
The Effect of Communication Frequency and Channel Richness on the Convergence Between Chief Executive and Chief Information Officers

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ABSTRACT: Convergence (i.e., mutual understanding) between an organization's CEO and CIO is critical to its efforts to successfully exploit information technology. Communication theory predicts that greater communication frequency and channel richness lead to more such convergence. A postal survey of 202 pairs of CEOs and CIOs investigated the effect of communication frequency and channel richness on CEO/CIO convergence, as well as the effect of convergence on the financial contribution of information systems (IS) to the organization. Convergence was operationalized in terms of the current and future roles of information technology (IT) as defined by the strategic grid. Rigorous validation confirmed the current role as composed of one factor and the future role as composed of three factors (i.e., managerial support, differentiation, and enhancement). More frequent communication predicted convergence about the current role, differentiation future role, and enhancement future role. The use of richer channels predicted convergence about the differentiation future role. Convergence about the current role predicted IS financial contribution. From a research perspective, the study extended theory about communication frequency, media richness, convergence, and the role of IT in organizations. From a managerial

perspective, it provided direction for CEOs and CIOs interested in increasing their mutual understanding of the role of IT.

KEY WORDS AND PHRASES: CEO/CIO communication, channel richness, communication frequency, managerial communication, media richness, strategic grid.

MUTUAL UNDERSTANDING BETWEEN the chief executive officer (CEO) and chief information officer (CIO) is critical to an organization's successful exploitation of information technology (IT). Such understanding can facilitate the organization's alignment of IT with business strategy [43], which in turn predicts both improved IT and business performance [18].

Conversely, the lack of mutual understanding between the CEO and CIO can cause problems. For example, if the CIO fails to understand business objectives or the CEO fails to understand the value of IT and how to employ it to achieve those objectives [53, 54], then strategic information systems (IS) planning will be adversely affected [29, 43]. Furthermore, failure to achieve such understanding can affect the organization's ability to acquire support for IT investments and the IS function [25]. The IS department's budget, after all, depends on top management's understanding and perception of the role of IT [58].

Mutual understanding of that role is critical both at the current time and in the future [3]. Assuming that such understanding is based on correct information, understanding of the current role increases the likelihood of the proper support for critical, existing functions that rely on IT for daily operations. However, IT support for current functions does not guarantee support for future operations. In fact, plans and strategies for an organization's current IT may be counterproductive for future corporate strategies [3]. Therefore, mutual understanding—often referred to as convergence—about the future role of IT is also important.

Convergence between the CEO and CIO is important, but few studies have investigated the process through which it is achieved. The objective of this paper is to examine the role of communication in achieving convergence in the CEO/CIO relationship. The research questions are: Do the frequency of communication and the richness of the communication channel between the CEO and CIO influence convergence about the current and future role of IT in an organization? Does convergence influence the IS financial contribution to the firm? Figure 1 illustrates the research model.

Communication Frequency, Channel Richness, Convergence, and IS Financial Contribution

COMMUNICATION FREQUENCY, CHANNEL RICHNESS, convergence, and IS financial contribution are the constructs in this research. Each is now defined along with its importance to IT management.

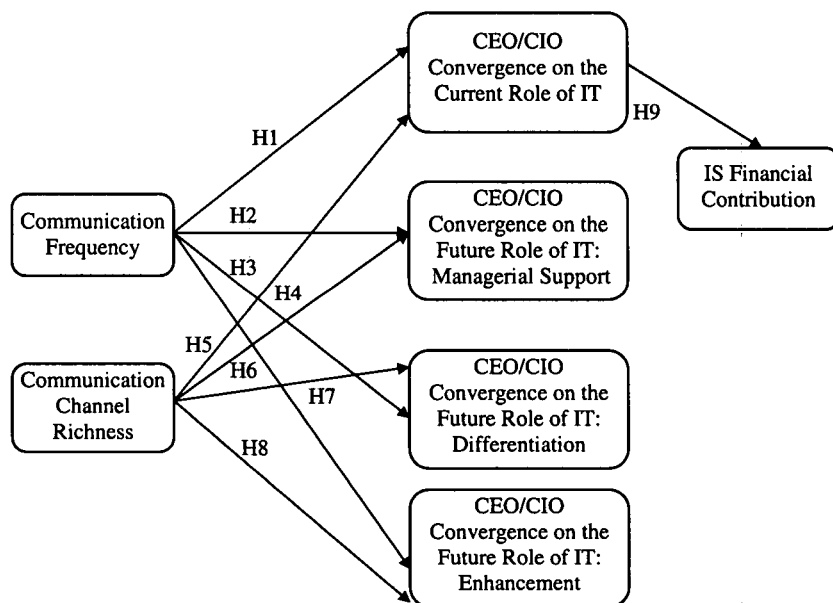


Figure 1. Research Model

Frequency

Communication is defined as a process in which individuals share and create information in order to reach a mutual understanding [65]. Through frequent communication, they develop common definitions of situations and build consensus [79]. Such communication is referred to as an “adjustment process” [81], through which relationships are transformed over time [71]. Similarly, it is described as a facilitator of gradual convergence of meanings and opinions about situations [9, 79].

Frequent communication is important in IT management in several respects. First, it helps IT personnel and their users have a common understanding of the organization’s business functions and how IT can be used to support these functions [47].

Second, it positively affects an organization’s competitive use of IT. For example, when CEOs communicate frequently with IT managers, the organization is more motivated to use IT for competitive advantage [38].

Third, frequent communication between IT and business executives positively influences the alignment of IT with business strategy. A case study of organizations in the insurance industry identified such communication as a factor that influenced alignment [60]. More specifically, the case revealed that the social dimension of alignment (i.e., the state where business and IT executives mutually understood and were committed to the organization’s IT mission, objectives, and plans) was influenced by frequent communication between the executives [61]. Interviews in ten business units of three insurance companies provided the basis for analysis of the effect of communication frequency on mutual understanding of IT plans. The current research extends these findings by using a much larger sample of CEOs and CIOs to examine the

relationship between frequency and mutual understanding (although called convergence in this study) of IT plans as well as of the realized role of IT in the organization.

Channel Richness

Communication channel richness is generally seen as independent of communication frequency [59, 75]. That is, greater richness neither necessarily implies greater frequency, nor is implied by it.

Communication channel richness refers to the extent to which media have the ability to overcome different frames of reference, clarify ambiguous issues, and thus facilitate understanding between communicating individuals [21]. Certain communication media have a greater capacity than others to facilitate understanding. Thus, they are termed *richer media or channels* [21, 22]. (The terms *media* and *channels* are used synonymously.)

According to media richness theory, a rich medium is one that enables immediate feedback, supports multiple cues such as facial and nonverbal expressions, accommodates language variety (e.g., numbers, natural language, etc.), and allows communication participants to tailor a message to fit personal requirements. Based on these four characteristics, an initial hierarchy was developed to indicate the following channel classifications in order of decreasing richness: (1) face-to-face, (2) telephone, (3) personally addressed media such as letters and memos, (4) nonpersonally addressed media such as telegrams, and (5) unaddressed media such as flyers and bulletins [22]. Subsequent hierarchies confirmed that face-to-face and telephone communication, respectively, were the richest modes of communication. However, they further indicated that e-mail communication was slightly higher in richness than other traditional written communication [44, 86]. This may be because e-mail richness is in part a function of social factors (e.g., peer acceptance of e-mail) and the user's experience (e.g., with the topic) [16, 35, 46, 48].

