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The effect of strategic alignment on the use of IS-based resources for competitive advantage

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Abstract

Persuasive evidence has described the strategic use of information resources in organizations. As a result, IS researchers have sought empirically to link that use to improved organizational performance. However, this alignment-performance relationship has been difficult to confirm.

The current study contributes by distinguishing the alignment of the information systems plan with the business plan (ISP–BP) and the reciprocal alignment (BP–ISP). The study used 107 matched pairs of IS executives and other senior executives. Analysis showed that for IS executives both ISP–BP and BP–ISP alignment predicted the use of IS-based resources for competitive advantage. However, for other senior executives, only ISP–BP alignment predicted it. Study results suggest both groups of subjects share an understanding of the role of ISP–BP in creating competitive advantage from their information systems investments. However, the lack of a shared understanding of BP–ISP alignment may prevent organizations from achieving that advantage.

Keywords: Strategic information systems planning; Competitive advantage; Alignment; Confirmatory factor analysis; Structural equation modeling

1. Introduction

Contemporary organizations are aligning IS and business strategies to improve organizational performance. Charles Schwab and Amazon.com have leveraged existing

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processes with online access and employed a first-mover strategy to realize record online revenues (Stewart, 1999). Dell Computer, in a first-mover strategy, has achieved success by aligning its core competency in supply-chain expertise with Internet technology. Chemical companies have successfully aligned information technology strategy and a business strategy of customer relationship management by creating virtual storefronts from which customers can access databases and complete transactions unassisted. Fingerhut has leveraged its transaction history of 75 million customers with data warehousing technology to identify customers with the highest potential for targeted marketing campaigns. Banks are mining data warehouses of customer information to profile profitable customers and target them with specialized services to retain their best and most profitable ones (Whiting and Sweat, 1999). Newcomer National Airlines is overcoming market entry barriers using an IS infrastructure that includes Internet and intranet sites, a data warehouse, and airplane maintenance system (Hibbard and Engler, 1999). All of these examples represent IS-based applications that are aligned with business plans and positively affect organizational performance.

IS-based applications can create competitive advantage based on the generic strategies of cost leadership, product differentiation, and market focus (Porter, 1980; McFarlan, 1984; Bakos and Treacy, 1986; Sethi and King, 1994). Strategic partnering, electronic data interchange, the introduction of switching costs via electronic alliances, distributed databases, geographical information systems, data warehouses, object-oriented development, and enterprise resource planning are all examples of IT investments for attaining competitive advantage (Eardley and Lewis, 1996; Gatignon and Xuereb, 1997).

Increased attention has been given to the alignment of IS and business strategies to create that advantage. In fact, the lack of such alignment has been argued to be the reason many businesses fail to realize value from investments in IT (Henderson and Venkatraman, 1993).

Investments in IT are often decided on the basis of the information systems plan and should be governed by the objectives of the firm as expressed in the business plan (Saunders and Jones, 1992). Thus, this alignment of the information systems plan and business plan is of utmost importance and leads to IS effectiveness (Chan and Huff, 1993). Firms are apt to view such IS-aligned investments as being strategically important and believe that they can enable IS resources to be used to produce competitive advantage (Kettinger et al., 1994).

The objectives of the study described herein were to: (1) provide a model of the relationship of strategic alignment and the use of IS-based resources to produce a competitive advantage; (2) develop measures for constructs of the model; (3) perform psychometric tests of those constructs; and (4) test the dependent variable from two perspectives — that of IS executives and that of other senior executives. This study would thus contribute to existing research through the parsimonious examination of the impact of alignment on the competitive advantage construct.

2. Model of strategic IS alignment

The research model envisages two types of strategic alignment that will be positively

associated with the use of IS for competitive advantage. The first is the alignment of the IS plan with the business plan (ISP–BP). The second is the alignment of the business plan with the IS plan (BP–ISP). The following survey of literature elucidates the research model by summarizing the theory supporting each construct and its related measure.

2.1. The importance of strategic IS alignment

Strategic IS alignment is the linkage of the firm's IS and business plans (Premkumar and King, 1992). Ideally, the business plan and information systems plan, both products of the corporate planning function, should be linked by mapping IS strategies directly to one or more business strategies in a manner that optimizes the return to the organization (King, 1978; Calhoun and Lederer, 1990). By aligning the IS plan and the business plan, information resources support business objectives and take advantage of opportunities for the strategic use of IS (McLean and Soden, 1977; McFarlan, 1984; Zviran, 1990; Premkumar and King, 1991). Alignment requires business and IS executives to assume joint responsibility for delivering benefits from IS investments. Such a collaborative and symmetrical approach to planning can yield significant IS-based competitive advantages and is evidenced by the IS plan's linkage to the business plan and the reflection of IS opportunities in the business plan. Companies benefit from strategic alignment because information resources are more likely to support business objectives thus increasing opportunities for the strategic use of IS (McLean and Soden, 1977; McFarlan, 1984; Zviran, 1990; Premkumar and King, 1991).

Opinion surveys have indicated the importance of strategic alignment to both IS and other senior executives (Hartog and Herbert, 1986; Niederman et al., 1991). In fact, IS executives have ranked the top two planning objectives as being the alignment of IS with business strategies and the identification of opportunities for IS-based competitive advantage (Earl, 1993).

Although IS and other senior executives may agree on the importance of strategic alignment, they might not agree about how it affects the impact of IS on organizational performance (Cash et al., 1988). Perceptual differences and lack of communication can hinder efforts at attaining strategic alignment and may lead to mismatches between IS investments and business objectives (Reich, 1992; Coakley et al., 1995). Accordingly, a recent survey of over 300 firms revealed poor communication between IS and other senior executives to be the key inhibitor of alignment (Papp and Luftman, 1995).

2.2. Alignment of the IS plan with the business plan

Two types of strategic alignment exist. The first, alignment of the IS plan with the business plan, is the direct reference in the IS plan to the business plan's mission, objectives, and strategies. The organizational strategy set consisting of mission (i.e. duty), goals (i.e. objectives for fulfilling the mission), and strategies (i.e. intended procedures for achieving the objectives) will guide the design of the IS plan and ensure alignment with the direction of the company (King, 1978). Communication of the business plan to IS management is a prerequisite to this alignment (Calhoun and Lederer, 1990).

Transformation of the business strategy set into an IS strategy set addresses the role of information in the firm, information policies and standards, the IS development strategy,

Table 1
Operationalization of the alignment of the IS plan with the business plan (ISP–BP)

Variable	Measure
ISP_1	The IS plan reflects the business plan mission
ISP_2	The IS plan reflects the business plan goals
ISP_3	The IS plan supports the business strategies
ISP_4	The IS plan recognizes external business environment forces
ISP_5	The IS plan reflects the business plan resource constraints

and development of the IS plan (King, 1978). In the most prevalent top–down approach where the business plan precedes development of the IS plan, IS goals flow from and should be linked strongly to business goals (Zviran, 1990). For organizations that envision strategic IS applications, alignment between IS and business strategies is critical (Henderson and Sifonis, 1988) and managers need to view IT as a critical weapon. Strategic use of IS and related information technologies can impact organizational-level variables such as entry barriers, suppliers and customers, industry rivalry, search and switching costs, intra- and inter-organizational efficiency (Porter and Millar, 1985; Bakos and Treacy, 1986; Mahmood and Soon, 1991). An important purpose of the IS plan is to recognize the firm's scarce resource constraints (McFarlan et al., 1983) and external business forces (Reich and Benbasat, 1996). Table 1 uses these concepts to operationalize the construct for ISP–BP alignment.

