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## The Role of Convergence in Information Systems and Business Planning

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## **The Role of Convergence in Information Systems and Business Planning**

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### **ABSTRACT**

*A key challenge to top management is the alignment of IS and business plans for the purpose of producing an IT-based competitive advantage. This study uses a well known communication theory to provide new insight into the impact of CEO and CIO planning participation on IS and business alignment via the convergence of views between the CEO and CIO regarding the current and future strategic impact of IT on the firm's success. One hundred and nine matched pairs of questionnaire responses from CIOs and CEOs were collected using a postal survey. Results indicated that CIO participation in business planning predicted current convergence, and current convergence predicted the alignment of the IS plan with the business plan as well as the alignment of the business plan with the IS plan. Alignment of the IS plan with the business plan predicted key IS plan objectives whereas alignment of the business plan with the IS plan did not. Key IS plan objectives predicted the use of IT for competitive advantage.*

*The paper contributes by confirming that convergence plays a mediating role between the participation of the CIO in business planning and the alignment of the IS plan with the business plan. It also contributes by underscoring the impact of key IS plan objectives on the use of IT for competitive advantage.*

### **INTRODUCTION**

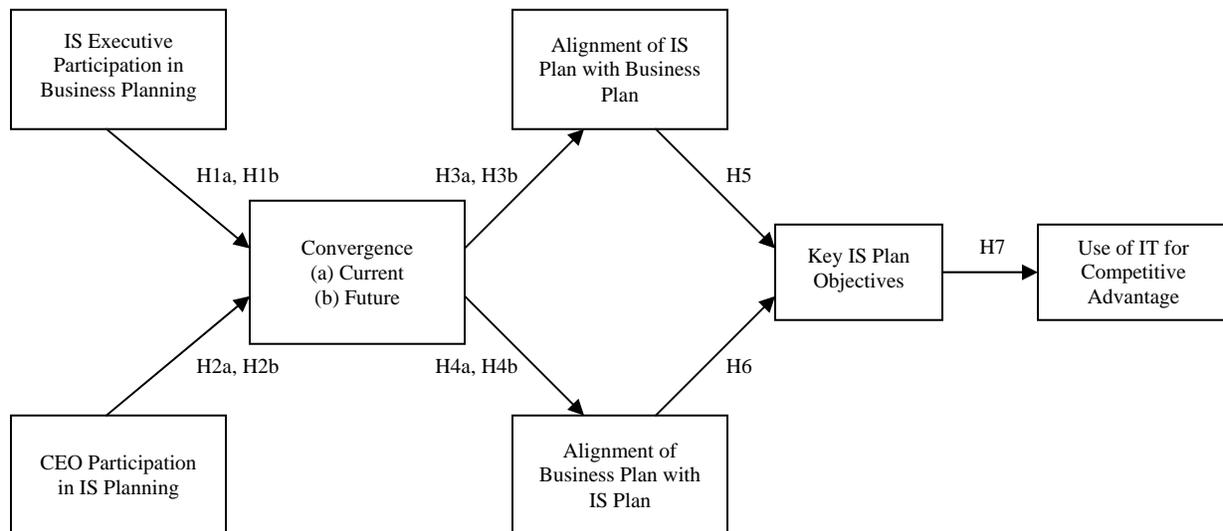
For more than a decade, a top issue facing both information systems and business executives has been the alignment of IS planning with business objectives (Brancheau & Wetherbe, 1987; Brancheau, Janz, & Wetherbe, 1996; Luftman & McLean, 2004; Niederman, Brancheau, & Wetherbe, 1991). Alignment can positively affect business performance through the development of applications critical to business activities (Lederer & Mendelow, 1989). Such support of business activities can lead to enhanced IS performance payoffs, improved financial performance, and increased profitability (Chan, 2002; Das, Zahra & Warkentin, 1991; Kearns, 2005; Tallon, Kraemer & Gurbaxani, 2000).

Research has indicated that increases in communication between business and IS executives are positively associated with increases in alignment (Reich & Benbasat, 2000). However, research has not sufficiently examined the mechanism through which such communication influences alignment and the relationship of alignment to IS strategic planning.

The central purpose of this study is to use the role of common understanding (also known as convergence) among business and IS executives to explain the effect of their participation in information systems planning and business planning on their alignment of business and IS plans (Kearns and Lederer, 2003) as they develop key IS plan objectives to employ their IT for competitive advantage. The study, therefore, tests hypotheses concerning the effect of planning participation on convergence, of convergence on alignment, of alignment on the presence of key

IS plan objectives, and of those objectives on the use of IS for competitive advantage. The research model appears in Figure 1.

**Figure 1. Figure Model**



## CONSTRUCTS

### IS Executive Participation in Business Planning

IS executives often participate in and thus provide input to the firm's business planning process. They are thus present during the creation of the organization's mission statement, goals, and strategies. They may be asked to provide their input if general management believes that business planning is more effective as a participative process involving all key managers (Sabherwal & King, 1991). The participation of the IS executive may be seen as a binding mechanism that bridges the gap between IS and business strategies (Reich & Benbasat, 2000; Vitale, Ives & Beath, 1986). The IS executive becomes aware of the overall strategic business plan and hence is thought to be able to craft the IS strategy to support and enhance the effectiveness of business planning (Armstrong & Sambamurthy, 1999).