Media richness theory argues that performance improves when richer media are used for equivocal tasks and that the use of richer media for less equivocal tasks lowers performance. More specifically, when the communication channel matches the message content or task, performance is greater [22, 41]. This implies that in order to achieve optimal performance, the media selected should depend on the nature of the communication. The theory was initially confirmed using qualitative data when tested with traditional media such as face-to-face, telephone, and letters [22], and partially supported for testing with new media such as e-mail and voice mail [42, 45, 72]. In one study, however, a reanalysis of the published data using the traditional media in Daft et al. [22] suggested a potential moderator [62]. Moreover, only modest evidence supported the theory with e-mail, video conferencing, voice mail, and online database as media, thus again suggesting potential moderators. Recent findings further suggest that use of new media may be appropriate to overcome situational constraints even when the media's characteristics do not match the message content or task [62].

Media selection is important in IT management. The use of richer channels to communicate strategic IS planning requirements helps IT managers minimize the com-

plexity of the planning task [82]. Although higher-level managers such as CEOs and CIOs tend to use much richer communication (such as via oral channels) [63], variation in richness across them at the individual level can still exist.

Convergence

Rogers and Kincaid [65] defined convergence as the tendency for two or more individuals to move toward one point, and to unite in a common interest or focus. The authors saw it as the objective of communication. Their convergence model described communication as a dynamic process of idea and knowledge generation, which occurs over time through interaction with others and which leads to mutual understanding and collective action.

More recently, researchers have used the terms *convergence*, *mutual understanding*, *shared understanding*, and *shared cognition* interchangeably to indicate the state where communicating individuals agree on a certain topic or issue (e.g., [7, 27, 32, 47, 74]). Consistent with Lind and Zmud [47], this paper defines convergence as the "degree of mutual understanding" [47, p. 15] between an organization's CEO and CIO about the role of IT.

The IT function and the organization in general can benefit from convergence. When an organization's technology providers and users converge on both the importance of the firm's activities and the potential for technology to support the activities, more innovative proposals for using IT result [47].

Convergence between IT and business executives is also beneficial. It exists when business executives understand IT objectives and IT executives understand business objectives. Convergence between these executives supports the development of a shared vision of the role and contribution of IT to the organization [60] and it facilitates IT success [67].

IS and business executives have agreed that the most critical issues in IS management are improving IS strategic planning, using IS for competitive advantage, and facilitating organizational learning so that new IS technologies are integrated into the entire operation of the firm [13]. Considering that such issues are strategy-oriented and thus presumed to be equivocal [82], convergence between IT and business executives about those issues would result from frequent iterations of interpretations and reasonings based on rich media.

McFarlan et al.'s well-known strategic grid framework proposed two distinct roles of IT, a current and a future role [49]. More recent research has shown that the current role has one dimension, whereas the future role has three [57]. The current role represents the organization's reliance on IT at the present time. The managerial support future role embodies how organizations direct their planned systems development projects to support decision making and organizational efficiency. The differentiation future role focuses on the use of such projects to help the organization make its products and services unlike those of its competitors. The enhancement future role represents how firms plan to use IT to facilitate the maintenance of existing systems.

The current and the future role of IT constructs were initially derived as distinct [49]. More recently, distinctiveness between the current role as well as the three individual future roles of IT constructs was empirically demonstrated [57]. Understandably, moreover, an organization's current role of IT does not necessarily determine its future role of IT [56, 77].

Both the current and future roles of IT are critical strategic issues [49]. They are thus deemed inherently more equivocal and would require richer media to foster communication [76, 82]. When IT personnel and their users employ richer channels to communicate strategic requirements, they converge more on the organization's business functions and how IT can be used to support these functions [47].

IS Financial Contribution

IS are commonly believed to enhance competitiveness and thus make a financial contribution to firm performance. Popular measures of such a contribution include increased sales revenue, market share, and return on investment (ROI) [55].

Increased sales revenue of at least \$30 million was linked to IT investments at Phillips 66 during the 1980s [36]. FedEx's recent annual revenue of more than \$19 billion has likewise been attributed to its effective use of IS [28]. In fact, as a result of such outcomes, increased sales revenue is often the primary motivation for investing in IS [68].

Increased market share, more often than not, signals greater profitability [30]. Observers have attributed increases in market share to the contribution of IS [1, 3, 28]. For example, ExxonMobil's Web-based, business-to-business system reduced its order processing costs from \$45 per order to \$1.25, enabling the firm to reduce prices and thus increase market share [78].

ROI for IT expenditures is critical, particularly because such expenditures exceeded \$1 trillion worldwide in 2001, and were expected to increase approximately 10 percent each year thereafter [69]. Many firms have attributed favorable ROI to IS investments [78]. Chevron's electronic document management system, for example, resulted in a 95 percent ROI over its five-year project life [80].

Hypotheses

ROGERS AND KINCAID'S [65] CONVERGENCE MODEL described communication as a cyclical process, which involved the repetitive exchange and sharing of information between two or more individuals in order to reach a mutual understanding. Through cycles of information exchange, participants are expected to move toward a more mutual understanding of each other's meaning.

Each cycle of information exchange results in incremental changes in an individual's accuracy regarding a point of interest. Such changes could, of course, reveal underlying biases that generate greater conflict and thus reduce convergence. However, more often than not, frequent communication is assumed to allow communicating individuals to eventually "zero in on" [51, p. 482] the attribute that is salient for each of them, and thus to increase convergence.

Lind and Zmud [47] suggested further that frequent contact between communicating individuals implied a certain level of intimacy, which had the potential for reducing barriers to achieving convergence. They investigated the influence of convergence between IT providers and users of technology on innovation. Their study of a large multinational firm found that frequent communication between those parties resulted in a higher degree of convergence regarding the importance of business activities and the potential for IT to support these activities.

The convergence model of communication [65] and Lind and Zmud's [47] findings can be extended to CEO/CIO communication. Frequent communication between the CEO and CIO would provide greater opportunity for exchanges of information. Such exchanges would promote mutual trust, reduce barriers between the functional roles, and thus facilitate convergence.

More specifically, frequent communication between the CEO and CIO would promote mutual understanding about functions that the organization is critically dependent upon for daily operations. Furthermore, such communication would help ensure that IT resources are used to support these critical daily activities. Therefore,

Hypothesis 1: When an organization's CEO and CIO communicate more frequently with each other, the degree of convergence about the current role of IT is higher.

Likewise, it is reasonable to expect that frequent communication between the CEO and CIO would result in exchanges of information about the organization's future domain. Frequent exchanges would promote mutual trust and understanding about the organization's strategy and how IT could be deployed to support or enable that strategy. Because three dimensions represent such deployment [57], the following three hypotheses are proposed:

Hypothesis 2: When an organization's CEO and CIO communicate more frequently with each other, the degree of convergence about the future role of IT in providing managerial support is higher.

Hypothesis 3: When an organization's CEO and CIO communicate more frequently with each other, the degree of convergence about the future role of IT in differentiating the organization is higher.

Hypothesis 4: When an organization's CEO and CIO communicate more frequently with each other, the degree of convergence about the future role of IT in providing enhancements for existing systems is higher.

An individual's choice of communication channels could also affect convergence. Because communication channels vary in their ability to convey information [20, 21], they probably differ in their ability to facilitate convergence [47]. More specifically, richer channels (e.g., face-to-face communication) would more likely facilitate convergence than less rich channels (e.g., printed reports, charts, and graphs). Rich channels have the capacity to transmit body language, tone of voice, and other physical cues that affect the understanding and interpretation of communication. Physical cues can be as important to understanding a message as the actual words [70].

Empirical evidence has supported the proposition that communication channels vary in their capacity to convey a variety of cues [22]. That evidence supported a relationship between task and media selection. Specifically, managers preferred richer media for equivocal communication tasks and less rich media for unequivocal ones. Moreover, high-performing managers were more sensitive to the need to use rich channels for equivocal messages than were low-performing managers.

Equivocality (i.e., ambiguity) exists when managers have multiple and conflicting interpretations about organizational situations [22, 84]. It has been associated with lack of convergence between managers. It is high between managers from different functional areas of an organization because their frames of reference differ [22]. Thus, it is often high between an organization's CEO and CIO [26, 39, 43, 52, 60, 82]. It is reasonable to expect that by providing multiple ways to convey a message, rich media would diminish equivocality, and thus facilitate convergence.