2.3. Alignment of the business plan with the IS plan

Alignment of the business plan with the IS plan is the second type of strategic alignment. It is accomplished when the business plan directly references the IS plan and acknowledges specific IS applications and technologies (Sabherwal, 1989). It endorses senior management's support for the IS function, verifies the importance of information resources to the firm, and acknowledges a higher level of integration between IS and business planning (Saunders and Jones, 1992). When the business plan references specific IS applications and technologies, firms are more likely to identify IS opportunities and use information resources strategically (Earl, 1987). Goldsmith (1991) argued for BP–ISP integration by noting that competitive advantage could be secured when business and IS strategies were formulated together. Table 2 uses these concepts to operationalize the construct for BP–ISP alignment.

Table 2
Operationalization of the alignment of the business plan with the IS plan (BP–ISP)

Variable	Measure
BP_1	The business plan refers to the IS plan
BP_2	The business plan refers to specific IS applications
BP_3	The business plan refers to specific information technologies
BP_4	The business plan utilizes the strategic capability of IS
BP_5	The business plan contains reasonable expectations of IS

Despite the promising advantage of this higher level of integration, ISP–BP and BP–ISP alignment do not coexist in most firms (Earl, 1993; Teo and King, 1997). The lack of management involvement in SISP (Galliers, 1987) and the presence of internal inhibitors to the strategic use of IS also demonstrate the lack of BP–ISP alignment (King and Teo, 1994).

Literature that discusses the alignment process as being top–down and IS strategies as being driven by business strategies implicitly indicates the paucity of BP–ISP alignment in actual practice (King, 1978). Evidence about the lack of participation by top management in IS planning (Lederer and Mendelow, 1988) and about alignment of IS strategies to business strategies (Zviran, 1990) similarly intimates the dearth of BP–ISP alignment. Research about the use of steering committees to ensure linkage of IS to business objectives (Gupta and Raghunathan, 1989) and the inappropriate use of accounting measures to rank IS investments (Clemons, 1991) also illustrate its shortage.

2.4. The Importance of the alignment dichotomy

BP–ISP alignment and ISP–BP alignment are both important, but for different reasons. BP–ISP is important because it ensures that the business plan reflects the experience and knowledge of the organization in utilizing IS-based resources (Bensaou and Earl, 1998). It increases organizational understanding of information technology and agreement between managers on how best to use IT, both of which are important to strategic IS planning success (Segars and Grover, 1988). Finally, BP–ISP alignment signifies better top management understanding and thus greater top management commitment, both of which are vital to the strategic use of IS-based resources (King and Teo, 1997; Lederer and Sethi, 1996).

ISP–BP alignment is important because it signifies IS management's understanding of business strategy (Reich and Benbasat, 1996). Even so, it does not ensure that the business plan reflects the experience and knowledge of the organization. It does not show top management commitment to information systems (as does BP–ISP alignment), and IS investment decisions are simply too important to be delegated solely to the IS executive (Jarvenpaa and Ives, 1991). Without direct acknowledgment by top management (such as via BP–ISP alignment), organizations may ignore the strategic potential of information technology in the execution of their plans (Boynton et al., 1994; Reich and Benbasat, 1996).

Cresap et al. (1983) raised the importance of the alignment dichotomy in a survey of the extent of IS needs explicitly contained in the business plan and explicit references of the IS plan to the business plan. Goldsmith (1991) further stressed the significance of the dichotomy noting that full BP–ISP integration was necessary in order to achieve competitive advantage from IS investments. Various authors have characterized the highest level of BP–ISP evolution as being one of integrated, synchronistic planning in which BP and ISP occur simultaneously in a reciprocal fashion (King, 1984; Synnot, 1987; Teo and King, 1997).

IS-based strategies extend beyond the efficiency yielding support services associated with the process-oriented top–down planning of strictly ISP–BP alignment. Organizations have thus begun to realize that competitive advantage may be gained by implementing

strategies that reflect the thoughtful fusion of business objectives and processes with information technology. Use of technology, even superior technology, is not a sufficient condition (Savoia and Jordan, 1996). Where IS does not collaborate reciprocally with other functional areas, alignment will be only unilateral. Success will depend upon whether IS can exploit technology properly when processes and objectives have already been determined. This limitation can be overcome if a bilateral process — the alignment dichotomy — exists whereby business objectives are shaped around the IS technology infrastructure and incorporate special IS opportunities when available.

2.5. Use of IS-based resources to create a competitive advantage

Competitive advantage, in this study, refers to the competencies, capabilities, and resources that provide a distinct attraction to customers and create a superiority over competitors (Boar, 1994). Use of IS-based resources for competitive advantage is a proxy for organizational performance and thus the dependent variable (Vitale, 1986; Clemons and Row, 1991; Sethi and King, 1991). This construct was chosen because research suggests that both types of strategic alignment promote the use of IS for competitive advantage and that competitive advantage favorably affects organizational performance (Hartog and Herbert, 1986; Niederman et al., 1991).

The use of IS-based resources for competitive advantage in this study was measured by the extent of usage of IS for such competencies as the ability to create switching costs, lower product costs, create product differentiation, enable existing business strategies, and create new business strategies. Prior research that has attempted to relate functional level investments to organizational level performance through traditional financial measures has proved inadequate (Venkatraman and Ramanujam, 1986; Saunders and Jones, 1992). Although an indirect measure, the use of IS-based resources for competitive advantage offers management the ability to equate IS investment with outcomes that support business strategies and are designed to affect organizational performance positively. This study operationalized the organizational performance construct using strategic IS practices derived from Porter's (1980) competitive forces model.

Under the competitive forces model, such strategic applications include those used to help lower product costs, differentiate products and services, alter the bargaining power of suppliers and customers, and impose barriers to market entry (McFarlan, 1984; Ives and Learmonth, 1984; Porter and Millar, 1985). Creating information partnerships, introducing switching-costs, identifying distinctive organizational competencies, and leveraging unique firm capabilities also facilitate competitive advantage (Clemons and Row, 1991; Kettinger et al., 1994). Consequently, information-based resources can enable existing or create new business strategies to help the organization realize its objectives (Lederer and Mendelow, 1988; Henderson and Venkatraman, 1993).

These concepts appear in Table 3. They operationalize the construct for the dependent variable-use of IS-based resources to create a competitive advantage. Competitive advantage constructs had been proposed previously in other forms. Mahmood and Soon (1991) developed a 101-item model and Palvia (1997) developed a 134-item model to measure the impact of IS on various organizational variables. Sethi and King (1994) developed a multidimensional index of competitive advantage of 29 items for evaluating and

Table 3
Operationalization of the use of IS-based resources to create a competitive advantage (CA_{IS} and CA_{Other})

Variable	Measure
	With respect to our company's core products or services and major customers and suppliers, IS has been used to…
CA_1	…provide advantages such as lower costs or product differentiation.
CA_2	…influence the buyer's decision to switch to our products.
CA_3	…leverage unique firm capabilities.
CA_4	…enable existing business strategies.
CA_5	…create new business strategies.

prioritizing individual IS applications. These extensive models did not suit our purpose of measuring the existence of competitive advantage of a firm's portfolio of IS applications by two different respondents — one inside and one outside the IS area. Our five-item construct succinctly and parsimoniously operationalizes the construct, use of IS-based resources for competitive advantage, with measures grounded in theory, but sufficiently general to be understood by executives outside of the IS area.

3. Hypotheses

Fig. 1 depicts the four hypotheses in this research.

3.1. Hypotheses 1 and 2: ISP–BP alignment

IS management knowledge of the business plan is a pre-requisite for the IS plan to reflect the business plan mission, goals, strategies, and resource constraints, and to address external environmental forces (Zviran, 1990). Through such knowledge, IS management will be better committed to affect organizational performance and the IS plan can better carry out top management's objectives. By recognizing external environment forces, the plan can better respond to the dynamic and competitive status of its industry. By better reflecting business plan resource constraints, the IS plan will be more realistic, make more efficient use of IT, and more likely be funded. By better carrying out top management's objectives and addressing environmental forces, information systems can more likely be identified, funded, and developed to produce competitive advantage.

