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# A contingency model for estimating success of strategic information systems planning

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ABSTRACT

Strategic information system planning (SISP) has been identified as a critical management issue. It is considered by many as the best mechanism for assuring that IT activities are congruent with those of the rest of the organization and its evolving needs.

Our research investigated the success of SISP as a function of its key success factors (KSFs) in different contexts and SISP approaches, in a framework that integrated all of the SISP components and provided a new perspective on how the constructs are instrumental to produce SISP success.

Based on responses from 172 American CIOs, our study's findings empirically supported our research model: the combination of SISP context and approach was found to have a moderating influence on the basic relationship between SISP KSFs and its success, the best predictor for the long-term success of the SISP process was apparently based on the three-way interactions between SISP's KSFs, its approach and its context. In addition, specific combinations of SISP approach and SISP context were found to decrease or increase the size of the "planning paradox" (the inconsistency in the behavior of the "basic relationship" between the three).



## 1. Introduction

The dynamic and uncertain nature of today's environment entails observation on many levels, of the structural, business, to technological environment. New patterns of interaction within organizations, such as moving from vertical integration to outsourcing, and to virtual organizations, allow the development of strategic alliances and partnerships that enable firms to focus on their core competencies. Organizations are changing in response to these needs by becoming flat, fast, flexible, adaptive, collaborative and information-intensive structures, by using IT.

The impact of this on strategic management has been to provoke the adoption of total system thinking, i.e., management of the entire strategy process and its components [11], thus, there is clearly a need for preliminary strategic planning activities to successfully assimilate the ITs [16].

Strategic information system planning (SISP) *is the process of strategic thinking that identifies the most desirable IS on which the firm can implement and enforce its long-term IT activities and policies.* It is a mechanism for assuring that IT activities are aligned with the organization's evolving needs and strategies [15], SISP was identified as a critical management issue in the 1990s and is still ranked high as a critical issue today of key issues in IS management.

With the pervasiveness of IT in the 2000s and increasing pressure on firms to leverage their IT assets, the importance of SISP has increased [7]. Organizations are now investing extensively in IS to obtain maximum benefits of IT. But ISs are often deemed unsuccessful due to lack of alignment between IS and business planning; huge divergence in the approaches adopted by different enterprises in time, cost, and environmental factors and ignoring of IS project management activities in most enterprises, especially SMEs [6].

While studies have indicated the important effect of context on IS planning, the incorporation of contextual factors has not been general and categorization of the factors has not been made explicit while some factors have only been superficially examined [4]. As centralization increases, IT tends to control the planning process and, as a result, IS planning becomes more tactical than strategic and is dominated by IT infrastructure planning.

Prior research on the difficulties that SISP processes have encountered, suggested that the competitive environment, with its rapidly changing IT, may exacerbate the dangers of ineffective planning. Surveys have found that more than half of the parties involved in SISP are dissatisfied with the outcome.

Researchers have investigated SISP success, and its factors and problems, the effect of top management support [8], SISP process [12,13], IS planning methodologies and approaches, planning

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horizon, business change, IT change, and their alignment [14], and various other aspects of the planning process [9]. Empirical research investigating the influence of IS planning on SISP success has been based on a general list of organizational characteristics or specific aspects, such as the need to conduct comprehensive planning in a turbulent environment, the external IT and business environment [2], environmental analysis [3], or the impact of the role of IS in the organization.

Few researchers have tried to identify and understand the integration among the various design dimensions of the planning process [1,5], though there has been some discussion on the main dimensions of the SISP process and their impact on SISP success but with no empirical support. These problems have led to the suggestion that *contingency theory* would be an appropriate mechanism with which to study SISP.

We decided to study and empirically test a new framework for understanding SISP success, premising that a multidimensional examination could provide a successful process.

## 2. Model background

The variables that impact on the success of the SISP process can be categorized on one of three dimensions:

- *Key success factors* including a variety of prescriptions that reflect the "rational behavior" of the SISP process. Research studies that focus on this dimension examine the necessary conditions (e.g., user participation) that make the process more effective in studying the correlation between KSFs and SISP success. However there is a possible *planning paradox*: the success of the SISP process cannot be solely predicted from the KSFs, which may adversely affect the success of the SISP process.
- *The planning approach* including decision variables that represent various alternatives for the planning style adopted during the SISP process (e.g., what is the planning focus? what is the time horizon covered in it?). Organizations sometimes use a commercial methodology that dictates the attributes of the planning approach.
- *The planning context* including variables that represent attributes of the organization and its environment. These include external conditions that can impact the process and its success (e.g., the level of environmental uncertainty, the organizational structure, and importance of IT to the organization).

The importance of fit between the planning approach and the planning context has been emphasized in strategic management literature, including the area of strategic IT planning. Newkirk and Lederer found that greater SISP comprehensiveness predicted greater SISP success. In another study, they found that more extensive strategy formulation uniformly predicted successful planning in more uncertain environments, whereas strategic awareness generally predicted it in less uncertain ones.

Many studies have examined one dimension only (KSFs or approach or context), a few have examined two dimensions and tested their interactions and/or their mutual impact, but very few have included all three.

## 3. Our research model

The conceptual framework presented in Fig. 1 involves the three dimensions in a model that attempts to explain success in an SISP process. The research model is based on contingency theory, postulating a *basic relationship* between two variables moderated by a contingency variable. It is commonly used in studies pertaining to strategic planning at the corporate level and has also been applied in investigating IS management processes. It has been used to study the SISP process in relation to its fit with environmental characteristics, with the role of IS, and with corporate strategy.

### 3.1. SISP success—dependent variable

We defined the success of the SISP process as depending on two variables:

1. The degree of improvement in the capabilities associated with the SISP process.
2. The degree of effectiveness in meeting the objectives of the SISP process.