Moreover, use of richer communication channels would improve decision quality by providing faster feedback [24, 41]. Such feedback would help CEOs and CIOs to more quickly resolve misunderstandings about the role of IT in the organization. The ability to provide faster feedback would be particularly valuable when applying IT to support the organization's current operations. Inability to quickly resolve misunderstandings about the current role of IT could result in disruptions in company operations.

The opportunity for faster feedback about the current role of IT would increase convergence and thus ensure that existing IT resources were used, as needed, to maintain smooth company operations. The CIO would better understand the business and how IT should be used to support daily activities. Likewise, the CEO would better understand IT and its ability to support current company operations. Therefore,

Hypothesis 5: When an organization's CEO and CIO use richer channels to communicate with each other, the degree of convergence about the current role of IT is higher.

As a result of using richer channels to communicate with the CEO, IT managers are less concerned with strategic planning issues [82]. This suggests that IT managers who use rich communication channels have a better understanding of organizational goals and strategy and, consequently, find strategic planning a less difficult task. A further implication is that the use of richer channels to communicate with the CEO reduces equivocality and thus increases convergence about the organization's strategy and the significance of IT in the future.

Likewise, it is reasonable to expect that the use of richer channels to communicate strategic planning information would also enable the CEO to better understand IT and its future role in the organization. Because the future role of IT is represented by three dimensions, the following three hypotheses are proposed:

Hypothesis 6: When an organization's CEO and CIO use richer channels to communicate with each other, the degree of convergence about the future role of IT in providing managerial support is higher.

Hypothesis 7: When an organization's CEO and CIO use richer channels to communicate with each other, the degree of convergence about the future role of IT in differentiating the organization is higher.

Hypothesis 8: When an organization's CEO and CIO use richer channels to communicate with each other, the degree of convergence about the future role of IT in providing enhancements for existing systems is higher.

Effective application of IT depends on communication between IT and business managers [12]. Such communication helps managers from diverse areas within an organization develop a shared vision of the contribution of IS to the organization [60]. It is reasonable to expect that such convergence between an organization's CEO and CIO about its existing IS would reflect their greater knowledge of each other's needs, and their resulting greater ability to meet those needs. More successful collaboration would be an outcome of this knowledge, and it would ensure that the system resources were more effectively applied to address top management's objectives. This addressing of objectives would thus increase the system's financial contribution [29, 43]. Therefore,

Hypothesis 9: When the degree of CEO/CIO convergence about the current role of IT is higher, the IS financial contribution to the organization is higher.¹

Methodology

THIS STUDY USED A POSTAL SURVEY consisting of two questionnaires. The CEO of the organization completed one and the CIO or top IT executive completed the other. All subjects provided responses about their frequency of communication with each other, the richness of the channels they used to communicate, and their perceptions of the role of IT in the organization. CEOs responded to items about the financial contribution of IS to the organization.

The content validity of each questionnaire was examined prior to the mailing of the survey [11, 73]. Five IT professors, of whom two had previously published research on interpersonal communication, initially reviewed each instrument. Their comments and suggestions were used to revise the surveys. Next, five sets of executives (one CEO and one CIO per set) pilot tested the surveys. The senior author met with each subject individually while he or she filled out the survey. After completion of each survey, the executive provided feedback and comments about it. The feedback from each set of executives resulted in a revision, which in turn, was given to the next set of executives.

Operationalization of Variables

The communication-frequency construct, based on the work of Jang [37], was measured with a single-item scale. CIO (and CEO) subjects were asked to "please answer the following about your communication frequency with the CEO (or CIO,

respectively) about important issues as accurately as possible on a 1 (very infrequent) to 5 (very frequent) scale during a typical month via five channels." The measure contained one item for each of the channels and one for overall communication. A single task (i.e., communication "about important issues") was used to control for the potential equivocality of the communication. Based on previous IS research, the assumption was that such issues were strategy-oriented and therefore presumed to be equivocal [82]. The CEO and CIO responses to the items about their frequency of communication for the channels were summed. This sum was used for hypothesis testing. (The items used in this study are available from the senior author.)

An adapted version of Bacharach and Aiken's [5] communication-frequency measure was used to validate Jang's construct. The Bacharach and Aiken measure required subjects to respond to an item with the number of times they used each communication channel during a typical month. The Jang measure was deemed preferable for the hypothesis testing itself because self-reports such as Bacharach and Aiken's have been shown to overreport and underreport in different communication channels [63].

The media-richness construct was measured with an adapted version of Webster and Trevino's [83] instrument over five channels. Subjects responded on a 1 (no extent) to 5 (great extent) scale about the extent to which a channel had the ability to give and receive timely feedback, convey multiple types of information, transmit varied symbols, and tailor messages to fit the sender or receiver's requirements when communicating with each other.

This study used Rice et al.'s [64] five channels—face-to-face, telephone, e-mail, business memo, and voice mail. Zmud et al.'s [86] list of 14 channels appeared more comprehensive, but they mapped into Rice et al.'s five and thus permitted a more parsimonious instrument.

Twenty items (i.e., four characteristics for each of the five channels) measured richness. Responses for these 20 items were used for two purposes. First, they were used to determine the richness rating for each medium across all CEOs and all CIOs. Subjects' responses to the four richness items for a specific medium were averaged to determine the richness rating for that specific medium for his or her group (CEO or CIO). For example, the richness rating for face-to-face communication for CEOs was computed by averaging all CEO responses to the four items about the richness of the medium.

Second, the 20 channel richness items were used in the following calculation to determine a standardized communication-channel richness measure for each respondent:

1. The appropriate richness rating for each CEO for each medium was multiplied by that respondent's answers to Jang's [37] item about how frequently he or she used the medium to communicate with the CIO; this produced the respondent's weighted measure of communication-channel richness for each medium. An analogous computation was done for each CIO for each medium.
2. The weighted measures of communication-channel richness were summed across each participant's responses for all media and then divided by the sum of the

communication-frequency responses for the participant. This produced a single standardized communication-channel richness measure for each participant.

These calculations were consistent with Lind and Zmud's [47] measure for communication-channel richness in that those researchers also weighted channel richness based on frequency. They assumed the variables would be uncorrelated, but after finding them correlated at a statistically significant level, they added a new hypothesis to their model. In the current study, we also assumed the variables would be uncorrelated and, as explained below in the "Reliability and Validity" section, found them uncorrelated, thus permitting such a weighting without any new hypotheses. Because multiple informants were used, an average of the CEO's and CIO's standardized communication-channel richness score provided the overall communication-channel richness measure used for hypothesis testing.

The current and future roles of IT construct were measured with Raghunathan et al.'s [57] strategic grid instrument. The current role of IT construct was comprised of one factor. Subjects indicated on a scale of 1 (strongly disagree) to 5 (strongly agree) the extent to which they agreed to six items about the current portfolio of IS for their organization. CEO/CIO convergence about the current role of IT for each item was determined by calculating the absolute value of the difference between the CEO and CIO response for that item. The construct was thus a latent variable of these six calculated items.

The future role of IT construct contained three factors, which represented how organizations were directing their system development projects. The managerial support factor, the differentiation factor, and the enhancement factor contained four, three, and two items, respectively. Subjects indicated on a scale of 1 (low significance) to 5 (high significance) the significance of nine specific types of projects as they related to the firm's future portfolio.

CEO/CIO convergence on the managerial support future role of IT was a four-item latent variable of the absolute values of the differences between the CEO and CIO response for each of the items. Similarly, CEO/CIO convergence on the differentiation and the enhancement future roles of IT were also latent variables of the absolute values of the differences between their three and two items. Smaller differences indicated more convergence for all four role of IT constructs. (Reliability and validity statistics for the role of IT measures and for the calculated convergence measures are reported in the "Analysis" section below.)