IS executives may participate by regularly attending business planning meetings in which they help formulate business goals (Lederer & Mendelow, 1989). On the other hand, they may have easy access to top management through regular informal contacts (Raghunathan & Raghunathan, 1990). Such types of contact may be either frequent or infrequent.

### CEO Participation in IS Planning

CEOs may participate in IS planning. They are thus present during the identification of proposed IS applications that are intended to support the organization's mission statement, goals, and strategies (Keen, 1991). They provide input because they believe their overall knowledge and leadership will make IS planning more effective (Byrd, Sambamurthy & Zmud, 1995; Jitpaiboon & Kalaian, 2005).

A CEO might participate as a member of a corporate IS steering committee (Jarvenpaa & Ives, 1991). On the other hand, the CEO might participate via informal contacts with IS management (Lederer & Mendelow, 1989). Regardless, the CEO who participates in IS planning discovers more about competitors' use of IS, learns more about

IS opportunities within the firm, and better understands the importance of spending on IS as a strategic investment (Jarvenpaa & Ives, 1991).

## **Convergence**

The term “convergence” has its roots in Rogers and Kincaid’s (1981) model of communication. The model stipulates that regular interaction and frequent exchange of views between individuals enables them to more accurately and comprehensively understand each other’s perspectives. Such mutual understanding and appreciation of another’s view enables differences to be narrowed and commonalities to be amplified. Rogers and Kincaid labeled the resulting state convergence.

In the context of interaction between IT and managerial personnel, convergence has been defined and studied as the degree of mutual understanding between IS providers and other business personnel concerning an organization’s business activities (Lind & Zmud, 1991). Research has suggested the importance of convergence in the business planning process (Earl & Feeny, 1994; Feeny, Edwards & Simpson, 1992; Robbins & Duncan, 1988; Zmud, 1988). Because the strategic impact of information technology is so critical to management, the confluence of views between the CEO and CIO on the current and future strategic role of IT in supporting the activities of the organization might reasonably be considered an important indicator of convergence (Applegate, McFarlan & McKenney, 1996; Raghunathan, Raghunathan & Qiang, 1999).

## **Alignment of IS Plan with Business Plan**

The alignment of the IS plan with the business plan means that the IS plan reflects the business plan mission and goals. By doing so, the IS plan can better support business strategies. An aligned IS plan recognizes external business environmental forces (Bourgeois, 1985; Raghunathan & Raghunathan, 1990; Zviran, 1990). The strength of this linkage can be seen in the extent to which the IS plan incorporates the firm’s resource constraints (McFarlan, 1984). Managers believe that the alignment of the IS plan with the business plan is critical to organizational success because it improves the role of the IS plan in promoting a more effective implementation of the business plan (Bergeron, Raymond, & Rivard, 2004; Teo & King, 1996).

## **Alignment of Business Plan with IS Plan**

The alignment of the business plan with the IS plan is accomplished when the business plan directly refers to the IS plan and acknowledges specific IS applications and technologies (Sabherwal, 1989). Under such alignment, the business plan better utilizes the strategic capability of information systems, and can contain more reasonable expectations of IS capabilities (Earl, 1987; Saunders & Jones, 1992). Managers believe that the alignment of the business plan with the IS plan is critical because it improves the likelihood that the organization will use its information resources to help it achieve its goals (Bergeron, Raymond, & Rivard, 2004; Teo & King, 1996).

## **Key IS Plan Objectives**

An IS plan is crucial because it allows an organization to determine how to leverage IS-based opportunities to improve firm performance (Bharadwaj, 2000). The plan typically includes such key objectives as the creation of a company-wide information architecture (Brown & Magill, 1984; Tavakolian, 1989), decision support systems for managers to enhance their decision making capabilities (Holsapple & Whinston, 1996), and an IS infrastructure appropriate for organizational needs (Armstrong & Sambamurthy, 1999). In addition, the plan may also include the development of information partnerships with suppliers and customers (Johnson & Vitale, 1988) and the means by which to exploit the firm’s distinctive competencies (Andrews, 1980).

## **Use of IT to Gain Competitive Advantage**

An organization can gain competitive advantage by investing in IS applications that directly provide an edge in the market. It can use investment in IS to gain competitive advantage on multiple fronts. On the product side, IS applications can lower manufacturing costs or enable product differentiation. On the market front, IS can be

used to establish electronic links with suppliers or customers and create barriers that could dissuade competitors from entering the market. For example, customers could be reached directly and persuaded to switch over from competitors' to the firm's products (Ives & Learmonth, 1984; McFarlan, 1984; Porter & Millar, 1985). IS applications can also be used to leverage unique firm capabilities (Clemons & Row, 1991; Kettinger et al., 1994; Lea, 2005).

