A Resource-based Analysis of IT Personnel Capabilities and Strategic Alignment

Leelien Ken Huang

Graduate Institute of Management of Technology
Feng Chia University
100, Wenhwa Rd. Seatwen, Taichung, Taiwan
leelien.huang@gmail.com Ph: 886-4-2451-7250 ext: 4075

Researchers argue that information technology (IT) personnel capabilities and strategic alignment are important organizational resources. Grounded in the resource-based view, this research examines the relationship between IT personnel capabilities and strategic alignment, showing how companies leverage IT effectively on the basis of complementary and co-specialized organizational resources. This research confirmed those IT personnel's technical skills (e.g., "systems" and "computer") per se are hardly unique and inimitable resources to enable strategic alignment unless comparable efforts are spent to enhance business skills (e.g., "performance skill", "business knowledge", and "organizational skill") as well. Insights gained from this research help researchers and practitioners to better understand and focus their attention on complementary business skills necessary for IT human resources development. Implications are discussed.

Keywords: resource-based view, IT personnel capabilities, strategic alignment
ACM Classification Area: Hm

INTRODUCTION

Contingency theory has contributed to the quality and productivity of information systems (IS) function and to the larger company by providing feedback to manage and improve IS function to better fit the business needs (Benlian and Hess, 2007). Industrial organization theory focuses on how companies use their ability to identify external threats and information technology (IT) opportunities (Porter, 1991). The researcher uses the resource-based view (RBV) as theoretical foundation since it internally emphasizes what and how IT-based resources can be effectively deployed to sustain strategic alignment (i.e., IS-business alignment) (Peteraf, 1993; Tippins and Sohi, 2003; Wernerfelt, 1984).

Despite the unclear definition and criticism (Priem and Butler, 2001), "resources" generally are tangible (e.g., financial, physical assets, etc.), intangible (e.g., image, quality, etc.), and human related (e.g., planning practices, managerial know-how, technical know-how, etc.) (Grant, 1991). The RBV tends to define broadly "resources", including assets, knowledge, capabilities, and organizational processes (Barney, 1991). In the IS literature, IT-based resources include capabilities related to IT infrastructure, IT personnel, and IT-enabled intangibles (Bharadwaj, 2000). The researcher focuses on IT personnel capabilities because they are the foundation of IT infrastructure and are strategically valuable for the IS department to facilitate business processes to generate

Copyright© 2010, Australian Computer Society Inc. General permission to republish, but not for profit, all or part of this material is granted, provided that the JRPIT copyright notice is given and that reference is made to the publication, to its date of issue, and to the fact that reprinting privileges were granted by permission of the Australian Computer Society Inc.

Manuscript received: 28 November 2008
Communicating Editor: Graham Low

intangible resources (e.g., customer responsiveness improvement, knowledge leverage, synergy with other business units and suppliers, etc.) (Chung, Byrd, Lewis and Ford, 2005; Henderson, Venkatraman and Oldach, 1996; Huang, Ou, Chen and Lin, 2006; Luftman, 2003; Ross, Beath and Goodhue, 1996; Rockart, Earl and Ross, 1996).

Within the RBV, IT personnel capabilities are considered unique expertise, competences, and knowledge needed to provide IT services (Byrd and Turner, 2000), generally classified into two major subsets: technical and business skills (Benbasat, Dexter and Mantha, 1980; Melville, Kraemer and Gurbaxani, 2004). Skilled IT personnel potentially affect a company's strategic agility and are critical enablers of strategic alignment (Fink and Neumann, 2007; Luftman, Papp and Brier, 1999; Weill, Subraman and Broadbent, 2002). The RBV regards the strategic alignment as a valuable internal asset, which is the basis for profitability (Barney, 1991; Tippins and Sohi, 2003).

Much literature has broadly examined the relationship between IT-based resources utilization and performance financially (e.g., ROA, ROE, etc.), non-financially (e.g., competitive advantage in differentiation, unique capabilities, etc.), intermediately (e.g., process-related), or affectively (e.g., perception-related) (Davaraj and Kohli, 2003; Kohli and Grover, 2008), but few studies have specifically focused on how skilled IT personnel may contribute to the alignment.

Although current studies have tended to examine the intermediate and affective relationship between IT personnel capabilities and the flexible IT infrastructure (e.g., Fink and Neumann, 2007) or IT-enabled intangibles (e.g., Huang *et al*, 2006), the researcher further focuses on the direct and moderating effect of IT personnel capabilities on the strategic alignment by specifying what type of them can and cannot be sources of the alignment (Tippins and Sohi, 2003).

While Taiwan is well known for its progressive use of IT (Chen, 2003), it has not yet been determined if the traditional RBV that is important in the Western strategic use of IT is also applicable in Taiwan. This research helps to fulfill the conspicuous gap by addressing whether or not technical skills of IT personnel lead to a greater strategic alignment only when leveraged in tandem with other complementary organizational (business) skills (Kettinger and Lee, 2002; Sambamurthy, Bharadwaj and Grover, 2003). This is consistent with the recent trend that IT personnel should combine technical and business skills for IT strategic potential (Bassellier and Benbasat, 2004).

The research is organized as follows. First, the researcher develops the research framework that defines the RBV of IT personnel capabilities and strategic alignment. Next, the researcher provides the methodology, a description of the factors used to measure IT personnel capabilities and strategic alignment, the method used to collect the data, and the results obtained. Finally, the researcher discusses the implications and concludes with the contributions made.

THEORETICAL BACKGROUND

The RBV has been applied to IS works since the 1990s. Examples include IT outsourcing performance discrepancies (e.g., Teng, Cheon and Grover, 1995), senior leadership (e.g., Armstrong and Sambamurthy, 1999), IT knowledge (e.g., Bassellier, Benbasat and Reich, 2003; Teo and Ranganathan, 2003; Tippons and Sohi, 2003; Grover, Gokhale and Narayanswamy, 2009), IT experience-based learning (e.g., Matsuo, Wong and Lai, 2008), dynamic capabilities (e.g., Sher and Lee, 2004), competitive advantage created by IT (e.g., Lai, Zhao and Wang, 2006), senior IT leadership (e.g., Byrd, Lewis and Bradley, 2006), and IT capabilities (e.g., Duhan, 2007; Priem and Butler, 2001).

All of these works generally demonstrate that a sustainable company is capable of possessing unique IT-based resources that are valuable, rare, inimitable, and non-substitutable (i.e., so-called

VRIN attributes) (Eisenhardt and Martin 2000) and are not perfectly mobile (duplicated) in the market (Kearns and Lederer, 2003). Using the RBV as a lens, the researcher was able to view IT personnel capabilities that are likely to be valuable and inimitable as a potential source of the strategic alignment.

Overview of the Research Model

The key concept of the RBV is "complementarity" and "co-specialization" that determine whether IT-based resources can be strategically deployed (i.e., strategic alignment) (Henderson and Venkatraman, 1993; Reddy, 2006; Tippins and Sohi, 2003; Teo and Ranganathan, 2003).

The application of IT together with other complementary organizational resources (e.g., complementary business skills, alignment with business goals, etc.) enhances the business value of IT (Powell and Dent-Micallef, 1997; Kohli and Grover, 2008). IT-based resources such as strategic IS planning process (SISP – a kind of proprietary technology) was once thought to create the competitive value of IT (Reich and Benbasat, 1990; Sabherwal and King, 1995; Sabherwal and Tsoumpas, 1993). However, it is becoming increasingly difficult to keep proprietary (i.e., valuable assets), since a wide variety of business resources (e.g., staff mobility, formal and informal technical/ business communication, problem solving, managerial skills, customer, market, etc.) are involved to disseminate detailed information about SISP for IT decision (Bharadwaj, 2000; Mata, Fuerst and Barney, 1995). Thus, the implementation of IT requires complementary business resources to meet business goals (Tippins and Sohi, 2003).

Moreover, a company applying the necessary IT hardware realizes little advantage without the necessary personnel business skills and managerial processes to use it successfully (Clemons and Row, 1991). While the literature stresses the importance of technical foundations for implementing IT (Chung, Rainer and Lewis, 2003; Keen, 1991), technical systems (e.g., ERP, CRM, EDI, SCM, etc.) per se does not sustain any competitive advantage since rivals can easily duplicate that (Bharadwaj, 2000). Rather, companies must be able to mobilize and deploy IT-based resources through co-specialization of (i.e., co-presence or combination with) other organizational resources, which becomes key to the strategic use of IT (Barney, 1996; Bharadwaj, 2000; Teo and Ranganathan, 2003).

Figure 1 shows the research model demonstrating the RBV of the complementary and co-specialized (moderating) relationship between the two IT personnel capabilities subsets (technical and business skills) and the predictive (direct) relationship between IT personnel capabilities (predictor) and the strategic alignment (criterion).