The IS financial-contribution construct was measured using Premkumar and King's [55] three items. CEOs indicated on a scale of 1 (no extent) to 5 (great extent) how much IS had contributed to the organization's ROI, sales revenue, and market share. The construct was thus a latent variable of these items.

Data Collection

The participating organizations were headquartered in two southeastern states. The chamber of commerce in the largest city within the sampling area had agreed to endorse

the research. That endorsement included the active solicitation and encouragement of organizational executives and chamber members to participate in the research. It also included the use of their membership list.

In addition to the chamber of commerce list, two other resources were used to identify potential participants. One was a database of major employers in the sampling area. The other was the American Business Index.

Organizations headquartered in the sampling area were selected as potential subjects if they had at least 50 employees or if the chamber data indicated the presence of an IT function within the firm. These criteria resulted in the identification of 1,011 organizations.

CEOs of the 1,011 organizations were then contacted to solicit their participation in the research via an initial letter on chamber of commerce stationery signed by a chamber official. It included a postage-paid return postcard to be completed by the CEO. CEOs willing to participate were required to write the name of the organization's top IT manager on the postcard. The survey packets were then mailed directly to the CEO and CIO of the organization.

The cover letters for each survey emphasized that participation was entirely voluntary and that responses were strictly confidential. This method to identify multiple respondents within a single firm is consistent with previous IS research. For example, some studies have mailed packages of surveys directly to the CEO for completion by that executive, and for forwarding to and completion by other company employees (e.g., [33, 66]). Although the current study relied on the CEO to identify the top IT manager, surveys were mailed directly and thus independently to each informant, therefore requiring no personal contact between them, and thus reducing the ever-present likelihood and extent of socially acceptable responses.

Five hundred twenty-one CEOs (52 percent) returned the postcard and 228 (23 percent) agreed to participate. Follow-up phone calls were made to ascertain why the other 293 CEOs returned the postcard, but otherwise declined to take part in the study. Many of their organizations, for example, had a general policy against participating in research, but the CEO returned the postcard because the chamber of commerce (i.e., the sponsor of the research) had made persistent effort at encouraging a response. The major reasons for not completing the survey were that the company policy prevented participation (54.3 percent), there were time restrictions (26.6 percent), the CEO was not available at the time of the survey (7.9 percent), and the company was in the process of closing (4.1 percent).

Subjects returned 204 matched surveys for a response rate of 20 percent. Two of the matched surveys were unusable due to incomplete responses, so 202 were used as the sample for the study.

The major industries represented were manufacturing (20.3 percent), medicine/law/education (13.4 percent), finance/insurance (10.4 percent), wholesale/retail (8.4 percent), construction (7.9 percent), government/utilities (5.4 percent), and real estate (5.4 percent). Also, 16.3 percent specified other industries, and 12.4 percent did not identify their industry.

Table 1. Means and Standard Deviations for Constructs

Construct	CEO		CIO	
	Mean	Standard deviation	Mean	Standard deviation
Communication frequency				
Face-to-face	4.08	1.06	3.85	1.21
Telephone	2.83	1.04	2.72	1.04
E-mail	3.08	1.35	3.09	1.36
Business memo	2.04	1.05	1.87	0.90
Voice mail	2.62	1.12	2.56	1.18
Channel richness				
Face-to-face	4.31	0.80	4.29	0.75
Telephone	2.64	0.76	2.45	0.70
E-mail	3.81	1.04	3.95	1.33
Business memo	2.70	0.82	2.81	0.70
Voice mail	2.78	0.79	2.77	0.78
Current role of IT	3.77	0.62	3.82	0.65
Future role of IT	84.84			
Managerial support	84.85	0.62	3.73	0.54
Differentiation	67.67	0.68	3.48	0.76
Enhancement	3.44	0.69	3.42	0.57
IS financial contribution	2.75	0.98	N/A	N/A

The average gross revenues for the 202 organizations were \$3 billion and average total assets were \$13 billion. The mean number of employees was 3,569.

The CEOs had an average of 26 years of industry experience, 19 with their organization, and 13 in the CEO position. The CIOs had an average of 14 years of industry experience, nine with the organization, 15 in the IT field, and six in the CIO position.

Approximately 37 percent of the CEOs had postgraduate degrees. An additional 35 percent had undergraduate degrees. Of the CIOs, 22 percent had postgraduate and 43 percent had undergraduate degrees.

Table 1 provides the mean and standard deviation for each construct in the model. The table shows that CEOs and CIOs ranked face-to-face and e-mail, as the most frequently used and richest media, respectively. Business memo was the least frequently used and telephone had the lowest richness.

A time-trend extrapolation [4] was used to assess the presence of nonresponse bias. Its premise is that nonrespondents are more similar to late respondents than to early ones. Therefore, using the first 25 percent of the returned surveys as early respondents and the last 25 percent as surrogates for nonrespondents, a multivariate analysis of variance of the 15 current and future role of IT variables was performed to determine if differences in response time were associated with different responses. The results indicated no significant differences for the CEO responses (Wilks's lambda = 0.87, $p = 0.25$) or CIO responses (Wilks's lambda = 0.85, $p = 0.23$) [19].

Analysis

Reliability and Validity

Communication Frequency

CORRELATION ANALYSIS WAS USED TO VALIDATE Jang's [37] communication-frequency construct. The correlation between it and the summed Bacharach and Aiken [5] measure (which had 26 fewer responses) was 0.46 ($p < 0.01$) for CEOs and 0.64 ($p < 0.001$) for CIOs.

Jang's [37] scaled item for each channel correlated significantly ($p < 0.01$) with Bacharach and Aiken's [5] item for the corresponding channel. The correlation between such corresponding items was higher than any other correlation between non-corresponding items. This provided some support for convergent and discriminant validity [15].

Further, a paired *t*-test indicated there was no difference in CEO and CIO responses about their overall frequency of communication with each other. These results provided additional support for convergent validity [15].

Communication-Channel Richness

First, a separate principal components analysis (PCA) was performed for CEOs and CIOs for each channel for a total of 10 PCAs. Each item loaded on its respective channel at 0.52 or better. Cronbach's alphas ranged from 0.71 to 0.90. Thus, the unidimensionality and reliability of the constructs were supported.

Confirmatory factor analysis (CFA) with the software package EQS, version 5.2, was then used to validate the channel-richness construct, which contained the five channels. The maximum likelihood method of parameter estimation and robust statistics were employed. A model was deemed a good fit for the data if the Satorra-Bentler scaled chi-square to degrees of freedom ratio ($SBS\chi^2/df$) was less than 3 [17], the nonnormed fit index (NNFI) and robust comparative fit index (RCFI) were at least 0.90 [8], the LISREL adjusted goodness-of-fit index (AGFI) was greater than 0.80 [31], the standardized root mean square residual (RMR) was less than 0.10 [31], and the root mean square error of approximation (RMSEA) was less than 0.08 [14].

CEO and CIO data were independently fitted. Modification indices were observed for each execution. To prevent overmodification of the model, only one change was made during a single execution [40].

Initial statistical results indicated that respecifications were required to achieve a good fit for the CEO and CIO channel-richness models. Examination of the residual matrices provided some evidence that the voice mail and business memo factors were misspecified. Furthermore, during the study, two CIOs had inquired (via a telephone conversation) about the channel-richness items and one CEO had written comments on the survey to further clarify the completed responses. In each case, the subjects had expressed some difficulty in differentiating between e-mail and business memo communication and between telephone and voice mail communication. They further

suggested that e-mail was frequently used to send attached business memos and the telephone was used to support voice mail communication. Thus, responses for e-mail items could include e-mail with and without business memo attachments. Similarly, responses for telephone items could include traditional telephone use and use that resulted in a voice mail message. Finally, managers and executives more likely use richer media than do lower-level workers [63]. Based on this evidence, the voice mail and business memo factors were dropped from the model. Table 2 shows the results of the CFA.