## **HYPOTHESES**

### **The Impact of Planning Participation on Convergence**

In terms of Rogers and Kincaid's (1981) model of communication, planning participation in the current study represents the regular interaction and frequent exchange of views between the IS executive and CEO, enabling them to gain better, more accurate, and comprehensive understandings of each other's perspectives. The increased exposure through such interaction and exchange increases the likelihood IS executives and CEOs will arrive at common beliefs, attitudes, and assumptions (Carley, 1991; Carley & Kaufer, 1993). Mutual understanding and appreciation of another's view, according to the model, causes differences to be narrowed and commonalities to be amplified, resulting in convergence. In this study, convergence is represented by the agreement concerning the strategic impact of information systems in terms of two timeframes, the present and the future, and it would result from participation by both the IS executive in business planning and the CEO in IS planning.

Participation in business planning would enable the IS executive to learn about the CEO's views by attending planning meetings and taking part in the formulation of business goals (Jones, Taylor, & Spencer, 1995). In addition, informal and frequent contacts would foster such learning (Armstrong & Sambamurthy, 1999). In these interactions, the IS executive would gain increased exposure to the CEO's perspective through the exchange of views, so the IS executive would be more likely to gain common beliefs, attitudes, and assumptions, and to appreciate the strategic impact of current information systems as well as the potential strategic impact of future ones from the CEO's perspective. Thus, we hypothesize:

H1a: CIO participation in business planning will be positively associated with convergence between the CEO and CIO about the current strategic role of information systems.

H1b: CIO participation in business planning will be positively associated with convergence between the CEO and CIO about the future strategic role of information systems.

The CEO would learn about the IS executive's views through membership in a corporate IS steering committee and via informal contacts with IS management. Such participation would make the CEO more knowledgeable about competitors' use of IS and about IS opportunities within the firm (Keen, 1991). It would enable the CEO to appreciate the IS executive's interest in spending on IS as strategic investment. CEO participation on IT steering committees, for example, has been shown to result in business strategies that are more likely to utilize IS effectively (Goldsmith, 1991). Such exposure would increase the likelihood of common understanding about the strategic impact of current systems and the intended impact of future ones. Thus, we hypothesize:

H2a: CEO participation in IS planning will be positively associated with convergence between the CEO and CIO about the current strategic role of information systems.

H2b: CEO participation in IS planning will be positively associated with convergence between the CEO and CIO about the future strategic role of information systems.

### **The Impact of Convergence on Alignment**

According to Rogers and Kincaid's (1981) model of communication, mutual understanding between individuals is a prerequisite for the achievement of common goals and aspirations that require joint action. Convergence provides a common denominator of views and thus forms the basic charter for the successful accomplishment of collective goals. One collective goal would be the strategic alignment between business and IS plans, a major management challenge today (Feeny & Wilcocks, 1998). Such strategic alignment exists in two

directions: that of the IS plan with the business plan and that of the business plan with the IS plan.

Convergence on both the current and future strategic impact of IT would reflect common understanding of how the organization now does, and later will take advantage of IT. Convergence would thus facilitate the creation of an IS plan that reflects the business mission, goals, and strategies, and would form the charter for such a plan. Without the IS executive's understanding of the mission, goals, and strategies, the IS plan simply could not refer to the business plan. In fact, extensive interaction and communication between the CEO and IS executive has been found to be associated with a high degree of alignment between the IS and the business plans (Feeny, Edwards, & Simpson, 1992; Raghunathan, 1992; Rockart, Earl, & Jeanne, 1996). Thus, we hypothesize:

H3a: Convergence between the CEO and CIO on the current strategic role of information systems is positively associated with the degree of alignment of the IS plan with the business plan.

H3b: Convergence between the CEO and CIO on the future strategic role of information systems is positively associated with the degree of alignment of the IS plan with the business plan.

Convergence on the current and future strategic impact of IT would also facilitate the creation of a business plan that refers to the IS plan. It would enable the business plan to refer to specific IS applications and technologies (Sabherwal, 1989). It would help creators of the business plan to have reasonable expectations of information systems. Without the CEO's understanding of the current and future impact of IS, the business plan could not refer to the IS plan. Thus, we hypothesize:

H4a: Convergence between the CEO and CIO on the current strategic role of information systems is positively associated with the degree of alignment of the business plan with the IS plan.

H4b: Convergence between the CEO and CIO on the future strategic role of information systems is positively associated with the degree of alignment of the business plan with the IS plan.

### **The Impact of Alignment on Key IS Plan Objectives**

The alignment of the IS plan with the business plan will have produced a commitment by the IS executive and CEO for the need to incorporate key objectives into the IS plan to achieve the business mission and goals. Therefore, the organization will more likely plan to create an IS infrastructure appropriate for organizational needs (Lederer & Mendelow, 1989; Pyburn, 1983). In addition, the IS plan would incorporate technologies that support such business strategies as the creation of partnerships with suppliers and customers. Also, the IS plan would acknowledge the challenges of the external business environment and thus be able to increase the likelihood that planned technologies would buttress the distinctive competencies of the firm. An IS plan that recognizes business strategies would facilitate the implementation of decision support systems and a company-wide information infrastructure to support those strategies. Thus, we hypothesize:

H5: The degree of alignment of the IS plan with the business plan is positively associated with the presence of key IS plan objectives.