According to Raghunathan and Raghunathan: "the system capabilities . . . can be viewed as the "means" or process aspect of

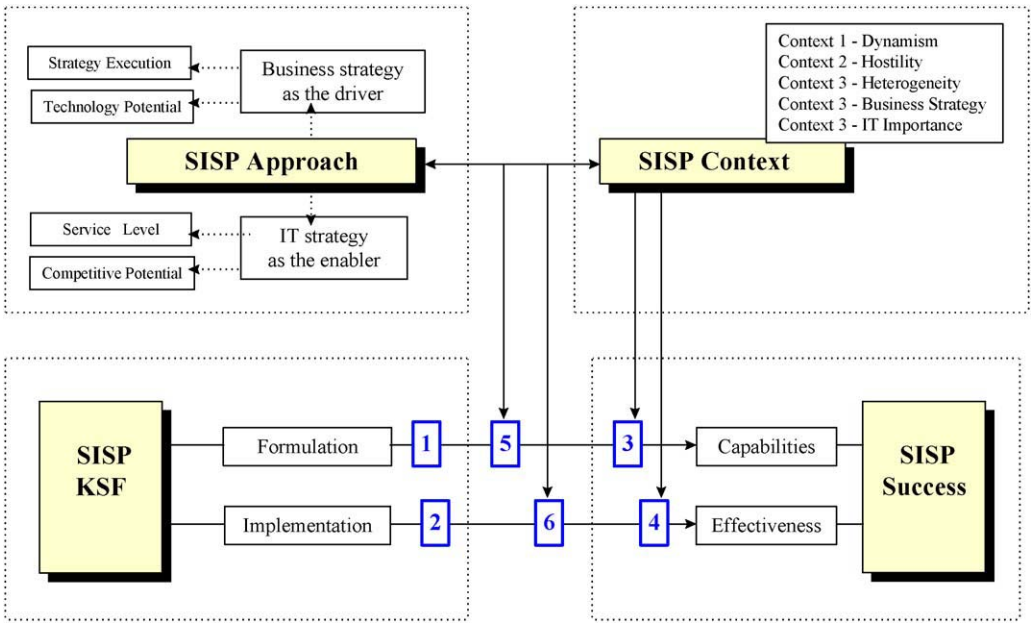


**Fig. 1.** Research model and hypotheses.

the concept of planning success and as a predictor of the "ends" or outcome benefits of planning, i.e., the fulfillment of planning objectives". Their findings support the assumption that capabilities and effectiveness are two different variables that measure the SISP process along different time horizons. The first variable represents the short-term planning improvement benefits that can be achieved during or immediately after the plan formulation phase of the SISP process. The second represents the goal-centered approach to the evaluation of effectiveness, or the long-term benefits from the process, achieved during or after the implementation of the plan.

In our model, SISP success is measured by the degree of improvement in planning *capabilities*, which reflect short-term success, during or after plan formulation, and by the degree of planning *effectiveness*, which reflects long-term success, during or after plan implementation. The operational definitions of these variables (Appendix A, part D) are based on previous studies that reported a high degree of internal validity and consistency of the measures for the capabilities and the effectiveness variables.

### 3.2. SISP KSFs (The SISP process)—independent variable

We assumed that the KSFs (Appendix A, part B) relating to the *strategy formulation* phase of the SISP process were different from those relating to the *implementation* phase, and suggested therefore that KSFs should be categorized according to the phase in which they appear. It is an approach that has been adopted in research on IS planning and has shaped the design of research models in the area. Furthermore, it allowed presentation of the independent variable along different time horizons, similar to that of the dependent variable. 18 KSFs were selected to represent the two phases of the SISP process.

### 3.3. SISP approach—moderating variable

In light of its importance in research on key IS management issues, we adopted the dimension of alignment between corporate strategy and IT to describe the SISP approach (Appendix A, part C). This construct was measured using the four dominant perspectives of Henderson and Venkatraman's Strategic Alignment Model, which has been used in previous empirical studies. The first perspective (strategy execution) is based on using the traditional hierarchical approaches for strategic planning of IT, like Rockart's CSF or IBM's BSP. The second (technology potential) is based on a technological focus on attributes and critical areas of IT that fit a chosen organizational strategy. The third (service level) mainly focused on developing the capabilities of the IS group to handle more flexibly and efficiently unexpected future demands of end-users, and situations when organizational strategies are unclear or change frequently. The fourth (competitive potential) relates to the impact of IT on business strategy and on the redesign of business processes.

### 3.4. SISP context—moderating variable

Following studies, SISP context (Appendix A, part A) is a wrapping (meta-) construct which incorporates three component contexts: environmental – referring to uncertainty; organizational – dealing with business strategy issues; and technological – referring to IS importance.

## 4. Hypotheses

The research model of Fig. 1 was derived from the conversion of the dimensions of the conceptual framework into crisp variables. Boxed numbers denote the six research hypotheses.

The first two hypotheses concern a basic relationship between SISP KSFs and SISP success:

**H1.** There is a positive association between SISP key success factors in the formulation phase of the SISP process and the improvement in planning capabilities.

**H2.** There is a positive association between SISP key success factors in the implementation phase of the SISP process and the effectiveness of the SISP process.

H1 and H2 represented a "narrow" research perception that investigated a relationship between a single explanatory variable (SISP KSFs) and a dependent variable (SISP success). This is problematic and was expected to fail in explaining the dependent variable, leading to the planning paradox. Therefore, this basic relationship was later investigated with two contingency variables (SISP context and SISP approach) that were presumed to affect it.