Current Role of IT

The current-role-of-IT construct was a single-factor model. PCA was performed for the CEO and CIO data. Each item loaded on its respective factor at 0.51 or better. Cronbach's alphas for the CEO and CIO data were 0.88 and 0.89, respectively. Thus, the unidimensionality and reliability of the construct were supported.

Future Role of IT

PCA for the CEO and CIO data showed that the managerial-support and differentiation future-role-of-IT factors were unidimensional. Each item loaded on its respective factor at 0.62 or better. Cronbach's alphas ranged from 0.71 to 0.80. Because the enhancement factor contained two variables, correlation was used to assess its reliability. The correlation between the two variables for the CEO and CIO data was 0.35 ($p < 0.01$) and 0.36 ($p < 0.01$), respectively. Thus, these tests supported the reliability of the future role of IT constructs.

Table 3 presents the factor correlations for the four role-of-IT constructs. Although some are statistically significant, all are well below the maximum suggested cutoff of 0.90 [6].

IS Financial Contribution

The IS financial-contribution construct was a single-factor model. PCA showed that each item loaded on the factor at 0.78 or better. Cronbach's alpha was 0.86. Thus, the unidimensionality and reliability of the construct were supported.

Hypothesis Testing

Structural equation modeling (SEM) was performed to test the hypotheses in Figure 1. Communication frequency (based on Jang's [37] item) and communication channel richness (based on Lind and Zmud's [47] calculations) were each represented by a manifest variable. As mentioned above, convergence about the current and future role of IT contained latent variables, which were determined by calculating the absolute value of the difference between the CEO and CIO response for that variable. IS financial contribution was a latent variable of ROI, sales revenue, and market share.

Table 2. Final Goodness-of-Fit Indices

Test statistic	Recommended	CEO channel- richness model	CIO channel- richness model	Measurement model	SEM
SBS χ^2 /df	≤ 3.00	2.30	2.63	1.60	1.75
NNFI	≥ 0.90	0.93	0.90	0.90	0.91
RCFI	≥ 0.90	0.98	0.95	0.91	0.94
AGFI	≥ 0.80	0.88	0.88	0.85	0.89
RMR	≤ 0.10	0.04	0.03	0.06	0.08
RMSEA	≤ 0.08	0.07	0.05	0.06	0.07

Table 3. Correlation Coefficients for Convergence Constructs

	Current role	Future roles		
		Managerial support	Differentiation	Enhancement
Current role	1.000			
Future roles				
Managerial support	0.022	1.000		
Differentiation	0.285*	0.489***	1.000	
Enhancement	0.128	0.446***	0.502***	1.000

* $p < 0.05$; *** $p < 0.001$.

A two-step approach recommended by Anderson and Gerbing [2] was followed. The first step used CFA to develop an acceptable measurement model. The second was to specify a structural model, which represented the hypothesized relationships.

The research model demonstrated acceptable reliability. The composite reliability index (ρ_c) was used to assess the reliability of the research model. All constructs exceeded the 0.70 minimum preferred level [34], thus demonstrating acceptable reliability. All factor loadings were significant at $p < 0.001$. Thus, convergent validity was supported. A variance extracted test supported discriminant validity between the model constructs. Table 4 shows composite reliability as well as descriptive statistics for the constructs. Table 2 shows the goodness-of-fit indices for the final measurement and structural models.²

Communication frequency predicted CEO/CIO convergence about the current role (H1), the differentiation future role (H3), and the enhancement future role (H4) of IT, whereas H2 (the effect of the frequency on convergence about the managerial support future role) was not supported. Channel richness predicted convergence about the differentiation future role (H7), whereas H5 (the effect of channel richness on convergence about the current role), H6 (effect of channel richness on convergence about the managerial support role), and H8 (effect of channel richness on convergence about the enhancement future role) were not supported. Convergence about the current role predicted IS financial contribution to the organization (H9). Figure 2 shows the final structural model with the path coefficients.

Control variables were organization size (i.e., number of employees), CEO tenure in the position, and CIO tenure in the position. Organization size predicted convergence about the current role of IT, the managerial support future role of IT, and IS financial contribution to the firm. CEO tenure was related to IS financial contribution, and CIO tenure was related to the managerial support future role of IT and to IS financial contribution to the firm.

Moreover, because previous research has suggested that an organization's strategic grid position (i.e., a cell in the two-dimensional categorization based on the organization's current and future role of IT) might influence communication between CIOs and CEOs [49], analysis of variance (ANOVA) tested whether communication frequency

Table 4. Composite Reliability and Descriptive Statistics

Construct	Latent variable	ρ_c	Mean	Standard deviation
Communication frequency	N/A	N/A	19.64	4.02
Channel richness	Face-to-face (CEO)	0.90	4.34	0.93
	Face-to-face (CIO)	0.84	4.33	0.96
	Telephone (CEO)	0.81	2.12	1.02
	Telephone (CIO)	0.72	2.00	0.94
	E-mail (CEO)	0.91	4.03	1.24
	E-mail (CIO)	0.84	4.09	1.03
Total channel richness	N/A	N/A	3.61	0.15
Current role of IT convergence	Same as construct	0.86	0.73	0.69
Future role of IT convergence	Managerial support	0.72	0.65	0.64
	Differentiation	0.77	0.79	0.68
	Enhancement	0.97	0.57	0.61
IS financial contribution	Same as construct	0.84	2.75	0.98

or channel richness differed according to such a position. No differences were found based on either CEO or CIO data.

Discussion of Findings

THE STUDY SUPPORTED THE NOTION that frequent communication between an organization's CEO and CIO would predict greater convergence about the current role of IT (H1) and about two of the future roles of IT—namely, differentiation (H3) and enhancement (H4). However, frequent communication did not predict CEO/CIO convergence about the future role of IT in providing managerial support (H2). Confirmation of H1, H3, and H4 was consistent with previous theory and research. For example, the convergence model of communication posited that frequent communication between two or more individuals enabled them to move toward a more mutual understanding [65]. Similarly, Lind and Zmud's [47] study of communication in a large multinational corporation confirmed that more frequent communication predicted convergence between providers and users of technology regarding the importance of business activities and the potential for IT to support those activities.

Failure to confirm H2 (managerial support) implies that frequent communication is more valuable for some strategic issues than for others. The managerial-support dimension of the future role of IT captured the extent to which the firm planned to use IT to provide managers with information that is needed for supporting decision making [57]. Perhaps, managers' decision making varies so much by position (e.g., CEO versus CIO) and individual style (e.g., analytic versus intuitive) that more frequent communication simply does not enable them to envision the organizational value of

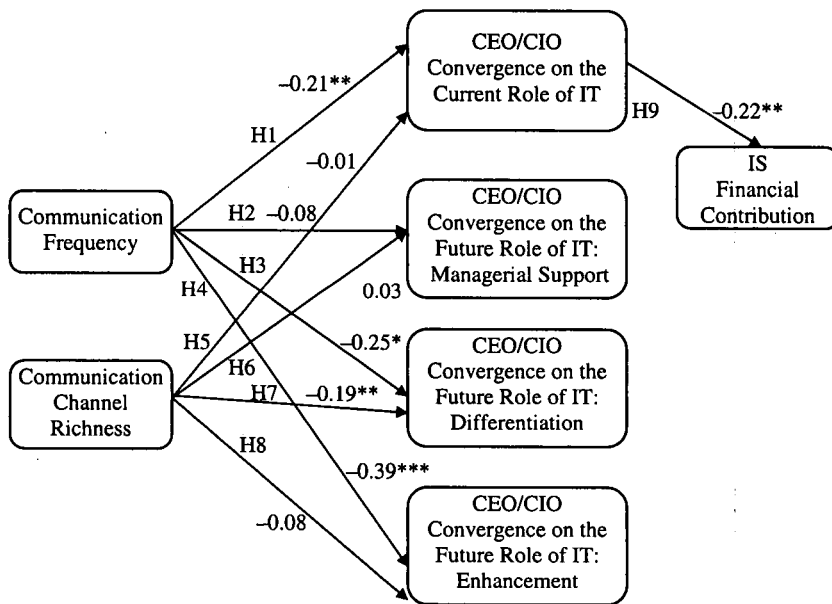


Figure 2. Final Structural Model with Path Coefficients.

