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Strategic Information Systems Planning Success: An Investigation of the Construct and Its Measurement[1]

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[1]Izak Benbasat was the accepting senior editor for this paper.

Abstract

Strategic information systems planning (SISP) requires significant outlays of increasingly scarce human and financial resources. Yet, there exists very little understanding of how the success of this planning activity is measured. Using classical frameworks for measurement development as well as contemporary statistical techniques for assessing dimensionality, this study theoretically develops and empirically tests a measurement model of SISP success. The results suggest that SISP success can be operationalized as a second-order factor model. The first order constructs of the model are termed alignment, analysis, cooperation, *and* improvement in capabilities. *These factors are governed by a second-order construct of* SISP success. *The results of the study are framed as a tool for benchmarking planning efforts as well as a foundation for operationalizing a key dependent variable in SISP research.*

Introduction

Within information systems (IS) literature, much attention has been devoted to developing methodologies for conducting strategic planning. These methods are designed to aid IS planners in aligning their strategies with those of the organization (King 1988), identifying opportunities to utilize information technologies (IT) for competitive advantage (Ives and Learmonth 1984; McFarlan 1984; Porter and Millar 1985; Wiseman 1985), and/or analyzing internal processes and patterns of data dispersion throughout the organization (Brancheau and Wetherbe 1986; Davis 1982; Goodhue et al. 1992; Zachman 1982). Increasingly, it has become apparent to observers in the field that such characterizations of planning are narrow (Das et al. 1991; Sambamurthy et al. 1993), or simply inaccurate (Earl 1989, 1993). Further, it has been suggested that strategic planning activities within IS have much similarity with larger organizational systems of strategic planning (Henderson et al. 1987; Hufnagel 1987;

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Venkatraman 1985; Venkatraman and Henderson 1994) and, therefore, should be conceptualized, operationalized, and evaluated in similar terms.

Strategic IS planning (SISP) activities require substantial resources in terms of managerial time and budget. Therefore, the process must deliver benefits beyond the resources necessary to sustain it in order to contribute positively to organizational effectiveness. Yet, quantification of the benefits of planning cannot be reduced to simple financial measures such as return on investment, payback, or internal rate of return. As has been noted, SISP (like overall strategic planning) renders many benefits that are intangible (King 1988). Therefore, measuring how well SISP was done this year and how planning has improved over time is a complex exercise and must incorporate consideration of these intangible process contributions. Although evaluative frameworks, such as that developed by King (1988), are an important starting point in measuring strategic planning success, there have been few efforts undertaken within IS literature to formally develop empirically-based definitions of this important performance characteristic. As has been observed, it is likely that some organizations realize aspects of planning effectiveness that are not realized by others (and vice-versa) (Goodhue et al. 1992). Such findings are lost when effectiveness is captured within a single aggregated scale. Although a limited number of studies have captured SISP effectiveness as more than a single, "is your planning system effective," scale (Premkumar and King 1991, 1992), the focus of these studies has been directed on process and/or organizational characteristics that impact SISP. As a result, limited theoretical or practical justification is provided for the content of SISP effectiveness measures.

Recent work provides both a theoretical and operational basis for conceptualizing measurement models of planning success (Raghunathan and Raghunathan 1994). Within the context of general IS planning, this work demonstrates that planning success seems to be a complex system of interrelated constructs. A major implication of this research is that achievement along a single first-order dimension of planning success is a necessary but not sufficient condition for success along the higher-order dimension of planning success. Within the context of strategic planning, it is likely that a similar structure of interrelated constructs with different theoretical definitions constitute the measurement space of planning success. In order to assess the extent and specific nature of benefits rendered by SISP activities, these broad dimensions of effectiveness must be theoretically and operationally defined. The development of such multidimensional conceptualizations can (1) capture multiple aspects of SISP success that may be subsumed within general (single scale) measures, (2) provide insight into the nature of interrelationships among success dimensions, and (3) provide a more accurate diagnostic tool to assess SISP activities within organizations. Until such concepts are developed, the varying criteria of planning effectiveness among studies will inhibit the generalizability and accumulation of research findings that attempt to identify effective approaches to strategic planning. In addition, IS managers will be without a framework within which the organizational resources devoted to strategic planning activities can be more easily and accurately justified.

This study theoretically develops and statistically tests a measurement model of SISP success.[2] Incorporating both classical frameworks for developing measures and contemporary statistical techniques for assessing dimensionality, the intent of the research is to develop a theoretical and operational construct space for latent factors that may be indicative of SISP success. The remainder of the study is organized in five sections. The first section examines theoretical perspectives for measuring planning success. The primary purpose of this section is to build a rationale and theoretical basis for defining "success" with respect to strategic planning. The second section examines literature within IS and strategic management as a means of defining a theoretical and operational construct space of SISP success.

[2]The terms "planning system success" and "planning system effectiveness" are used interchangeably in this paper.

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Here, the objective is to develop and describe the item measures and underlying factors that may constitute a measurement model of SISP success. The third section empirically examines the psychometric properties of the measurement models. Using confirmatory factor analysis, the validity and reliability of each scale is tested as a means of assessing the distinctness of each construct as well as the presence of complex and/or unreliable item measures. The fourth section formally assesses the structure of interrelationships among latent variables. Specifically, the efficacy of a second-order factor model in capturing the variation among the first-order constructs is empirically tested. The concluding section describes potential limitations and implications of the study for both research and practice.

Theoretical Perspectives for Assessing the Success of Strategic Planning

An examination of literature within IS and strategic management reveals four distinct approaches for assessing the effectiveness of strategic planning, "goal-centered judgment," "comparative judgment," "normative judgment," and "improvement judgment."

Goal-centered judgment

Goal-centered judgment seeks to assess the degree of attainment in relation to targets. A typical question in this mode is *To what extent are the multiple objectives (or goals) of planning fulfilled?* This approach is perhaps the most intuitive and widely applied metric for measuring strategic planning success (Venkatraman and Ramanujam 1987). It has also been underscored in evaluative frameworks within IS planning literature. This evaluative dimension has been termed "IS planning effectiveness" (King 1988) and referred to as "measurement against purpose" (Steiner 1979). Organizations may differ in terms of number and specific goals for planning. However, there are general objectives which all strategic planning systems should strive to obtain. Therefore, this measurement perspective is useful both for its intuitiveness and ease of operation. Within the context of general managerial planning, this perspective has been tapped in developing constructs of planning systems success (see Venkatraman and Ramanujam 1987; see also Raghunathan and Raghunathan 1994). Through literature review, six important goals for planning (enhancing managerial development, predicting future trends, short-term performance, long-term performance, gathering relevant information, and avoiding problem areas) were identified and their validity empirically demonstrated in capturing the extent of "key" objective fulfillment (Venkatraman and Ramanujam 1987).

Comparative judgment

This evaluative perspective compares the effectiveness of a particular system with other "similar systems" (typically those set up in comparable organizations) (Earl 1989). The typical question in this mode is *How does our system's performance compare against similar systems that are operating in comparable organizations?* Within this mode of planning assessment, effectiveness may be implied through the ability of the system to anticipate events that were not anticipated by competitors. Conversely, a less effective planning system may fail to forecast trends or events that have been readily identified by competitors. While this perspective is also very intuitive, it is many times difficult to actually implement. Gathering accurate and timely information regarding comparable systems can be difficult if not impossible. Additionally, it may be an invalid basis of comparison if comparable systems are under-achieving (i.e., the firm's planning regresses to mediocrity).

Normative judgment

A relevant assessment question within the normative perspective is *How does our system's*

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performance compare against that of a theoretically ideal system? In essence, the system is compared to "standards of the field" rather than the unique planning goals of the organization (King 1983). Such an approach is more amenable to research contexts if literature and/or expert opinion can readily identify these "standards" of good planning. Such standards should be as encompassing as possible while independent of environmental and organizational contexts. Within strategic management and IS literature, several "key" planning studies have utilized this evaluative perspective (Goodhue et al. 1992; King 1983; Venkatraman and Ramanujam 1987). For example, five criteria for assessing the success of strategic data planning have been identified (Goodhue et al.1992). These standards of successful planning (implemented systems, development of a data architecture, guidelines for development priorities, reengineering, and education/communication) are then used to evaluate the efforts of sample cases and suggest reasons for the existence (and non-existence) of planning success.