Hypotheses H3–H6 investigated the existence of an interaction effect, i.e., whether the impact of SISP KSFs on SISP success, disregarding SISP context and SISP approach, was different from the impact when SISP context and SISP approach were considered. H3 and H4 tested whether SISP context or SISP approach separately affected the basic relationship, whereas H5 and H6 tested whether the basic relationship was affected by the combined impact of SISP context and SISP approach.

H3 and H4 reflect the assumption that considering only the SISP context or SISP approach, but not both, does not explain the basic relationship. Therefore, our expectation was that both would be rejected.

**H3.** The impact of SISP key success factors in the formulation phase on the improvement in planning capabilities is dependent on the SISP context or the SISP approach.

**H4.** The impact of SISP key success factors in the implementation phase on the effectiveness of the SISP process is dependent on the SISP context or the SISP approach.

Two additional hypotheses proposed the existence of a three-way interaction between SISP KSFs, SISP context, and SISP approach that triggers a joint effect of these three on SISP success.

**H5.** The impact of SISP KSFs in the formulation phase on the improvement in planning capabilities is dependent on the degree of fit between the SISP context and the SISP approach.

**H6.** The impact of SISP KSFs in the implementation phase on the effectiveness of the SISP process is dependent on the degree of fit between the SISP context and SISP approach.

## 5. Research methodology

The data for this study were collected by means of a questionnaire. Its validity and clarity were pre-tested in a pilot implementation with five IS faculty and 22 graduate students (who were practicing CIOs). The pilot tested internal consistency among questions, biases, errors of syntax and structure and filling out time, and resulted in suggestions for improvements.

The survey respondents were CIOs of US firms. This choice was based on the findings of previous studies that CIOs were the main drivers of the SISP process and were involved in it more than other managers.

The sampling population was the Directory of Top Computer Executives, East and West Edition. After deleting small organizations (less than 300 employees), questionnaires were mailed to a random sample of 2300 organizations, of which 167 responded within 2 months. Reminders were then sent to a random sample of

**Table 1**
Sectorial distribution of respondent organizations.

| Sector | Number of respondents | No SISP | SISP | Sector % out of total SISP |
|---|---|---|---|---|
| Industry | 64 | 4 | 60 | 34.6 |
| Insurance | 22 | 4 | 18 | 11.9 |
| Banking | 2 | 0 | 2 | 1.1 |
| Other financial | 5 | 1 | 4 | 2.7 |
| Commerce | 11 | 0 | 11 | 5.9 |
| Education | 14 | 0 | 14 | 7.6 |
| Health | 14 | 0 | 14 | 7.6 |
| Transportation | 6 | 0 | 6 | 3.2 |
| Infrastructure | 14 | 1 | 13 | 7.6 |
| Federal administration | 1 | 0 | 1 | 0.5 |
| State administration | 15 | 0 | 15 | 8.1 |
| Local administration | 15 | 3 | 12 | 8.1 |
| N/A | 2 | 0 | 2 | 1.1 |
| Total | 185 | 13 | 172 | 100% |

500 organizations drawn from the non-respondents (the limit of 500 reminder letters was due to research budget constraints), resulting in 39 additional responses.

Out of the 206 responses, 185 questionnaires were acceptable for analysis. Of these, 13 were returned by organizations that had not implemented an SISP process. The remaining 172 questionnaires were amenable to statistical analysis. The demographics of respondent organizations are given in Table 1.

The low response rate 9%, 206 responses out of 2300 mailed questionnaires, may be due to:

1. Low response rates are typical of American CIOs.
2. As 93% of the responding organizations (172 out of 185 proper responses) had implemented a SISP process, it can be assumed that many CIOs did not respond because their organizations had not implemented an SISP process.
3. Organizations tend not to disclose information on strategic issues. In spite of our promise of confidentiality, CIOs may have been unwilling to disclose strategic information to an outsider. The need to report on the degree of SISP success or admit a failure may have posed additional difficulties that reduced the response rate.
4. *Problematic timing*. The questionnaires and reminders were mailed between November and January, a time when many mangers are on vacation and/or are involved in reporting and planning sessions; thus, may not have had time to fill out the questionnaires.

To eliminate the possibility of a non-response bias, the late return technique was performed to verify that the sample of 172 responses is also representative of the organizations that did not respond. The test was based on the common assumption that those who responded in the second round (39 out of 500) represented the non-respondents.

The sample of 206 responding organizations was divided into the group of 167 early respondents (replying before the reminder) and the group of 39 late respondents. A Pearson Chi-square test was used to investigate whether the two groups differed in terms of economic sector affiliation, number of employees and annual sales. The null hypothesis stated that there was no significant difference between the two groups. It could not be rejected at a 5% level of significance for the three variables. We thus concluded that the early and late respondents were similar and that the sample of observations represents the sampling frame from which it was drawn and thus can be used for statistical analysis. This improved the external validity of the questionnaire and added confidence to the validity of the statistical conclusions.

### 5.1. Validity and reliability assessment

The quality of measurement of the research variables was examined by applying statistical techniques. *External validity* was tested by applying the non-response bias test. Previous studies have tested *content validity* by adopting operational definitions that proved valid in earlier studies, by using different principles for the design of the questionnaire; and pre-testing a pilot questionnaire on a sample of the target population.

Factor analysis was used to test *construct validity* and *discriminant validity*. The factor analysis was initially performed on the 12 items that represent SISP success; see the capabilities and effectiveness statements in Appendix A. Table 2 exhibits the factor groupings and their loading values.

An exploratory factor analysis with two factors grouped the SISP success measurement items into two categories: six items (S01–S06) converged into one factor that reflected the capabilities and satisfaction improvement dimension; the other six converged into a factor that represented the effectiveness of the SISP process. It was later used to measure the long-term success of the SISP process. A confirmatory factor analysis (CFA) was also performed on the detailed items: it supported their convergence into two factors.