The alignment of the business plan with the IS plan again signals top management support for information systems (Peak, Guynes, & Kroon, 2005). Such alignment would thus better enable the organization to plan to exploit the potential of information systems. For example, business plan references to specific IS applications and information technologies more likely will lead to planning efforts to create decision support systems and other specific applications within a company-wide information architecture because top management better understands and supports those applications and technologies. On the other hand, business plan references to the overall IS plan more likely will lead to top management support for an IS infrastructure appropriate for organizational needs. Finally, the reasonable expectations in a well-aligned business plan suggest that top management will use information systems to make the most of the firm's distinctive competencies. Thus, we hypothesize:

H6: The degree of alignment of the business plan with the IS plan is positively associated with the presence of key IS plan objectives

## **The Impact of Key IS Plan Objectives on the Use of IT for Competitive Advantage**

The presence of the key IS plan objectives can help a company gain competitive advantage in many ways (Bakos & Treacy, 1986; Chan & Huff, 1993; Kettinger et al., 1994; Parsons, 1983; Porter & Millar, 1985; Saunders & Jones, 1992; Venkatraman & Ramanujam, 1987). For example, exploiting the firm's distinctive competencies and establishing electronic links with suppliers or customers (two plan objectives) will enable a company to provide lower costs or product differentiation (Porter, 1980; Wu et al., 2003). In addition, the creation of information partnerships with customers can influence them to switch to a firm's products (Porter, 1980). On the other hand, the creation of an IS infrastructure and a company-wide information architecture increases the cost and difficulty for other firms to copy the business functions and information technology, and thus creates barriers to keep competitors from entering a company's markets (McFarlan, 1984). Finally, the development of a decision support system provides a company with unique capabilities that can be exploited to help it compete with other companies. Thus, we hypothesize:

H7: The presence of key IS plan objectives will be positively associated with the use of IT for competitive advantage.

## **METHODOLOGY**

### **Survey Instrument and Construct Measures**

A multi-informant field survey consisting of two instruments was created to collect data for this study. Both instruments contained survey questions to be answered on a 1 to 7 point Likert scale with dimensions of "strongly disagree" (as 1), "disagree," "mildly disagree," "neutral," "mildly agree," "agree," and "strongly agree" (as 7).

Both instruments were to be mailed to the senior IS executive, who would be asked to complete the primary instrument and to direct the secondary instrument to another top manager who was knowledgeable about but outside the IS area. All respondents would be assured confidentiality. Primary and secondary respondents would receive two separate envelopes with which to respond privately so as to further ensure confidentiality and thus reduce systematic bias. In this way, neither business executive would have felt pressured to give any particular answers. (A control number was assigned to each pair for later matching so that the two survey instruments could be returned in separate envelopes. An explanation of the control number was also available in the survey.)

The primary instrument had items for CIO participation in business planning, CEO participation in IS planning, alignment of IS plan with business plan, alignment of business plan with IS plan, key IS plan objectives, and use of IT to gain competitive advantage. Table 1 shows these measures.

Paired responses on convergence were to be obtained from the IS executive (i.e., the primary respondent) and the other senior executive from the same organization (i.e., the secondary respondent) using the items in Table 2. The current convergence construct would be obtained by subtracting the absolute value of the difference between the IS executive and other senior executive on the current IS impact item from the constant, 8, in order to produce higher numbers for more convergence and lower for less. The future convergence construct would be calculated analogously using the paired items concerning the future impact of IS.

### **Survey Piloting**

A pilot test of the survey instrument was conducted on eight practitioners (including CIOs and other senior business executives) in four different industries in a large U.S. metropolitan area. Comments and suggestions from the test subjects led to modifications of the construct measures, reduction of the measures to single sentences to eliminate ambiguity, and rearrangement of the sentences to avoid responses that were either socially desirable or outcomes from previous questions. Three professors of MIS with research interests in strategic information systems planning also examined the instrument and provided feedback to the authors.

**Table 1. Participation, Alignment, Objectives, and Competitive Advantage Constructs.**

CIO Participation in Business Planning	
CIOPAR1	The IS executive regularly attends business planning meetings.
CIOPAR2	The IS executive contributes to the formulation of business goals.
CIOPAR3	The IS executive has regular informal contacts with top management.
CIOPAR4	The IS executive has easy access to the CEO.
CIOPAR5	The IS executive has frequent contacts with the CEO
CEO Participation in IS Planning	
CEOPAR1	The CEO plays an important role in the corporate IS steering committee.
CEOPAR2	The CEO becomes knowledgeable about competitors' use of IS.
CEOPAR3	The CEO has frequent informal contacts with IS management.
CEOPAR4	The CEO becomes knowledgeable about IS opportunities within the firm.
CEOPAR5	The CEO regards spending on IS as strategic investments.
Alignment of IS Plan with Business Plan	
ALISP1	The IS Plan reflects the business plan mission.
ALISP2	The IS Plan reflects the business plan goals.
ALISP3	The IS Plan supports the business strategies.
ALISP4	The IS Plan recognizes external business environment forces.
ALISP5	The IS Plan reflects the business plan resource constraints.
Alignment of Business Plan with IS Plan	
ALBP1	The Business Plan refers to the IS Plan.
ALBP2	The Business Plan refers to specific IS applications.
ALBP3	The Business Plan refers to specific information technologies.
ALBP4	The Business Plan utilizes the strategic capability of IS.
ALBP5	The Business Plan contains reasonable expectations of IS.
Key IS Plan Objectives	
IS performs planning practices to:	
KO1	Create information partnerships with suppliers or customers.
KO2	Create decision support systems for middle and top management.
KO3	Create a company-wide information architecture.
KO4	Create an IS infrastructure appropriate for organizational needs.
KO5	Exploit the firm's distinctive competencies.
Use of IT to Gain Competitive Advantage	
IS has been used to:	
CA1	Provide advantages such as lower costs or product differentiation.
CA2	Establish electronic links with suppliers or customers.
CA3	Create barriers to keep competitors from entering our markets.
CA4	Influence the buyer's decision to switch to our products.
CA5	Leverage unique firm capabilities.