Improvement judgment

Within this perspective, a typical question is *How has the planning system adapted to changing circumstances?* In other words, the focus is on assessing how the planning system has evolved or adapted *over time* in supporting organizational planning needs. This approach is particularly useful in cases where the system is in its initial stages and has yet to reach steady state (Lorange and Vancil 1976). However, within any context, the assessment of a system's capacity to improve is an important indicator of effectiveness. King (1988) relies heavily upon this perspective in his framework for evaluating SISP. In essence, that work suggests that planning evaluators examine patterns in (1) the relative efficiency in use of financial and personnel resources devoted to SISP, (2) the actual use of strategic plans, (3) the contribution of SISP to organizational performance, and (4) changes in IS strategy resulting from changes in business strategy. When examined through the lens of system adaptability, these metrics can give IS managers useful insight in determining how SISP has improved in terms of resource use and organizational contribution. Other work incorporates this perspective in operational definitions of planning system success (Venkatraman and Ramanujam 1987; Raghunathan and Raghunathan 1994).

Although each of these perspectives is a legitimate approach for assessing planning system success, some are more relevant for specific planning methodologies while others are more relevant for broader planning system dimensions (Venkatraman and Ramanujam 1987). Comparative and/or normative perspectives are more easily applied to methods such as strategic data planning because the technique will usually occur over a measurable time horizon and will tend to have a narrower focus and set of outcomes (Goodhue et al. 1992). In contrast, characteristics of goal fulfillment and adaptability provide a more applicable measurement perspective for process dimensions of planning systems which tend to be ongoing, broader in focus, and exhibit a variety of outcomes (Raghunathan and Raghunathan 1994). Given the broader perspective of this research, the perspectives of "goal-centered judgment" and "improvement judgment" are chosen as the theoretical bases for conceptualizing SISP success. Collectively, these perspectives represent the "ends" (the output of the planning system) and "means" (adaptability of the process) view for evaluating planning system benefits and, as important, are consistent with much of the evaluative literature within SISP (Brancheau and Wetherbe 1986; Earl 1993; Hufnagel 1987; King 1983, 1988; McLean and Soden 1977). Working within these perspectives, a theoretical and operational construct space for SISP success is developed.

A Theoretical Domain of SISP Success

As noted in prior research (DeLone and McLean 1992), it is likely that many aspects of

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effectiveness with respect to IS and IS management are complex. In essence, multiple, interrelated success dimensions which are themselves measured by multiple indicators are more likely to capture changes in performance than an all-encompassing scale item or set of financial measures. Research suggests that extensive literature review and expert opinion provide a sound foundation upon which a theoretical domain (or construct space) of complex variables can be formed (Churchill 1979). From this theoretical domain, an operational basis for assessing the status and change in complex phenomenon can be defined. Following similar studies in strategic management and IS (Joshi 1989; Straub 1989; Venkatraman 1989), this study frames theoretical and operational dimensions of SISP success within the paradigm developed by Churchill (1979).

Utilizing the perspectives of "goal-fulfillment" and "improvement in capabilities" as theoretical underpinnings, an extensive review of IS literature was conducted to (1) identify various SISP objectives and (2) identify any underlying dimensions that would provide structure for the resulting objectives. The journals that formed the basis for the literature review include *MIS Quarterly, Information Systems Research, Decision Sciences, The Journal of Information Systems, Management Science, IBM Systems Journal, The Proceedings of the International Conference on Information Systems, Communications of the ACM, Information & Management, Harvard Business Review*, and *Sloan Management Review.* These journals are cited in several studies as leading research outlets within the field of IS (Gillenson and Studz 1991; Pinsonneault and Kraemer 1993). Over 150 articles appearing between 1980 and 1994 were independently examined for content that addressed objectives of SISP. Through this analysis, over 50 objectives for SISP were identified. To verify completeness of this listing and consolidate redundancies, "experts" were asked to add overlooked objectives, take away those that no longer seemed relevant, and identify objectives that may be identical. These experts included seven senior IS executives, four doctoral students (each ABD with significant industry experience), and four IS academics (each with significant publication activity within SISP). After two rounds of review, a set of 28 objectives remained. In general, each expert agreed that this set of objectives represented relevant and relatively distinct goals for SISP.

To create a theoretical structure for the objectives, the authors and panel of experts independently and then collectively grouped them based on similarity. Upon two iterations of classification by the authors and panel in addition to one round of formal interview between the authors and panel, three broad dimensions of objective fulfillment were deemed adequate in providing structure for the identified objectives. These dimensions are termed *alignment, analysis,* and *cooperation.* In the paragraphs that follow, the content domain of each of the three dimensions and relevant literature is summarized. This is followed by a review of the fourth dimension, *improvement in capabilities,* which is based on the "improvement judgment" perspective discussed above.

Alignment

It is generally accepted that one of the key factors for successful IS planning is the close linkage of the IS strategy and business strategy (Baets 1992; Bowman et al. 1983; Das et al. 1991; Henderson and Venkatraman 1993; Henderson et al. 1987; King 1978). This linkage or *alignment* helps facilitate acquisition and deployment of information technology that is congruent with the organization's competitive needs rather than existing patterns of usage within the organization (Bowman et al. 1983). Some authors also suggest that such alignment heightens the stature of IS within the organization, thus facilitating the financial and managerial support necessary to effectively implement innovative systems (Chan and Huff 1992; Das et al. 1991; Henderson et al. 1987). Alignment may be manifested through an understanding of organizational objectives by top IS planners (King 1978; Lederer and Mendelow 1987; Lederer and Sethi 1988;), a perceived need to change IS objectives in light of changes in corporate strategy (Das et al.

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1991; King 1988), mutual understanding between top managers and IS planners (Boynton and Zmud 1987; Earl 1989), and a heightened view of the IS function within the organization (Henderson and Sifonis 1988; King 1978; Lederer and Sethi 1988).

Analysis

When IS planners undertake a concerted effort to better understand the internal operations of the organization in terms of its processes, procedures, and technologies, a degree of *analysis* is realized. Much current SISP literature has focused on issues surrounding "self analysis" (Boynton and Zmud 1987; Brancheau et al. 1989; Hackathorn and Karimi 1988; Henderson et al. 1987; Lederer and Sethi 1988). In essence, the IS organization seeks to better understand the processes, power bases, and existing technologies which characterize the firm. Many of the objectives related to this broad dimension seek to find the most effective ways to operate and compete with information technology. Other objectives seek to build an "architecture" of integrated applications and databases across the functional boundaries of the organization. In general, effective analysis should provide a clear understanding of how information is used within the organization and uncover critical development areas.

Cooperation

When general agreement concerning development priorities, implementation schedules, and managerial responsibilities is reached, a degree of cooperation is attained. This level of cooperation is important in order to reduce potential conflict which may jeopardize the implementation of strategic IS plans (Henderson 1990). In essence, IS planners must ensure that "key" coalitions and bases of power within the organization are supportive of the process and content of SISP. Additionally, it is important to obtain a general level of agreement on development priorities and a level of coordination concerning development standards and IT use among organizational sub-groups. Such actions reflect the importance of creating a partnership between IS and user groups for successful implementation efforts (Henderson 1990; Henderson and Sifonis 1988).

Improvement in capabilities

While focusing on the fulfillment of key objectives provides a useful metric for assessing the outcomes of SISP, it provides little insight into the capability of the planning process to adapt to changing circumstances. In other words, it is equally important to assess how the process of planning has adapted over time in order to gain a fuller determination of planning system effectiveness (a central tenet of the *improvement judgment* perspective). This effectiveness criterion has been formally defined and operationalized as *improvement in capabilities* (Venkatraman and Ramanujam 1987). As noted in that study, an effective planning system should improve over time in its basic capabilities to support the organization. Within the context of SISP, the organizational learning that accompanies planning experience should result in improved capabilities to achieve alignment between IS and business strategies, analyze and understand the business and its associated technologies, foster cooperation and partnership among functional managers and user groups, anticipate relevant events and issues within the competitive environment, and adapt to unexpected organizational and environmental changes.