*, **, and *** are significant at $p < 0.05$, $p < 0.01$, and $p < 0.001$, respectively.

IS that would support it [10, 23, 50, 85]. Thus, such communication would not affect convergence for the managerial-support future role.

The study supported the notion that channel richness would predict convergence about the differentiation future role (H7). Information concerning potential emerging technologies, new products and services, and proposed ways of competing (i.e., the differentiation construct) are probably quite equivocal. With such high equivocality, the use of rich channels would be necessary to produce convergence [22].

Failure to support the effect of channel richness on convergence about the current role (H5), managerial support future role (H6), and enhancement future role (H8) is, at first glance, somewhat surprising. Although such a result might be seen as a broad contradiction of media-richness theory (i.e., that channel richness predicts higher performance under equivocality), we suggest another interpretation. We suggest that current role, managerial-support future role, and enhancement future role may, in fact, simply be relatively low in equivocality (despite being strategic). That is, information would most likely be available about the organization's current operations and the role of IT to support them (H5). Informational inputs to managerial decision making may be fairly well known throughout the organization (H6). Documentation of requests for maintenance and improvements would provide information about the future role of IT for enhancing existing systems (H8). This information for those three roles of IT would reduce uncertainty [22] and thus decrease equivocality about them. Unlike the differentiation future role (with its great uncertainty about emerging technologies, new products and services, and proposed ways of competing), the current, future managerial,

and future enhancement roles would not necessitate rich channels to produce convergence [22], and the H5, H6, and H8 path coefficients would be low.

H9 said that when the degree of CEO/CIO convergence about the current role of IT is higher, the IS financial contribution to the organization would be higher. The data supported H9. This was consistent with the expectation that convergence reflects better collaboration in ensuring that organizations more effectively apply IS.

Finally, this study extended previous research such as that of Reich and Benbasat [60, 61]. First, this study showed, for example, that communication frequency between business and IT executives predicted convergence about the current role of IT as well as about two of the three future roles, whereas Reich and Benbasat had investigated strictly a planned role. Second, it confirmed the value of such convergence, particularly about the current role, because it predicted IS financial contribution to the organization. Third, it responded to Reich and Benbasat's [61] suggestion for future research using a larger sample of strictly headquartered organizations by studying more than 200 such firms and thus contributing to the generalizability of their findings. Fourth, due to the large sample size, the current study was able to consider the weight of the influence of each construct.

Implications

Implications for Researchers

THIS STUDY FOUND THAT COMMUNICATION FREQUENCY predicted CEO/CIO convergence for the current role (H1), future differentiation role (H3), and future enhancement role (H4). These results might stimulate further research about other factors that could affect these relationships. Perhaps, the combined effects of communication frequency and content of the communication is more important than the single effect of communication frequency. Perhaps, the duration of the communication episodes would affect the results of the study. Researchers could also study such intervening factors as the development of mutual trust and the potential to reduce barriers. These variables might help further explain the relationship between communication frequency and CEO/CIO convergence.

This study found that communication frequency predicted CEO/CIO convergence for all roles except the managerial-support future role of IT (H2). We speculated that variations in management position and decision-making style may have been responsible for the lack of support for that hypothesis. Additional research is needed to test that speculation or identify other reasons for the unexpected finding.

Lack of support for H5, H6, and H8 (the use of rich communication channels predicts more convergence about the current, future managerial support, and future enhancement roles of IT) indicated that research is needed to further examine the relationship between communication-channel richness and CEO/CIO convergence. We suggested a potential explanation above—that is, some roles might not have been highly equivocal. Further research might thus decompose IT strategy into its components and examine the extent of equivocality associated with each. Researchers could perhaps employ

Rice et al.'s [64] measures to assess the equivocality of the roles. The current researchers had considered use of those measures, but the survey instrument was already quite long. Lengthening it would potentially have reduced the response rate.

The study found support for the relationship between CEO/CIO convergence about the current role of IT and IS financial contribution to the organization (H9). Researchers might conduct a longitudinal study of the relationship between the CEO/CIO future role of IT convergence constructs and IS financial contribution to the organization. The longitudinal nature of the study would permit data collection for the convergence construct at one time with the IS financial contribution data collected later. The effect of agreeing about the future might prove interesting to researchers and managers.

Other implications relate directly to the constructs. In general, the study indicated that the constructs were more complex than initially thought. For example, the CFA for the channel-richness construct was unable to fit data for two of the channels (voice mail and business memo) to the initial model. Thus, they were dropped. Although theory provided an explanation for the lack of fit, research is needed to improve and validate the channel-richness construct. Perhaps, some of the media are not distinct.

The measures in this research were based on each subject's perception. Some—in particular, communication frequency—might have benefited from an objective assessment. However, that would have required considerable record keeping of communication activity. Given the decision to employ a large sample and the executive status of the participants, a less intrusive method was chosen so as to increase the response rate. Future research might, however, attempt objective record keeping across a large sample.

This study examined convergence between the CEO and CIO. Although past research has acknowledged the importance of their relationship, future work should consider convergence between other key executives. Similarities or differences in findings might facilitate an understanding not only of convergence but also of communication between CEOs and CIOs.

Because the subjects in the current study were high-level executives and a large sample was required to perform the intended analysis, an important objective was to keep the survey as brief as possible to increase response rate. Thus, in the interest of such brevity, the current study used a broad item that asked subjects to respond about their communication regarding "important issues." This phrase was adapted from prior research (i.e., [82]) that had studied the mode of communication between the IS manager and the CEO. Perhaps, future research could use more specific communication topics (e.g., the extent to which the communication was formal, the amount of IT expenditures, or the knowledge each party had about the other's domain of expertise).

Implications for Managers

Communication frequency predicted convergence about the current role, the differentiation future role, and the enhancement future role of IT. Under the assumption that the organization wants to facilitate convergence, this implies that organizations

might want to encourage the activities that produce frequent communication between the CEO and CIO about those specific roles.

Communication frequency did not predict convergence about the managerial-support future role of IT. Encouraging more frequent communication to facilitate it thus might not be productive. Under the aforementioned assumption, organizations might want to stress other activities instead. Rather than simply try more frequent communication, perhaps organizations might want to attempt discussions among CEOs and CIOs focused on the potential value of IS that support decision making at the top, middle, and lower levels of management.

Channel richness predicted convergence about the differentiation future role of IT alone. Organizations thus might benefit by providing more opportunities for managers to engage in rich, face-to-face interactions about how IT could be used in the future to differentiate its products and services.

Channel richness did not predict convergence about the current role, the managerial-support future role, and the enhancement future role of IT. Again, under the assumption that organizations might want to facilitate such convergence, they might try other activities. If the current role and enhancement future role are not as equivocal as assumed, then perhaps communication frequency is the avenue for greater convergence on those two. Focused discussion on the potential value of IS that supports decision making might be the means of increasing convergence on the managerial-support future role.

This study found support for the hypothesis that greater convergence on the current role of IT predicts greater IS financial contribution to the organization. Such a finding is consistent with the organizational objective of increasing convergence between managers. An implication of the finding is that organizations might want to carry out the activities that seem to facilitate such convergence.

Conclusion

CONVERGENCE BETWEEN A CEO AND CIO about the role of IT is invaluable to an organization. This study confirmed the effect of communication frequency on convergence concerning the current, enhancement future, and differentiation future roles of IT. It also confirmed the effect of channel richness on convergence concerning the differentiation future role.