Anecdotal evidence of IS-based successes in other firms motivates executives to align the ISP with the BP in order to affect organizational performance (Bruce, 1998). Because IS and other senior executives are knowledgeable about IS planning and potential competitive advantage resulting from IS applications, the following hypotheses are proposed:

Hypothesis 1. IS executives will associate greater ISP–BP alignment with the greater use of IS-based resources for competitive advantage.

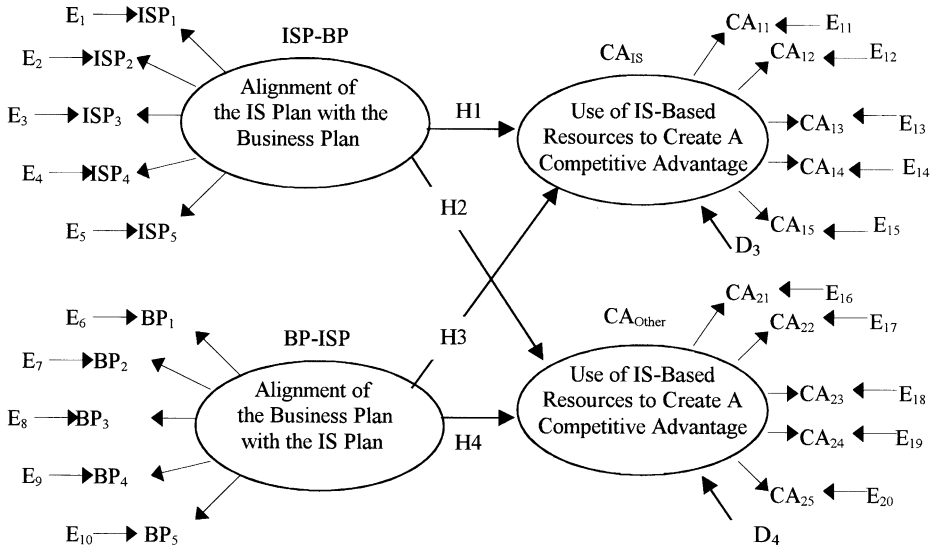


Fig. 1. Model of strategic alignment.

Hypothesis 2. Other senior executives will associate greater ISP–BP alignment with the greater use of IS-based resources for competitive advantage.

3.2. Hypotheses 3 and 4: BP–ISP alignment

References in the business plan to specific IS applications and information technologies from the IS plan demonstrate senior management's knowledge of and interest in information systems. The utilization of the strategic capability of IS and reasonable expectations of IS, as evident in BP–ISP alignment, also proclaim senior management's commitment. With knowledge, interest, and commitment, senior management will more likely fund IS proposals designed to produce competitive advantage.

BP–ISP alignment is of great interest to IS executives because they are primarily responsible for the success of the IS plan. At the same time, the involvement of other business executives in integrating business and IS strategies via BP–ISP alignment will help assure the continued interest and commitment of those executives (Boynton et al., 1994; Reich and Benbasat, 1996). Hence BP–ISP alignment will increase the likelihood of success for IS-based strategies. Because IS and other senior executives are knowledgeable about alignment and potential competitive advantage resulting from IS applications, the following hypotheses are proposed:

Hypothesis 3. IS executives will associate greater BP–ISP alignment with the greater use of IS-based resources for competitive advantage.

Hypothesis 4. Other senior executives will associate greater BP–ISP alignment with the greater use of IS-based resources for competitive advantage.

Several alignment typologies have illustrated planning synchronicity in which both ISP–BP and BP–ISP alignment co-exist (Goldsmith, 1991; Earl, 1993). Thus, simultaneous support for all four hypotheses is a very reasonable expectation.

4. Methodology

4.1. Survey instrument and construct measures

The model was investigated using a multi-informant field survey consisting of two instruments. Both instruments contained single sentence questions to be answered on a seven-point Likert-type scale. The evaluative dimensions for the scales were Strongly Disagree, Disagree, Mildly Disagree, Neutral, Mildly Agree, Agree, and Strongly Agree. Both instruments also contained general demographic questions.

Both instruments were sent to the senior IS executive who was asked to complete the primary instrument and direct the secondary instrument to another member of top management who was familiar with, but separate from the IS area. The primary instrument contained five questions for each of the model's independent variables and eight questions for the dependent variable. The secondary instrument contained only the eight questions for the dependent variable. The relevant survey questions appear in Appendix A.

Efforts were made to reduce systematic bias in the secondary instrument (i.e. the one for the other business executive). Both instruments went initially to the senior IS executive. That executive was asked to complete the primary instrument and direct the secondary to another senior member of top management who was familiar with, but separate from the IS area. The secondary respondent was assured of the confidentiality of responses and given a separate, addressed envelope with which to respond privately so as to further ensure confidentiality and thus reduce systematic bias. All secondary responses were received in those envelopes. As a result, the other business executive would not have felt any pressure to give any particular answers. Nevertheless, systematic bias may result from the IS executive's criteria for selection of the other business executive. However, this paired survey approach is accepted in IS research (Teo and King, 1997).

4.2. Multi-informant measures

In this study, paired responses on the CA construct were obtained from the IS executive (i.e. the primary respondent) and another senior executive from within the same organization (i.e. the secondary respondent). Because the two surveys were returned in separate envelopes, a control number was placed on each to enable later pairing. An explanation of the control number also appeared on the survey. Pairing responses from both sources allowed measurement of the agreement between IS executives and other senior executives on the dependent variable.

Single informant bias may result when information is collected from a single source within the organization (Huber and Power, 1985). Multi-informant surveys provide the advantage of reducing common source variance associated with sampling from the same

source for both the independent and the dependent variables. Multi-informant surveys also help to overcome problems of misspecification where constructs have been conceptualized at one level (i.e. the organizational level) and measured at another (i.e. individual perceptions). Pairing responses from both sources also allowed measurement of agreement between IS executives and other senior executives on the dependent variable.

The rationale to limit paired responses to the dependent variable was based on the reliability of the senior IS executive as an informant. Generally, informants should be chosen who are most familiar with the subject matter. However, it was also desirable to test the reliability of the senior IS executive's perceptions. By comparing responses to another high-ranking informant within the same organization, it was possible to ascertain the reliability of the primary informants perceptions and reduce the possibility of response bias. In fact, the correlation between CA_{IS} and CA_{other} was strong and statistically significant ($r = 0.57$, $p < 0.001$).

4.3. Survey results

The sample was drawn randomly from a database of over 12,000 firms covering all SEC codes. Beginning with a random number between 0 and 9, every tenth firm was selected until a sample of 1200 was reached. Five duplicates were eliminated and replaced by resampling.

The survey instrument was pre-tested on three professors of MIS with research interests in strategic information systems planning, a professor of strategic management, and a professor of statistics. Comments from these tests resulted in revisions to the construct measures, the reduction of the measures to single sentences to avoid ambiguity, and rearrangement of the sentences to avoid responses that were either socially desirable or a consequence of the immediately preceding questions. The authors also pilot tested the instrument on eight practitioners (including CIOs and other senior business executives) in four different industries in a large US metropolitan area.

After revising the instrument based on the pilot, the researchers mailed 1200 copies to chief information officers in the US. Useable responses for the primary survey came from 161 senior IS executive respondents. Useable responses for the secondary came from 107 other business executives. The mean response was 5.05 for IS executives and 4.80 for other senior executives on the seven-point scale. (Fig. 2 compares the mean of the responses for each item.) The difference between means was significant at the 0.001 level indicating that IS executives are probably more optimistic about the use of IS-based applications to create a competitive advantage for the organization. (Fig. 3 illustrates this optimism by showing the percentage differences for each item.) Still, the correlation ($r = 0.57$, $p < 0.001$). strongly supports the notion that IS and other senior executives generally agree about the use of IS based resources for competitive advantage. The high positive correlation also suggests the absence of common source variance.