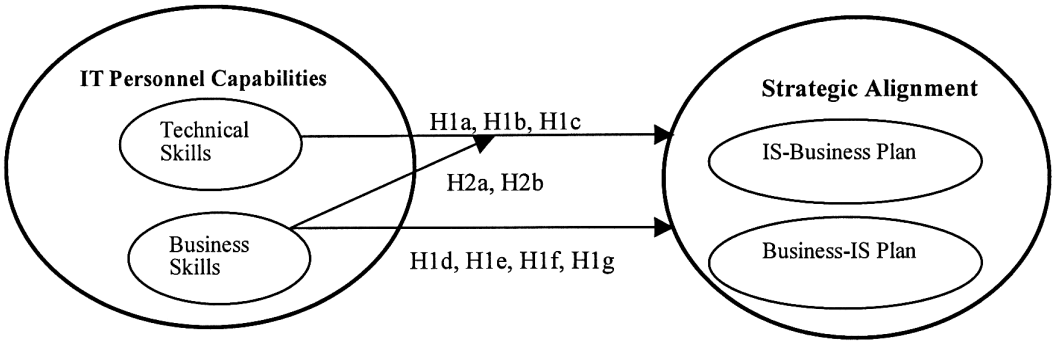


Figure 1: The Research Model

In the model, the researcher argues that companies should compete for IT personnel capabilities that co-specialize technical skills with complementary business skills. These skills co-specialization processes (i.e., alignment) are very socially complex (relationship relevant), have time compression diseconomy (longer time to foster), and exhibit causal ambiguity (successful reason unknown), which are likely to have VRIN attributes and thus become unique IT-based resources that are difficult for the rivals to duplicate (Barney, 1991; Mahoney and Pandian, 1992; Conner and Prahalad, 1996; Eisenhardt and Martin 2000).

When co-presenting technical skills with complementary business skills, these unique IT personnel capabilities effectively coordinate and integrate both IS and business plans, thus improving the strategic alignment (Barney, 1991; Huang *et al*, 2006; Peteraf, 1993; Teo and Ranganathan, 2003; Tippins and Sohi, 2003). The moderating effect of business skills on the alignment reflects a certain complementary and co-specialized level with technical skills.

Criterion: Strategic Alignment

Strategic alignment reflects the extent to which the business mission, objectives, and plans are supported by the IS mission, objectives, and plans (Metha and Hirschheim, 2007; Reich and Benbasat, 2000; Sambamurthy and Zmud, 1999; Hirschheim and Sabherwal, 2001).

Within the RBV, strategic alignment is considered rare, valuable, idiosyncratic, embedded, and inimitable organizational resource (e.g., coordination or integration skills) (Teo and Ranganathan, 2003), which should be contrasted with underlying IT and create competitive advantage (Barney, 1991; Eisenhardt and Martin 2000; Kearns and Lederer, 2003; Peteraf, 1993). Because of its VRIN attributes, strategic alignment is viewed as a dynamic capability reflecting managerial adaptive (aligning) process (e.g., the process of co-presenting technical skills with business skills) that assemble, integrate, and deploy IT-based resources to support overall business goals (Barney, 1996; Jarvenpaa and Ives, 1990; Mata, Fuerst and Barney, 1995; Mahoney and Pandian, 1992; Reich and Benbasart, 1996; Teece, Pisano and Shuen, 1997).

As shown in Table 1, two dimensions of "alignment of IS plan with business plan" and "alignment of business plan with IS plan" describe the strategic alignment where IS and business plans are important cohesive organization planning resources (Teo and Ranganathan, 2003).

Alignment of IS plans with business plans ensures that IS plan supports company direction (Kearns and Lederer, 2004). IT-based resources should be explored and associated with business goals (Sabherwal and Chan, 2001). Alignment of IS plan with business plan helps the company locate its strategic position for greater awareness of potential IT (Kearns and Lederer, 2001; Raghunathan and Raghunathan, 1990).

Alignment of business plan with IS plan focuses on how top management commits certain IT applications according to IS plan (Kearns and Lederer, 2004). Doing so reflects management support of the importance of IT-based resources (Reich and Benbasat, 1996). Alignment of business plan with IS plan helps the company identify contributions of IT and determine priorities for IT investment, build a flexible, cost-effective IT infrastructure, and develop the resources for deploying IT successfully (Ward and Peppard, 2002).

Predictor: IT Personnel Capabilities

Although recent IT personnel capabilities research combine technical, behavioural, and business skills (Bassellier and Benbasat, 2004; Byrd, Lewis and Turner, 2004; Fink and Neumann, 2007; Luftman, Kempaiah and Nash, 2006), technical and business skills are generally examined (Table 2) since business skills encompass behavioural skills relating to the capacity of a company or its

Dimension	Definition	Key Study	Contributor
IS-business Plan Alignment	IS plan reflects business plan	Investigating moderating role of IS-business alignment between IT and performance, showing a synergistic coupling between strategic alignment and IT with company performance.	Byrd, Lewis and Bryan (2006)
		"Relationship management" has a significant impact on IS and business strategies alignment, using balanced scorecard.	Hu and Huang (2006)
		The planning process based on a case study is found to help align IT with business strategies and improve and facilitate the communication on IT project management.	Peak, Guynes and Kroon (2005)
		Validating an IS-business alignment framework that allows executives determine current alignment levels and monitor future alignment required.	Avison, Jones, Powell and Wilson (2004)
Business-IS Plan Alignment	Business plan reflects IS plan	The lack of connection between business and IS planning due to the relatively immature business planning processes within the forces.	Hartung, Reich and Benbasat (2000)
		Business-IS alignment and IT evaluation contribute to high-perceived business value of IT.	Tallon, Kraemer and Gurbaxani (2000)
		Business-IS alignment is a concern for late post-merger between oils and gas companies.	Metha and Hirschheim (2007)

Table 1: Definition of Strategic Alignment Construct

employees to adapt to environmental changes (Benbasat *et al*, 1980; Melville *et al*. 2004).

Enhancing IT personnel capabilities, structural elements (e.g., empowered and autonomous systems design, enriched and shared jobs, team-work processes, and incentives for collaborative learning and sharing of work practices, etc.) create a flexible environment where IT people not only leverage their own technical and business skills but also bear the assets of the entire social-technical network to which employees belong (Nadler and Tushman, 1997). Within the RBV, such assets (i.e., company-specific skills and knowledge) have no known way (i.e., causal ambiguity) for the rivals to short-circuit those elements because a company's idiosyncratic IT personnel capabilities require years to develop (Barney, 1991; Bradawaj, 2000; Lei, Hitt and Bettis, 1996).

IT personnel with a broad range of technical and business skills compose a flexible IT infrastructure that helps design and produce customized products or services since they can communicate well with business people, thus enabling the strategic alignment (Chung *et al*, 2005; Luftman *et al*, 1999). In support of this, Reich and Benbasat (1990) argued that successful IT personnel usually have high levels of technical and business skills, directly leading to the alignment (Feeny and Willcock, 1998; Mata *et al*, 1995; Marchand, Kettinger and Rollins, 2000; Ross *et al*,

Dimension	Definition	Selected Example	References
Technical Skills	IT personnel's specific expertise in such technical areas as systems analysis, computer programming, and model design.	ERP, CRM, SCM, RFID, database management, and emerging technologies, etc.	Bharadwaj (2000) Byrd and Turner (2000; 2001) Lee, Trauth and Farwell (1995) Nelson (1991) Ross *et al* (1996)
Business Skills	IT personnel's ability to understand the overall business environment and specific organizational context, including the relationship among the IS department and business people, the organization, the society, and IT personnel's performance	Company specific knowledge, organi–zation culture, open communication, IT-business collaboration environment, project management, performance	Bassellier and Benbasat (2004) Benbasat *et al* (1980) Bharadwaj (2000) Capon and Glazer (1987) Powell and Dent-Micallef (1997) Tesch, Jiang and Klein (2003) Fink and Neumann (2007)

Table 2: Definition of IT Personnel Capabilities Construct

1996; Wade and Hulland, 2004). Tippins and Sohi (2003) also noted that companies with high level IT personnel are in a superior position to manage the intangible assets that generates market leadership, leading to the alignment (Chung *et al*, 2005).

Thus, companies with skilled IT personnel are expected to integrate IT and business processes effectively, to be aware of and develop reliable IT applications that support business needs cost effectively, to communicate with business units efficiently, and to innovate valuable IT-based products or services in response to dynamics (Byrd *et al*, 2004; Chung *et al*, 2005; Ross *et al*, 1996). Such dynamics make IS department more sophisticated, where IT personnel are likely to be more skilled and flexible because of experiences, skills, and practices accumulated and transplanted through sharing mechanisms (e.g., training, education, learning-by-doing, workshops) (Benbasat *et al*, 1980; Mata *et al*, 1995), leading to a greater alignment (Bharadwaj, 2000; Gupta, Karimi and Somers, 1997; Luftman *et al*, 2006). Based on the definition of IT personnel capabilities in Table 2, the following hypothesis is formulated.

Hypothesis 1 (H1): Technical skills related to (a) systems, (b) computer, (c) model; and business skills related to (d) people, (e) organization, (f) society, and (g) performance directly and positively influence the strategic alignment.

Good technical skills alone do not make successful IT personnel, who must have a business vision to identify new IT opportunities, determine which IT trends are worth pursuing, ensure that the IT infrastructure is constantly evolving, and seek IT-based business innovations (Luftman *et al*, 2006).

Creating a user community that accepts technological changes and embraces new systems usually takes years, during which an IS department must build staff's business sense of mutual trust and commitment to shared goals (Chatfield and Bjorn-Anderson, 1997; Matsuo *et al*, 2008; Sambamurthy and Zmud, 1999). So, systems development requires interactive teams of IT personnel (Bradawaj, 2000).

Thus, business skills are crucial for IT personnel while coordinating the multi-faceted activities associated with the successful implementation of IT (Bharadwaj, 2000). A distinguishing factor of successful companies is sophisticated IT personnel with appropriate business skills (Sambambrthy and Zmud, 1999). When leveraging complementary business skills (Clemons and Row, 1991), IT can create competitive advantage. In a sense, technologically savvy IT personnel are expected to possess business skills to generate better alignment (Lee *et al*, 1995).

