data from dyadic relationships in marketing channels', *Journal of Marketing Research*, Vol. 19, pp.517–524.
- Kaplan, R.S. and Norton, D.P. (1996) *The Balanced Scorecard – Translating Strategy into Action*. Boston, MA: Harvard Business School Press.
- Kohli, A.K. and Jaworski, B.J. (1990) 'Market orientation: the construct, research propositions and managerial implications', *Journal of Marketing*, Vol. 54, pp.1–18.

- Kumar, N., Stern, L.W. and Anderson, J.C. (1993) 'Conducting interorganizational research using key informants', *Academy of Management Journal*, Vol. 36, pp.1633–1651.
- Marr, B. (2005) *Perspectives on Intellectual Capital: Multidisciplinary Insights into Management, Measurement and Reporting*. Oxford: Butterworth-Heinemann.
- Marr, B., Gray, D. and Neely, A. (2003) 'Why do firms measure their intellectual capital?', *Journal of Intellectual Capital*, Vol. 4, pp.441–464.
- MERITUM (2002) MEasuRING Intangibles To Understand and improve innovation Management. Guidelines for Managing and Reporting on Intangibles. Meritum Project, a TSER Project, Meritum and E\*Know-net project work (2001–2003).
- Mukherjee, A. and Nath, P. (2003) 'A model of trust in online relationship banking', *Int. J. Bank Marketing*, Vol. 21, pp.5–15.
- Narver, J.C. and Slater, S.F. (1990) 'The effect of a market orientation on business profitability', *Journal of Marketing*, Vol. 54, pp.20–35.
- Nonaka, I. and Takeuchi, H. (1995) *The Knowledge Creating Company: How Japanese Companies Manage the Dynamics of Innovation*. New York: Oxford University Press.
- Nunnally, J. (1978) *Psychometric Theory* (2nd ed.). New York: McGraw-Hill.
- O'Donnell, D., Tracey, M., Henriksen, L.B., Bontis, N., Cleary, P., Kennedy, T. and O'Regan, P. (2006) 'On the 'essential condition' of intellectual capital-labour', *Journal of Intellectual Capital*, Vol. 7, pp.111–128.
- O'Regan, P., O'Donnell, D., Kennedy, T., Bontis, N. and Cleary, P. (2001) 'Perceptions of intellectual capital: Irish evidence', *Journal of Human Resource Costing and Accounting*, Vol. 6, pp.29–38.
- Ordóñez de Pablos, P. (2002) 'Evidence of intellectual capital measurement from Asia, Europe and Middle East', *Journal of Intellectual Capital*, Vol. 3, pp.287–302.
- Organisation for Economic Co-operation and Development (OECD) (1996) *Measuring What People Know: Human Capital Accounting for the Knowledge Economy*. Paris: OECD.
- Osterloh, M. and Frey, B.S. (2000) 'Motivation, knowledge transfer and organizational forms', *Organization Science*, Vol. 11, pp.538–550.
- Penrose, E.T. (1963) *The Theory of the Growth of the Firm*. Oxford: Basil Blackwell.
- Petrash, G. (1996) 'Dow's journey to a knowledge value management culture', *European Management Journal*, Vol. 14, pp.365–373.
- Petty, R. and Guthrie, J. (2000) 'Intellectual capital literature review: measuring, reporting and management', *Journal of Intellectual Capital*, Vol. 1, pp.155–176.
- Phillips, L.W. (1981) 'Assessing measurement error in key informant reports: a methodological note on organizational analysis in marketing', *Journal of Marketing Research*, Vol. 18, pp.395–415.
- Pulic, A. (2005) 'Value creation efficiency at national and regional levels: case study – croatia and the european union', In A. Bounfour and L. Edvinsson (Eds), *Intellectual Capital for Communities*. Oxford: Butterworth-Heinemann.
- Quinn, J.B., Anderson, P. and Finkelstein, S. (1996) 'Managing professional intellect: making the most of the best', *Harvard Business Review*, Vol. 74, pp.71–80.
- 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 & Brand Management*, Vol. 11, pp.399–409.
- Rolland, N. and Chauvel, D. (2000) 'Knowledge transfer in strategic alliances', In C. Despres and D. Chauvel (Eds), *Knowledge Horizons: The Present and the Promise of Knowledge Management* (pp.225–236). Boston, MA: Butterworth Heinemann.
- Roos, G. and Roos, J. (1997) 'Measuring your company's intellectual performance', *Long Range Planning*, Vol. 30, pp.413–426.