Persons who cannot be contacted with the initial questionnaire should be excluded from the survey (Armstrong and Overton 1977). After adjusting for undeliverable surveys, a response rate of 24.4% was realized for the primary instrument (senior IS

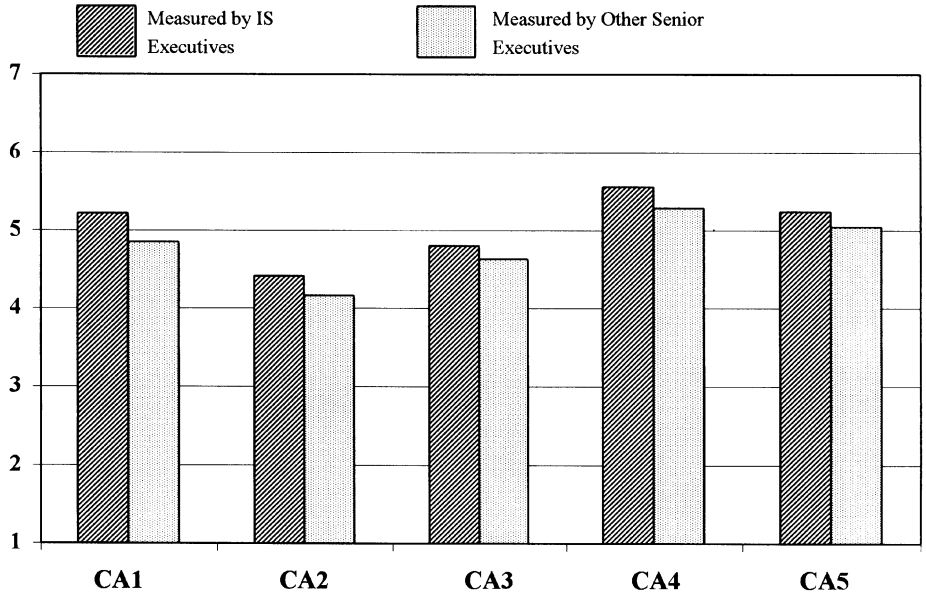
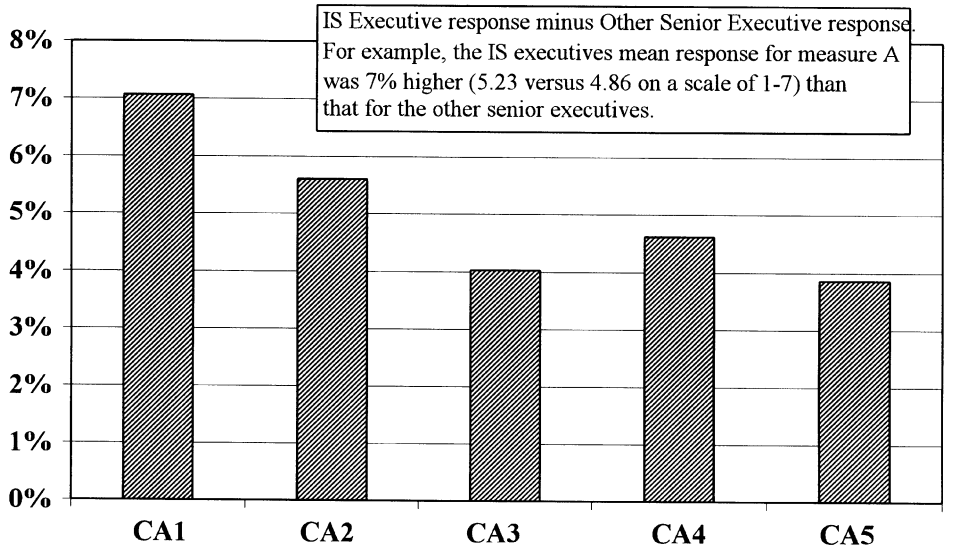


Fig. 2. Mean values for the CA construct measures.

executive respondents) and 16.5% for the secondary instrument (other senior executives).[2]

The average number of total employees and IS departmental employees for responding firms was 3070 and 71 employees, respectively. Company size, as measured by annual revenues and employees, ranged from small to large. Table 4 presents the frequency of response by industry. From Table 5 it is evident that approximately one-half of all respondents had annual revenues exceeding $250 million and 20 or more IS employees. Apparently, subjects were well educated and experienced within both their industry and

[2] Two rounds of mailings comprised the survey. After the first, the senior author randomly phoned subjects to discover if they had received it. Contacts revealed that many surveys had not been received. In many cases, secretaries had followed instructions to routinely discard all surveys. In other cases, the executive had either changed positions or left the company. Interpolation indicated that approximately 45% had not been delivered. Without the adjustment for undeliverable responses, the primary instrument response rate would have been 13.4%. Because the IS executive had to pass the secondary instrument to the other senior executive, the latter response rate could be calculated as 66.5% (or 107 divided by 161).



With respect to our company's core products or services and major customers and suppliers, IS has been used to ...

CA1 ... provide advantages such as lower costs or product differentiation.
CA2 ... influence the buyer's decision to switch to our products.
CA3 ... leverage unique firm capabilities.
CA4 ... enable existing business strategies.
CA5 ... create new business strategies.

Fig. 3. Percent difference between means for the CA construct measures.

company. IS executives also had considerable IS experience. Probably both sets of subjects are representative of US organizations.

4.4. Analysis of non-response bias

Assessment of bias from non-respondents was accomplished via two tests. First, demographic data measuring firm size was compared for 400 randomly selected non-respondents to analogous data for the 161 respondents. Total assets and total employees were not found to be significantly different using two-tailed t-tests ($p \leq 0.05$).

Second, a comparison of the values of the dependent variable by return date was conducted. If early respondents differ in their beliefs from later respondents, and especially if a trend is evident, then the timing of response may signal the presence of a bias between respondents and non-respondents (Armstrong and Overton, 1977; Chapman 1992). The researchers divided the 161 returns into eight time-periods of equal length and measured the value of the dependent variable for each of the eight periods. Differences between the means were not statistically significant at the 0.05 level. Together, these two

Table 4
Survey response by industry

Industry	Frequency
Manufacturing	50
Wholesale/Retail	24
Utilities and communications	20
Construction	8
Finance	8
Publishing/news	7
Computers	5
Consumer products	4
Petroleum	3
Aerospace	2
Auto/heavy industry	2
Health care	2
Legal	2
Restaurants	2
Transportation	2
Agriculture	1
Education	1
Hotels	1
Insurance	1
Mining	1
Pharmaceuticals	1
Other	14
Total responses	161

tests suggest that data from the respondents were not significantly different from those of non-respondents.

5. Analysis of data

Research data was analyzed using structural equation modeling. A discussion of this method and the confirmatory approach appears in Appendix B. Results of the confirmatory factor analysis are presented in Table 6 which includes standardized loadings for each of the study variables and measures of reliability and validity. Variable loadings were generally very high and significant ($p < 0.001$). Convergent validity was supported by four tests and study variables were internally consistent. Measures for goodness-of-fit, presented in Table 7 along with recommended test values, supported the overall reliability and validity of the model (Marsh et al., 1988; Bollen, 1989; Bentler, 1990; Chau, 1997).