Hypothesis 2 (H2): Business skills: (a) are more positively associated with the strategic alignment; and (b) moderate the effect of technical skills on the strategic alignment.

RESEARCH METHODOLODY

Senior IS managers in a single company were selected as respondents. Any possible bias stemming from the single source of information is recognized as a potential limitation. Besides general demographic questions, respondents were asked to score perceived characteristics of overall capabilities of their IT staff and strategic alignment of their companies (7 = *Strongly Agree* to 1 = *Strongly Disagree*).

Measure

As shown in Table 3, there are seven dimensions of IT personnel capabilities construct: systems (SYM), computer (CPR), model (MDL), people (PPL), organization (ORG), society (SCT), and performance (PFM). Two dimensions of strategic alignment construct, IS-business plan alignment (ISBUS) and business-IS plan alignment (BUSIS), were selected for their interpretability and empirical support in prior research. Table 3 also shows the questionnaire items.

Dimension	Survey Question	Research Support
	IT Personnel Capabilities-Technical Skills	
Systems (SYM)		
SYM1	Degree of preparing effective user document	Benbasat *et al* (1980); Bharadwaj (2000); Ravichandran and Lertwongsatien (2002)
SYM2	Degree of effectively evaluating system performance	Benbasat *et al* (1980); Bharadwaj (2000); Ravichandran and Lertwongsatien (2002)
SYM3	Degree of flexible/matured system development	Benbasat *et al* (1980); Bharadwaj (2000); Ravichandran and Lertwongsatien (2002)
Computer (CPR)		
CPR1	Degree of designing and implementing databases with a generalized database management system	Benbasat *et al* (1980); Bharadwaj (2000); Ravichandran and Lertwongsatien (2002)
CPR2	Degree of developing structured or modular programs	Benbasat *et al* (1980); Bharadwaj (2000); Ravichandran and Lertwongsatien (2002)
CPR3	Degree of estimating line and terminal requirements, volume, and message length, queues, etc.	Benbasat *et al* (1980); Bharadwaj (2000); Ravichandran and Lertwongsatien (2002)

Dimension	Survey Question	Research Support
Model (MDL)		
MDL1	Degree of recognizing management model	Benbasat *et al* (1980); Bharadwaj (2000); Ravichandran and Lertwongsatien (2002)
MDL2	Degree of formulating and solving complex simulation model	Benbasat *et al* (1980); Bharadwaj (2000); Ravichandran and Lertwongsatien (2002)
	IT Personnel Capabilities-Business Skills	
People (PPL)		
PPL1	Degree of communicating and interacting with non-IT people	Benbasat *et al* (1980)
PPL2	Degree of recognizing and removing personality problems	Benbasat *et al* (1980)
Organization (ORG)		
ORG1	Degree of identifying organizational key issues and problems	Benbasat *et al* (1980); Ravichandran and Lertwongsatien (2002)
ORG2	Degree of determining the positive and negative IT impacts	Benbasat *et al* (1980); Capon and Glazer (1987)
ORG3	Degree of understanding organization culture	Benbasat *et al* (1980); Coperland and McKenny (1988)
ORG4	Knowledge about product delivery and logistic system	Ravichandran and Lertwongsatien (2002)
Society (SCT)		
SCT1	Degree of notices the privacy issue and its implication on databanks.	Benbasat *et al* (1980)
SCT2	Degree of IT impact on industrial/clerical/ managerial positions	Same as above
Performance (PFM)		
PFM1	Degree of the ability to work cooperatively	Bharadwaj (2000); Ravichandran and Lertwongsatien (2002)
PFM2	Degree of addressing business problems	Bharadwaj (2000)
PFM3	Degree of performing task accurately	Benbasat *et al* (1980)
PFM4	Degree of skilled in multiple technologies	Ravichandran and Lertwongsatien (2002)
PFM5	Degree of being responsible for bus. problem	Benbasat *et al* (1980)
PFM6	Degree of service-oriented	Bharadwaj (2000)
PFM7	Degree of accomplishing multiple tasks	Ravichandran and Lertwongsatien (2002)
PFM8	Degree of the ability to plan, organize, lead	Same as above

Dimension		Survey Question	Research Support
	PFM9	Degree of the ability to write clear memo	Benbasat *et al* (1980)
	PFM10	Degree of the ability to teach others	Same as above
		Strategic Alignment	
IS-Business (ISBUS)			
	ISBUS1	IS plan reflects business plan mission	Kearns and Lederer (2004); McFarlan *et al* (1983); Zviran (1990)
	ISBUS2	IS plan reflects business plan goals	Same as above
	ISBUS3	IS plan supports business strategies	Same as above
	ISBUS4	IS plan recognizes external business environmental forces	Same as above
	ISBUS5	IS plan reflects business resource constraints	Kearns (1997)
Business-IS (BUSIS)			
	BUSIS1	Business plan reflects IS plan	Goldsmith (1991); Premkumar and King (1991); Premkumar and King (1994)
	BUSIS2	Business plan refers to IT applications	Same as above
	BUSIS3	Business plan refers to IS Plan	Same as above
	BUSIS4	Business utilizes strategic capability of IT	Same as above
	BUSIS5	Business expects IT reasonably	Same as above

Table 3: Construct and Survey Questions

Instrument and Pretest

The instrument involved a series of refinements using IS doctoral students, IS professors, and IS practitioners. Comments and suggestions were incorporated into the final instrument. Thirty-seven senior IS manager interviews were completed over the two-week pre-test period. A measure of internal consistency was calculated for each of the seven dimensions underlying the IT personnel capabilities construct and each of the two dimensions underlying the strategic alignment construct, respectively generating an acceptable Cronbach's Alpha value of 0.510~0.986 and 0.839~0.922 (Nunnally, 1978), showing no significant difference from the comments received during the questionnaire refinement.

Survey Execution and Non-response Bias

Surveys were sent directly to senior IS managers of 815 companies qualified after satisfying four requirements (i.e., autonomy in selecting strategies, company size over 200 employees, a structural position, and operation over three years). The sample was from *The Year 2007 Largest Corporations in Taiwan-Top 5000* published by the China Credit Information Service, Ltd. (www.credit.com.tw). The questionnaires were returned by 221 senior IS managers; among them, 196 questionnaires were useable. The overall response rate of 24.04% (196 of 815 surveys) was similar to that experienced with other surveys when sampling senior managers (Byrd and Turner, 2001).

Sector (SIC)	Sent	Failed	Returned	Useable	Useable Response Rate (%)
Elec. Pwr. Supply (3300)	12	1	0	0	0
Gas Supply (3400)	19	0	4	3	15.78
Bldg Developer (3901)	12	0	1	1	8.33
Civil Eng (3801-3804)	26	2	7	5	19.23
Gas Station (4721)	17	1	0	0	0
Auto Sales (4741)	30	0	8	6	20.00
Department Store (4751)	31	5	6	6	19.35
Convenience Store (4753)	13	0	2	2	15.38
Retail Outlet (4754)	13	0	2	2	15.38
Hotels (5011)	41	2	11	9	21.95
Eat & Drink (5110, 5120)	43	3	11	13	30.23
Bus Trans. (5331)	14	0	7	4	28.57
Sea Trans. (5410)	6	0	0	0	0
Air Trans.-Passenger (5510)	3	0	2	1	33.33
Travel Agency (5710)	5	0	2	1	20.00
Air Trans.-Cargo (5743)	3	0	0	0	0
Logistics (56-59)	43	5	11	11	27.91
Telecom (6000)	14	0	5	4	28.57
Banks (6212, 6213)	65	0	20	20	30.76
Securities (6311)	28	1	10	9	32.14
Life Insurance (6410)	28	3	7	7	25.00
Property Insurance (6420)	10	0	2	2	20.00
RE Broker (6612)	11	2	5	3	27.27
RE Mgmt (6691)	21	3	5	5	23.81
Car Leasing (6721)	8	2	0	0	0
Accounting (6920)	6	0	3	2	33.33
Eng. Tech. Serv. (7000)	19	2	7	6	31.57
IC & Integr. (7102, 7202)	85	9	26	25	29.41
Software Design (7201)	76	5	19	20	26.31
Internet Supply Serv. (7321)	12	0	4	3	25.00
Consulting (7401-7402)	23	3	7	7	30.43
Advertising (7601-7602)	26	2	9	7	26.92
Hospitals (8110)	3	0	1	1	33.33
Publishing (8410, 8420)	11	1	2	2	18.18
Book Agency (8430)	18	1	6	4	22.22
Motion Picture (85)	2	1	0	0	0
TV, Radio (8610-8630)	15	1	8	4	22.22
Recreation (9001)	3	1	1	1	33.33
Overall	**815**	**56**	**221**	**196**	**24.04**

Note 1: Sectors are listed based on Taiwan SIC codes in the bracket.
Note 2: "Failed" means "un-contacted."
Note 3: The useable response rate was based on the number of useable surveys divided by the number of surveys distributed.
Note 4: Non-response not included.

Table 4: Breakdowns of Responses

Table 4 presents the frequency of survey responses by standard industrial classification (SIC) groups. Characteristics of senior IS managers and respondent companies are presented in Table 5. About 30% of the companies had annual sales exceeding $300 million. Overall, 89% of senior IS managers had the title of senior manager or above and more than 60% had acquired considerable work experience in the company (mean = 10.64 years) and within an industry (mean = 16.83 years). Despite much literature arguing divergent IT expectation between IS and business managers (e.g., Huang and Quaddus, 2008), respondents' knowledge, experience and one-down level (80% reported) to the business executive were assumed to have easy access to shared decision making and in assisting in selecting strategies, which would not markedly bias this single-sourced results regarding the strategic use of IT (i.e., strategic alignment).