- Rothberg, H.N. and Erickson, G.S. (2002) 'Competitive capital: a fourth pillar of intellectual capital?' In N. Bontis (Ed), *World Congress on Intellectual Capital Readings* (pp.13–56). Boston, MA: Butterworth-Heinemann.
- Rousseau, D.M., Sitkin, S.B., Burt, R.S. and Camerer, C. (1998) 'Introduction to Special topic forum. not so different after all: a cross-discipline view of trust', *Academy of Management Review*, Vol. 23, pp.393–404.
- Rumelt, R.P. (1984) 'Towards a strategic theory of the firm', In R.B. Lamb (Ed.), *Competitive Strategic Management*. Engelwood Cliffs, NJ: Prentice-Hall.
- Schultz, T.W. (1961) 'Investment in human capital', *American Economic Review*, Vol. 51, pp.1–17.
- Seleim, A., Ashour, A. and Bontis, N. (2004) 'Intellectual capital in Egyptian software firms', *The Learning Organization: An International Journal*, Vol. 11, pp.332–346.
- 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, pp.185–198.
- Slater, S. and Narver, J. (1995) 'Market orientation and the learning organisation', *Journal of Marketing*, Vol. 59, pp.63–74.
- Spender, J.-C. (1996) 'Making knowledge the basis of a dynamic theory of the firm', *Strategic Management Journal*, Vol. 17, pp.45–62.
- Stewart, T. (1997) *Intellectual Capital: The New Wealth of Organizations*. New York: Doubleday/Currency.
- Stovel, M. and Bontis, N. (2002) 'Voluntary turnover: knowledge management friend or foe', *Journal of Intellectual Capital*, Vol. 3, pp.303–322.
- Straub, D.W. (1989) 'Validating instruments in MIS research', *MIS Quarterly*, Vol. 13, pp.147–169.
- Sullivan, P. (2000) *Value-Driven Intellectual Capital: How to Convert Intangible Corporate Assets into Market Value*. New York: John Wiley & Sons.
- Sveiby, K.E. (1997) *The New Organizational Wealth: Managing and Measuring Knowledge-Based Assets*. New York: Berrett-Koehler.
- Ulrich, D. (1998) 'Intellectual capital = Competence × Commitment', *Sloan Management Review*, Vol. 39, pp.15–26.
- Venkatraman, N. (1989) 'Strategic orientation of business enterprises: the construct, dimensionality and measurement', *Management Science*, Vol. 35, pp.942–962.
- Viedma, J.M. (2002) 'Innovation Capability – Benchmarking System (ICBS)', In N. Bontis (Ed.), *World Congress on Intellectual Capital Readings* (pp.243–265). Boston, MA: Butterworth-Heinemann.
- Wernerfelt, B. (1984) 'A resource-based view of the firm', *Strategic Management Journal*, Vol. 5, pp.171–180.
- Wold, H. (1982) 'Systems under indirect observation using PLS', In C. Fornell (Ed.), *A Second Generation of Multivariate Analysis* (pp.325–347). NY: Praeger.
- Wright, P.M., McMahan, G.C. and McWilliams, A. (1994) 'Human resources and sustained competitive advantage: a resource-based perspective', *Int. J. Human Resource Management*, Vol. 5, pp.301–326.

## Notes

- 1 The underlying concept behind the Basel Accords is to strengthen the relationship between economic and regulatory capital – the capital that banks must hold to protect the financial services system from the risk of failure. The Basel II Accord aims to

modernise the global framework for calculating regulatory capital in the financial services industry to protect it from shocks to the system caused by credit defaults, operational failures and market fluctuation. Its scope is much wider than any previous capital regime. It attempts to both standardise regulatory approaches and introduce more flexible and risk-sensitive measures for the calculation of regulatory capital. Basel II intends to capture all 'entrepreneurial risks' within consolidated banking groups. Implementation is required by the end of 2006, for all banks in Europe and many internationally active elsewhere.

- 2 Transforming data provides the researcher with a means to modify the dependent and independent variables, to correct violations of the assumptions of regression (e.g. non-normality). In our study, the assumption was that the ratio of a variable's mean divided by its standard deviation should be  $>4$ . For more details see Hair et al. (1992).