Fig. 4 presents the path coefficients, with associated *t*-values in parentheses, for the final structural model. The ISP–BP and BP–ISP constructs were measured only by senior IS executives. The dependent variable CA_{IS} was measured by senior IS executives and the dependent variable CA_{Other} was measured by other senior executives. The disturbance terms of 0.734 and 0.886 for the dependent variables indicate that the model explains

Table 5
Characteristics of respondents

	Senior IS executives	Other senior executives
Years of college education	5.1	5.4
Years of experience in industry	17.5	18.5
Years of experience with company	12.2	14.7
Years of experience in information systems area	20.8	na
*Annual Revenues*In %		
$1 billion and above	14.68	
$500–$999 million	11.01	
$250–$499 million	22.94	
Less than $250 million	33.03	
Missing data	18.35	
Employees		
10,000 and above	4.59	
5000–9999	9.17	
2500–4999	13.76	
1000–2499	32.11	
Less than 1000	35.78	
Missing data	4.59	
IS employees		
200 and above	5.50	
100–199	11.93	
50–99	7.34	
20–49	22.02	
10–19	23.85	
Less than 10	24.77	
Missing data	4.59	

about 48% of the variability in the CA_{IS} construct and 22% in the CA_{Other} construct (Hoyle, 1995).

6. Discussion of results

6.1. Support of hypotheses

Study results support three of the four hypotheses. Alignment of the IS plan with the business plan was associated with the use of IS for competitive advantage by both IS executives and other senior executives (Hypotheses 1 and 2). Alignment of the business plan with the IS plan was associated with the use of IS for competitive advantage by the senior IS executives (Hypothesis 3), but not by other senior executives (Hypothesis 4).

Table 6
Results of confirmatory factor analysis

Constructs and indicators	Standardized loadings	*t*-values	Composite reliability	Indicator reliability	Variance extracted estimate
ISP–BP Alignment			0.913		0.683
ISP1	0.888	11.35		0.789	
ISP2	0.936	12.47		0.876	
ISP3	0.949	12.77		0.901	
ISP4	0.667	7.58		0.445	
ISP5	0.638	7.17		0.407	
BP–ISP Alignment			0.943		0.770
BP1	0.877	11.63		0.769	
BP2	0.915	12.36		0.837	
BP3	0.915	12.14		0.837	
BP4	0.898	11.35		0.806	
BP5	0.774	8.74		0.599	
Competitive advantage (IS executive)			0.843		0.522
CA11	0.781	4.17		0.610	
CA12	0.647	3.85		0.419	
CA13	0.828	4.21		0.686	
CA14	0.723	3.98		0.523	
CA15	0.609	3.70		0.371	
Competitive advantage (other senior executives)			0.895		0.634
CA21	0.749	6.96		0.561	
CA22	0.656	7.37		0.430	
CA23	0.814	7.32		0.663	
CA24	0.833	7.41		0.694	
CA25	0.906	7.93		0.821	

Table 7
Goodness-of-fit measures for the structural model

	Critical value	Model statistic
Satorra–Bentler chi-square	–	299.72 ($p < .001$)
Degrees of freedom	–	190
Chi-square/degrees of freedom	≤ 2.0	1.58
Average absolute standardized residual	≤ 2.0	0.048
Non-normed fit index	≥ 0.90	0.906
Comparative fit index	≥ 0.90	0.920
Robust comparative fit index	≥ 0.90	0.946
Standardized mean squared residual	≤ 0.10	0.032

6.2. Importance of aligning the IS plan with the business plan

Findings from this study strongly support the expectation that alignment of IS with business plans produces the use of IS-based resources for competitive advantage. Results from both IS and other senior executives are consistent with the prediction that when the IS plan reflects the mission and goals of the firm, supports business strategies, recognizes external forces, and reflects resource constraints, then the organization more likely uses IS strategically.

6.3. Importance of aligning the business plan with the IS plan

Findings from this study also support the expectation that alignment of business with IS plans produces the use of IS-based resources for competitive advantage from the perspective of IS executives. However, findings from the study do not support that expectation from the perspective of the other business executives. Although the association

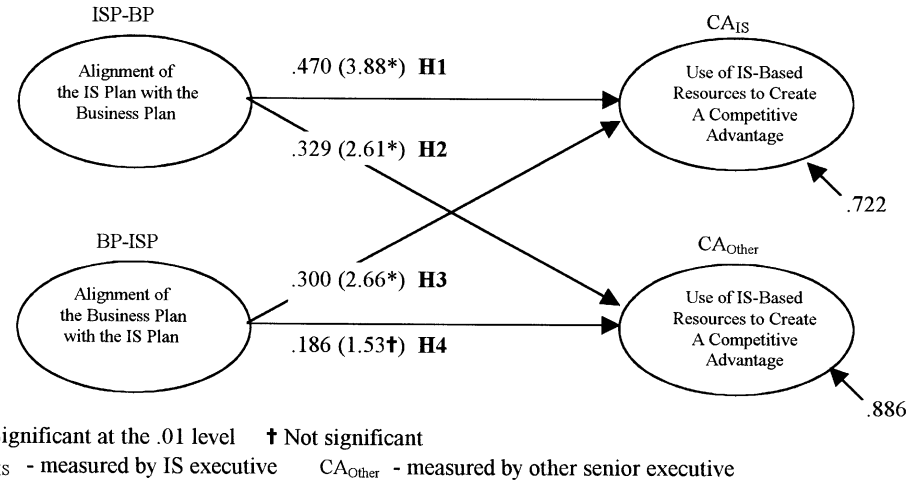


Fig. 4. Influence of strategic alignment on the use of IS-based resources to create a competitive advantage.

between BP–ISP alignment and the use of IS-based resources to create a competitive advantage was positive for both groups, it was weaker and lacked statistical significance for other business executives. Three reasons might explain this unexpected difference.

First, IS executives may overestimate the importance of IS to the firm. If so, then the alignment of the business plan with the IS plan may simply not be necessary to ensure the use of IS for competitive advantage. Conversely, other business executives may undervalue the importance of IS to the firm. If so, then the alignment of the business plan with the IS plan might be quite valuable in improving the use of IS for competitive advantage.

Second, it is possible that both IS and other business executives correctly understand the importance of IS to the firm. However, the other business executives might perceive the alignment of the information systems plan with the business plan as sufficient to support the use of IS-based resources for competitive advantage. These executives may be cognizant of opportunities for further alignment, but deem the effort unlikely to produce increased benefits.

Third, these other business executives may simply believe that the alignment of the information systems plan with the business plan is the appropriate approach to strategic alignment. They may not be particularly cognizant that the alignment of the business plan with the information systems plan is a viable and useful alternative. While this may be a less astute vision, senior executives could easily hold it if they lack knowledge of the opportunities of IS-based resources.

Thus no single reason irrefutably explains the failure to support the relationship between BP–ISP alignment and the use of information-based resources for competitive advantage with data from other senior executives. Perhaps a combination of the three suggested here is responsible.

However, the implication of the failure to support the relationship — especially in light of its support with IS executives and the very strong correlation of the use of information-based resources for competitive advantage for both sets of subjects — is very noteworthy. Namely, while many IS executives and other senior business executives probably do share an understanding of the role of ISP–BP alignment, they do not share an understanding of the role of BP–ISP alignment in their organizations. Chances are that without that latter shared understanding, their organizations are missing significant potential benefits from information systems investments.

7. Contributions

7.1. Contributions to theory and research

This study makes several useful contributions to theory and research. First, it tests existing theory about the impact of strategic alignment on the use of IS-based resources for competitive advantage. In doing so, it provides strong support for the impact of the alignment of the IS plan with the business plan. However, it provides only partial support for the impact of the alignment of the business plan with the IS plan. Moreover, it provides just conjecture as to why only partial support was found.