An Operational Definition of SISP Success

Given the development of a theoretical domain of SISP success, formal conversion of the construct definitions into measurable scales can be undertaken. In general, the overriding goal of this task is to insure that the meaning associated by the researcher with each item is the

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same as that associated with it by the targeted respondent. In addition to defining content domain, panels of experts and potential respondents can offer much insight into potential problems resulting from ambiguous or poorly defined scale operationalizations (Churchill 1979). Additionally, the Q-sort technique (Moore and Benbasat 1991), in which experts and/or potential respondents group items according to their similarity, can provide a powerful means of confirming the underlying structure of complex variables and establishing their validity. This procedure is especially recommended when new scales are being developed. Given the sparse empirical work in this area, it was determined that both expert opinion and Q-sorting should be utilized as a means of accurately defining the theoretically derived construct space of SISP success.

Q-sorting and item refinement

Approximately six weeks after the final round of domain development and refinement, a Q-sort instrument that provided a description of the hypothesized constructs as well as a random listing of the 28 objectives for SISP was developed. These objectives were recast in the form of single sentences and were provided on pages separate from the construct descriptions. The construct descriptions consisted of a single paragraph and were all contained on a single page. The instrument was pre-tested by two professors of marketing research and was then administered to the original panel of experts as well as five additional senior IS executives. The instructions, which were provided on the cover sheet, asked the respondent to indicate which construct was most closely associated with each scale item or if such matching was indeterminable. The respondent was allowed to reference the page of construct descriptions as often as needed and was encouraged to note instances of ambiguity or lack of clarity in the wording of scale items.

Results of the Q-sort exercise seem to confirm the adequacy of the developed scale items in capturing the prespecified goal-fulfillment factors. On average, the objectives associated with alignment were correctly classified at a rate of 89%. The rate of correct classification was 80% for objectives associated with analysis and 78% for those associated with cooperation. The overall percentage of correct classification was a rather strong 82%. Individual items that were correctly classified at a rate of 90% or greater were retained for further analysis. These 23 items seem to exhibit consistent meaning across the panel and therefore were adopted as measures of their associated constructs. Although this analysis did not incorporate multiple rounds of sorting typically used in Q-sorts (Moore and Benbasat 1991), these results seem to provide strong preliminary evidence of construct validity and therefore no further analysis was deemed necessary for item refinement or development. The first three sections of Table 1 outline the specific measures of "goal fulfillment" generated through the Q-sort and item refinement exercises.

As noted earlier, a fourth factor, "improvement in capabilities," reflects the ability of the planning system to continuously improve in its support of organizational functioning. Research has been conducted to empirically validate measures of this planning success measure within the context of general planning (see Venkatraman and Ramanujam 1987; see also Raghunathan and Raghunathan 1994). These measures include the ability to identify problem areas, ability to generate new and novel ideas, ability to identify new business opportunities, and ability to adapt to unanticipated changes. Such capabilities have also been identified within IS literature as important components of evolving planning systems (King 1988). Utilizing these measures along with the key objective criteria of alignment, analysis, and cooperation, measures of planning capabilities are derived. These scale items are presented in the final section of Table 1.

In preparation for large-scale data collection, all items and the survey instrument were pretested by 23 senior IS executives. Similar to the targeted respondent of the survey, each of these managers was actively involved in strategic IS planning, and each had significant experience within the field of IS management.

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Table 1. Initial Item Measures for Goal Fulfillment and Improvement Constructs of SISP

	Item Measures of Planning Alignment (Seven-Point Scale Anchored by "Entirely Unfulfilled" and "Entirely Fulfilled")
AL1	Understanding the strategic priorities of top management.
AL2	Aligning IS strategies with the strategic plan of the organization.
AL3	Adapting the goals/objectives of IS to changing goals/objectives of the organization.
AL4	Maintaining a mutual understanding with top management on the role of IS in supporting strategy.
AL5	Identifying IT-related opportunities to support the strategic direction of the firm.
AL6	Educating top management on the importance of IT.
AL7	Adapting technology to strategic change.
AL8	Assessing the strategic importance of emerging technologies.
	Item Measures of Planning Analysis (Seven-Point Scale Anchored by "Entirely Unfulfilled" and "Entirely Fulfilled")
AN1	Understanding the information needs of organizational subunits.
AN2	Identifying opportunities for internal improvement in business processes through IT.
AN3	Improved understanding of how the organization actually operates.
AN4	Development of a "blueprint" which structures organizational processes.
AN5	Monitoring of internal business needs and the capability of IS to meet those needs.
AN6	Maintaining an understanding of changing organizational processes and procedures.
AN7	Generating new ideas to reengineer business processes through IT.
AN8	Understanding the dispersion of data, applications, and other technologies throughout the firm.
	Item Measures of Planning Cooperation (Seven-Point Scale Anchored by "Entirely Unfulfilled" and "Entirely Fulfilled")
CO1	Avoiding the overlapping development of major systems.
CO2	Achieve a general level of agreement regarding the risks/tradeoffs among system projects.
CO3	Establish a uniform basis for prioritizing projects.
CO4	Maintaining open lines of communication with other departments.
CO5	Coordinating the development efforts of various organizational subunits.
CO6	Identifying and resolving potential sources of resistance to IS plans.
CO7	Developing clear guidelines of managerial responsibility for plan implementation.
	Item Measures of Planning Capabilities (Seven-Point Scale Anchored by "Much Deterioration" and "Much Improvement")
CA1	Ability to identify key problem areas.
CA2	Ability to identify new business opportunities.
CA3	Ability to align IS strategy with organizational strategy.
CA4	Ability to anticipate surprises and crises.
CA5	Ability to understand the business and its information needs.
CA6	Flexibility to adapt to unanticipated changes.
CA7	Ability to gain cooperation among user groups for IS plans.

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All organizations were visited by one of the researchers and face-to-face interviews were conducted with each manager. Assessments were made on the items, constructs, and comprehensiveness of the instrument. Some items were slightly refined and a preliminary assessment indicated that there was a high degree of internal consistency among scale items.

Data collection and the role of an organizational informant

In many empirical studies, the measurement of organizational characteristics has typically utilized a "key informants" methodology. In essence, this method of data collection relies on a select set of members for providing information about a social setting. Such informants are not chosen at random; rather, they are chosen because they possess special qualifications such as status, experience, or specialized knowledge. In survey research, targeted respondents assume the role of a key informant and provide information on an aggregated unit of analysis by reporting on group or organizational properties rather than personal attitudes and behaviors (Venkatraman 1989). The use of key informants has been a popular approach within empirical IS studies (Pinsonneault and Kraemer 1993). However, in the absence of a strategy to obtain accurate data, results can be confounded, leading to erroneous conclusions (Huber and Power 1985; Hufnagel and Conca 1994).

A particularly damaging confound in utilizing an organizational informant is a lack of knowledge by the respondent. Therefore, within the context of this study, it was important to identify organizations that actively engage in SISP and to identify respondents within those organizations who are emotionally involved with, and most knowledgeable about, the activity. With this in mind, over 20 organizations were visited to determine the types of firms which undertook strategic IS planning, the level in the organizational hierarchy at which most of the planning activity was concentrated, and the organizational member most knowledgeable about, and with the highest amount of "vested interest" in, strategic IS planning. Overwhelmingly, firms of larger size, with higher levels of geographic complexity, and with higher levels of "information intensity" (e.g., insurance companies, banks, large manufacturers), actively engaged in SISP. Additionally, the activity tended to be most concentrated in the highest levels of the management hierarchy. Based on this and other information gathered in the field interviews, it was determined that the senior IS executive (vice president, CIO, director) represented the most accurate source of organizational information regarding SISP. Further, it was determined that smaller, structurally simple, and less information-intense organizations may be unable to provide responses of interest.