Exploratory factor analysis was also performed on the 18 measurement items that represent the SISP KSFs. The 18 items converged into two factors, as depicted in Table 3. Items KSF01–KSF13 converged into one named "strategy formulation" and items KSF14–KSF18 collapsed into a factor "achieving effectiveness of the SISP process".

The SISP KSFs of the implementation phase converged into a single category that included items measuring the quality of plan implementation. Factor analysis of the 10 items representing environmental uncertainty was performed to validate their

**Table 2**
Factor loadings for SISP success.

| | |
|---|---|
| T1 improving capabilities and satisfaction | |
| S03 | Identifying new ideas and opportunities (0.832) |
| S05 | Establishing uniform basis for prioritizing IT projects (0.772) |
| S02 | Identifying key problem areas (0.728) |
| S04 | Improving coordination of decision making (0.706) |
| S06 | Improving control of human, software and hardware resources (0.689) |
| S01 | Understanding the information needs of the business (0.523) |
| T2 achieving effectiveness of the SISP process | |
| S08 | Gaining a competitive advantage from IT (0.815) |
| S07 | Anticipating changes and trends in the industry (0.784) |
| S09 | Aligning IT with business needs (0.731) |
| S10 | Implementing appropriate information architecture (0.692) |
| S11 | Increasing user satisfaction with IT services (0.621) |
| S12 | Increasing top management commitment to IT (0.568) |

**Table 3**
Factor loadings for SISP key success factors.

| | |
|---|---|
| T1 strategy formulation key success factors | |
| KSF01 | Prior to the process, there was a feeling that the process was a necessity (0.874) |
| KSF04 | The methodology (approach) for performing the process was predefined (0.793) |
| KSF03 | The process objectives were predefined (0.786) |
| KSF10 | Corporate management participated in preparing the strategic plan (0.775) |
| KSF02 | A joint vision united all the stakeholders in performing the process (0.744) |
| KSF06 | A team with overall responsibility was appointed to prepare the strategic plan (0.728) |
| KSF05 | The organization appointed a process project leader (0.719) |
| KSF07 | The planning team included representatives from various lines of business (0.709) |
| KSF12 | External consultants took part in the process (0.684) |
| KSF11 | An organizational steering committee exercised control over the process (0.651) |
| KSF08 | The planning team included senior managers (0.607) |
| KSF09 | The planning team was respected by and acceptable to the organization (0.585) |
| KSF13 | The resulting strategic plan report was approved by corporate management (0.564) |
| T2 strategy implementation key success factors | |
| KSF18 | A periodic review of the degree of implementation of the plan was performed (0.827) |
| KSF15 | The strategic plan recommendations were periodically reviewed and updated (0.784) |
| KSF17 | The strategic plan served as input to the annual IS plans (0.721) |
| KSF16 | Corporate management allocated the resources needed for plan implementation (0.595) |
| KSF14 | The planning team accompanied the implementing phase of the strategic plan (0.520) |

**Table 4**
Factor loadings for SISP context (environmental uncertainty).

| | |
|---|---|
| Dynamism | |
| UNCRT1 | Products or services in our industry become obsolete very quickly (0.842) |
| UNCRT2 | The technologies underlying products or services in our industry change very quickly (0.773) |
| UNCRT3 | We cannot predict what our competitors are going to do next (0.699) |
| UNCRT4 | We cannot predict when the demand for our products or services will change (0.624) |
| Hostility | |
| UNCRT5 | The survival of our organization is currently threatened by tough price competition (0.888) |
| UNCRT6 | The survival of our organization is currently threatened by tough competition in product/service quality (0.820) |
| UNCRT7 | The survival of our organization is currently threatened by tough competition in product/service differentiation (0.815) |
| Heterogeneity | |
| UNCRT8 | In our industry, there is considerable diversity in customers' buying habits (0.880) |
| UNCRT9 | In our industry, there is considerable diversity in nature of competition (0.875) |
| UNCRT10 | In our industry, there is considerable diversity in product lines (0.803) |

subdivision into three categories that represented the degrees of dynamism, hostility, and heterogeneity. Table 4 depicts the factor groupings and loading values as prescribed by the conceptual framework of our study.

The validity of the business strategy variable was tested by a statistical analysis of its relationship with the number of employees in the sampled organizations. An ANOVA at a 0.05 significance level showed a significant association between the two variables ($\chi^2 = 17.8$, $df = 8$, $p = .023$), supporting the validity of measuring business strategy as a categorical variable.

Similarly, the validity of the measurements of the variables *IS role* and *SISP approach* was tested by an analysis of the relationship between them, based on empirical findings that confirmed the relationship between two phenomena representing a growth cycle. An analysis of variance at a 0.05 significance level resulted in a significant relationship between the two variables ($\chi^2 = 27$, $df = 6$, $p = .000$), indicating that the measurements of the variables had an acceptable validity.

**Table 5**
Reliability of research variables (Cronbach's coefficient $\alpha$).

| Variable | Number of items | Cronbach's coefficient $\alpha$ |
|---|---|---|
| SISP key success factor (formulation phase) | 13 | 0.7819 |
| SISP key success factor (implementation phase) | 5 | 0.7433 |
| SISP success (capabilities) | 3 | 0.8195 |
| SISP success (effectiveness) | 4 | 0.8044 |
| SISP context (dynamism) | 4 | 0.7455 |
| SISP context (hostility) | 3 | 0.8292 |
| SISP context (heterogeneity) | 3 | 0.8499 |

The reliability of the research variables was examined by the degree of internal consistency, using Cronbach's alpha test with a minimum value of $\alpha > 0.7$ as a limit for an acceptable reliability. The values in Table 5 for the research variables, the number of items used to measure them, and the corresponding $\alpha$ values indicate a high degree of internal consistency among the items.