Second, the research illustrates the value and efficacy of multi-informant sources. The use of such sources is often recommended, but difficult to realize in survey research. In the current research, use of multi-informants was very valuable because the different perspectives from different managerial positions provided richer results. In particular, the correlation between the two dependent variables identifies the perceptual agreement of IS and other business executives.

Third, the research tests new constructs for ISP–BP alignment, BP–ISP alignment, and the use of IS-based resources for competitive advantage. Although measures for the constructs were grounded in existing theory, empirical research had not tested them grouped as such.

7.2. Contributions to practice

These findings are especially relevant for practitioners. First, they support the notion that businesses should pursue strategic alignment practices to improve organizational performance using IS-based resources. Findings from both IS and other senior executives demonstrate that ISP–BP alignment presages competitive advantage.

Second, because of these findings from both groups, IS executives should probably attempt to carry out the specific ISP–BP alignment practices in this research. That is, they should attempt to ensure that the IS plan reflects the business plan mission and goals, supports the business strategies, recognizes business environmental forces, and reflects resource constraints.

Third, IS executives should realize that other senior executives might not perceive that BP–ISP alignment presages competitive advantage. IS executives should realize that they may more highly prize having the business plan directly reference the IS plan, specific IS applications, and information technologies than do other senior executives. Findings from IS executives suggest that BP–ISP alignment leads to competitive advantage, whereas findings from other senior executives do not.

Fourth, when IS executives believe that such perceptual differences exist, they might mount an educational campaign to inform other senior executives about the importance of BP–ISP alignment. Specifically, they might attempt to convince other business executives to give greater recognition to IT capabilities when shaping business strategies. They might also try to educate them about the accomplishments and potential advantages of information systems. This could reduce perceptual differences and lead to an improved understanding of the role of IS in the organization.

Fifth, and probably the most important, IS executives and other senior business executives should accept joint responsibility for efforts to achieve IS-based competitive advantage. Collaboration between business and IS executives is vital to ensure that information technology investments reflect thoughtful and experienced judgment from both perspectives introduced in a symmetrical manner. The higher level of integration, accomplished through BP–ISP alignment by making information technology knowledge and IS opportunities available early in the business planning process, is more likely to produce an optimum melding of strategies. The achievements of Charles Schwab, Amazon.com, Dell Computer, Fingerhut, Newcomer National Airlines, and the banks and chemical

companies mentioned in the introduction to this paper are more likely available to organizations whose executives share a vision of the impact of such alignment.

Finally, executives should consider practices other than strategic alignment that may predict the use of IS-based resources for competitive advantage. While study results indicate that alignment accounts for almost half of the variability, other important predictors account for the other half. In summary, the competitive advantage potentially available from strategic partnering, electronic data interchange, the introduction of switching costs via electronic alliances, distributed databases, geographical information systems, data warehouses, object-oriented development, enterprise resource planning and other examples of contemporary IT will be better realized when both ISP–BP and BP–ISP alignment are present.

7.3. Future research

Future research should address questions raised in this study and extend its findings. It should investigate fully why the impact of the alignment of the business plan with the IS plan did not presage competitive advantage from the perspective of other senior executives. It should extend the use of multi-informant sources in other studies. By employing the same measures developed here, future research should further validate the constructs used in this study. These same constructs could also be used to explain other phenomena of IS planning and competitive advantage.

Future research on this model could benefit from a larger sample that may improve reliability and model fit. An alternative set of measures could also be used to operationalize the CA construct.

Future studies of alignment might consider a framework with a linkage cause vs. linkage effect dimension and an intellectual vs. social dimension (Reich and Benbasat, 1996). The ISP–BP and BP–ISP alignment dichotomy in the current research emphasized the effects of linkage rather than its causes. Research could investigate these causes. It could also investigate the social (choice of actors, timing, decision making and communication used in mission, objectives and plan formulation) as well as the intellectual (i.e. the methodologies for such formulation) issues. Future research should also consider the relationship of industry characteristics to the linkage cause vs. linkage effect dimension.

8. Conclusions

This study strongly supports the commonly held view that effective ISP–BP alignment presages the use of IS-based resources for competitive advantage. However, it does not so strongly support the analogous association of BP–ISP alignment with such advantage. A deeper understanding of these findings might reveal how organizations can apply strategic alignment to IS-based resources in order to gain competitive advantage and improve organizational performance.

Appendix A. Survey questions

INFORMATION SYSTEMS EXECUTIVE SURVEY

This survey seeks to assess the strategic impact of information systems (IS) and information technology (IT) on your firm. To avoid confusion, we have consistently used IS to mean both IS and IT. Please circle the response indicating the extent to which you *agree* or *disagree* with each statement. SD (strongly disagree) D (disagree) MD (mildly disagree) N (neutral) MA (mildly agree) A (agree) SA (strongly agree)

With respect to our company's core products or services and major customers and suppliers, IS has been used to…	SD	D	MD	N	MA	A	SA
…provide advantages such as lower costs or product differentiation.	1	2	3	4	5	6	7
…influence the buyer's decision to switch to our products.	1	2	3	4	5	6	7
…leverage unique firm capabilities.	1	2	3	4	5	6	7
…enable existing business strategies.	1	2	3	4	5	6	7
…create new business strategies.	1	2	3	4	5	6	7
…make it more costly for our customers to change suppliers.	1	2	3	4	5	6	7
…establish electronic links with suppliers or customers.	1	2	3	4	5	6	7
…create barriers to keep competitors from entering our markets.	1	2	3	4	5	6	7
The following questions concern the alignment of IS and business strategy.	SD	D	MD	N	MA	A	SA
The IS plan reflects the business plan mission.	1	2	3	4	5	6	7
The IS plan reflects the business plan goals.	1	2	3	4	5	6	7
The IS plan supports the business strategies.	1	2	3	4	5	6	7
The IS plan recognizes external business environment forces.	1	2	3	4	5	6	7
The IS plan reflects the business plan resource constraints.	1	2	3	4	5	6	7
The business plan refers to the IS Plan.	1	2	3	4	5	6	7
The business plan refers to specific IS applications.	1	2	3	4	5	6	7
The business plan refers to specific information technologies.	1	2	3	4	5	6	7
The business plan utilizes the strategic capability of IS.	1	2	3	4	5	6	7
The business plan contains reasonable expectations of IS.	1	2	3	4	5	6	7
OTHER BUSINESS EXECUTIVE SURVEY							
With respect to our company's core products or services and major customers and suppliers, IS has been used to…	SD	D	MD	N	MA	A	SA
…provide advantages such as lower costs or product differentiation.	1	2	3	4	5	6	7
…influence the buyer's decision to switch to our products.	1	2	3	4	5	6	7
…leverage unique firm capabilities.	1	2	3	4	5	6	7
…enable existing business strategies.	1	2	3	4	5	6	7
…create new business strategies.	1	2	3	4	5	6	7
…make it more costly for our customers to change suppliers.	1	2	3	4	5	6	7
…establish electronic links with suppliers or customers.	1	2	3	4	5	6	7
…create barriers to keep competitors from entering our markets.	1	2	3	4	5	6	7

Appendix B. Analysis of data with structural equation modeling

B.1. Structural equation modeling

An exploratory factor analysis using principal component analysis with Varimax rotation, Kaiser normalization, and eigenvalues greater than one converged upon four factors with items identical to those originally theorized in the a priori model in Fig. 1. However, because the constructs are well grounded in existing theory, this paper details a confirmatory factor analysis using structural equation modeling (SEM). SEM fits an

Table B1
Results of tests for discriminant validity (CA_{IS} — dependent variable measured by senior IS executive, CA_{Other} — dependent variable measured by other senior executives)

Constructs	r	r^2	Variance extracted	Estimates	VEE > r^2
ISP–BP	0.590	0.348	0.683	0.770	Yes
ISP–CA_{IS}	0.644	0.415	0.683	0.522	Yes
BP–CA_{IS}	0.555	0.308	0.770	0.522	Yes
ISP–CA_{Other}	0.438	0.192	0.683	0.634	Yes
BP–CA_{Other}	0.378	0.143	0.770	0.634	Yes

observed covariance matrix to a hypothesized covariance matrix imposed by the structural equations which define the model (Norusis, 1988) and, because of its inferential nature, supports hypothesis testing better than other multivariate methods (Byrne, 1994). The method has been used in several MIS research studies (Chau, 1997).