Working within this context, the East Edition of the *Directory of Top Computer Executives* was adopted as an initial sampling frame of potential respondents. This index includes the names, titles, addresses, and phone numbers of top computer executives in the eastern half of the United States. Due to fundamental differences in profit motive and subsequent focus of planning activities between private and public firms (Lederer and Sethi 1988), all hospitals, educational institutions, and governmental agencies were removed from the initial sampling frame. The sampling frame was further reduced through elimination of firms whose senior IS managers did not hold the job title of CIO, VP, director of MIS, or director of strategic planning. From this resultant sampling frame of over 1,000 potential respondents, a random sample of 550 was chosen.

A cover letter and survey instrument were mailed to each member of the sample. To encourage immediate response, a dollar bill was attached to each cover letter. To encourage accurate response, each potential participant was promised a customized report of the research findings that would profile the respondent's firm relative to the entire sample, their respective industry, firms of comparable size, and firms with similar years of experience in SISP. Within two weeks, 65 responses (11.8% of surveys mailed) were received. Within three weeks, an additional 128 responses (23.2% of surveys mailed) were received, for a collected

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total of 35.1%. Within five weeks, an additional 58 surveys (10.5 % of the total mailed) were received for a collected total of 45.6%. The remaining surveys were collected in the sixth and seventh week after the initial mailing for a total response of 47.63%. This response rate is markedly higher than that usually realized in comparable IS studies (Pinsonneault and Kraemer 1993; Premkumar and King 1992; Raghunathan and King 1988) and can perhaps be attributed to the targeted nature of the mailing and the incorporated incentives. Nine responses contained incomplete data or were otherwise unfit for analysis and were subsequently eliminated, thereby yielding an effective response rate of 46.8%. The collected sample consists primarily of manufacturers (48.2%) followed by finance/insurance entities (17.4%) and wholesale/retail (14.2%) and is skewed toward larger firms with about 95% having sales over $100 million and 54% with sales over half a billion dollars. The majority (73%) of the respondents are either just below or two levels below the CEO. In sum, the data collection process yielded 253 distinct assessments of the 30 scale items listed in Table 1.

Empirical Assessment of Construct Measurement

As developed, each of the item clusters (or scales) in Table 1 represents an a priori measurement model of the theoretical construct space of SISP success. Given this theory-driven approach to construct development, the analytical framework of confirmatory factor analysis (Bollen 1989; Jöreskog 1993) provides an appropriate means of assessing the efficacy of measurement among scale items and the consistency of a prespecified structural equation model with its associated network of theoretical concepts. In essence, the expectation is that each of the developed scales in Table 1 will uniquely measure its associated factor and that this system of factors will measure an overarching or second order factor of planning system success. General procedures for assessing theory within the realm of confirmatory analysis are suggested by Jöreskog (1993) and Anderson (1987), as well as Gerbing and Anderson (1988). A recent study (Segars 1997) reconciles and illustrates the theoretical and empirical underpinnings of these early works within the context of IS research. This resulting framework suggests that each of the measured factors be modeled in isolation, then in pairs, and then as a collective network. Proceeding in this manner provides the fullest evidence of measurement efficacy and also reduces the likelihood of confounds in full structural equation modeling which may arise due to excessive error in measurement (Anderson 1987; Anderson and Gerbing 1988; Jöreskog 1993; Segars and Grover 1993). Working within this context, the CALIS procedure of SAS (version 6.12) was utilized as the analytical tool for testing statistical assumptions and estimation of the measurement and structural equation models discussed in the following sections.

Checks for statistical assumptions

Two important assumptions of confirmatory factor modeling are multivariate normality and model determinacy (or identification). Because multivariate normality is difficult to test, it is recommended that univariate normality among variables be initially tested. In essence, establishing univariate normality among of a collection of variates helps gain, though not guarantee, multivariate normality (Hair et al. 1992). Such testing can be accomplished through examination of the moments around the mean of each variate's distribution (Bollen 1989). Among the variables of this study, analysis of these statistics suggests no serious departures in univariate normality. As a further test of this statistical assumption, several multivariate tests of skewness and kurtosis were examined (Mardia 1970). Checks of these statistics also suggest no serious departures from multivariate normality or excessive kurtosis.

As structural models become complex, there is no guaranteed approach for ensuring that model identification has been obtained (Bollen 1989). However, there are a number of diagnostics that can be utilized in gathering evi-

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dence of identification. Perhaps the most readily obtainable measure comes from the estimation program itself. CALIS performs a simple test for identification during the estimation process and alerts the user of possible identification problems. In all models estimated in the present analysis, no such warnings were observed. However, this test is not robust in capturing all instances of unidentified models (Jöreskog 1993). Another method of testing identification involves multiple estimation of the structural model with differing starting values. Programs such as CALIS, which estimate parameters of structural models, provide the researcher with a means of specifying an initial value for any coefficient. If a starting value is not specified, the program automatically computes them through likelihood or least-squares techniques. If the model is identified, the solution of each model should converge at the same point each time. Such an approach was undertaken in each of the estimated models of this analysis. In all cases, solutions converged at the same point and were identical, thereby providing strong evidence of model identification.

Convergent validity and unidimensionality

Upon the estimation of measurement models for *alignment, analysis, cooperation,* and *capabilities,* it is possible to directly assess measurement efficacy. As noted in previous research (Gerbing and Anderson 1988), model fit measures, in particular χ^2, provide direct statistical evidence of both convergent validity and unidimensionality. Further evidence of these properties is gained through high and significant factor loadings as well as low residuals between the observed and implied covariance matrices. In instances where the initial models proposed by the researcher do not fit the data, examination of indicator loadings, t-values, and the residual matrix can provide insight into possible model improvement (MacCallum 1986; Segars and Grover 1993). Importantly, simplifying models by removing items may create identification problems (Bollen 1989). Additionally, a model that is over-simplified may be capitalizing on "chance" rather than reflecting true sources of variation in the observed covariance matrix (Chin and Todd 1995). Therefore, extreme caution must be exercised when modifications are incorporated. Further, the efficacy of significantly altered models must be scrutinized when they have been modified in the absence of theory or when they have not been confirmed with an independent data set.

The measurement properties for the final models of *alignment, analysis, cooperation,* and *capabilities* are presented in Table 2. As shown, relatively little adjustment to the theorized models of Table 1 is required as a result of measurement modeling. In the initial phase of isolated model estimation, only items AL1 and AL2 of *alignment* and AN2 of *analysis* were deleted due to a lack of reliability. No items associated with the hypothesized models of *cooperation* or *capabilities* were eliminated. In the subsequent tests for discriminant validity (discussed in the following section), item AN5 of *analysis* was also deleted due to a significant cross-loading with the construct *alignment.* Overall, the parameter estimates, fit indices, and observed residuals imply that the revised models of Table 2 are a good fit for the observed correlations among their respective items. In each case, the χ^2 value is relatively low (i.e., not significant at $p < 0.10$) and the GFI and AGFI are well above 0.90. RMSR is 0.03 (or less) and all indicator reliabilities are sufficiently high and statistically different from zero. The residual matrix for each model contains no values significantly different from zero and the composite reliabilities of each construct are all about 0.90. In each instance, the average variance extracted (AVE) is above 0.50, indicating that the variance captured by the respective construct is larger than the variance due to measurement error (Fornell and Larcker 1981). In sum, the fit statistics seem to suggest that each scale is capturing a significant amount of variation in these latent dimensions of strategic planning success.

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Table 2. Final Measurement Properties of Planning Success Measures

Alignment					
Item	**Mean**	**Standard Deviation**	**ML Estimate (λ)**	**t-Value**	**P-Level**
AL3	4.30	1.10	0.89	17.82	p < .001
AL4	4.41	1.11	0.86	16.87	p < .001
AL5	4.48	1.11	0.84	16.23	p < .001
AL6	4.30	1.10	0.84	16.14	p < .001
AL7	4.42	1.10	0.83	15.84	p < .001
AL8	4.31	0.96	0.74	13.40	p < .001

Measures of Model Fit

χ^2 (9) = 19.05 (p = 0.02)
Goodness of Fit = 0.97
Adjusted Goodness of Fit = 0.93
Root Mean Square Residual = 0.01
Factor Reliability = 0.93
Average Variance Extracted = 0.70

Refinement(s) From Initial Model

AL1 and AL2 deleted due to lack of item reliability.