## 6. Analysis and findings

### 6.1. Descriptive statistics

Table 6 exhibits the descriptive statistics for the research variables. As evident from the results, the responses represent almost the full range of values on the 1–7 scales, facilitating an effective analysis of the data.

Using the Miles and Snow typology [18] to measure *business strategy*, 39% of the 172 organizations were shown to have a defender strategy, 46% had an analyzer strategy and 15% a prospector strategy.

*IS role/importance* was measured on the basis of a typology that identified three organization types that differ in terms of integrating IT with business strategy. In 92% of the sampled organizations, the IS group supported, or was involved in, business strategy. Less than 8% reported a minor role of IS, expressed in support of operations only.

*SISP approach* was measured on the basis of Henderson and Venkatraman's typology of four perspectives for IS strategic planning that differ in terms of the strategic fit between the organization and IS. More than 38% of the sampled organizations used a competitive potential planning approach, which is akin to BPR. About 31% used

**Table 6**
Descriptive statistics for the 172 organizations (scale of 1–7).

| Variable | Mean | S.D. | Data distribution | | | | |
|---|---|---|---|---|---|---|---|
| | | | Min. | 25 quartile | Median | 75 quartile | Max. |
| Capabilities | 5.24 | .911 | 2 | 4.67 | 5.17 | 5.83 | 7 |
| Effectiveness | 5.11 | .762 | 2 | 4.67 | 5.17 | 5.67 | 7 |
| Formulation Phase_ Key Success Factors | 4.98 | .809 | 2 | 4.46 | 4.96 | 5.66 | 7 |
| Implementation Phase_Key Success Factors | 5.01 | .974 | 2 | 4.40 | 5.20 | 5.60 | 7 |
| Dynamism | 3.99 | 1.142 | 1 | 3.00 | 4.00 | 4.75 | 7 |
| Hostility | 4.51 | 1.410 | 1 | 3.67 | 4.67 | 5.33 | 7 |
| Heterogeneity | 3.86 | 1.396 | 1 | 3.00 | 4.00 | 5.00 | 7 |

**Table 7**
Results of the regression related to SISP success in the short term.

| Statistical estimates | | | | Independent variables | |
|---|---|---|---|---|---|
| Sig. $\alpha = 5\%$ | $\Delta R^2$ | $T$ | $\beta_n$ | Variable description | Variable symbol |
| H1: Basic model | | | | | |
| **.000** | **.157** | **6.61** | **.452** | Formulation phase KSFs | F_KSF |
| H3: Approach and context as a single moderator | | | | | |
| .823 | .000 | .22 | .016 | SISP approach | Approach |
| .616 | .001 | −.50 | −.240 | Interaction variable | F_KSF*Approach |
| .763 | .000 | .30 | .022 | SISP context (dynamism) | Dynamism |
| .180 | .009 | 1.34 | .670 | Interaction variable | F_KSF*Dynamism |
| .716 | .001 | .36 | .026 | SISP context (hostility) | Hostility |
| .432 | .003 | .78 | .392 | Interaction variable | F_KSF*Hostility |
| .510 | .002 | .66 | .047 | SISP context (heterogeneity) | Heterogeneity |
| .911 | .000 | .11 | .058 | Interaction variable | F_KSF*Heterogeneity |
| .542 | .002 | .61 | .044 | SISP context (bus. strategy) | Bus_Strtgy |
| .197 | .008 | 1.29 | .635 | Interaction variable | F_KSF*Bus_Strtgy |
| .351 | .004 | .93 | .069 | SISP context (IS role) | IS_Role |
| .318 | .005 | 1.00 | .591 | Interaction variable | F_KSF*IS_Role |
| H5: Approach and context in combination | | | | | |
| .251 | .007 | 1.15 | .329 | Three-way interaction | F_KSF*Approach*Dynamism |
| .244 | .007 | 1.16 | .330 | Three-way interaction | F_KSF*Approach*Hostility |
| .715 | .001 | .36 | .092 | Three-way interaction | F_KSF*Approach*Heterogeneity |
| **.004** | **.040** | **2.89** | **.783** | Three-way interaction | F_KSF*Approach*Bus_Strategy |
| .718 | .002 | .56 | .084 | Three-way interaction | F_KSF*Approach*IS_Role |

$N = 172$, dependent variable = capabilities, F_KSF = formulation phase KSFs, I_KSF = implementation phase KSFs.
Bold values significance are listed as 5%.

the more traditional strategy execution approach, which assumes that the IS infrastructure is a passive entity that supports organizational strategy and processes. About 18% used a technology potential approach, and about 12% used a service level approach.

### 6.2. Testing the basic relationship hypotheses: H1, H2

The relationship between SISP KSFs and SISP Success was the basic relationship in our research. The statistical analyses of this relationship are shown in Tables 7 and 8 as H1: for short-term success and H2: for long-term success.

The results indicate that H1 and H2 cannot be rejected, suggesting that:

- The KSFs for the formulation phase of the SISP process positively affect planning capabilities.
- The KSFs for the implementation phase positively affect the effectiveness of the SISP process.

Confirmation of these research hypotheses strengthens the findings of earlier studies.

### 6.3. Testing the hypotheses of the contingency model for predicting short-term SISP success (H3, H5)

H1 and H2 reflect a "narrow" perception that investigates a relationship between a single explanatory variable (SISP KSFs) and a dependent variable (SISP success). As this perception is destined to fail (the planning paradox), this tests the basic relationship as impacted by two contingency variables (SISP context and SISP approach). The main statistical techniques for investigating interactions in a contingency model are ANOVA and moderated multiple regression (MMR).