In situations where prior theory is strong and emphasis is on further testing and development, covariance-based full estimation methods such as maximum likelihood estimate (MLE) are most appropriate. Theory-oriented, MLE emphasizes the transition from exploratory to confirmatory analysis as contrasted to a causal-predictive approach such as partial least squares which is suitable for situations of high complexity but low theoretical information (Joreskog and Wold, 1982). The essential statistical assumption of SEM is multivariate normality. In practice, data rarely meet this criterion. The software used for this analysis, EQS, provides robust statistics (such as the Satorra–Bentler scaled chi-square and robust standard errors) for analysis on data that may not be multivariate normally distributed.

Model testing followed the two-phase approach prescribed by Anderson and Gerbing (1988). In this approach, both a measurement model and a structural model are specified allowing a confirmatory assessment of construct validity (Hatcher, 1994).

B.2. The measurement model

In building the measurement model, multiple indicator variables were used for each construct and there was no evidence of multidimensionality. Unidimensionality is desired because it avoids ambiguity in assigning precise meaning to the estimated construct. (Anderson and Gerbing, 1982). Frequently, the initially specified measurement model fails to provide acceptable fit and respecification is necessary. In this study, respecification involved dropping three of the original eight items measuring the CA construct. Fig. B1 presents the final measurement model including covariances between the four latent factors, associated t-values, and indices for goodness-of-fit. The four model constructs are measured by 20 indicator variables: five for each of the constructs. Each of the indicator variables — ISP_i, BP_i, and CA_i — has an associated error term, E_i. The CA construct is measured by the same items but by two different respondents. The dependent variable CA_{IS} was measured by senior IS executives and the dependent variable CA_{Other} was measured by another senior executives. The high values for the goodness-of-fit measures support the fit of the study data to the final measurement model.

B.3. The structural model

In the second phase, a structural model was specified to analyze the validity of the theorized causal paths that describe the relationships between the constructs. The disturbance terms (D_3 and D_4) for the models are 0.722 and 0.886 for CA_{IS} and CA_{Other}, respectively. Thus, the model explains about 48% of the variability in the CA_{IS} construct (calculated as $1 - 0.734^2$) and 22% (calculated as $1 - 0.886^2$ of the CA_{Other} construct (Hoyle, 1995).

Intercorrelations between study variables and latent factors for both the CA_{IS} and the CA_{Other} models appear in Table B2. As expected, correlations between indicator variables sharing a common factor were positive and higher than those with other factors.

B.4. Testing for model construct validity

Construct validity estimates how well the operationalization measures the underlying latent factor (Schwab, 1980) and includes four components — content validity, convergent validity, discriminant validity, and predictive validity (Venkatraman and Ramanujam, 1987).

B.4.1. Content validity

Content validation is a judgmental process by which competent judges make a determination as to the adequacy of the measuring instrument in fulfilling its purpose. For this study, content validation was examined via a pilot test of the primary and secondary surveys on four IS and four other senior executives. Their comments were incorporated into the final instruments.

B.4.2. Convergent validity

Convergent validity is the level of shared variance among the indicator variables. Three measures of convergent validity were performed: indicator reliability, composite reliability, and the average variance extracted estimate. Measures for the final structural model are presented in Table 6 with standardized loadings and accompanying *t*-values for each indicator variable.

Indicator reliability describes the percent of variation in the indicator that is explained by the underlying latent factor and is defined as the square of the correlation between the latent factor (e.g. the construct) and the indicator (Hatcher, 1994). This is also the square of the standardized loading. For example, the indicator reliability for variable ISP_1 in Table 6 is equal to the square of its loading or $(0.888)^2 = 0.789$. Thus we can say that about 79% of the variability in ISP_1 is accounted for by the ISP alignment construct.

Composite reliability reflects the internal consistency of the indicators measuring the latent factor. This index, analogous to coefficient alpha, ranges from 0 to 1, and will be high if the indicators are strongly correlated with one another (Fornell and Larcker 1981). For the four factors all composite reliabilities exceeded 0.84 indicating that the measures were all internally consistent.

Variance extracted estimates for latent factors assess the amount of variance that is captured by the factor as opposed to the amount ascribed to random measurement error. The index ranges from 0 to 1 and it is desirable that estimates demonstrate a value of 0.50

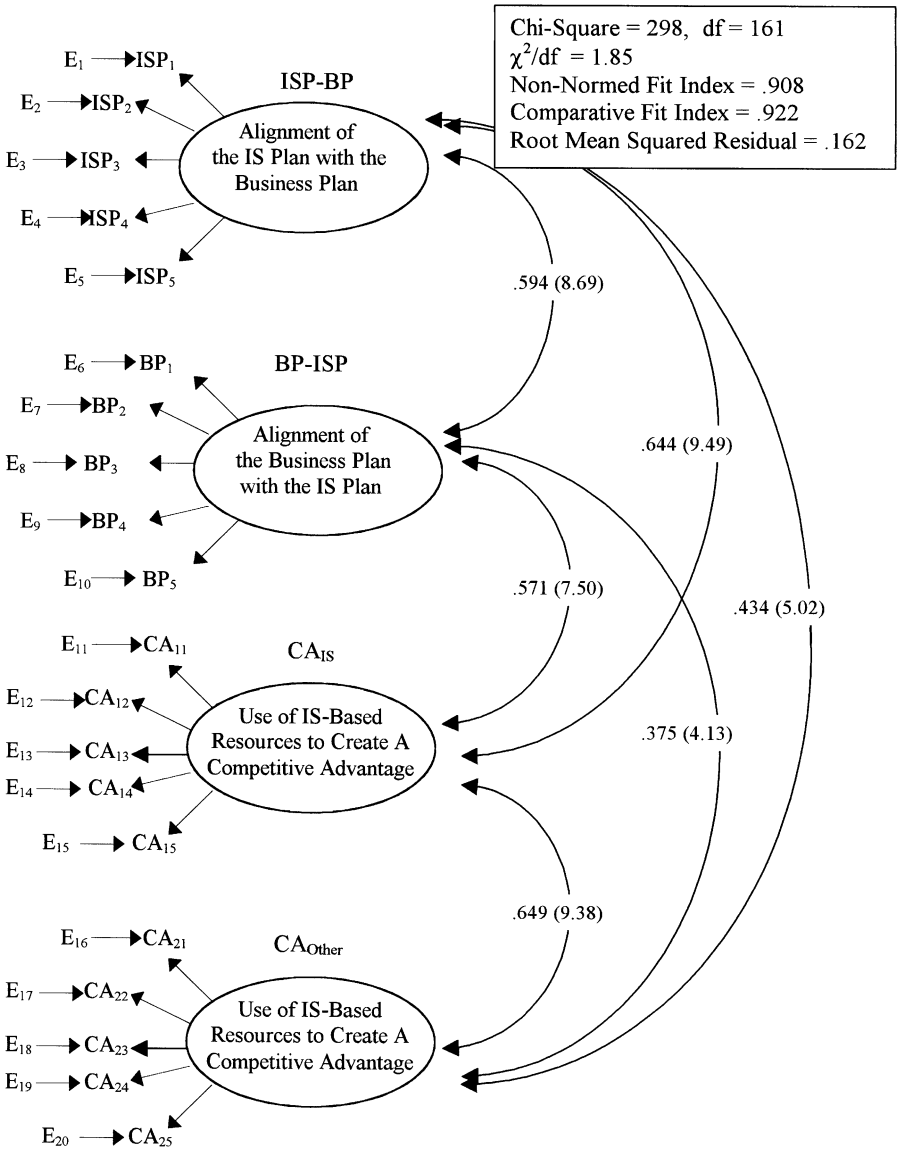


Fig. 5. Final measurement model.

or higher. Variance extracted estimates all exceed the suggested value of 0.50 and, taken as a group, the three constructs performed very well.