The failure of frequency to predict convergence on managerial support may explain potential difficulties in developing IT strategy that gains the greatest benefit possible from managerial-support systems. The failure of richness to predict current, enhancement future, and managerial-support future roles may imply a greater equivocality for the differentiation future role than for those three. Such findings can guide future research not only about communication theory but also IT strategy. They can also provide managers with suggestions about what they may and may not emphasize in their efforts to increase convergence and use it to improve organizational performance.

NOTES

1. Given the relatively weaker expectation that convergence between the CEO and CIO about the *future* role of IT would have influenced *current* IS financial contribution, no hypotheses were proposed for that role.

2. CFA details are available from the authors.

REFERENCES

1. Afuah, A., and Tucci, C.L. *Internet Business Models and Strategies: Text and Cases*, 2d ed. Boston: McGraw-Hill, 2003.
2. Anderson, J.C., and Gerbing, G.W. Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, 103, 3 (1988), 411–423.
3. Applegate, L.M.; McFarlan, F.W.; and McKenney, J.L. *Corporate Information Systems Management: Text and Cases*, 5th ed. Boston: Irwin/McGraw-Hill, 1999.
4. Armstrong, J.S., and Overton, T.S. Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, 14, 3 (1977), 396–402.
5. Bacharach, S.B., and Aiken, M. Communication in administrative bureaucracies. *Academy of Management Journal*, 20, 3 (1977), 365–377.
6. Bagozzi, R.P.; Yi, Y.; and Phillips, L.W. Assessing construct validity in organizational research. *Administrative Science Quarterly*, 36, 3 (1991), 421–458.
7. Barkhi, R. The effects of decision guidance and problem modeling on group decision-making. *Journal of Management Information Systems*, 18, 3 (Winter 2001–2002), 259–280.
8. Bentler, P.M. *EQS Structural Equations Program Manual*. Encino, CA: Multivariate Software, 1995.
9. Berger, P.L., and Luckmann, T. *The Social Construction of Reality*. Garden City, NY: Anchor Books, 1966.
10. Bertrand, M., and Schoar, A. Managing with style: The effect of managers on firm policies. *Quarterly Journal of Economics*, 118, 4 (2003), 1169–1209.
11. Boudreau, M.; Gefen, D.; and Straub, D.W. Validation in information systems research: A state-of-the-art assessment. *MIS Quarterly*, 25, 1 (2001), 1–24.
12. Boynton, A.C.; Zmud, R.W.; and Jacobs, G.C. The influence of IT management practice on IT use in large organizations. *MIS Quarterly*, 18, 3 (1994) 299–318.
13. Brancheau, J.C., and Wetherbe, J.C. Key issues in information systems management. *MIS Quarterly*, 11, 1 (1987), 23–45.
14. Browne, M., and Cudeck, R. Alternative ways of assessing model fit. In K.A. Bollen and J.S. Long (eds.), *Testing Structural Equation Models*. London: Sage, 1993, pp. 136–162.
15. Campbell, D.T., and Fiske, D.W. Convergent and discriminant validation by the multitrait–multimethod matrix. *Psychological Bulletin*, 56, 1 (1959), 81–105.
16. Carlson, J.R., and Zmud, R.W. Channel expansion theory and the experiential nature of media richness perceptions. *Academy of Management Journal*, 42, 2 (1999), 153–170.
17. Carmines, E.G., and McIver, J.P. Analyzing models with unobserved variables. In G.W. Bohrnstedt and E.F. Borgatta (eds.), *Social Measurement: Current Issues*. Beverly Hills, CA: Sage, 1981.
18. Chan, Y.E.; Huff, S.L.; and Barclay, D.W. Business strategic orientation, information systems strategic orientation, and strategic alignment. *Information Systems Research*, 8, 2 (1997), 125–150.
19. Compeau, D.R., and Higgins, C.A. Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, 19, 2 (1995), 189–211.
20. Daft, R.L., and Lengel, R.H. Information richness: A new approach to managerial information processing and organization design. In B. Staw and L. Cummings (eds.), *Research in Organization Behavior*. Greenwich, CT: JAI Press, 1984, pp. 191–233.
21. Daft, R.L., and Lengel, R.H. Organizational information requirements, media richness, and structural design. *Management Science*, 32, 5 (1986), 554–572.

22. Daft, R.L.; Lengel, R.H.; and Trevino, L.K. Message equivocality, media selection, and manager performance: Implications for information systems. *MIS Quarterly*, 1, 1 (1987), 355-366.
23. Dearborn, O., and Simon, H. Selective perception: A note on the departmental identification of executives. *Sociometry*, 21 (1958), 140-144.
24. Dennis, A.R., and Wixom, B.H. Investigating the moderators of group support systems use with meta-analysis. *Journal of Management Information Systems*, 18, 3 (Winter 2001-2002), 235-257.
25. Earl, M.J. The chief information officer: Past, present, and future. In M.J. Earl (ed.), *Information Management: The Organizational Dimension*. New York: Oxford University Press, 1996, pp. 456-484.
26. Earl, M.J., and Vivian, P.D. *The Role of the Chief Information Officer: A Study of Survival*. London: London Business School, 1993.
27. Ensley, M.D., and Pearce, C.L. Shared cognition in top management teams: Implications for new venture performance. *Journal of Organizational Behavior*, 22, 2 (2001), 145-160.
28. Farhoomand, A.F.; Ng, P.S.P.; Conley, W.L.; Brown, S.A.; and Venkatesh, V. Building a successful e-business: The FedEx story. *Communications of the ACM*, 46, 4 (2003), 84-90.
29. Feeny, D.F.; Edwards, B.R.; and Simpson, K.M. Understanding the CEO/CIO relationship. *MIS Quarterly*, 16, 4 (1992), 435-448.
30. Gale, B.T., and Buzzell, R.D. Marketing position and competitive strategy. In G. Day, B. Weitz, and R. Wensley (eds.), *The Interface of Marketing and Strategy*. Greenwich, CT: JAI Press, 1993, pp. 101-144.
31. Gefen, D.; Straub, D.W.; and Boudreau, M. Structural equation modeling and regression: Guidelines for research practice. *Communications of the AIS*, 4, 7 (2000), 1-78.
32. Gnyawali, D.R., and Stewart, A.C. A contingency perspective on organizational learning: Integrating environmental context, organizational learning processes, and types of learning. *Management Learning*, 34, 1 (2003) 63-89.
33. Hann, J., and Weber, R. Information systems planning: A model and empirical tests. *Management Science*, 42, 7 (1996), 1043-1064.
34. Hatcher, L. *A Step-by-Step Approach to Using the SAS System for Factor Analysis and Structural Equation Modeling*. Cary, NC: SAS Institute, 1994.
35. Higa, K.; Sheng, O.R.L.; Shin, B.; and Figueredo, A.J. Understanding relationships among teleworkers' e-mail usage, e-mail richness perceptions, and e-mail productivity perceptions under a software engineering environment. *IEEE Transactions on Engineering Management*, 47, 2 (2000), 163-173.
36. Hitt, L.M., and Brynjolfsson, E. Information technology and internal firm organization: An exploratory analysis. *Journal of Management Information Systems*, 14, 2 (Fall 1997), 81-102.
37. Jang, S.Y. Influence of organizational factors on information systems strategic planning. Ph.D. dissertation, University of Pittsburgh, 1989.
38. Jarvenpaa, S.L., and Ives, B. Executive involvement and participation in the management of information technology. *MIS Quarterly*, 15, 2 (1991), 205-227.
39. Jones, M.C.; Taylor, G.S.; and Spencer, B.A. The CEO/CIO relationship revisited: An empirical assessment of satisfaction with IS. *Information and Management*, 29, 3 (1995), 123-130.
40. Joreskog, K.G., and Sorbom, D. *LISREL 7: A Guide to the Program and Applications*, 2d ed. Chicago: SPSS, 1989.
41. Kahai, S.S., and Cooper, R.B. Exploring the core concepts of media richness theory: The impact of cue multiplicity and feedback immediacy on decision quality. *Journal of Management Information Systems*, 20, 1 (Summer 2003), 263-299.
42. Karahanna, E., and Limayem, M. E-mail and v-mail usage: Generalizing across technologies. *Journal of Organizational Computing and Electronic Commerce*, 10, 1 (2000), 49-66.
43. Keen, P.G.W. *Shaping the Future: Business Design Through Information Technology*. Boston: Harvard Business School Press, 1991.
44. King, R.C., and Xia, W. Media appropriateness: Effects of experience on communication media choice. *Decision Sciences*, 28, 4 (1997), 877-910.
45. Kock, N. Compensatory adaptation to a lean medium: An action research investigation of electronic communication in process improvement groups. *IEEE Transactions on Professional Communication*, 44, 4 (2001), 267-285.

