

The Typology of Information Requirements and IS Planning Capability

문 태 수¹⁾

I. Introduction

Organizations have begun to create information systems that can provide a strategic impact and earn substantial competitive advantage. While it is clear that management needs understandable and action-oriented information, it is still unclear how to identify this information and implement information systems that provide it in an easy-to-use form. Also, managers in many organizations complain that while they are receiving more information than ever before, the quality of that information is lacking.

Planning is an ongoing organizational function that provides the framework for operational activities and decision making. The organizational mission is translated into operational objectives through an organizational hierarchy of planning activities. The reasons for formal organizational planning are to focus the energies and activities of the organization on the achievement of its objectives, to reconcile differences in objectives and plans of subareas and individuals within the organization, and to remove ambiguities about what the organization should do[Davis & Olson, 1985].

Traditionally, IS has been viewed by IS practitioners and researchers as playing only a support role[Ein-dor & Segev, 1978; Ives & Hamilton & Davis, 1980]. Recently, however, due to significant declines in the cost of information technology and the greatly improved speed and power of computers, IS is beginning to move from its traditional role as an application of back office support to one offering opportunities to gain significant competitive advantages[McFarlan, 1984]. It is being increasingly viewed as having the capability to alter core organizational directions, reorient corporate strategy and redefine industry structure[Benjamin & Rockart & Scott-Morton & Wyman, 1984; Parsons, 1983; Rockart & Scott-Morton, 1984; Porter & Miller, 1985].

This change in the role of the organizational IS has brought about an increased emphasis on the planning aspects of IS management. While justifying the importance

1) 경주대학교 산업정보학과

of planning, Brancheau & Wetherbe[1987] point out that "effective planning requires the discipline and vision to foresee problems and opportunities within a turbulent and complex environment" and "the rapidly changing business environment's increased involvement of end-users, accelerated technological change, and lack of reliable methods" have created a continuing need to improve IS planning. IS managers should focus on those aspects of planning systems which contribute to their effectiveness.

Especially, the significance of properly defining information requirements prior to proceeding on to the design phases of corporate information systems development is very important. Generally, information requirements in a organization are changed by the change of task environment. When the environment is perceived as hostile, competitive, rapidly changing, or when the organization depends heavily on the environment for resources, the organization gathers more data about the environment[Pfeffer & Salancik, 1978].

II. Literature review on IS planning

The importance of IS planning is reflected in a series of studies. The adoption of key IT issues where "Improvement of Strategic IS Planning" has perennially been ranked as one of the top-3 issues[Ball & Harris, 1982; Dickson & Leitheiser & Wetherbe, 1984; Hartog & Herbert, 1986; Brancheau & Wetherbe, 1987; Watson, 1990; Niedermann & Brancheau & Wetherbe, 1991].

Various approaches to information systems planning have evolved [King, 1978; Rockart, 1979; Bowman & Davis & Wetherbe, 1983; Carlson, 1979; Holland Systems, 1986; IBM, 1984; Martin, 1989; McFarlan, 1981; Wetherbe & Davis, 1982]. Some of these approaches are documented and employed in the development of information systems in the real world. Recent issues in IS planning say that information systems planning should be carried out strategically so as to make information systems more effective and strategically useful.

This new role of IS has brought into focus the necessity of planning for the IS function, so that its plans are in alignment with the firm's business plans[King, 1988; McFarlan & McKenney & Pyburn, 1983]. IS planning is being increasingly used to explicate the organization's business plans and strategies, to identify IS opportunities that support the business plans, to develop information architectures based on user's information needs, and to develop long-term developmental plans for the IS function[Premkumar & King, 1992].

Past research on IS planning has examined the relationship between the organizational factors and IS planning to a limited extent. Various organizational

factors such as the quality of business planning, organizational support mechanisms, top management and user involvement, the resources devoted to planning, organization size, and management style have been found to influence IS planning[Pyburn, 1983; Cash et al., 1984, Raghunathan & Raghunathan, 1991; Galliers, 1991; Lederer & Sethi, 1988; Earl, 1993; Premkumar & King, 1992].

These studies follow the general contingency theory paradigms that relate technology, innovation, organizational and IS functional characteristics, organizational and IS effectiveness to their organizational contexts. These studies have, however, some limitations in generalization of the results. Drawbacks of past studies in IS planning are as follow: 1) few large-scale empirical studies; 2) lacking clarity of the dimensionality of IS planning process and performance; 3) limitations of the generalizability of the results. There is a need for a comprehensive framework that examines the relationship among a broad set of organizational factors and IS planning processes and IS planning performance.