The partial contingency model underlying H3 investigated whether the SISP context or SISP approach variables directly affected SISP success in the short term and/or individually moderate the basic model:

H3 :

$$\text{Capabilities} = \alpha + \beta_1\,\text{F\_KSF} + \beta_2\,\text{Approach} + \beta_3\,\text{F\_KSF} * \text{Approach} + \beta_4\,\text{Context} + \beta_5\,\text{F\_KSF} * \text{Context}$$

The comprehensive contingency model underlying H5 investigates the effect of including the combination of SISP context and SISP approach in the basic model in the short term, as represented by the $\beta_6$ coefficient added to the regression equation:

H5 :

$$\text{Capabilities} = \alpha + \beta_1\,\text{F\_KSF} + \beta_2\,\text{Approach} + \beta_3\,\text{F\_KSF} * \text{Approach} + \beta_4\,\text{Context} + \beta_5\,\text{F\_KSF} * \text{Context} + \beta_6\,\text{F\_KSF} * (\text{Approach and Context})$$

Table 6 presents the results of testing H3 and H5. The findings of testing H3 (partial contingency model) indicated that none of the SISP context or SISP approach variables directly affected the SISP success, or moderated the basic relationship. The findings of

**Table 8**
Results of the regression related to SISP success in the long term.

| Statistical estimates | | | | Independent variables | |
|---|---|---|---|---|---|
| Sig. $\alpha = 5\%$ | $\Delta R^2$ | $T$ | $\beta_n$ | Variable description | Variable symbol |
| H2: Basic model | | | | | |
| **.000** | **.358** | **9.74** | **.599** | Implementation phase KSFs | I_KSF |
| H4: Approach and context as a single moderator | | | | | |
| .553 | .001 | −.59 | −.038 | SISP approach | Approach |
| .538 | .001 | −.61 | −.248 | Interaction variable | I_KSF*Approach |
| .246 | .005 | 1.16 | .073 | SISP context (dynamism) | Dynamism |
| .113 | .010 | 1.59 | .666 | Interaction variable | I_KSF*Dynamism |
| .893 | .000 | −.13 | −.008 | SISP context (hostility) | Hostility |
| **.027** | **.019** | **2.23** | **.975** | Interaction variable | I_KSF*Hostility |
| .593 | .001 | −.53 | −.033 | SISP context (heterogeneity) | Heterogeneity |
| .731 | .000 | −.34 | −.143 | Interaction variable | I_KSF*Heterogeneity |
| .663 | .001 | .43 | .028 | SISP context (bus. strategy) | Bus_Strtgy |
| .939 | .000 | −.76 | −.031 | Interaction variable | I_KSF*Bus_Strtgy |
| **.009** | **.026** | **2.64** | **.168** | SISP context (IS role) | IS_Role |
| **.005** | **.029** | **2.87** | **1.07** | Interaction variable | I_KSF*IS_Role |
| H6: Approach and context in combination | | | | | |
| **.017** | **.021** | **2.41** | **.629** | Three-way interaction | I_KSF*Approach*Dynamism |
| **.003** | **.032** | **3.01** | **.764** | Three-way interaction | I_KSF*Approach*Hostility |
| .179 | .007 | 1.35 | .320 | Three-way interaction | I_KSF*Approach*Heterogeneity |
| **.003** | **.034** | **3.04** | **.733** | Three-way interaction | I_KSF*Approach*Bus_Strategy |
| **.000** | **.059** | **4.30** | **1.33** | Three-way interaction | I_KSF*Approach*IS_Role |

$N = 172$, dependent variable = effectiveness, F_KSF = formulation phase KSFs, I_KSF = implementation phase KSFs.
Bold values significance are listed as 5%.

testing H5 (the comprehensive contingency model) showed that the various combinations of SISP context, in terms of dynamism, hostility, heterogeneity or IS role, and SISP approach did not have a joint effect on the basic relationship. The one exception was the significant interaction between SISP KSFs, SISP approach and SISP context (in terms of business strategy), which added somewhat to the explanation of the basic model.

### 6.4. Testing the hypotheses of the contingency model for predicting long-term SISP success (H4, H6)

*The partial contingency model* underlying H4 investigated whether the SISP context and SISP approach variables directly affected SISP success in the long term and/or individually moderated the basic model:

H4 :

$$\text{Effectiveness} = \alpha + \beta_1\ \text{I\_KSF} + \beta_2\,\text{Approach} + \beta_3\,\text{I\_KSF} * \text{Approach} + \beta_4\,\text{Context} + \beta_5\,\text{I\_KSF} * \text{Context}$$

*The comprehensive contingency model* underlying H6 investigated the effect of including the combination of SISP context and SISP approach in the basic model in the long term, as represented by $\beta_6$ coefficient added to the regression equation:

H6 :

$$\text{Effectiveness} = \alpha + \beta_1\ \text{I\_KSF} + \beta_2\,\text{Approach} + \beta_3\,\text{I\_KSF} * \text{Approach} + \beta_4\,\text{Context} + \beta_5\,\text{I\_KSF} * \text{Context} + \beta_6\,\text{I\_KSF} * [\text{Approach and Context}]$$

Table 7 presents the results of testing H4 and H6. The findings of testing H4 indicated that IS role directly affected SISP success and also moderated the basic model. The other SISP context and SISP approach variables neither impacted SISP success directly nor moderated the basic model. This does not contradict the theoretical rationale of the study, which claimed that a contingency variable that represented approach or context alone did not moderate the basic relationship and hence called for a comprehensive contingency model.