**Table 2. Convergence Items.**

CONEX	Existing information systems have a strategic impact.
CONFUT	Future systems will have a strategic impact.

**Response**

From a list of over 12,000 organizations from private industry, 1,200 were randomly selected. The list, purchased from Lighthouse Lists of Ft. Lauderdale, Florida, included the full name and address of the CIO. Surveys were directly mailed to the CIOs of the selected companies.

Within the first month, 123 surveys were received. After that, follow-up phone calls were made to non-respondents to encourage them to complete the survey. Information from these calls revealed that many surveys

failed to reach the CIO because secretaries had intercepted and thrown them away, based on organization policy. Some surveys were not delivered because the CIO had changed positions or had left the organization. Some CIOs also said that they would not provide information they regarded as confidential, nor would they complete the survey, which they regarded as an academic exercise with low priority.

Eight weeks later, 161 usable surveys were received from CIOs, and 109 were obtained from the other senior executives. These 109 paired surveys, containing both the CIO and other senior executive responses, constituted the research data.

Five hundred forty surveys could not be delivered because the CIO had changed position or had left the company, or because organizational policy forbade replying to surveys. Disregarding this reduction of the total from 1,200 to 660, response rates can be calculated as 13.4% (161/1,200) for CIOs alone and of 9.1% (109/1,200) for the 109 paired surveys.

Characteristics of the respondents and their organizations appear in Tables 3, 4, 5, and 6. Table 3 presents the respondents' education and experience, and demonstrates that both groups were highly qualified on the subject matter of the survey. Table 4 shows the frequency of survey response by major SIC industry code. Table 5 shows the revenue, and Table 6 shows the number of employees in the organizations.

**Table 3. Average Years of Education and Experience of Respondents.**

	CIO	Other Senior Manager
College education	5.1	5.4
Experience in industry	17.5	18.5
Experience with company	12.2	14.7
Experience in IS area	20.8	0

**Table 4. Respondent Firms by Industry.**

Industry	Frequency	Percent
Manufacturing	52	32.3
Wholesale/Retail	24	14.9
Utilities & Communications	20	12.4
Finance/Legal	10	6.2
Construction	8	5.0
Publishing/News	7	4.3
Computers	5	3.1
Consumer Products	4	2.5
Petroleum	3	1.9
Aerospace	2	1.2
All Other	26	16.2
Total responses	161	100.0

**Table 5. Annual Sales Revenue Breakdown of Respondent Companies.**

	Percent
\$5 billion or more	5.0
\$1 billion to \$5 billion	14.3
\$500 million to \$1 billion	11.8
Less than \$500 million	52.8
Not reported	16.1
Total	100.0

**Table 6. Workforce Size Breakdown of Respondent Companies.**

Company Employees	Percent
8,000 or more	7.1
4,000 to 8,000	12.8
1,000 to 4,000	42.3
500 to 1,000	19.9
Fewer than 500	17.9
Total	100.0

## DATA ANALYSIS AND RESULTS

### Psychometric Properties of Measures

Psychometric tests were conducted using Partial Least Squares (PLS) Graph Version 3.0 (Chin, 2001), a structural equation modeling tool that utilizes a component-based approach to estimation. Covariance-based SEM tools such as LISREL and EQS use a maximum likelihood function to obtain parameter estimates. However, PLS uses a least squares estimation procedure, allowing the flexibility to represent both formative and reflective latent constructs, and it places minimal demands on measurement scales, sample size, and residual distributions (Chin, 1998; Falk & Miller, 1992; Fornell & Bookstein, 1982; Wold, 1982).

PLS was used to examine the internal consistency reliability (ICR), convergent validity, and discriminant validity of the constructs (Barclay, Higgins, & Thompson, 1995; Chin, 1998; Compeau, Higgins, & Huff, 1999). ICR is the standardized component loading of a manifest indicator on a latent construct, and is also known as composite reliability (Chin, 1998). ICR values are similar to those of Cronbach's alpha, with .70 or higher considered adequate (Agarwal & Karahanna, 2000; Barclay, Higgins, & Thompson, 1995; Compeau, Higgins, & Huff, 1999). ICR values were computed from the normal PLS output using the formula  $ICR = (\sum \lambda_i)^2 / [(\sum \lambda_i)^2 + \sum (1 - \lambda_i^2)]$ , where  $\lambda_i$  is the standardized component loading of a manifest indicator on a latent construct (Chin, 1998).