Few study on the influence of information requirements on IS planning capability was performed[Davis & Olson, 1985; Venkatraman & Ramanujam, 1987; Premkumar & King, 1992; Raghunathan & Raghunathan 1994]. However, because of poor explanation of the dimensions of IS planning construct, the explanation of the influence of information requirements on IS planning capability still remains incomplete.

Most changes in organizational information requirement is originated from changes in environmental factors such as customers, suppliers, and competitors. The better the understanding is about the business environment being faced, the better the chance of developing a solution that uses a information technology creatively. If the user's underlying business problem will be addressed by a new requirement, it must be clearly stated and understood through requirement analysis for IS adoption.

Galbraith[1973, 1977] explained the observed variations in organizational form based upon the amount of information needed to reduce task related uncertainty and thereby attain an acceptable level of performance. He proposed that specific structural characteristics and behaviors would be associated with information requirements, and a line of research and theorizing has provided support for this relationship.

Daft & Lengel[1984] suggested that the two answers to the question, why do organizations process information?, are to reduce uncertainty based on several studies[Galbraith, 1973, 1977; Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Thompson, 1967] and to reduce equivocality based on Weick's study[1979]. Uncertainty and equivocality may arise from departmental technology, from coordination of departments to manage interdependence, or from the external environment[Tushman & Nadler, 1978].

An information system should meet the needs of the organization it serves, and

applications should meet the needs of their users. The requirements for the information system are therefore determined by the strategies, goals, procedures, and behavior of individuals within the organization acting individually and collectively. There are four major reasons why it is difficult to obtain a correct and complete set of requirements [Davis & Olson, 1985]: 1) the constraints on humans as information processors and problem solvers; 2) the variety and complexity of information requirements; 3) the complex patterns of interaction among users and analysts in defining requirements; 4) unwillingness of some users to provide requirements for political or behavioral reasons.

Davis [1982] proposed two levels of information requirements: 1) organizational-level information requirements; 2) application-level information requirements. After three years, Davis & Olson [1985] suggested three types of information requirements: 1) organization-level information requirements, 2) database-level information requirements, 3) application-level information requirements.

First, information requirement determination at the organization or enterprise level is a key element in developing an information systems master plan. The requirements are factored into databases and subsystems (a portfolio of applications) that can be scheduled for development. Second, database requirements arise both applications and ad-hoc queries. The overall architecture for the databases to meet these requirements can be defined as part of organizational information requirements. Major classes of data through data modeling procedures are defined and associated with organizational processes that require them. Third, the process for the determination of information requirements at the application level defines and documents specific information content plus design and implementation requirements. These types of information requirements are associated with data presentation format, screen design, user interface, and response time.

Despite of several research efforts that attempt to elucidate links between information requirements and planning capability, the results of this body of research are fragmented. This state of affairs has arisen because most previous research on planning systems has suffered from two major conceptual shortcomings. First, most studies have used rather simplistic conceptualizations of the notion of planning [Camillus, 1975; Steiner & Schollhammer, 1975; King, 1978]. Thus, researchers have attempted to show differences in financial performance between "planners" and "nonplanners" or "formal planners" and "informal planners." Second, most studies have essentially focused on developing better conceptual models for IS planning [Zani, 1970; McFarlan, 1971; King, 1978; King, 1983; Bowman et al., 1983]. Because of these shortcomings, a broader concept of IS planning capability is needed, as shown in table 1.

The present study is an attempt to explore the contingent nature of IS

planning-related factors in the context of the strategic relevance of an organization's IS. The literature in the IS planning area has been extensively used in the choice of

Table 1. Dimensions of IS Planning Capability

Dimensions	Description	Key Supporting Literature
IS Planning Resources	The degree of organizational support in the form of budget, duration, involvement of top management and end user, IS staff in planning, etc.	King & Cleland[1978] Ramanujam et al.[1986] Raghunathan et al.[1990] Premkumar & King[1992]
Quality of Business Planning	The degree of provision in the form of documentation to show strategic directions for the IS function	Premkumar & King[1991] Pyburn[1983] Premkumar & King[1994]
Internal Capability	The degree of attention to organizational factors(leadership, planning capability, functional coverage, communication, etc. structure ill-defined, strategic problem.	Ramanujam et al.[1986] Venkatraman et al.[1987] Premkumar & King[1992] Raghunathan et al.[1994]
IS Maturity	The degree of maturity to the existing IS to support organizational information requirements	Nolan[1979, 1982]
IS Planning Methodologies	The degree of emphasis given to the use of planning methodologies to structure ill-defined, strategic problem.	Ramanujam et al.[1986] Premkumar & King[1991]
Change Management	The need to anticipate and overcome resistance to planning and to create a favorable climate for IS planning	Steiner et al.[1975] King[1983] Ramanujam et al.[1986]