A. Company Information

Company Size		**Annual Sales (US$)**		**IS Dept. Size**		**IS Dept.History**	
250-800	39%	<=100 MM	53%	<=50	39%	<=10	36%
801-1000	22%	101-300 MM	17%	51-100	21%	11-30	39%
1001-3000	22%	301-1000 MM	16%	101-300	23%	>30	20%
3001-5000	7%	1001-3000 MM	4%	>300	13%	Unknown	5%
Over 5000	10%	>3001 MM	10%	Unknown	4%		

No. of IT App. Used		**Using IT App. History**		**Users of IT App.**		**Purpose of IT App.**	
<=10	44%	<=10	67%	Customer	35%	Cost Reduced	38%
11-30	24%	11-30	24%	Internal	59%	Efficiency	27%
>30	26%	>30	5%	Suppliers	4%	Differentiation	19%
Unknown	6%	Unknown	4%	Unknown	2%	Unknown	16%

Scope of IT App.	
Entire Range P/S	76%
Only a Segment	21%
Unknown	3%

B. Senior IS Manger Information

Age		**Gender**		**Education**		**Title**	
<=30	1%	Male	87%	Bachelor	53%	CIO	10%
31-40	33%	Female	5%	Master	37%	VP/EVP/SVP	23%
41-50	35%	Unknown	8%	Others	7%	AVP	30%
>50	24%			Unknown	3%	Sr. Mgr	26%
Unknown	7%					Others	2%
						Unknown	9%

Company Experience		**Industry Experience**		**Reporting Level to Business Executive**	
<=5	25%	<=10	28%	One down	80%
6-10	30%	11-20	33%	Two down	11%
11-20	23%	21-30	18%	Others	6%
>20	16%	>30	15%	Unknown	3%
Unknown	6%	Unknown	6%		

Table 5: Characteristics of Respondent Company and Senior IS Manager

Construct	F1	F2	F3	F4	F5
IT Personnel Capabilities					
SYM1				0.698	
SYM2				0.737	
SYM3				0.744	
CPR1			0.873		
CPR2			0.839		
CPR3			0.804		
MDL1					
MDL2	0.544				
PPL1					
PPL2					
ORG1					0.698
ORG2					0.656
ORG3		0.781			
ORG4		0.805			
SCT1					
SCT2			0.516		
PFM1	0.544				
PFM2					
PFM3	(0.536)	(0.536)			
PFM4	0.685				
PFM5	0.722				
PFM6	0.623				
PFM7	0.631				
PFM8	0.626				
PFM9	(0.600)				(0.627)
PFM10	(0.577)				(0.579)
Eigenvalues	11.19	2.45	1.40	1.21	1.13
Cumulative % Variance Explained	18.91	32.55	44.77	56.59	66.86
Strategic Alignment					
ISBUS1	0.906				
ISBUS2	0.899				
ISBUS3	0.927				
ISBUS4	0.897				
ISBUS5	0.897				
Eigenvalues	4.098				
Cumulative Variance Explained (%)	81.964				
BUSIS1	0.911				
BUSIS2	0.949				
BUSIS3	0.933				
BUSIS4	0.875				
BUSIS5	0.885				
Eigenvalues	4.150				
Cumulative Variance Explained (%)	82.997				

Note 1: Only factor loadings greater than 0.5 are shown. Those items not shown were dropped.
Note 2: The loading in parenthesis indicates cross loading items that were dropped.

Table 6: Rotated Component Matrix of Joint Factor Analysis

Characteristics of respondents and non-respondents were compared for differences in terms of company type (chi-square = 5.33 [9 df, $p = 0.804$]), sales revenue (chi-square = 2.12 [6 df, $p = 0.902$]), and company size (chi-square = 7.03 [4 df, $p = 0.134$]). No significant differences were found at the .05 level of confidence ($p > 0.05$), suggesting the absence of non-response bias in the data.

Reliability and Construct Validity of IT Personnel Capabilities and Strategic Alignment

Principal component analysis was used. Items with factor loadings below 0.5 on any factor or with factor loadings above 0.5 on more than one factor were dropped (Hair, Anderson, Tatham and Black, 1998). When loading onto more than one factor, the varimax-rotated factors were used for subsequent analyses if they were statistically interpretable and theoretically meaningful. Item loadings in the rotated factor matrices were used to interpret and label the emergent factors. Eigenvalues for variation were used to examine the number of factors largely responsible for variation in the data. The cut-off for the number of factors was one eigenvalue (Kaiser, 1974).

To ensure the reliability and validity of IT personnel capabilities, joint factor analysis was conducted although the items used in each source had been validated in the literature; when they were combined to measure both technical and business skills, the factor structure was not confirmed by their combination. Twenty-six items were used to measure seven dimensions: SYM (three items), CPR (three items), MDL (two items), PPL (two items), ORG (four items), SCT (two items), and PFM (ten items). These items were loaded on five varimax rotated factors (Table 6). Items in CPR and SYM were captured by F3 and F4. F1 contained seven items (MDL2, PFM1, PFM4 ~ PFM8), primarily capturing IT personnel's ability to perform well, labeled *performance skill* (PFM). F2 contained two items (ORG3 and ORG4), measuring IT personnel's knowledge about business culture and routines, labeled *business knowledge* (BUK). F5 contained two items (ORG1 and ORG2), measuring IT personnel's organizational skill, labeled *organizational skill* (ORG). As a result, CPR, SYM, PFM, BUK, and ORG that were used for subsequent analyses replaced the seven original dimensions.

Construct	Uni-dimensionality	# of Factor Loaded	Cumulative % Variance Explained (R^2)	Correlation Between Two Items	Alpha Value
IT Personnel Capabilities					
Business:					
PFM(7)	F1 Confirmed	1	58.953		0.882
BUK(2)	F2 Confirmed	1	84.735	0.695**	0.819
ORG(2)	F5 Confirmed	1	83.779	0.676**	0.805
Technical:					
SYM(3)	F3 Confirmed	1	76.195		0.834
CPR(3)	F4 Confirmed	1	81.581		0.885
Strategic Alignment					
ISBUS (5)	F1 Confirmed	1	81.964		0.944
BUSIS (5)	F1 Confirmed	1	82.997		0.948

Note 1: Numbers in parenthesis identify the number of questionnaire item remained

Note 2: ** Correlation was significant at the 0.01 level of confidence.

Table 7: Theoretical Structure Confirmation of Dimension Emerged

Construct	Uni-dimensionality	# of Factor Loaded	Cumulative % Variance Explained (R^2)	# of Dimension Drop	Dimension Remained
IT Personnel Capabilities	Confirmed	1	56.556	0	PFM (0.842) CPR (0.632) BUK (0.688) SYM (0.800) ORG (0.779)
Strategic Alignment	Confirmed	1	64.066	0	ISBUS (0.843) BUSIS (0.816)

Note 1: Numbers in parenthesis indicate the factor loadings.

Table 8: Theoretical Structure Confirmation of IT Personnel Capabilities and Strategic Alignment Constructs

Factor analyses of multiple items of each emergent factor were repeated to confirm their theoretical structure. Correlation analysis was also performed to ensure that two-item factors BUK and ORG loaded onto a single factor. Items for each individual factor loaded onto a single factor that had acceptable Cronbach's coefficient alpha ranging from 0.805 to 0.885 (Nunnally, 1978), and the correlations between the two-item factors were significant (BUK [0.695] and ORG [0.676], $p < 0.01$), thereby confirming the theoretical structure of emergent dimensions (Table 7). To retain the theoretical structure of IT personnel capabilities construct, factor loadings were computed by the averages of multiple items of each emergent dimension. As expected, all five emergent dimensions loaded onto a single factor ($R^2 = 0.565$, Table 8).

ISBUS and BUSIS dimensions were also confirmed (Table 6) and had acceptable Cronbach's coefficient alpha ranging from 0.944 to 0.948 (Table 7) (Nunnally, 1978). They were used to reflect the strategic alignment construct, which loaded onto a single factor ($R^2 = 0.641$, Table 8), indicating that they captured the aspect of strategic alignment.

RESULTS AND DISCUSSION

Analysis of Predictive Validity

To examine the relationship between IT personnel capabilities and strategic alignment, moderated hierarchical regression analysis was conducted as shown in Table 9. Company size that may influence IS-business relationship was included in the model as a control variable (Delone, 1988).

The full model (M5) that controlled for all related variables and interactions had the largest explanatory power in predicting the variance of "IS-business plan alignment" ($R^2 = 0.46$ [$F = 13.67$, $p<0.01$], $\Delta R^2 = 0.03$ [Hierarchical $F = 2.56$, $p<0.05$]). In the M5, "systems" ($\beta = 1.24$, $p<0.05$), "computer" ($\beta = -1.14$, $p<0.1$), and "business knowledge" (emerged from organization) ($\beta = 0.79$, $p<0.1$) were significant predictors. However, "computer" showed an unexpected negative association. A plausible explanation is that senior IS manager participants may have placed too much emphasis on their IT personnel's computer technique while co-presented with business skills, leading to a lower alignment. Despite this, Hypothesis 1 was generally supported (H1a, H1b, H1e) based on the RBV, implying that greater alignment (i.e., valuable asset as noted) requires a higher level of both technical and business skills. These results were similar to those found in Teo and Ranganathan's (2003) study where co-specialization of technology applications and managerial IT training improve the integration of IS plan with business processes.