46. Lee, A.S. Electronic mail as a medium for rich communication: An empirical investigation using hermeneutic interpretation. *MIS Quarterly*, 18, 2 (1994), 143-150.
47. Lind, M.R., and Zmud, R.W. The influence of a convergence in understanding between technology providers and users on technology innovativeness. *Organization Science*, 2, 2 (1991), 195-217.
48. Markus, M.L. Electronic mail as the medium of managerial choice. *Organization Science*, 5, 4 (1994), 502-527.
49. McFarlan, F.W.; McKenney, J.L.; and Pyburn, P. Information archipelago—Plotting a course. *Harvard Business Review*, 61, 1 (1983), 145-161.
50. McKenney, J.L., and Keen, P.G.W. How managers' minds work. *Harvard Business Review*, 52, 3 (1974), 79-90.
51. McLeod, J.M., and Chaffee, S.H. Interpersonal approaches to communication research. *American Behavioral Scientist*, 16, 4 (1973), 469-499.
52. Miller, M.D., and Gibson, M.L. The CIO as an integrative strategist. *Information Strategy: The Executive's Journal*, 11, 2 (1995), 35-40.
53. Nath, R. Aligning MIS with the business goals. *Information and Management*, 16, 2 (1989), 71-79.
54. Neo, B.S. Factors facilitating the use of information technology for competitive advantage: An exploratory study. *Information and Management*, 15, 4 (1988), 191-201.
55. Premkumar, G., and King, W.R. An empirical assessment of information systems planning and the role of information systems in organizations. *Journal of Management Information Systems*, 9, 2 (Fall 1992), 99-125.
56. Raghunathan, B., and Raghunathan, T.S. Planning implications of the information systems strategic grid: An empirical investigation. *Decision Sciences*, 21, 2 (1990) 287-300.
57. Raghunathan, B.; Raghunathan, T.S.; and Qiang, T. Dimensionality of the strategic grid framework: The construct and its measurement. *Information Systems Research*, 10, 4 (1999), 343-355.
58. Raghunathan, T.S.; Gupta, Y.P.; and Sundararaghavan, P.S. Assessing the impact of IS executives' critical success factors on the performance of IS organizations. *Information and Management*, 17, 3 (1989), 157-168.
59. Ranft, A.L., and Lord, M.D. Acquiring new technologies and capabilities: A grounded model of acquisition implementation. *Organization Science*, 13, 4 (2002), 420-443.
60. Reich, B.H., and Benbasat, I. Measuring the linkage between business and information technology objectives. *MIS Quarterly*, 20, 1 (1996), 55-81.
61. Reich, B.H., and Benbasat, I. Factors that influence the social dimension of alignment between business and information technology objectives. *MIS Quarterly*, 24, 1 (2000), 81-113.
62. Rice, R.E. Task analyzability, use of new media, and effectiveness: A multi-site exploration of media richness. *Organization Science*, 3, 4 (1992), 475-500.
63. Rice, R.E., and Shook, D.E. Relationships of job categories and organizational levels to use of communication channels, including electronic mail: A meta-analysis and extension. *Journal of Management Studies*, 27, 2 (1990), 195-229.
64. Rice, R.E.; D'Ambra, J.; and More, E. Cross-cultural comparison of organizational media evaluation and choice. *Journal of Communication*, 48, 3 (1998), 3-26.
65. Rogers, E.M., and Kincaid, D.L. *Communication Networks*. New York: Free Press, 1981.
66. Sabherwal, R., and Chan, Y.E. Alignment between business and IS strategies: A study of prospectors, analyzers, and defenders. *Information Systems Research*, 12, 1 (2001), 11-33.
67. Sabherwal, R., and Kirs, P. The alignment between organizational critical success factors and information technology capability in academic institutions. *Decision Sciences*, 25, 2 (1994), 301-330.
68. Schwartz, A.P. The economics of a strategy for advanced information technology. *Information Strategy*, 9, 1 (1992), 11-17.
69. Seddon, P.B.; Graeser, V.; and Willcocks, L.P. Measuring organizational IS effectiveness: An overview and update of senior management perspectives. *Database for Advances in Information Systems*, 33, 2 (2002), 11-28.
70. Short, J.; Williams, E.; and Christie, B. *The Social Psychology of Telecommunications*. London: Wiley, 1976.
71. Singlemann, P. Exchange as symbolic interaction: Convergences between two theoretical perspectives. *American Sociological Review*, 37 (August 1972), 414-424.

72. Straub, D.W., and Karahanna, E. Knowledge worker communications and recipient availability: Toward a task closure explanation of media choice. *Organization Science*, 9, 2 (1998), 160–175.
73. Straub, D.W. Validating instruments in MIS research. *MIS Quarterly*, 13, 2 (1989), 147–169.
74. Tan, M. Establishing mutual understanding in systems design: An empirical study. *Journal of Management Information Systems*, 10, 4 (Spring 1994), 159–183.
75. Trauth, E., and Jessup, L.M. Understanding computer-mediated discussions: Positivist and interpretive analyses of group support system use. *MIS Quarterly*, 24, 1 (2000), 43–79.
76. Trevino, L.K.; Webster, J.; and Stein, E.W. Making connections: Complementary influences on communication media choices, attitudes, and use. *Organization Science*, 11, 2 (2000), 163–193.
77. Tukana, S., and Weber, R. An empirical test of the strategic-grid model of information systems planning. *Decision Sciences*, 27, 4 (1996), 735–756.
78. Turban, E.; McLean, E.; and Wetherbe, J. *Information Technology for Management: Transforming Business in the Digital Economy*, 3d ed. New York: John Wiley & Sons, 2002.
79. Van de Ven, A.H., and Walker, G. The dynamics of interorganizational coordination. *Administrative Science Quarterly*, 29, 4 (1984), 598–621.
80. Velker, L. Knowledge the Chevron way. *KMWorld*, 8, 2 (1999), 20–21.
81. Warriner, C.K. *The Emergence of Society*. Homewood, IL: Dorsey, 1970.
82. Watson, R.T. Influences on the IS manager's perceptions of key issues: Information scanning and the relationship with the CEO. *MIS Quarterly*, 14, 2 (1990), 217–231.
83. Webster, J., and Trevino, T.K. Rational and social theories as complementary explanations of communication media choices: Two policy capturing studies. *Academy of Management Journal*, 38, 6 (1995), 1544–1572.
84. Weick, K. *The Social Psychology of Organizing*. Reading, MA: Addison-Wesley, 1979.
85. White, J.C.; Varadarajan, P.R.; and Dacin, P.A. Market situation interpretation and response: The role of cognitive style, organizational culture, and information use. *Journal of Marketing*, 67, 3 (2003), 63–79.
86. Zmud, R.W.; Lind, M.R.; and Forrest, W.Y. An attribute space for organizational communication channels. *Information Systems Research*, 1, 4 (1990), 440–457.

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