Analysis					
Item	**Mean**	**Standard Deviation**	**ML Estimate (λ)**	**t-Value**	**P-Level**
AN1	4.46	0.96	0.73	12.85	p < .001
AN3	4.44	1.00	0.73	13.05	p < .001
AN4	4.47	1.08	0.79	14.54	p < .001
AN6	4.10	0.92	0.80	14.72	p < .001
AN7	4.18	0.97	0.80	14.65	p < .001
AN8	4.42	1.06	0.71	12.40	p < .001

Measures of Model Fit

χ^2 (9) = 16.37 (p = 0.06)
Goodness of Fit = 0.97
Adjusted Goodness of Fit = 0.94
Root Mean Square Residual = 0.02
Factor Reliability = 0.89
Average Variance Extracted = 0.58

Refinement(s) From Initial Model

AN2 deleted due to lack of item reliability
AN5 deleted due to significant cross-loading with Alignment.

Cooperation					
Item	**Mean**	**Standard Deviation**	**ML Estimate (λ)**	**t-Value**	**P-Level**
CO1	4.66	1.21	0.68	11.87	p < .001
CO2	4.22	1.03	0.78	14.28	p < .001
CO3	4.22	1.21	0.76	13.88	p < .001
CO4	4.73	0.98	0.78	14.48	p < .001
CO5	4.38	0.98	0.81	15.14	p < .001
CO6	4.16	0.93	0.77	13.97	p < .001
CO7	4.23	1.08	0.79	14.69	p < .001

Measures of Model Fit

χ^2 (14) = 22.01 (p = 0.08)
Goodness of Fit = 0.97
Adjusted Goodness of Fit = 0.95
Root Mean Square Residual = 0.02
Factor Reliability = 0.91
Average Variance Extracted = 0.60

Refinement(s) From Initial Model

No items deleted.

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Table 2. Continued

Capabilities					
Item	Mean	Standard Deviation	ML Estimate (λ)	t-Value	P-Level
CA1	4.88	0.81	0.80	14.97	p < .001
CA2	4.64	0.82	0.69	12.12	p < .001
CA3	4.97	1.01	0.79	14.62	p < .001
CA4	4.35	0.83	0.67	11.51	p < .001
CA5	5.02	0.85	0.81	15.18	p < .001
CA6	4.53	0.91	0.72	12.75	p < .001
CA7	4.80	0.93	0.71	12.50	p < .001

Measures of Model Fit
χ^2 (14) = 24.31 (p = 0.04)
Goodness of Fit = 0.97
Adjusted Goodness of Fit = 0.94
Root Mean Square Residual = 0.03
Factor Reliability = 0.90
Average Variance Extracted = 0.56

Refinement(s) From Initial Model
No items deleted.

Assessment of discriminant validity

Discriminant validity is inferred when measures of each construct converge on their respective true scores which are unique from the scores of other constructs (Churchill 1979). Empirically, this is achieved when the correlations between any two dimensions are significantly different from unity (Bagozzi et al. 1991). Such evidence can be obtained through the comparison of an unconstrained model that estimates (or "frees") the correlation (Φ) between a pair of constructs and a constrained model which fixes the value of the construct correlation to unity. The difference in χ^2 between these models is also a χ^2 variate with degrees of freedom equal to one. A significant χ^2 difference implies that the unconstrained model is a better fit for the data, thereby supporting the existence of discriminant validity (Anderson 1987; Bagozzi and Phillips 1982; Bagozzi et al. 1991; Gerbing and Anderson 1988; Venkatraman 1989). Such tests are conducted between all possible pairs of constructs within the theoretical system. Once discriminant validity has been established through paired tests, a more refined indication of the "extent of discrimination" between construct pairs can be gained through comparison of the AVE for each construct with the estimated correlation between constructs. Discriminant validity is strongly inferred when AVE for each construct is greater than the squared correlation between constructs. Such results suggest that the items share more common variance with their respective constructs than any variance the construct shares with other constructs. As suggested in previous research, this heuristic may be overly restrictive in some contexts and should be used as a supplementary means of assessing the degree of discriminant validity (Fornell and Larcker 1981).

In the present analysis, testing discriminant validity through pairwise χ^2 difference tests requires the estimation of 12 covariance structures (six constrained, six unconstrained) and evaluation of six χ^2 differences. As noted earlier, initial analysis of indicator reliabilities and modification indices across the paired tests suggested that one item (AN5) exhibits a highly significant cross-loading with the construct of *alignment*, hence, this item was eliminated from further analysis and all affected paired tests were recalculated. All other items exhibited characteristics of unidimensional measurement as evidenced by the χ^2 values associated with the unconstrained models (Gerbing and Anderson 1988). In all cases, the normed χ^2 value is well below the suggested cutoff of five (Anderson 1987; Bagozzi et al. 1991; Gerbing and Anderson 1988), suggesting that the

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scales contain properties of internal and external consistency. In addition, the observed reliabilities of indicators remained virtually invariant (±.01) across the estimated unconstrained models providing additional evidence of solution stability.

Table 3 contains the results of the pairwise χ^2 difference tests among constructs. As shown, all χ^2 differences are significant at $p < .001$. Hence, each scale seems to capture a construct that is significantly unique from other constructs providing evidence of discriminant validity. Importantly, the estimated correlation between all construct pairs is below the suggested cutoff of 0.90 (Bagozzi et al. 1991; Fornell and Larcker 1981), implying distinctness in construct content. However, comparison of the AVE of construct pairs to the squared correlation between pairs suggests that *alignment* and *analysis* as well as *analysis* and *cooperation* are highly associated and may not exhibit strong properties of discriminant validity. The AVE for all other construct pairs is well above the squared correlations between constructs, suggesting strong properties of discriminant validity. In sum, the findings seem to suggest that the indicators of the final models in Table 3 are unidimensional and that each construct is relatively distinct in content. However, the discriminant validity is varied among constructs with the content domain of *alignment* and *analysis* as well as *analysis* and *cooperation* being less distinct than that of other construct pairs. Such results can be expected given that each of the constructs are themselves posited indicators of the higher-order construct, SISP success.

Evaluating a Covariation Model of SISP Success

As theorized, SISP success is a higher-order phenomenon that is evidenced through high performance across multiple dimensions. Interestingly, the observed correlations among the hypothesized dimensions of planning success seem to suggest that effectiveness in SISP is an aggregate of *alignment, analysis, cooperation* and *capabilities.* As shown in Table 3, correlations among these dimensions are statistically significant and of high magnitude, suggesting the existence of such a structure. In other words, while each of these dimensions is distinct, success along one implies success along the others. Previous research notes that this operational perspective represents a theoretically strong basis for capturing complex effectiveness measures (DeLone and McLean 1993; Raghunathan and Raghunathan 1994). Importantly, the reported correlations are not a rigorous test of such effects. However, a "second-order" factor modeling perspective can capture these correlations and "explain" them using a higher order construct that is an integrative latent representation of SISP success. In essence, this structure is expected to resemble a factor model with correlations among the first-order constructs (*alignment, analysis, cooperation,* and *capabilities*) being governed by a second-order factor "SISP success." The efficacy of such a structure can be tested using a comparative methodology for higher-order factor models (Bollen 1989; Jöreskog 1993; Marsh and Hocevar 1985).