	Predictor					Control Variable	Interaction						Model Summary			
	CPR	SYM	PFM	BUK	ORG	"Size"	CPR*PFM	CPR*BUK	CPR*ORG	SYM*PFM	SYM*BUK	SYM*ORG	Model F	R^2	ΔR^2	Hierarchical F
Criterion: ISBUS																
M1						-0.09							1.99	0.01		
M2	0.07	0.53***				-0.03							32.98***	0.33	0.32	48.01***
M3	0.03	0.37***	0.23***	0.09	-0.01	-0.02							20.72***	0.38	0.05	6.04***
M4	-0.49	0.36***	-0.73**	1.32***	-0.58**	0.00	1.97**	-2.14***	1.08*				16.98***	0.43	0.05	6.25***
M5	-1.14*	1.24**	0.60	0.79*	-0.18	0.00	2.75***	-2.03***	1.15**	-1.37	0.93	-0.89	13.67***	0.46	0.03	2.56**
Criterion: BUSIS																
M1						-0.10							2.16	0.01		
M2	-0.05	0.60***				-0.03							34.68***	0.34	0.33	50.43***
M3	-0.09	0.43***	0.16**	0.14**	0.08	-0.01							22.59***	0.40	0.06	7.30***
M4	-0.39	0.41***	0.29	0.42	-0.62**	0.01	-0.29	-0.52	1.35**				15.91***	0.42	0.02	1.93
M5	-0.48	0.61	-0.05	0.19	0.08	0.01	-0.86	-0.65	3.24***	1.42	0.33	-2.12***	13.06***	0.44	0.02	3.03**

Note: ***Significant at 0.01 level, ** Significant at 0.05 level, * Significant at 0.1 level

Table 9: Results of Moderated Hierarchical Regression Analysis

Regarding "business-IS plan alignment", although the M5 provided better-predicted variance (R^2 = 0.44 [F = 13.06, p<0.01], ΔR^2 = 0.02 [Hierarchical F = 3.03, p<0.05]), the current overall ability of IT personnel to predict that alignment may not be sufficient (β = 0.61, p>0.1 [systems]; β = -0.48, p>0.1 [computer]; β = -0.05, p>0.1 [performance skill]; β = 0.19, p>0.1 [business knowledge]; β = 0.08, p>0.1 [organizational skill]).

A plausible explanation is since business executives may lack the technical knowledge needed to refer a business plan to a specific IT application, they may assign strategy formulation to senior IS managers, thus resulting in more accurate predictions of "IS-business plan alignment". That is, when IT personnel capabilities increase, the extent to which an IS plan reflects the business plan increases more substantially than when a business plan refers to the IS plan. Although this implies that "business-IS plan alignment" may not constitute a necessary condition for using IT strategically, its low predictive validity can be caused by the lack of appropriate top management support for IT. This situation was similar to that found in Kearns and Lederer's (2001) study and Huang and Quaddus's (2008) study where senior IS managers and business executives have a divergent expectation about business and IS plan integration, thus influencing top management support.

Analysis of Dominance

As shown in Table 10, Budescu's (1993) approach was used to investigate the relative importance between technical and business skills. Only three significant predictors: "systems", "computer", and "business knowledge" were tested for "IS-business plan alignment".

A comparison of M3 and M2 suggested that adding "systems" (β = 0.49, p<0.01) to "business knowledge" (β = 0.18, p>0.1) significantly increased the explanatory power in predicting the variance of "IS-business plan alignment" (ΔR^2 = 0.21, hierarchical F = 64.89, p<0.01). M5 and M6, which compared "business knowledge" (β = 0.32, p<0.01) and "systems" (β = 0.53, p<0.01) with "computer" (β = 0.28, p<0.01 [vs. BUK]; β = 0.07, p>0.1 [vs. SYM]) also showed that adding "business knowledge" and "systems" to "computer" significantly increased the model's power to predict the alignment (ΔR^2 = 0.10, hierarchical F = 25.45, p<0.01 [BUK vs. CPR]; ΔR^2 = 0.21, hierarchical F = 61.90, p<0.05 [SYM vs. CPR]). In the full model (M7), it was also found that "systems" better predicted variance in the alignment than did the combined "business knowledge" and "computer" (ΔR^2 = 0.13, hierarchical F = 42.21, p<0.01).

A plausible explanation is that senior IS manager participants reported (expected) more emphasis (i.e., top management support) on systems application development, which could help evaluate business and user performance, than on simply the fulfillment of hardware and software requirements, thus leading to a higher reported importance of "systems" along with a moderated importance of "business knowledge." This supports our previous finding that both "systems" and "business knowledge" had a significant positive link and "computer" had a significant negative link (Table 9).

Although there was a stronger positive relationship between "systems" and the alignment than between "business knowledge" (or "computer") and the alignment, business knowledge (β = 0.18, p<0.01) was still found to be more important than "computer" (β = 0.08, p>0.1). Thus, Hypothesis 2a was generally supported based on the RBV, implying that although technical skills were influential in helping the IS department achieve business goals, business skills still played a more important complementary role in predicting the alignment. These results were similar to the significant role of behavioural capability for the strategic agility found in Fink and Neumann's (2007) study.

Predictors	β	Model F	R^2	ΔR^2	Hierarchical F
M1		1.99	0.01		
Control Variable					
M2 (vs. 1)		17.07***	0.14	0.13	31.86***
BUK	0.37***				
Control Variable					
M3 (vs. 2)		36.55***	0.35	0.21	64.89***
SYM	0.49***				
BUK	0.18***				
Control Variable					
M4 (vs. 1)		14.29***	0.12	0.11	26.33***
CPR	0.34***				
Control Variable					
M5 (vs. 4)		19.14***	0.22	0.10	25.45***
BUK	0.32***				
CPR	0.28***				
Control Variable					
M6 (vs. 4)		32.98***	0.33	0.21	61.90**
SYM	0.53***				
CPR	0.07				
Control Variable					
M7 (vs. 4)		27.79***	0.35	0.13	42.21***
SYM	0.46***				
BUK	0.18***				
CPR	0.08				
Control Variable					

Note 1: ***Significant at 0.01 level, ** Significant at 0.05 level

Note 2: Control variable is "company size" and the criterion is "ISBUS".

Table 10: Relative Importances of System, Computer and Business Knowledge: Hierarchical Regression Comparison

Analysis of Moderating Effect

To test Hypothesis 2b, interaction variables (product of technical skills and business skills) were entered into the hierarchical regression analysis (Table 9). For "IS-business plan alignment", no significant interactive effect of "systems" with all business skills was found. Although business skills such as "performance skill" (β = 0.60, p>0. 1) and "organizational skill" (β = -0.18, p>0. 1) did not strongly affect the alignment, their interactions with "computer" had a moderately positive effect (β = 2.75, p<0. 01 [CPR x PFM]; β = 1.15, p<0.05 [CPR x ORG]), evidencing that a higher level of "computer" complementarily required a higher level of both "performance skill" and "organizational skill" when pursuing the alignment, thus supporting the RBV.

Not surprisingly, the results showed a significantly negative interactive effect of "computer" with "business knowledge" (β = -2.03, p<0.01), suggesting that a lower level of "computer" and a higher level of "business knowledge" were required for better alignment. A plausible explanation is

similar to that for the previous finding of a negative association of "computer" (β = -1.14, p<0.1), indicating that participant senior IS managers perhaps placed too much emphasis on "computer" or too little emphasis on "business knowledge," thus lowering the degree of alignment and suggesting the need to improve "computer" (downward) and "business knowledge" (upward).

Hierarchical *F*-tests further confirmed that the predictive power of the full model (M5) was significantly stronger after interaction variables were included (Hierarchical F = 2.56, p<0.05). When each group of interaction variables ("systems" and "computer" [M4 and M5]) was added separately, predictive power also significantly increased (Hierarchical F = 6.25, p<0.01 and 2.56, p<0.05). These results confirmed the importance of interactions between technical and business skills for the alignment.

Regarding "business-IS plan alignment", only "organizational skill" was found to have a significant interactive effect (β = 3.24 [with "computer"], p<0.01; β = -2.12 [with "systems"], p<0.01, [M5]). Although "organizational skill" was more emphasized than it was for "IS-business plan alignment" (e.g., β = 1.15 [ISBUS], p<0.05 vs. 3.24 [BUSIS], p<0.01) and senior IS managers reported that organization-oriented systems application was heavily required (β = 1.24, p<0.05), it was actually not sufficient (β = -2.12 [with "systems"], p<0.01) for IT personnel to facilitate the alignment. A plausible explanation is that business executives may have a higher expectation about organizational skill required than senior IS managers do.

Thus, Hypothesis 2b was generally supported, suggesting that higher technical skills tend to need higher business skills to generate greater alignment. These results were similar to those found in the United States where IT personnel require sound business sense and expertise in the planning process to achieve successful alignment (Kearns and Lederer, 2003).

LIMITATIONS

The generalizability of the results may be limited due to the low survey response, although the response rate of 24.04% is acceptable in the literature (Byrd and Turner, 2001). This research has several limitations that should be considered in interpreting the results.