B.4.3. Discriminant validity

The variance extracted estimate also revealed support for discriminant validity. A

Table B2
Intercorrelations of study variables & latent factors; ISP, BP, CA1 and CA2 are latent factors

	ISP1	ISP2	ISP3	ISP4	ISP5	BP1	BP2	BP3	BP4	BP5	CA11	CA21	CA31	CA41	CA51	ISP	BP	CA1
Intercorrelations of study variables and latent factors as measured by the IS executive (CA_{IS})																		
ISP1	1.000																	
ISP2	0.917	1.000																
ISP3	0.844	0.887	1.000															
ISP4	0.591	0.622	0.632	1.000														
ISP5	0.567	0.596	0.606	0.671	1.000													
BP1	0.464	0.544	0.496	0.348	0.333	1.000												
BP2	0.485	0.510	0.518	0.363	0.348	0.818	1.000											
BP3	0.480	0.504	0.513	0.360	0.345	0.810	0.846	1.000										
BP4	0.461	0.485	0.493	0.345	0.331	0.778	0.813	0.804	1.000									
BP5	0.389	0.409	0.416	0.291	0.279	0.656	0.686	0.679	0.782	1.000								
CA11	0.465	0.489	0.497	0.348	0.334	0.400	0.417	0.413	0.397	0.335	1.000							
CA21	0.366	0.385	0.391	0.274	0.263	0.314	0.329	0.325	0.312	0.264	0.520	1.000						
CA31	0.479	0.504	0.512	0.359	0.344	0.412	0.430	0.426	0.409	0.345	0.681	0.536	1.000					
CA41	0.401	0.421	0.428	0.300	0.288	0.345	0.360	0.356	0.342	0.289	0.570	0.448	0.587	1.000				
CA51	0.332	0.349	0.355	0.249	0.239	0.286	0.298	0.295	0.284	0.239	0.472	0.372	0.487	0.407	1.000			
ISP	0.888	0.934	0.950	0.666	0.638	0.522	0.546	0.540	0.519	0.438	0.523	0.412	0.539	0.451	0.374	1.000		
BP	0.524	0.551	0.561	0.393	0.377	0.885	0.924	0.915	0.879	0.742	0.452	0.355	0.466	0.389	0.323	0.590	1.000	
CA1	0.572	0.601	0.611	0.429	0.411	0.492	0.514	0.508	0.488	0.412	0.813	0.640	0.838	0.701	0.581	0.644	0.555	1.000
	ISP1	ISP2	ISP3	ISP4	ISP5	BP1	BP2	BP3	BP4	BP5	CA12	CA22	CA32	CA42	CA52	ISP	BP	CA2
Intercorrelations of study variables and latent factors as measured by other senior executives (CA_{Other})																		
ISP1	1.000																	
ISP2	0.917	1.000																
ISP3	0.839	0.885	1.000															
ISP4	0.599	0.632	0.628	1.000														
ISP5	0.577	0.609	0.605	0.671	1.000													
BP1	0.468	0.551	0.491	0.351	0.337	1.000												
BP2	0.489	0.516	0.513	0.366	0.352	0.819	1.000											
BP3	0.485	0.512	0.509	0.363	0.350	0.813	0.849	1.000										
BP4	0.463	0.489	0.486	0.347	0.334	0.776	0.810	0.804	1.000									

Table B2 (*continued*)

	ISP1	ISP2	ISP3	ISP4	ISP5	BP1	BP2	BP3	BP4	BP5	CA11	CA21	CA31	CA41	CA51	ISP	BP	CA1
BP5	0.391	0.413	0.410	0.293	0.282	0.655	0.684	0.679	0.782	1.000								
CA12	0.301	0.318	0.316	0.225	0.217	0.257	0.268	0.266	0.254	0.215	1.000							
CA22	0.260	0.274	0.273	0.195	0.187	0.222	0.232	0.230	0.220	0.185	0.510	1.000						
CA32	0.320	0.337	0.335	0.240	0.231	0.273	0.285	0.283	0.270	0.228	0.627	0.542	1.000					
CA42	0.325	0.343	0.341	0.243	0.234	0.277	0.290	0.288	0.274	0.232	0.637	0.550	0.677	1.000				
CA52	0.357	0.376	0.374	0.267	0.257	0.305	0.318	0.316	0.301	0.254	0.699	0.604	0.743	0.755	1.000			
ISP	0.894	0.944	0.938	0.670	0.645	0.523	0.547	0.543	0.518	0.437	0.337	0.291	0.358	0.363	0.399	1.000		
BP	0.528	0.558	0.554	0.396	0.381	0.886	0.925	0.918	0.876	0.740	0.290	0.251	0.308	0.313	0.344	0.591	1.000	
CA2	0.392	0.413	0.411	0.293	0.283	0.334	0.349	0.347	0.331	0.279	0.768	0.664	0.816	0.829	0.910	0.438	0.378	1.000

suggested method to test for discriminant validity is to compare the squared correlation between two constructs with their respective variance extracted estimates (Fornell and Larcker, 1981).

Discriminant validity is demonstrated if each of the variance extracted estimates exceeds the squared correlation. As seen in Table B1, the variance extracted estimates are indeed greater than the squared correlations for each set of constructs. Thus, the measures successfully discriminate between the constructs.

B.4.4. Predictive validity

Finally, predictive validity refers to the ability of the model to predict the theorized relationships. In the structural equation model all path coefficients are positive, indicating positive relationships, and three of the four path coefficients are significant at the 0.01 level. These three strong associations support the predictive validity of the structural equation model (Raghunathan and Raghunathan, 1994).

Another method of measuring convergent validity is through the multitrait-multimethod (MTMM) approach. Employing multiple measures and utilizing different sources helps to ensure data converge in a similar meaning for the construct. While the MTMM matrix methodology has been recommended, it requires multiple samples making it more costly and time consuming (Campbell and Fiske, 1959; Schwab, 1980). Additionally, the approach does not separate random and systemic errors from the relationships between the latent factors (Segars and Grover, 1995).

B.5. Goodness-of-fit

The chi-square statistic (χ^2) provides a test of the residual differences between the covariance matrix derived from the survey data and the fitted population covariance matrix derived from the structural equation model. It is widely recognized that large values of χ^2 may only reflect departures from the assumption of multivariate normality and result in the rejection of a well-fitting model. For this reason, it was decided to replace the χ^2 test with the commonly used ratio of chi-square/degrees of freedom (χ^2/df). A common heuristic is that values of less than 2.0 indicate good model fit (Joreskog and Sorbom, 1989).

Assessing goodness-of-fit in a model is a relative process requiring the use of multiple test statistics to reduce any possible bias in a particular test (Bollen and Long, 1993; Hair et al., 1995). Various authors have chosen to use different sets of these tests (Hartwick and Barki, 1994; Chau, 1997). For this study, the statistical tests chosen were the Satorra–Bentler chi-square, chi-square to degrees of freedom (χ^2/df), average absolute standardized residual, non-normed fit index, comparative fit index, robust comparative fit index, and standardized mean squared residual. Goodness-of-fit statistics presented in Table 7 all exceed their recommended level for acceptance and support the fit of the model to the observed data.

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