A comparison of baseline and covariation models

The baseline model for testing the existence of *SISP success* implies that *alignment, analysis, cooperation,* and *capabilities* are associated but not governed by a common latent phenomenon. In other words, such a model suggests that these constructs are independent in their prediction of *SISP success.* Accordingly, this model, illustrated in Figure 1, was estimated using the correlation matrix of construct indicators observed in the sample (see Appendix A). The observed χ^2 for this baseline model was 420.02 (df = 293; p = .000). Although this figure seems abnormally high with respect to the isolated and paired modeling of the previous section, it must be reconciled with the rather large degrees of freedom inherent in the combined model. Normed χ^2, the most commonly used metric in these situations, is 1.43, implying good model fit and no evidence of over-fit-

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Table 3. Results of Discriminant Validity Tests: Planning Success Constructs

Test	ML Estimate	T-Value	Constrained Model χ^2	Unconstrained Model χ^2	χ^2 Difference
Alignment with					
Analysis	0.84	34.02***	188.42 (54)	48.64 (53)	139.78***
Cooperation	0.78	26.19***	364.14 (65)	100.76 (64)	263.38***
Capabilities	0.59	12.60***	624.88 (65)	114.82 (64)	510.06***
Analysis with					
Cooperation	0.89	42.26***	141.80 (65)	73.11 (64)	68.69***
Capabilities	0.64	14.51***	450.41 (65)	113.89 (64)	336.52***
Cooperation with					
Capabilities	0.65	15.02***	503.81 (77)	123.19 (76)	380.62***

***Significant at $p < .001$

ting (Jöreskog 1993). Importantly, the observed item loadings and correlation estimates of Figure 1 mirror the estimates reported in Tables 2 and 3. Such results seem to confirm the strength of measurement inherent within the scale items and the stability of the factor solution.

As illustrated in Figure 2, the alternative model posits a second-order factor governing the correlations among *alignment, analysis, cooperation* and *capabilities.* The theoretical interpretation of this higher-order factor is an overall trait of *SISP success.* Importantly, the second-order factor of this model is merely explaining the covariation among first-order factors in a more parsimonious way (i.e., one that requires fewer degrees of freedom). Therefore, even when the higher-order model is able to explain the factor covariations, the goodness-of-fit of the higher-order model can never be better than the corresponding first-order model. In this sense, the first-order model provides a target or optimum fit for the higher-order model. It has been suggested that the efficacy of second-order models be assessed through examination of the target (T) coefficient [T= χ^2 (baseline model)/χ^2 (alternative model)] (Marsh and Hocevar 1985). This coefficient has an upper bound of 1.0 with higher values implying that the relationship among first-order factors is sufficiently captured by the higher-order factor. In the present analysis, the observed χ^2 for the second-order factor model is 421.79 (df = 295). Adjusting for degrees of freedom, the normed value of χ^2 is 1.43, indicating good model fit and no evidence of over-fitting. The calculated target coefficient between the baseline and hypothesized models is a very high 0.99. This value suggests that the addition of the second-order factor does not significantly increase χ^2. Therefore, since the second-order model represents a more parsimonious representation of observed covariances (four paths in contrast to six correlations), it should be accepted over the baseline as a "truer" representation of model structure.

Further empirical support for acceptance of the higher-order factor structure is found in the magnitude and significance of estimated parameters as well as the amount of variance explained by the structural equations. All structural equation parameters are of high magnitude and exhibit significantly high t-values. Specifically, the paths between *SISP success* and its underlying first-order dimensions are 0.86 for *alignment,* 0.97 for *analysis,* 0.92 for *cooperation,* and 0.68 for *capabilities.* These parameter estimates are analogous to the reliabilities of observed indicators to posited constructs. Therefore, their high magnitude and consistency provides strong evidence of convergent validity and unidimensionality for the second-order construct of SISP *planning success.* Perhaps the most convincing evidence of this model's predictive strength is the observed total coefficient of determination. This statistic is a very strong 0.96, suggesting that a large amount of variance among the constructs is

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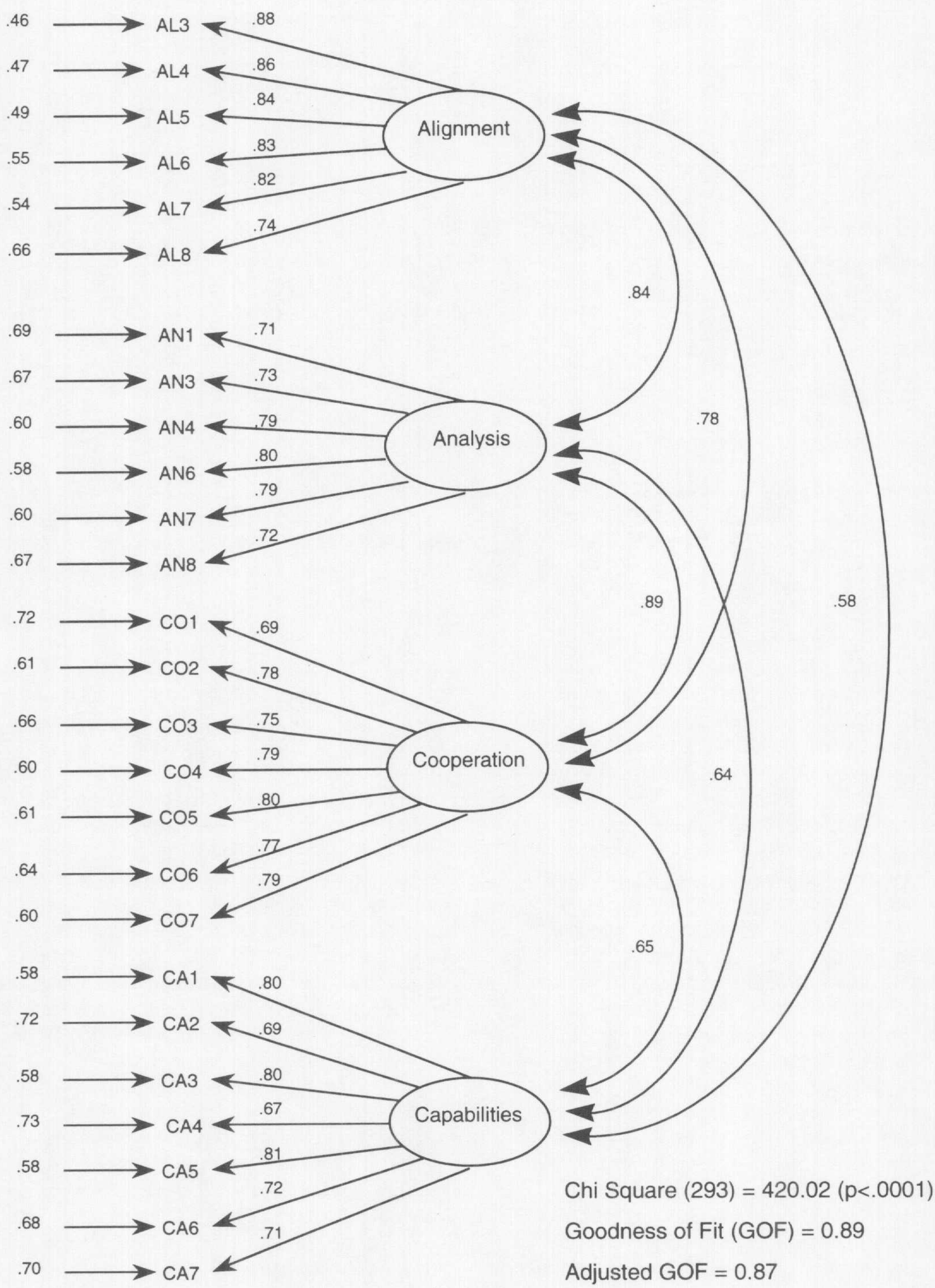