First, although single source bias was recognized, the research suggests that the results should be strengthened by data triangulation (Griffiths and Finlay, 2004). Future research may also look into business executives' perceptions. This may increase accuracy in predicting "business-IS plan alignment". However, two different respondents may generate the effect of a common source variance (Teo and King, 1997). To decrease this effect, the administration of match-paired surveys is suggested. Path analysis may provide a more accurate view as to which force (e.g., senior IS manager or business executive) better predict the strategic alignment in terms of resources controlled.

Second, a senior IS manager may have different perspective of IT personnel capabilities from that of an IT specialist and a good senior IS manager may be able to counteract the lack of business skills of his/her IT specialist. This research relies on the assumption that senior IS managers are better positioned to assess their overall IT specialists' capabilities and part of which is not perceptible to most IT specialists (Bassellier and Benbasat, 2004; Fink and Neumann, 2007).

Third, senior IS managers may tend to report their companies' intended rather than realized IT personnel capabilities and strategic alignment. If there is no intended capability or alignment, a senior IS manager may even create one for the benefit of the researcher (Kearns and Lederer, 2003). This is a common problem faced in the field of social sciences (Nisbett and Wilson, 1977).

Fourth, the criterion "strategic alignment" construct only focuses on the strategic content (i.e., aspects of IS plan and business plan), lacking the ability to reflect explicitly the company's dynamic capability for the alignment process, since the real business environment is changeable (Sabherwal

and Chan, 2001). The focus of this "strategy process" on how a company develops and implements IT management practices are more relevant to the RBV, since such a process is embedded and socially complicated and are difficult to imitate. Future research considers adding the dimension of the "integration process of IS and business plan" as a proxy for the strategic alignment, since it has a positive impact when the company sees IT as part of a well-integrated organizational system in terms of timing and development of both IS and business plans (Pollalis, 2003). Future research may also examine this integration, depicted by how senior IS managers relate to business executives in planning processes and what types of plans result from such a relationship and coordination so as to reduce the expectation gap and increase the accuracy of prediction in the alignment.

Fifth, this research did not consider the extent of competitive advantage to which the co-specialized or complementary use of technical and business skills of IT personnel can create. Future research should further examine the direct or indirect relationship between the strategic alignment and competitive advantage.

IMPLICATIONS

Based on the tested results (Table 11 over page), five out of the nine sub-hypotheses tested (i.e., H1a, H1b, H1e, H2a, and H2b) were found to support the RBV that the co-specialization or complementary use of IT and business resources has either a significant direct or moderating effect on the pursuit of higher strategic alignment.

Our key evidence generally suggested that complementary technical and business skills significantly predict the strategic alignment by basing the IS plan on the company's mission, goals, and strategies. The practical implication is that senior IS managers' human resources development efforts focused on strengthening technical skills may have limited contribution, unless comparable efforts are spent to enhance business skills as well (Fink and Neumann, 2007). For example, technical infrastructure investment may be changing because of the uncertainty of innovation outcomes and company profitability due to environmental pressure (Lin, 2007). Despite such changes, business-oriented IT human resources investment can be a relatively stable form of valuable company resources to assure the alignment (Sabherwal and Chan, 2001; Swanson, 2001).

Mapping a business plan to an IS plan seems not to reflect the company's ability to use IT strategically. As noted, this may be that top management is not knowledgeable about specific IT assets and applications, leading to a business plan that ineffectively supports IS plan (i.e., poor predictive results). The practical implication is that senior IS managers and business executives could have divergent IT expectation. For example, an aggressive company may seek out new market opportunities through multiple technologies that are supported by highly flexible IT personnel and are often considered inevitably necessary for strong position through time in all markets entered (Huang, 2009). Under this circumstance, an IS manager perhaps expects more strong top management support in IT personnel development and thus IT benefits (e.g., differentiation) recognition. However, the business executive often plays a role of responsible senior and thus would be more concerned about realized (not intended) IT payoffs after maintaining a good deal of technological flexibility and personnel capabilities, making the business executive more conservative and careful in evaluating IT personnel's organizational impact (i.e., whether more business-oriented IT staff).

Non-financial management and development criteria could be used to communicate with business executives by balancing both quantitative and qualitative forms of IT investment decision (Huang, 2009). As business executives become more familiar with the evaluation process of IT investment decision, they are likely to view IT strategically, be committed to developing capable IT

IT Personnel Capabilities Construct	Factor	Hypothesis 1	Tested	β	Why not Tested or Tested Result	Hypothesis 2	Tested	ΔR2	Why not Tested or Tested Result
Technical Skills									
	SYM	a. (Direct effect on SA)	Yes	ISBUS: 1.24*** BUSIS: 0.61	Generally Supported				
	CPR	b. (Direct effect on SA)	Yes	ISBUS: -1.14* BUSIS: 0.48	Generally Supported				
	MDL	c. (Direct effect on SA)	No	n.a.	Dropped and loaded to PFM				
Business Skills						a. (Relative importance)	Yes	M3 vs. M2: SYM:0.21*** M5 vs. M6: BUK:0.1*** SYM:0.21**	Partially supported
						b. (Moderating effect)	Yes	ISBUS: β=2.75*** (CPRxPFM) β=-2.03*** (CPRxBUK) β = 1.15** (CPRxORG) BUSIS: β = 3.24*** (CPRxORG) β =-2.12*** (SYMxORG)	Generally supported
	PPL	d. (Direct effect on SA)	No		Dropped				
	ORG	e. (Direct effect on SA)	Yes	ISBUS: 0.79 (BUK)* BUSIS: 0.19 (BUK) ISBUS: -0.18 (ORG) BUSIS: 0.08 (ORG)	Generally Supported				
	SCT	f. (Direct effect on SA)	No	n.a.	Dropped				
	PFM	g. (Direct effect on SA)	Yes	ISBUS: 0.60 BUSIS: -0.05	Not Supported				

Note 1: ***Significant at 0.01 level, ** Significant at 0.05 level, * Significant at 0.1 level.
Note 2: "SA" refers to strategic alignment.
Note 3: "Model" (MDL2) was loaded to performance. MDL1 was dropped because of poor loading (less than 0.5).
Note 4: "People" was dropped because of poor loading (less than 0.5).
Note 5: "Society" was dropped because the aspect measured by F3 did not capture it satisfactorily.

Table 11: Results of Testing Research Hypotheses

	Technical Skills		Business Skills		
	Systems	Computer	Performance Skill	Business Knowledge	Organizational Skill
Role					
IS-bus Plan Alignment	Predictor	Predictor	Moderator	Predictor/Moderator	Moderator
Bus-IS Plan Alignment	ns	ns	ns	ns	Moderator
Relative Importance					
IS-bus Plan Alignment	Strong	Weak	na	Medium	na
Bus-IS Plan Alignment	na	na	na	na	na

Note 1: "ns" means non-significant.

Note 2: "na" means non-applicable and indicates that relative importance was only examined for those significant predictors (and moderators). The result is generally indicated based on Table 9 and 10.

Table 12: Roles of IT Personnel Capabilities and Their Relative Importance

personnel and IS functions, and gain more confidence in managing complementary IT and business resources (Kearns and Lederer, 2001).

The researcher suggests that as a business plan becomes more aggressive, a more sophisticated evaluation process may be used to ensure that IT align with business goals, base policies, and procedures associated with control of IT activities. Future research should examine the discrepancy of IT expectation between senior IS managers and business executives across different strategic contexts (aggressive or conservative) associated with corresponding IT personnel capabilities.

While Table 12 indicates that technical skills in terms of "systems" and "computer" are important predictors, the evidence accentuated the moderating role of business skills by showing that the relationship between technical skills and both dimensions of strategic alignment changes generally depends on whether IT personnel possess higher or lower business skills in terms of "performance skill" (e.g., the ability to work cooperatively and perform tasks accurately), "business knowledge," (the ability to understand company culture and product delivery/logistics), and "organizational skill" (e.g., the ability to identify key company issues and problems and determine positive/negative IT organizational impacts).

The practical implication is that senior IS managers may need to prioritize their IT personnel training or human capital investment based on strategic needs of the alignment. For example, although "business knowledge" has medium relative importance (β=0.18, p<0.05 [Table 10]), it still has potential room to improve for a better alignment. This is because "business knowledge" should be co-specialized with "systems" (e.g., ability to evaluate system performance) that has current strong relative importance (β=0.46, p<0.05 [Table 10]). To facilitate strategic alignment, senior IS managers should not overemphasize IT staff's "computer" skills (e.g., the ability to design and implement databases; and develop structured or modular programs) that is weak in relative importance (β=0.08, p>0.1 [Table 10]).

CONCLUSION

Many large companies suffer from a lack of strategic alignment, due to the absence of appropriate IT personnel capabilities (Fink and Neumann, 2007; Reddy, 2006). Despite the few immature

empirical and theoretical studies on the relationship between IT-based and business resources (Byrd, 2001), this research used the RBV to examine how Taiwanese companies leverage their IT personnel technical skills together with complementary business skills to manage IT effectively (i.e., strategic alignment).

An examination of these skills provides researchers and practitioners with a better understanding as to what and how IT human resources can be deployed to serve business needs. Specifically, technical skills alone are unlikely to be responsible for company success in IT management. Such resources must be complemented and co-specialized with certain business skills (e.g., business knowledge, performance skill, and organizational skill) to gain better alignment that is viewed as distinctive competence (Mata *et al*, 1995). Competitors do not easily imitate this alignment, as causal ambiguity and social complexity are embedded in the alignment practices, a kind of managerial (co-specialized) process or experience to renew, adapt, integrate, build, and reconfigure IT with business resources (Barney, 1996).