Latent constructs with reflective indicators should meet two criteria for convergent and discriminant validity (Chin, 1998; Gefen, Straub, & Boudreau, 2000). First, the square root of the average variance extracted (AVE) for each construct should be at least .707 (i.e.,  $AVE > .50$ ) and should exceed that construct's correlation with other constructs (Barclay, Higgins, & Thompson, 1995; Chin, 1998; Fornell & Larcker, 1981). Second, the standardized item loadings (similar to loadings in principal components) should also be at least .707, and the items should load more highly on the constructs they are intended to measure than on other constructs (Agarwal & Karahanna, 2000; Compeau, Higgins, & Huff, 1999). The .707 standardized loadings minimum is not rigid; a few loadings below it may be acceptable (Chin, 1998).

Two measurement models were tested. The first model utilized the current impact convergence construct, represented by the absolute value of the difference between the IS executive and the other senior executive on their evaluation of the current impact of IS. The second model utilized the future impact convergence construct, calculated analogously using their evaluation concerning the future impact of IS.

Table 7 shows ICRs, AVE square roots, and correlations among latent constructs for both models. The

AVEs were computed from the normal PLS output using the formula  $AVE = \sum \lambda_i^2 / [\sum \lambda_i^2 + \sum (1 - \lambda_i^2)]$  (Chin 1998). The table shows that the ICRs exceed the minimum reliability criterion (.70) for both models. Each AVE square root (on the diagonal) is greater than .707 and in all cases greater than the correlation between that construct and other constructs for both models.

**Table 7. ICRs, AVE Square Roots, and Correlations among Latent Constructs with Current Convergence and Future Convergence (in parentheses)**

Latent Construct	ICR	AVE Square Roots (on-diagonal) and Correlations (off-diagonal)					
		CIOPAR	CEOPAR	ALISP	ALBP	KO	CA
CIOPAR	.94 (.93)	.87 (.86)					
CEOPAR	.93 (.93)	.74 (.68)	.86 (.85)				
ALISP	.94 (.94)	.54 (.55)	.46 (.44)	.87 (.87)			
ALBP	.96 (.96)	.60 (.62)	.67 (.67)	.65 (.66)	.91 (.91)		
KO	.87 (.87)	.49 (.49)	.46 (.47)	.48 (.48)	.40 (.40)	.76 (.76)	
CA	.86 (.86)	.59 (.59)	.53 (.54)	.43 (.43)	.37 (.37)	.56 (.56)	.75 (.75)

Table 8 shows the loadings for both models. Twenty-seven of the 30 items (all but CA2, CA3, and KO4) exhibited high loadings (above .707) for both the current and future models. The cross-loadings were computed as the Pearson correlations between latent variable component scores (in the eta matrix) and the manifest indicators of the other latent constructs (in the rescaled data matrix), both produced in the PLS measurement model run (Chin, 1998). No items loaded higher on constructs they were not intended to measure for either model.

**Table 8. Factor Structure Matrix of Loadings for Current and Future Models.**

	CURRENT	FUTURE
CIOPAR1	.917	.961
CIOPAR2	.925	.966
CIOPAR3	.768	.714
CIOPAR4	.836	.761
CIOPAR5	.897	.845
CEOPAR1	.802	.843
CEOPAR2	.832	.883
CEOPAR3	.811	.732
CEOPAR4	.921	.911
CEOPAR5	.907	.883
ALISP1	.908	.905
ALISP2	.939	.936
ALISP3	.925	.922
ALISP4	.755	.762
ALISP5	.809	.812
ALBP1	.914	.913
ALBP2	.936	.934
ALBP3	.938	.938
ALBP4	.936	.939
ALBP5	.791	.791
KO1	.763	.763
KO2	.756	.756
KO3	.758	.758
KO4	.700	.700
KO5	.832	.832
CA1	.837	.837
CA2	.633	.633
CA3	.626	.626
CA4	.761	.761
CA5	.855	.855
CA5	.855	.855

These results thus provide sufficiently strong evidence of reliability, convergent validity, and discriminant validity of the measurement instruments.