Figure 1. First-Order Factor Model of Strategic Planning Success

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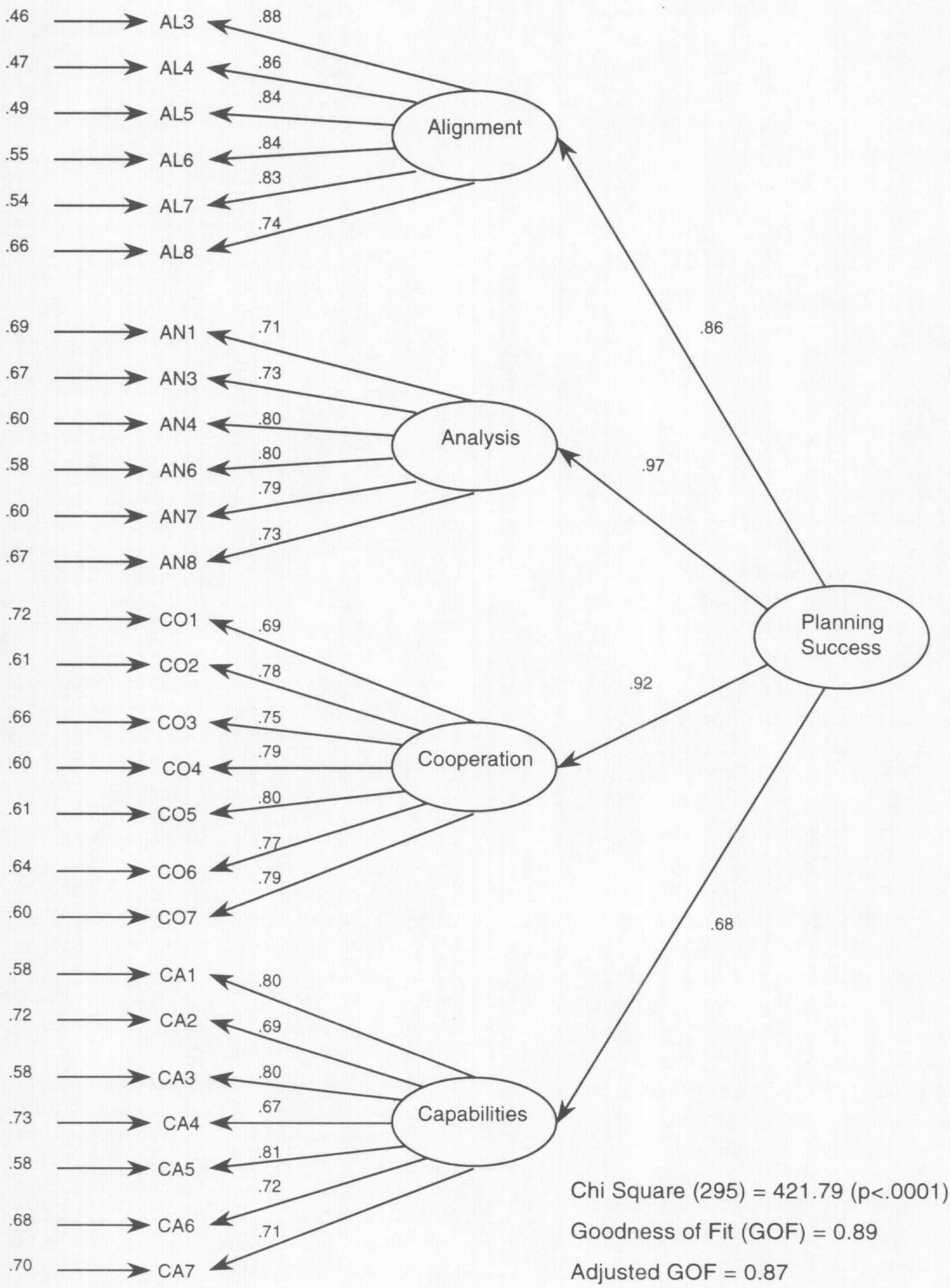

Figure 2. Second-Order Model of Strategic Planning Success

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captured by the structural equations. Therefore, on both theoretical and empirical grounds, the conceptualization of *SISP success* as a multidimensional measure consisting of *alignment, analysis, cooperation,* and improvement in *capabilities* seems justified.

Implications, Limitations, and Avenues of Future Research

As noted previously, an important agenda within IS research is the development of validated measures for effectiveness criteria (DeLone and McLean 1992). Such measures are needed for two reasons. First, these criteria provide a necessary metric for accurately assessing the value and performance of information technologies along with their associated structures for management. In many instances, practicing managers have no structured set of criteria upon which to gauge the activities associated with IS. Too often, assessment may be developed in terms of what is most easily measurable, such as performance-to-budget, return on investment, or cost-overruns. This method of evaluation may ignore many intangible benefits of IS resulting in erroneous conclusions regarding its current value and poor decisions regarding future management practices and investment. A second rationale for improved performance measures is research related. Many studies within IS utilize simplistic and rather varied measures in capturing aspects of effectiveness (DeLone and McLean 1992). In general, the lack of consistency among studies has hampered conclusions regarding the effectiveness of information systems and practices associated with their management. Therefore, validated performance measures are needed from the standpoint of establishing consensus among researchers in the field and thereby facilitating consistency in operationalization and cumulative research tradition.

Implications for practice

Planning is typically described in academic as well as practitioner communities as a fundamental managerial activity. Unfortunately, the contributions of managerial activities such as planning are many times difficult to quantify in practice. Yet, for the activity of planning to be formally and accurately evaluated, desired outcomes should be known and constantly reconciled with realized outcomes. The results of this study imply that planning objectives associated with (1) aligning IS strategies with organizational strategies, (2) understanding the processes, procedures, and technologies of the business, and (3) gaining the cooperation of various management and end-user groups provide a useful framework for structuring desired outcomes of strategic IS planning. In addition, objectives associated with improvement in capabilities provide a potentially important perspective for assessing the adaptability of the planning system in meeting planning needs. In sum, managerial planners should find the scales associated with these success dimensions a useful tool for rationalizing and refining the process of planning. These broad dimensions can also provide a useful set of themes for strategic planning that helps build common dialog and coordination among planners.

Along with structuring a planning agenda, a potentially important issue among IS executives is measuring the perceived value of strategic planning efforts among constituents within and outside the IS function. Do organizational constituents believe that higher levels of alignment, analysis, and cooperation are realized through SISP activities? Do members of other functional areas believe that SISP activities have adapted to changing competitive conditions? Without an empirically sound context for measuring these beliefs, erroneous conclusions regarding the monitoring, evaluation, and reconciliation of planning efforts can result. Given the apparently strong measurement properties of the scales developed in this research, their use within the organization may provide a more accurate context for identifying perceptions of SISP that are held by organizational members. Such data may be useful in addressing specific deficien-

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cies in the planning process or in more effectively marketing planning activities within and outside of the IS function.

Implications for research

While activities and roles of IS professionals have become better defined through rigorous research, the development of effectiveness measures has lagged behind in terms of definitional and operational rigor. In many research contexts, planning success is often captured as a single or small collection of scales that measure effectiveness in terms of "successful" or "unsuccessful." Such scales are appealing for their simplicity in administration and ease of analysis. However, because of their encompassing nature, many varying aspects of planning success are hidden in the measure. Further, a formal analysis that can rigorously assess the accuracy of measurement cannot be undertaken. The results of this study seem to confirm the contention that planning success is multidimensional (King 1988). Therefore, rather than viewing SISP through an overly simplistic lens, it seems more appropriate to frame studies within the context of broader and multiple dimensions of planning success. For example, the examination of a particular planning methodology or approach should consider the specific focus of the process along with the resources required for sustaining it. Perhaps a resource-intensive methodology achieves very high levels of planning success as defined in this study. In the absence of a broader view of success, some research designs may conclude that the planning effort is a failure. In order to capture the "full story," theoretically driven measures that capture complex outcomes of managerial activity are needed as a supplement to financial ratios and cost figures. An important implication for researchers is that these measures need not be "soft" nor nebulously defined. The empirical examination of relationships between planning approach, measures of planning success, and measures of resource intensity potentially represents a fundamental shift in research design that is needed to develop more prescriptive approaches for conducting and evaluating SISP.

While the content of planning success certainly has the most directly applicable implications for those interested in SISP, the structure of this factor model may have useful implications for other measures of IS effectiveness. Specifically, the empirical framework of higher-order factor analysis is utilized in this study to statistically structure the theoretical concept of planning system success. This factor structure has been useful in contexts of psychology and marketing research for modeling complex attributes such as general intelligence (Jöreskog 1993) and customer satisfaction (Bagozzi and Phillips 1982). Previous research has noted that the second-order factor model is likely to underlie many aspects of performance on both individual and organizational levels (DeLone and McLean 1992; Marsh and Hocevar 1985). Given the strong empirical evidence supporting the conceptualization of planning success, it seems likely that higher-order factor models may be useful in structuring other attributes of IS performance. Incremental model testing, as adopted in this study, provides a structured methodology for researchers interested in rigorously establishing the viability of hypothesized second-order performance factors.