It should be noted although IT personnel possess certain technical skills (e.g., "systems" and "computer"), and complementary business skills may ensure that the company bases its IS plan on business plan, divergent IT expectation (e.g., outcome of IT use) between senior IS managers and business executives may cause the insufficient support of business plan to IS plan. This research provides a more congruent view of the relative importance of different IT personnel capabilities, providing practical senior IS managers and business executives with more consistent priority guidelines when developing IT-based and business resources toward the strategic alignment.

REFERENCES

ARMSTRONG, C.P. and SAMBAMURTHY, V. (1999): Information technology assimilation in firms: The influence of senior leadership and IT. *Information Systems Research*, 10(4): 304-328.

AVISON, D., JONES, J., POWELL, P. and Wilson, D. (2004): Using and validating the strategic alignment model. *Journal of Strategic Information Systems*, 13(3): 223-246.

BARNEY, J. (1991): Firm resources and sustained competitive advantage. *Journal of Management*, 17(1): 99-120.

BARNEY, J.B. (1996): Gaining and sustaining competitive advantage, Reading, MA: Addision-Wesley.

BASSELLIER, G. and BENBASAT, I. (2004): Business competence of information technology professionals: Conceptual development and influence on IT-business partnerships. *MIS Quarterly*, 28(4): 673-694.

BASSELLIER, G., BENBASAT, I. and REICH, B.H. (2003): The influence of business managers' IT competence on championing IT. *Information Systems Research*, 14(4): 317-336.

BENBASAT, I., DEXTER, A.S. and MANTHA, R.W. (1980): Impact of organizational maturity of information systems skill. *MIS Quarterly*, March, 21-34.

BENLIAN, A. and HESS, T.A. (2007): Contingency model for the allocation of media content in publishing companies. *Information & Management*, 44(5): 492-502.

BHARADWAJ, A.S. (2000): A resource-based perspective on information technology capability and firm performance: An empirical investigation. *MIS Quarterly*, 24(1): 169-196.

BUDESCU, D.V. (1993): Dominance analysis: A new approach to the problem of relative importance of predictors in multiple regression. *Psychological Bulletin*, 114: 542-551.

BYRD, T.A. (2001): Information technology, core competencies, and sustained competitive advantage. *Information Resource Management Journal*, 14(2): 27-36.

BYRD, T.A., LEWIS, B.R. and BRADLEY, R.V. (2006): IS Infrastructure: The influence of IT senior leadership and strategic information systems planning. *The Journal of Computer Information Systems*, 47(1): 101-114.

BYRD, T.A., LEWIS, B.L. and BRYAN, R.W. (2006): The leveraging influence of strategic alignment on IT investment: An empirical examination. *Information & Management*, 43(3): 308-321.

BYRD, T.A., LEWIS, B.R. and TURNER, D.E. (2004): The impact of IT personnel skills on IS infrastructure and competitive IS. *Information Resource Management Journal*, 17(2): 38-62.

BYRD, T.A. and TURNER, D.E. (2000): An exploratory analysis of the information technology infrastructure flexibility construct. *Journal of MIS*, 17(1): 167-208.

BYRD, T.A. and TURNER, D.E. (2001): An exploratory examination of the relationship between flexible IT infrastructure and competitive advantage. *Information & Management*, 39: 41-52.

CAPON, N. and GLAZER, R. (1987): Marketing and technology: A strategic coalignment. *Journal of Marketing*, 51(3): 1-14.

CHATFIELD, A.T. and BJORN-ANDERSON, N. (1997): The impact of IOS-enabled business process change on business outcomes: Transformation of the value chain of Japan Airlines. *Journal of MIS*, 14(1): 13-40.

CHEN, T. (2003): Globalization of e-commerce VIII: Environment and policy in Taiwan. *Communications of the AIS*, 12: 326-353.

CHUNG, S.H., RAINER, R.K. Jr. and LEWIS, B.R. (2003): The impact of information technology infrastructure flexibility on strategic alignment and applications implementation. *Communications of the AIS*, 11: 191-206.

CHUNG, S.H., BYRD, T.A., LEWIS, B.R. and FORD, F.N. (2005): An empirical study of the relationships between IT infrastructure flexibility, mass customization, and business performance. *Database for Advances in Information Systems*, 36(3): 26-44.

CLEMONS, E.K. and ROW, M. (1991): Sustaining IT advantage: The role of structural differences. *MIS Quarterly*, 15(3): 275-292.

CONNER, K.R. and PRAHALAD, C.K. (1996): A resource-based theory of the firm: Knowledge versus opportunism. *Organizational Science*, 7(5): 477-501.

DAVARAJ, S. and KOHLI, R. (2003): Performance impacts of information technology: Is actual usage the missing link?, *Management Science*, 49(3): 273-289.

DELONE, W.H. (1988): Determinant of success for computer usage in small business. *MIS Quarterly*, 12(1): 51-61.

DUHAN, S. (2007): A capabilities-based toolkit for strategic information systems planning in SMEs. *International Journal of Information Management*, 27(5): 352-371.

EISENHARDT, K.M. and MARTIN, J.A. (2000): Dynamic capabilities: What are they? *Strategic Management Journal*, 21(10-11): 1105-1121.

FEENY, D.E. and WILLCOCKS, L.P. (1998): Core IS capabilities for exploiting information technology. *Sloan Management Review*, Spring, 9-21.

FINK, L. and NEUMANN, S. (2007): Getting agility through IT personnel capabilities: The mediating role of IT infrastructure capabilities. *Journal of AIS*, 8(8): 440-462.

GOLDSMITH, N. (1991): Linking IT planning to business strategy. *Long Rang Planning*, 24(6): 67-77.

GRANT, R.M. (1991): The resource-based theory of competitive advantage. *California Management Review*, 33(3): 114-35.

GRIFFITH, G.H. and FINLAY, P.N. (2004): IS-enabled sustainable competitive advantage in financial services, retailing, and manufacturing. *Journal of Strategic Information Systems*, 13: 29-59.

GROVER, V., GOKHALE, R.A. and NARAYANSWAMY, R.S. (2009): Resource-based framework for IS research: Knowledge firms and sustanibility in knowledge markets. *Journal of Association for Information Systems*, 10(4): 306-332.

GUPTA, Y., KARIMI, J. and SOMERS, T. (1997): Alignment of a firm's competitive strategy and information technology management sophistication: The missing link. *IEEE Transactions on Engineering Management*, 44(4): 399-413.

HAIR, J.F., ANSERSON, R.E., TATHAM, R.L. and BLACK, W.C. (1998): Multivariate data analysis, Upper Saddler River, NJ: Prentice-Hall.

HARTUNG, S., REICH, B.H. and BENBASAT, I. (2000): Information technology alignment in the Canadian Forces. *Canadian Journal of Administrative Sciences*.

HENDERSON, J.C. and VENKATRAMAN, N. (1993): Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal*, 32(1): 4-16.

HENDERSON, J.C., VENKATRAMAN, N. and OLDACH, S. (1996): Aligning business and IT strategies. In *Competing in the Information Age: Strategic Alignment in Practice,* LUFTMAN, J.N. (ed), New York Oxford University Press, 21-42.

HIRSCHHEIM, R. and SABHERWAL, R. (2001): Detours in the path toward strategic information systems alignment. *California Management Review,* 44(1): 87-108.

HU, Q. and HUANG, D. (2006): Using the balances score card to achieve sustained IT-business alignment: A case study. *Communications of the AIS*, 17: 181-204.

HUANG, L.K. (2009): The contingent role of innovation between IT management sophistication and strategic alignment. *Journal of Global Information Management*. 17(2): 60-92.

HUANG, L.K. and QUADDUS, M. (2008): An analysis of IT expectation across different strategic context of innovation: The CEO versus the CIO, *Proceedings of Pacific Asia Conference on Information Systems*, 3-7 July, Suzhou, China.

HUANG, S., OU, C., CHEN, C. and LIN, B. (2006): An empirical study of relationship between IT investment and firm performance: A resource-based perspective. *European Journal of Operational Research*, 173: 984-999.

JARVENPAA, S.L. and IVES, B. (1990): Information technology and corporate strategy: A view from the top. *Information Systems Research*, 1(4): 351-376.

KAISER, H.F. (1974): Little Jiffy, Mark IV. *Educational and Psychological Measurement*, 34: 111-117.

KEARNS, G.S. and LEDERER, A.L. (2001): Strategic IT alignment: A model for competitive advantage, *Proceedings of 22nd International Conference on Information Systems*, 16-19 December, New Orleans, Louisiana.

KEARNS, G.S. and LEDERER, A.L. (2003): A resource-based view of strategic IT alignment: How knowledge sharing creates competitive advantage. *Decision Sciences*, 34(1): 1-29.

KEARNS, G.S. and LEDERER, A.L. (2004): The impact of industry contextual factors on IT focus and the use of IT for competitive advantage. *Information & Management*, 41(7): 899-919.

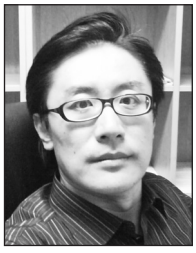
KEEN, P.G.W. (1991): *Shaping the Future, Business Design through Information Technology*. Cambridge, MA: Harvard Business Press.