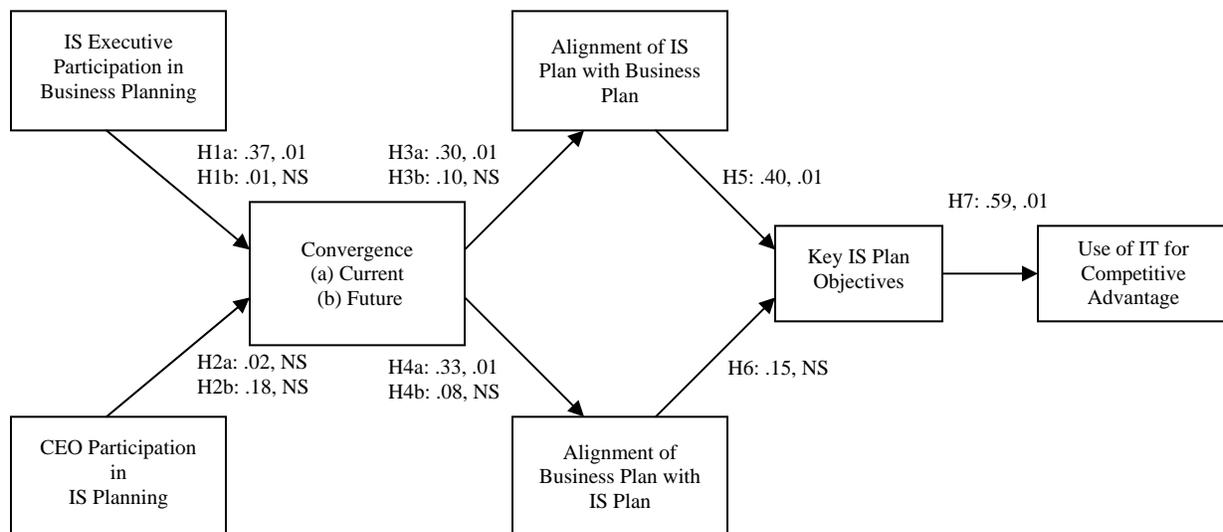
### **Test of Model and Hypotheses**

The hypotheses were tested by examining path coefficients (similar to standardized beta weights in a regression analysis) and their significance levels in two PLS structural models, one with current impact convergence and the other with future convergence. Bootstrapping with 500 re-samples (Chin, 1998) was performed on both research models to obtain estimates of standard errors for examining the statistical significance of path coefficients

using t-tests. The path coefficients and significance levels relating to current convergence (with H1a, H2a, H3a, and H4a) were obtained using the first model. Similarly, the path coefficients and significance levels relating to future convergence (with H1b, H2b, H3b, and H4b) were obtained using the second model. The remaining path coefficients (with H5, H6, and H7) were common to both models and hence tested twice. As expected, near identical results were obtained.

Figure 2 shows the combined results with path coefficients and significance levels for each hypothesis. Five of the eleven hypotheses were supported. IS executive participation in business planning predicted the convergence between the CEO and CIO about the current strategic role of information systems ( $\beta = .37, p < .01$ ), thereby supporting H1a. Convergence between the CEO and CIO on the current strategic role of information systems was associated with the degree of alignment of the IS plan with the business plan ( $\beta = .30, p < .01$ ), thus confirming H3a. For H4a, such convergence also predicted the alignment of the business plan with the IS plan ( $\beta = .33, p < .01$ ). The degree of alignment of the IS plan with the business plan was associated with the presence of key IS plan objectives ( $\beta = .40, p < .01$ ) for H5. Finally, the presence of key IS plan objectives in H7 predicted the use of IT for competitive advantage ( $\beta = .59, p < .01$ ).

**Figure 2. Results.**



## DISCUSSION OF RESULTS

### Effects on and of Convergence for Current Impact

This research found support for H1a but not H2a. H1a stated that CIO participation in business planning would be positively associated with convergence between the CEO and CIO about the current strategic role of information systems. H2a hypothesized that CEO participation in IS planning would be positively associated with convergence about that role. According to Rogers and Kincaid's (1981) model of communication, the regular interaction and frequent exchange of views between the IS executive and CEO would enable them to gain a better understanding of each other's perspectives. Thus, participation in business planning would enable the IS executive to learn about the CEO's views thus helping that person appreciate the strategic impact of current information systems from the CEO's perspective. This in turn would narrow the differences between the IS executive and the CEO, and amplify their commonalities, resulting in convergence.

One possible reason for the failure to support H2a could be that the CEO, by virtue of company position,

already has a broad view of the entire organization, and is simultaneously aware of the business objectives of the firm as well as the role of the functional areas, including that of current information systems, in realizing those objectives. In other words, participation in IS planning does not enhance the CEO's knowledge and thus does not enhance convergence. Alternatively, the CEO might not be very cognizant of the objectives of current information systems, and participation might not improve that understanding and thus might not facilitate convergence.

H3a and H4a hypothesized the positive effect of convergence on the alignment of the IS plan with the business plan (H3a) and of convergence on the alignment of the business plan with the IS plan (H4a). Both hypotheses were supported. These findings are consistent with the notion that convergence between the CEO and CIO on the current strategic role of information systems will lead to IT strategies and plans that reflect business requirements, and will promote the identification of explicit information systems and technologies in business strategies.

Interestingly, the means for current role for CIOs and CEOs were 5.83 and 5.43 respectively, a difference significant at the .01 level using a paired t-test. On the other hand, the means for future role for CIOs and CEOs were 6.13 and 6.29 respectively, a difference significant at the .10 level. Perhaps the CIOs' strong optimism about the current role along with the CEOs' somewhat weaker optimism about the future role further accentuates differences between both current and future roles as well as between the executives.