Limitations

Consistent with all studies that address IS-based performance metrics, this research has attempted to bring a theoretical and operational definition to a rather complex managerial concept. Such endeavors are ambitious in nature and therefore contain some inherent limitations. Perhaps the most significant potential limitation of the present study is the range of developed constructs for SISP success. In general, no claim is (or can be) made by this study to have captured every aspect of this rather complex phenomena. To its credit, the research design of this study has incorporated multiple rounds of theory building through literature review and expert opinion. In addition, a rigorous methodological approach of theory testing has been

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adopted that seems to confirm the adequacy of measurement. However, no psychometric technique can adequately address the completeness or breadth of measurement. Therefore, it is entirely possible that other dimensions of SISP success exist but are not conceptualized in the presented models.

Another potential limitation concerns the nature of the sample utilized in this analysis. As noted earlier, the sampling method of this study is that of convenience. The survey of this study was targeted to organizations that were likely to have defined processes for SISP and senior executives with vested interest in process outcomes. Although the utilized sampling frame has been widely-used in similar studies and contains organizations which likely participate in the activity of interest, no claim of external validity for this study's findings can be made. Instead, these findings can only be generalized to the population of firms within the sampling frame. This state of affairs in no way renders the results of the study irrelevant or limited. The firms within the sampling frame are members of either the Fortune 1000 manufacturing or Fortune 1000 service groupings and are typically the entities of most interest in IS research due to their technological sophistication. However, the sample is limited to domestic organizations and is biased toward larger manufacturing and service entities. Therefore, generalizing the observed patterns of planning and success to organizations of other nations or beyond the sampling frame may be problematic.

Along with the nature of the sampling frame, sample size may represent a limiting aspect of this research. In general, it is recommended that five data points be collected for every estimated parameter in a structural equation model (Hair et al. 1992). Although the collected sample of 253 is considered adequate in a general sense (Bearden et al. 1982), complex models (many indicators, many factors) such as the ones depicted in Figures 1 and 2 may require even larger sample sizes. In general, when models are complex and samples are small, the hypothesized model will be rejected too often (Bearden et al. 1982). Given the consistent convergence across all estimated models and the overwhelming empirical support for each of the models, limitations attributable to sample size do not seem particularly threatening in this analysis. However, its potential effect on measures of fit should be acknowledged in similar research contexts.

Other limitations of the study may be potential response bias associated with the "single informant" and lack of model refinement through independent sample testing. Within this study, a single organizational respondent was used as an informed source of information regarding levels of IS planning success. While such practice is typical of IS survey research (Pinsonneault and Kraemer 1993), it is by no means an ideal method of data collection (Hufnagel and Conca 1994). Multiple informants and structured methods of triangulation are perhaps the best method of obtaining the most accurate data regarding organizational properties. However, such methods potentially limit the number of issues that can be addressed and also limit the amount of useful data that can be collected. Nonetheless, possible biases associated with self-reporting by IS managers must be considered when interpreting the results of this study.

Finally, "true" confirmation of theoretical models is best obtained through model re-estimation on an independent or holdout sample. Due to the sophistication of SISP success in terms of number of indicators and factor complexity, model re-estimation was not feasible. Therefore, while the findings seem strong in terms of content and construct validity, the results of this study must be viewed as preliminary and in need of further confirmation.

Areas of future inquiry

While this study has provided further theoretical and operational definition to many aspects of SISP success, it has by no means answered all questions concerning this important managerial activity. A potential avenue of future research is replication of this study across a broader sampling frame or across a selected sample of international entities. The

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findings of such work would provide additional validity for these findings as well as provide additional empirical support for theoretical studies in the area. Such studies might also build theory by incorporating additional planning system dimensions which are reflective of new or evolving managerial practices and/or incorporate additional dimensions of planning system success which are reflective of newer performance issues.

Another needed area of inquiry concerns the evolution of planning systems over time. In other words, future research should attempt to identify patterns of planning system success as organizations become more experienced in strategic IS planning. Such work would provide interesting insight into the evolutionary path of strategic IS planning in terms of the type of system adopted within particular evolutionary stages, the length (time) of each stage, and motivations for moving between stages. Although this study implies that systems should exhibit characteristics of *alignment, analysis, cooperation* and improvement in *capabilities* over time, it says little about how these systems evolved or how they may further evolve. Empirical work in this area may help answer these questions and would have enormous prescriptive implications for practice. Hopefully, the results of this study can provide a solid theoretical and operational basis for research focused on differentiating the efficacy of varying planning configurations and for studies that determine migratory paths of planning system design and redesign for ever-changing technological and competitive contexts.

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Appendix A

Observed Correlation Matrix of Planning Success Measures (n = 253)

	AL3	AL4	AL5	AL6	AL7	AL8	AN1	AN3	AN4	AN6	AN7	AN8	CO1	CO2	CO3	CO4	CO5	CO6	CO7	CA1	CA2	CA3	CA4	CA5	CA6	CA7
AL3	1.0																									
AL4	.79	1.0																								
AL5	.76	.72	1.0																							
AL6	.72	.70	.70	1.0																						
AL7	.73	.69	.67	.73	1.0																					
AL8	.62	.63	.62	.65	.63	1.0																				
AN1	.49	.49	.52	.49	.50	.43	1.0																			
AN3	.55	.53	.54	.52	.51	.49	.56	1.0																		
AN4	.58	.59	.59	.56	.56	.50	.62	.61	1.0																	
AN6	.59	.58	.59	.55	.57	.49	.56	.57	.61	1.0																
AN7	.57	.57	.55	.56	.57	.48	.53	.56	.62	.68	1.0															
AN8	.53	.49	.54	.52	.52	.46	.52	.51	.53	.57	.59	1.0														
CO1	.49	.52	.51	.43	.47	.52	.47	.45	.51	.54	.47	.46	1.0													
CO2	.54	.55	.53	.49	.49	.50	.49	.49	.55	.57	.52	.54	.57	1.0												
CO3	.51	.52	.48	.46	.46	.41	.40	.49	.52	.50	.50	.45	.49	.62	1.0											
CO4	.56	.58	.50	.52	.49	.51	.52	.50	.59	.56	.57	.53	.57	.61	.61	1.0										
CO5	.53	.53	.45	.50	.51	.47	.51	.45	.56	.55	.53	.53	.57	.58	.60	.64	1.0									
CO6	.51	.44	.52	.49	.48	.50	.51	.51	.54	.56	.56	.58	.48	.58	.57	.60	.64	1.0								
CO7	.55	.52	.53	.53	.55	.51	.48	.50	.56	.57	.55	.53	.50	.63	.61	.58	.66	.63	1.0							
CA1	.41	.39	.41	.40	.38	.38	.33	.34	.40	.39	.35	.43	.36	.41	.30	.35	.37	.34	.36	1.0						
CA2	.33	.31	.30	.43	.30	.35	.30	.27	.33	.29	.31	.30	.24	.42	.28	.29	.31	.27	.31	.58	1.0					
CA3	.51	.43	.45	.44	.46	.45	.26	.36	.42	.43	.46	.52	.39	.47	.42	.37	.45	.47	.44	.68	.57	1.0				
CA4	.34	.25	.29	.37	.29	.28	.30	.32	.35	.39	.32	.32	.34	.42	.39	.34	.36	.30	.32	.53	.48	.48	1.0			
CA5	.41	.35	.34	.36	.37	.45	.41	.38	.40	.41	.41	.43	.44	.46	.35	.41	.42	.42	.47	.65	.55	.64	.52	1.0		
CA6	.34	.35	.35	.34	.34	.31	.29	.34	.39	.45	.39	.32	.39	.42	.38	.38	.38	.29	.37	.52	.48	.55	.53	.62	1.0	
CA7	.35	.32	.34	.33	.34	.35	.32	.31	.40	.35	.34	.34	.30	.44	.32	.29	.31	.33	.39	.56	.45	.54	.52	.58	.55	1.0

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