KETTINGER, W.J. and LEE, C.C. (2002): Understanding IS-user divide in IT innovation. *Communications of the ACM*, 45(2): 79-84.
KOHLI, R. and GROVER, V. (2008): Business value of IT: An essay on expanding research directions to keep up with the time. *Journal of the Association for Information Systems*, 9(1): 23-39.
LAI, F., ZHAO, X. and WANG, Q. (2006): The impact of information technology on the competitive advantage of logistics firms in China. *Industrial Management + Data Systems*, 106(9): 1249.
LEE, D.M.S., TRAUTH, E. and FARWELL, D. (1995): Critical skills and knowledge requirements of IS professionals: A joint academic /industry investigation. *MIS Quarterly*, 19(3): 313-340.
LEI, D., HITT, M.A. and BETTIS, R. (1996): Dynamic core competencies through meta-learning and strategic context. *Journal of Management*, 22(4): 549-569.
LIN, B.W. (2007): Information technology capability and value creation: Evidences form the US banking industry. *Technology in Society*, 29: 93-106.
LUFTMAN, J. (2003): Assessing IT/business alignment. *Information Strategy: the Executive's Journal*, Fall, 7-14.
LUFTMAN, J., KEMPAIAH, R. and NASH, E. (2006): Key issues for IT executives 2005. *MIS Quarterly executives*, 5(2): 81-99.
LUFTMAN, J., PAPP, R. and BRIER, T. (1999): Enablers and inhibitors of business-IT alignment. *Communication for the AIS*, 1(11): 1-33.
MAHONEY, J.T. and PANDIAN, J.R. (1992): The resource-based view within the conversation of strategic management. *Strategic Management Journal*, 13: 363-380.
MARCHAND, D.A., KETTINGER, W.J. and ROLLINS, J.D. (2000): Information orientation: People, technology and the bottom line. *Sloan Management Review*. 41(4): 69-80.
MATA, F.J., FUERST, W.L. and BARNEY, J. (1995): Information technology and sustained competitive advantage: A resource-based analysis. *MIS Quarterly*, 19(4): 487-505.
MATSUO, M., WONG, C.W.Y. and LAI, K. (2008): Experience-based learning of Japanese IT professionals: A qualitative research. *Journal of Strategic Information Systems*, 17(3): 202-213.
McFARLAN, F.W., McKENNEY, J.L. and PYBURN, P. (1983): The information archipelago-plotting a course. *Harvard Business Review*, January-February, 61 (1): 145-156.
MEHTA, M. and HIRSCHHEIM, R. (2007): Strategic alignment in mergers and acquistions: Theorizing IS integration decision making. *Journal of the Association for Information Systems*. 8(3): 143-174.
MELVILLE, N., KRAEMER, K. and GURBAXANI, V. (2004): Information technology and organizational performance: An integrative model of IT business value. *MIS Quarterly*, 28(2): 283-322.
NADLER, D.A. and TUSHMAN, M.L. (1997): *Competing by Design*, New York: Oxford University Press.
NELSON, R.R. (1991): Educational needs as perceived by IS and end user personnel: A survey of knowledge and skill requirements. *MIS Quarterly*, 15(4): 503-525.
NUNNALLY, J.C. (1978): *Psychometric Theory*, New York: McGraw-Hill.
PEAK, D., GUYNES, C.S. and KROON, V. (2005): Information technology alignment planning: A case study. *Information & Management*, 42(5): 635-649.
PETERAF, M.A. (1993): The cornerstones of competitive advantage: A resource based view. *Strategic Management Journal*, 14: 179-191.
POLLALIS, Y.A. (2003): Patterns of co-alignment in information-intensive organizations: Business performance through integration strategies. *International Journal of Information Management*, 23: 469-492.
PORTER, M.E. (1991): Towards a dynamic theory of strategy. *Strategic Management Journal*, 12: 95-117.
POWELL, T.C. and DENT-MICALLEF, A. (1997): Information technology as competitive advantage: The role of human, business, and technology resources. *Strategic Management Journal*, 13(7): 551-558.
PRIEM, R.L. and BUTLER, J.E. (2001): Is the resource-based view a useful perspective for strategic management research. *Academy of Management Review*, 26(1): 22-40.
PREMKUMAR, G. and KING, W.R. (1991): Assessing strategic information systems planning. *Long Range Planning*, 24(5): 41-58.
PREMKUMAR, G. and KING, W.R. (1994): Organizational characteristics and information systems planning: An empirical study. *Information Systems Research*, 5(2): 75-109.
RAGHUNATHAN, T.S. and RAGHUNATHAN, B. (1990): Planning implications of the information systems strategic grid: An empirical investigation. *Decision Science*, 21(2): 287-300.
RAVICHANDRAN, T. and LERTWONGSATIEN, C. (2002): Impact of information systems resources and capabilities on firm performance: A resource-based perspective, *Proceedings of 23rd International Conference on Information Systems*, 15-18 December, Barcelona, Spain, 577-582.
REDDY, S.B. (2006): Strategic flexibility and information technology properties: Competitive advantage and asset specificity. *Advances in Competitiveness Research*, 14(1): 16-43.
REICH, B.H. and BENBASAT, I. (1990): An empirical investigation of factors influencing the success of customer-oriented strategic systems. *Information Systems Research*, 1(3): 325-347.
REICH, B.H. and BENBASAT, I. (2000): Factors that influence the social dimension of alignment between business and information technology objectives. *MIS Quarterly*, 24(1): 81-133.

ROCKART, J.F., EARL, M.J. and ROSS, J.W. (1996): Eight imperatives for new IT organization. *Sloan Management Review*, 38(1): 43-55.
ROSS, J.W., BEATH, C.M. and GOODHUE, D.L. (1996): Develop long-term competitiveness through IT assets. *Sloan Management Review*, 38(1): 31-45.
SABHERWAL, R. and CHAN Y.E. (2001): Alignment between business and IS strategies: A study of prospectors, analyzers, and defenders. *Information Systems Research*, 12(1): 11-33.
SABHERWAL, R. and KING, W.R. (1991): Toward a theory of strategic use of information resources: An inductive approach. *Information & Management*, 20: 191-212.
SABHERWAL, R. and KING, W.R. (1995): An empirical taxonomy of the decision-making process concerning strategic applications of information systems. *Journal of MIS*, 11(4): 177-214.
SABHERWAL, R. and TSOUMPAS, P. (1993): The Development of strategic information systems: Some case studies and research proposals. *European Journal of Information Systems*, 2(4): 240-259.
SAMBAMURTHY, V., BHARADWAJ, A. and GROVER, V. (2003): Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. *MIS Quarterly*, 27(2): 237-264.
SAMBAMURTHY, V. and ZMUD, R.W. (1997): At the heart of success: Organizationwide management competencies. in *Steps to the Future: Fresh Thinking on the Management of IT-based Organizational Transformation*, eds SAUER, C. and YETTON, P.W., San Francisco: Jossey-Bass, 143-163.
SHER, P.J. and LEE, V.C. (2004): Information technology as a facilitator for enhancing dynamic capabilities through knowledge management. *Information & Management*, 41: 933-945.
SWANSON, R.A. (2001): *Assessing Financial Benefits of Human Resource Development*. Cambridge, MA: Perseus.
TALLON, P.P., KRAEMER, K.L. and GURBAXANI, V., (2000): Executives' perception of the business value of information technology: A process-oriented approach, *Journal of Management Information Systems*, 16(4): 145-175.
TEECE, D.J., PISANO, G. and SHUEN, A. (1997): Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7): 509-533.
TENG, T.S.H., CHEON, M J. and GROVER, V. (1995): Decisions to outsource information systems functions: Testing a strategic-theoretic discrepancy model. *Decision Science*, 26(1): 75-103.
TEO, T.S.H. and KING, W.R. (1997): Integration between business planning and information systems planning: An evolutionary-contingency perspective. *Journal of MIS*, 14(1): 185-214.
TESCH, D., JIANG, J.J. and KLEIN, G. (2003): The impact of information system personnel skill discrepancies on stakeholder satisfaction. *Decision Sciences*, 34(1): 107-129.
TEO, T.S.H. and RANGANATHAN, C. (2003): Leveraging IT resources and capabilities at the housing and development board, *Journal of Strategic Information Systems*, 12: 229-249.
TIPPINS, M.J. and SOHI, R.S. (2003): IT competency and firm performance: IS organizational learning a missing link? *Strategic Management Journal*, 24: 745-761.
WADE, M. and HULLAND, J. (2004): The resource-base view and information systems research: Review, extension, and suggestions for future research. *MIS Quarterly*, 28(1): 107-142.
WARD, J. and PEPPARD, J. (2002): *Strategic Planning for Information Systems*, John Wiley and Sons, Chichester, UK.
WEILL, P., SUBRAMANI, M. and BROADBENT, M. (2002): Building IT infrastructure for strategic agility. *MIS Sloan Management Review*, 44(1): 57-65.
WERNERFELT, B. (1984): A resource-based view of the firm. *Strategic Management Journal*, 5: 171-180.
ZVIRAN, M. (1990): Relationships between organizational and information systems objectives: Some empirical evidences. *Journal of MIS*, 7(1): 65-84.

BIOGRAPHICAL NOTES

Leelien Ken Huang is now an assistant professor with the Graduate Institute of Management of Technology at Feng Chia University, Taichung, Taiwan. He also holds a position as the section chief for the University Development. He received his MA in business administration from the University of Georgia-Athens, USA and DBA from Curtin University of Technology-Perth, Australia. He has substantial industry experience with banking and technology strategy managerial positions. His current research interests include E-learning, the strategic use of IT, and cross cultural research issues in IS.



Leelien Ken Huang