The findings of testing H6 supported the research hypothesis. The model, which proposed that the combination of SISP approach and SISP context have a moderating effect on the basic relationship between SISP success and SISP KSFs, was empirically confirmed for most of the context variables tested (except for the environmental heterogeneity variable). The findings indicate that the best predictor of long-term SISP success was the three-way interaction between KSFs, approach, and context. These findings confirmed the comprehensive contingency model, which explained SISP success in the long term.

## 7. Discussion and conclusions

Our research investigated the success of the SISP process as a variable that depends on three dimensions: *SISP KSFs*; *SISP approach*; and *SISP context*. The model expresses a theoretical rationale that the basic relationship between SISP success and SISP KSFs (or the planning paradox) is dependent on the fit between SISP context and SISP approach.

The empirical findings confirmed the hypotheses concerning the basic relationship, indicating a positive relationship between: SISP KSFs in the formulation phase of the SISP process and the improvement in planning capabilities; and SISP KSFs in the implementation phase and the effectiveness of the SISP process. Our findings did not confirm the partial contingency model but confirmed the need to investigate SISP success under a comprehensive contingency model.

The findings empirically confirmed the comprehensive contingency model for the success of the SISP process in the long term only. For all the variables tested, a significant moderating effect was found for the combination of context and approach with the basic relationship. The best prediction for long-term SISP success was based on the interaction among the three explanatory SISP variables (KSFs, context, and approach) and confirmed the theory that while a single contingency variable (SISP context) does not moderate the relationship between SISP KSFs and success, but its combination with another moderating variable (SISP approach) does generate a significant effect.

Our study was integrative and facilitated a comprehensive investigation of the SISP process. Its theoretical contribution was

expressed in the explanation of the planning paradox, suggesting a theory that explained the inconsistency in the basic relationship and empirically confirming the dependency of the basic relationship on the quality of fit between SISP context and approach. As recent empirical evidence seemed to suggest a negative relationship between IS and firm performance, the purpose in SISP was questioned [17]. The resolution of the productivity paradox triggered practitioners' interests and made SISP a common practice in firms [10].

Our findings also had a practical contribution, assisting CIOs in reconciling the dissonance between the considerable investment of time, capital, and human resources in SISP processes, and their IS failures, which was a key concern of CIO during the 1980s and 1990s, and in recent years has never been stronger. CIOs should therefore acknowledge the complexity of the process and engage in a preparatory planning stage (meta-planning) before starting the core SISP process.

The limitations of our study are mostly related to the research model (which has a multitude of variables and dimensions) and to the use of a mailed questionnaire as the data collection tool. The first limitation stems from the representation of dimensions of the research question. As the research model consisted of four dimensions that were not directly measurable observation, they were converted into variables by a process of filtering, whereby the variables were chosen from a larger number of variables identified as being suitable. The research design may therefore have excluded variables of importance.

A second limitation stemmed from insufficient operational measurement of several research variables. Measurement techniques that use multi-item scales can reduce the probability of measurement errors. However, due to the large number of variables in our study, these techniques would have led to a longer questionnaire, which could have reduced the response rate. Therefore, when the measurement technique would have been based on a large a number of items, simpler techniques were selected; this involved a risk of measurement errors in the categorical measurements of some variables.

A third limitation stemmed from measuring many variables using a Likert scale, in the form of statements that express a view of a subject; this, raised the possibility of bias due to the opinion of a respondent.

Finally, the low response rate of 8.95% and the fact that the study was performed only in one country, restrict the external validity of the questionnaire. A compensating factor for the former issue was the large size of our sample, 2300.

## Appendix A. All responses will be kept strictly confidential

Part A—Characteristics of the organization[a].

1. Please circle the extent to which you agree or disagree with the following statements as they pertain to ***the environment*** of your organization.

| | Strongly Disagree | | | | | | Strongly Agree |
|---|---|---|---|---|---|---|---|
| Products or services in our industry become obsolete very quickly | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| The technologies underlying products or services in our industry change very quickly | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| We can predict what our competitors are going to do next | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| We can predict when the demand for our products or services will change | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| The survival of our organization is currently threatened by: | | | | | | | |
| - tough price competition | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| - tough competition in product/service quality | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| - tough competition in product/service differentiation | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| In our industry, there is considerable diversity in: | | | | | | | |
| - customers' buying habits | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| - nature of competition | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| - product lines | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

2. Please indicate with a check mark [√] the description [one only] that most closely reflects your organization in terms of its ***business strategy***:

☐ Our organization attempts to locate and maintain a secure niche in a relatively stable product or service area. Our organization tends to offer a more limited range of products or services than its competitors, and tries to protect its domain by offering higher quality, superior service, lower prices, and so forth.

**Appendix A** (*Continued*)

☐ Our organization operates within a broad product-market domain that undergoes periodic redefinition. Our organization values being "first in" in new product and market areas, even if some of these efforts prove not to be highly profitable. Our organization responds rapidly to opportunities.

☐ Our organization attempts to maintain a stable, limited line of products or services, while at the same time moving out quickly to follow a carefully selected set of the more promising new developments in the industry. Our organization is seldom "first in" with new products or services. However, by monitoring the actions of major competitors in areas compatible with its stable product-market base, we can frequently be "second in" with a more cost-efficient product or service.

3. Please indicate with a check mark [√] the description [one only] that most closely reflects the ***role of information technology*** [IT] in your organization:

☐ IT supports operations and administrative functions. The IS group is **not related** to the development of organizational strategy.

☐ IT supports organizational strategy. The IS group actively **supports** the organizational strategy but is not involved in the development of organizational strategy.

☐ IT is integral to organizational strategy. The IS group and corporate management work together on developing IS applications that can **change** the industry structure.

[a]Part A operationalized the Context construct in the research model.