variables and in the formulation of questions to capture the underlying constructs. Thus, using the relationship between the typology of information requirements and IS planning capability of an organization, this study investigates the causal relationship for the IS planning processes across various organizations. Generally, relatively more strategic information requirement will differ from relatively less strategic ones in relation with the dimensions of IS planning capability.

The purpose of this study is to test a two-fold proposition: 1) to identify the typology of information requirements and the dimensions of IS planning capability; 2) to identify the relationship between the typology of information requirements and IS planning capability.

III. Research Model and Hypothesis

3.1. Research Model

Researches on the influence of IS planning capability on IS planning effectiveness were performed in the studies by Venkatraman & Ramanujam[1987], Premkumar & King[1992, 1994], Raghunathan & Raghunathan [1991, 1994]. However, there is yet no study on the impact of information requirement on IS planning capability, or the association between information requirements and IS planning capability.

Using the typology of information requirement adopted in Davis & Olson[1985], this study will identify the extent of the capability of IS planning, in the context of organizational information requirements. When the planner perceives that the organization requires the strategic information, it will be appropriate to consider IS planning capability for supporting strategic information. If the organization requires the operational information, the planner will attempt to consider IS planning capability for supporting operational information.

Anthony[1965] classified organizational hierarchy to three type of management activities, such as strategic planning, management control, operational control. Simon[1969] distinguished between two types of decisions: programmed and nonprogrammed. The first term refers to human decisions that could be simulated by a computer program. The second term refers to human decisions which can not be consistently replicated by a machine. Gorry & Scott Morton[1971] identified decision types by management activities, which is based on Anthony's classification framework for management activity and Simon's human decision model, and they argued that relevant information must be provided for them.

Galbraith[1973, 1977] explained the observed variations in organizational form based upon the amount of information needed to reduce task related uncertainty and thereby attain an acceptable level of performance. He proposed that specific structural characteristics and behaviors would be associated with information requirements, and a line of research and theorizing has provided support for this relationship.

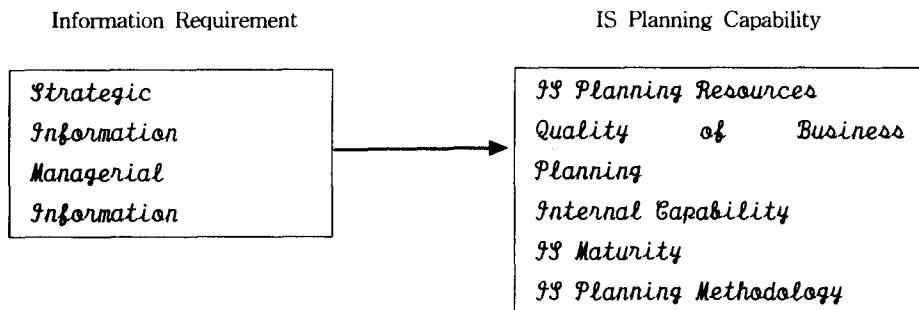
Organizational theorists have long believed that firms will institute more information requirements and invest in information systems planning to manage growth in size[Galbraith, 1973]. Generally speaking, information requirements within an organization are classified as three kinds of information requirements as strategic information for strategic management, managerial information for management control, operational information for routine operation.

Since IS planning has been defined as more open to outside influences, an increase in the importance of strategic information would be expected. Empirical evidence support for such a relationship is likely to provide useful guidance to companies

attempting to improve their IS planning process. Furthermore, data on the specific types of information used should be helpful in the planning of information systems to support a firm's objectives and strategies[Ahituv & Neumann, 1986; Kroeber & Watson, 1986].

As an organization requires more strategic information, in order to adapt to environmental uncertainty, a wider range of information is considered to be relevant, and the relative importance of different types of information shifts. The strategic level of new information may influence the nature of the planning system and, as a result, may alter that system. This means that the six dimensions of IS planning capability are different according to the types of information requirements. Rhyne[1985] empirically examined the relationship between corporate-level planning and information systems. He argued that data on the specific types of information used should be helpful in the design of information systems to support a firm's planning process.