### **Effects on and of Convergence for Future Impact**

CIO participation in business planning (H1b) and CEO participation in IS planning (H2b) were not positively associated with convergence between the CEO and CIO about the future strategic role of information systems. A reason for these unexpected findings may be that in this age of rapidly changing competition and rapidly emerging new information technologies, the CIO and CEO may be so uncertain about the future that, despite their participation in each other's planning, they still have different views about the future strategic role of information systems. Because they may anticipate the future differently, for example, one may overestimate the importance of information systems and the other may underestimate it, and thus they do not achieve convergence.

Convergence between the CEO and CIO on the future strategic role of information systems was neither positively associated with the degree of alignment of the IS plan with the business plan (H3b) nor with the degree of alignment of the business plan with the IS plan (H4b). One possible explanation may be that even when the CIO and CEO agree about the future, the uncertainty of future changes in competition and information technology still impede planning and weaken the alignments.

### **Alignment, Key Plan Objectives, and Competitive Advantage**

The alignment of the IS plan with the business plan was found to be strongly and significantly associated with the presence of key IS plan objectives (H5), whereas the alignment of the business plan with the IS plan (H6) was not. The alignment of the IS plan with the business plan would produce CIO and CEO commitment to incorporate such key planning objectives into the IS plan (H5) as the creation of information partnerships, decision support systems, a company-wide information architecture, and an appropriate IS infrastructure.

The alignment of the business plan with the IS plan was expected to predict planning for those objectives because such alignment would signal CEO support for that planning (H6). However, apparently alignment of the business plan with the IS plan is not sufficient to enable the organization to adopt the key IS plan objectives. The CEO commitment indicated by such alignment may be superficial, and the CEO might not enthusiastically encourage those objectives.

The presence of key IS plan objectives was strongly and significantly associated with the use of IT for competitive advantage (H7). This finding is consistent with expectations that the presence of such key IS plan objectives as the establishment of electronic links with suppliers or customers, and the creation of information partnerships with customers to prevent product switching, could help a company gain competitive advantage. It is similarly consistent with the expectation that another key IS planning objective, the creation of decision support systems, could provide a company with unique capabilities that can be exploited to help it compete.

### **Implications for Future Research**

This research found support for H1a, H3a, H4a, H5, and H7. Speculation is offered about reasons for the lack of support for H1b, H2a, H2b, H3b, H4b, and H6. Future research might test that speculation, or seek and test additional reasons for the lack of support.

The concept of convergence was examined in terms of both the current and future strategic roles of information systems as seen by the CEO and CIO. Future research might instead use multiple item measures for such roles. (This research had initially attempted to test its model using a convergence construct of both the current and future strategic roles, but the validation process suggested the two roles were distinct.)

The antecedents to convergence in the model were CIO participation in business planning and CEO participation in IS planning. Future research might use different antecedents. It could thus investigate the effects of such diverse modes of communication as video conferencing, telephone, electronic mail, letter, note, memo, and special reports on convergence. Alternatively, researchers could investigate the effectiveness of such activities as training for the CEO in IT and training for the CIO in business management. Research could also examine the role of informal interaction via management retreats, sporting events, or other social activities.

Future research could also examine the role played by such other stakeholders as the chief financial officer, vice president of marketing, or vice president of operations in engendering convergence. Because the creation of IT strategies requires input from diverse sources, it would be interesting to examine whether a multi-way convergence between the CEO, those executives, and the CIO could better explain the alignment of business and IS plans and the realization of key plan objectives. Analogous to the proposed research on two-way convergence, future studies could examine the relative effectiveness of different media in realizing this convergence.

The role of the hierarchical distance between CEO and CIO in influencing convergence is another potential research area. Investigators could explore whether the CIO, hierarchically several rungs below the CEO, would have more difficulty in attaining convergence than one with a CIO reporting directly to the CEO. This difficulty might occur because information tends to become distorted while being transmitted through multiple parties. What would be the best method to achieve convergence in such a scenario, given that face-to-face meetings and interactions between the CEO and CIO may be unlikely or infrequent?

### **Implications for Practice**

In this study, convergence between the CEO and the CIO predicted alignment between business and IS plans, which in turn predicted key IS plan objectives and the use of IT for competitive advantage. Such findings suggest the desirability of the achievement of such convergence. The participation of the CIO in business planning may thus be critical in bringing about this convergence.

On the other hand, the participation of the CEO in IS planning did not predict the convergence. Whereas the study provided especially compelling evidence for the CIO to participate in business planning, it thus did not do so for the CEO in IS planning.

The study further suggests that it is the alignment of the IS plan with the business plan rather than the alignment of the business plan with the IS plan that leads to the incorporation of key plan objectives and eventual competitive advantage. This implies that managers might accord greater priority to the alignment of the IS plan with the business plan than to the alignment of the business plan with the IS plan.

### **CONCLUSION**

For some time, a top issue facing both information systems and business executives has been the alignment of the IS plan and the business plan. The current research has contributed by confirming expectations about the importance of convergence between CEOs and CIOs in realizing that alignment. The study has also contributed by

confirming beliefs about the impact of alignment on the adoption of key IS plan objectives and on the use of IT for competitive advantage. It has laid the groundwork for researchers to better understand alignment and for managers to improve alignment through convergence.

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