Part B—SISP process in your organizations[b].

4. Please circle the extent to which you agree or disagree with the following statements as they pertain to the ***characteristics of the SISP process*** in your organization:

| | Strongly Disagree | | | | Strongly Agree |
|---|---|---|---|---|---|
| Prior to the process, there was a feeling that the process was a necessity | 1 | 2 | 3 | 4 | 5 |
| A joint vision united all the stakeholders in performing the process | 1 | 2 | 3 | 4 | 5 |
| The process was performed for the organization but not for the IS group | 1 | 2 | 3 | 4 | 5 |
| The process objectives were predefined | 1 | 2 | 3 | 4 | 5 |
| The methodology [approach] for performing the process was predefined | 1 | 2 | 3 | 4 | 5 |
| The organization appointed a process project leader | 1 | 2 | 3 | 4 | 5 |
| A team with overall responsibility was appointed to prepare the strategic plan | 1 | 2 | 3 | 4 | 5 |
| The planning team included representatives from various lines of business | 1 | 2 | 3 | 4 | 5 |
| The planning team included senior managers | 1 | 2 | 3 | 4 | 5 |
| The planning team was respected by and acceptable to the organization | 1 | 2 | 3 | 4 | 5 |
| Corporate management participated in preparing the strategic plan | 1 | 2 | 3 | 4 | 5 |

**Appendix A** (*Continued*)

| | | | | | |
|---|---|---|---|---|---|
| An organizational steering committee exercised control over the process | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | | | |
| External consultants took part in the process | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | | | |
| The resulting strategic plan report was approved by corporate management | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | | | |
| A timetable and milestones for implementing the plan were established | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | | | |
| The planning team accompanied the implementing phase of the strategic plan | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | | | |
| The strategic plan recommendations were periodically reviewed and updated | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | | | |
| Corporate management allocated the resources needed for plan implementation | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | | | |
| The strategic plan served as input to the annual IS plans | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | | | |
| A periodic review of the degree of implementation of the plan was performed | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | | | |

[b]Part B operationalized the KSF construct in the research model.

Part C—SISP approach in your organizations[c].

5. Presented here are four different definitions, offered by four chief information officers, concerning the nature of the SISP process performed in their organizations.
Please indicate with a check mark [√] the description [one only] that most closely reflects ***the SISP approach*** used by your organization:

☐ **A CIO of organization A**

"The SISP process in our organization assumed that IT must continue to support, in the future, the current organizational strategy. We mapped the organizational work processes that lead to the implementation of the current organizational strategy and identified the computing problems in these work processes. The current organizational strategy and organizational work processes were used as the basis for deriving the necessary IT resources [e.g., hardware resources, portfolio of IS applications] that would be needed by the organization in the coming years."

☐ **A CIO of organization B**

"Our perception, as in organization A, is that IT must continue to support, in the future, the current organizational strategy. Unlike organization A, most of our organizational work processes have been already computerized. Therefore, we undertook a SISP process that focused on determining an IT strategy/policy pertaining to various IS issues [e.g., IT outsourcing, downsizing]. Our main planning process objective was to consolidate IS strategies that were appropriate for better supporting the current organizational strategy."

☐ **A CIO of organization C**

"Our organization [unlike organizations A and B] did not use organizational strategy as a parameter in the SISP process. Our process mainly focused on developing the capabilities of our IS group [department]. We established a technical policy [e.g., we selected a software development tool,
we determined standards for hardware and telecommunications] that would enable our IS group to handle, more flexibly and efficiently, unexpected future demands of end-users, and situations when organizational strategies are unclear or frequently change."

**Appendix A** (*Continued*)

☐ **A CIO of organization D**

"The SISP process in our organization did not consider the organizational strategy as given [unlike organizations A and B]. The SISP process implemented in our organization assumed that IT is an enabler that can change organizational strategies. We chose the approach that IT is an active driver that redesigns the organizational strategy and the organizational work processes. We established a policy for introducing new information technologies [e.g., EDI, Internet] that can create new business opportunities."

[c]Part C operationalized the approach construct in the research model.

Part D—Contribution of the SISP process[d].

6. Please circle the extent to which you agree or disagree with the level that the SISP process in your organization has contributed to ***improving various planning capabilities***:

| | Strongly Disagree | | | | | | Strongly Agree |
|---|---|---|---|---|---|---|---|
| The SISP process has contributed to: | | | | | | | |
| understanding the information needs of the business | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| identifying key problem areas | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| identifying new ideas and opportunities | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| improving coordination of decision making | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| establishing uniform basis for prioritizing IT projects | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| improving control of human, software and hardware resources | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

7. Please circle the extent to which you agree or disagree with the level that the SISP process in your organization has contributed to the ***fulfillment of various SISP objectives***:

| | Strongly Disagree | | | | | | Strongly Agree |
|---|---|---|---|---|---|---|---|
| The SISP process has contributed to: | | | | | | | |
| anticipating changes and trends in the industry | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| gaining a competitive advantage from IT | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| aligning IT with business needs | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| implementing an appropriate information architecture | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| increasing user satisfaction with IT services | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| increasing top management commitment to IT | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

[d]Part D operationalized the SISP Success construct in the research model.

**Appendix A** (*Continued*)

Company: _____

Respondent's Job Title: _____

The company's primary industry: _____

Approximate number of employees in your company: _____

Approximate annual sales revenues [in dollars]:

[ ] Less than 100 million
[ ] 101 - 250 million
[ ] 251 - 500 million
[ ] 510 million - 1 billion
[ ] 1 - 3 billion
[ ] Over 3 billion

Please provide your name and address or attach your business card so we can send you a copy of the research results:

Name: _____

Address: _____

_____

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