Figure 1. Research Model



Environmental turbulence should not be viewed as acting directly on planning and information systems, but through the strategic choice of the executives in an organization[Child, 1972]. The importance of the chief executive officer's(CEO) active involvement in the planning process also has been emphasized by a number of authors[Andrews, 1971; Schendel & Hofer, 1978; King, 1983; Ramanujam & Venkatraman, 1987; Ramanujam & Venkatraman & Camillus, 1986; Premkumar & King, 1992; Lederer & Mendelow, 1993; Premkumar & King, 1994; Raghunathan & Raghunathan, 1994].

The purpose of this study is to identify the association between information requirements and IS planning capability. Rigorous studies on the influence of IS planning capability on IS planning effectiveness were performed by Venkatraman & Ramanujam[1987], Raghunathan & Raghunathan [1994]. However, there is at yet no study on the impact of information requirements typology to IS planning capability, or

the association between information requirements and IS planning capability. Especially, there is no study on how much to change the capability of IS planning according to the types of information requirements.

3.2. Research Hypotheses

IS planning includes the use of information about the past, current and projected performance to enable management to determine company missions, basic purposes, objectives, policies and program strategies[Mclean & Soden, 1977; Lederer & Mendelow, 1986]. IS planning design is a multifaceted management system that is contextually embedded. Hence, there are only several studies dedicated to IS planning process design[King, 1983; Ramanujam & Venkatraman & Camillus, 1986; Ramanujam & Venkatraman, 1987; Raghunathan & Raghunathan, 1990, 1994; Premkumar & King, 1992, 1994].

However, to date, there have been no studies testing the relationship between information requirement and IS planning processes. Bowman & Wetherbe & Davis[1983] suggested that strategic planning of the firm should be linked to resource allocation through the information requirement processes. In the end, designing IS planning capability is originated from organizational information requirements. Thus, it is very important to identify the relationship between information requirement and IS planning capability.

H1: Information requirement is positively related to IS planning capability needed.

This study considered three type of information requirement, as contingent variables for IS planning, which were needed from organizational goals, strategies, and the changes of task environment. The concerns of this study are twofold. One is what the design elements of IS planning capability are. The other is about the differences of IS planning capability by three types of information requirements.

Based upon an exploratory study of eight organizations which involved extensive interviews with IS and senior managers, Pyburn[1983] identified several factors which seemed particularly important to their planning success, or lack of it. These factors include such things as the style of senior management decision making, the volatility of the business(application portfolio), the complexity of the IS organization and management task, and the status and physical location of the IS manager. He found that the personal-formal and written-formal planning style had better performance, depending, in part, on a more formal general management style.

Hartman & White & Crino[1986] presented a prescriptive planning process model, based on information-processing research and strategies, which explicitly considered

the linkages among the environment, the organization's adaptation to that environment, the type of planning, and information-processing strategies.

Rhyne[1985] examined empirically the relationship between corporate-level planning and information systems. He was interested in the specific types of information used for the design of information systems to support a firm's planning process. He found that, as the planning process becomes more sophisticated, external and environmental types of information will become more important. This means that the type of information requirements are a very important factor in the relationship between information requirements and IS planning capability.

H2 : Strategic information requirements have higher correlation with the capability of IS planning than other information requirements

Most researchers have emphasized two sets of influences on the design of IS planning capability[King, 1978; Mclean & Soden, 1977; Davis, 1982; Ramanujam & Venkatraman, 1987]. They are the typology of information requirement and the design elements of IS planning systems.

Earl[1993] examined the strategic information systems planning(SISP) experience of 27 companies in England. He classified five different SISP approaches: Business-led, Method-driven, Administrative, Technological, and Organizational. Each approach has different characteristics and, therefore, a different likelihood of success. The results showed that the Organizational Approach appeared to be most effective. The taxonomy of the five approaches potentially provided a diagnostic tool for analyzing and evaluating an organization's experience with SISP.

Premkumar & King[1994] presented a research model, which was developed to link two dimensions of IS planning-the quality of IS planning and planning effectiveness-to a set of eight organizational factors derived from contingency research in IS planning (strategic business planning, organizational studies, and technology innovation). The results indicated that planning resources, the intended strategic impact of IS on future business operations, the quality of facilitation mechanisms, the quality of implementation mechanisms, and the quality of strategic business planning were significantly associated with the quality and effectiveness of IS planning.

Similar to these results, this study is interested in identifying the relationship between the types of information requirement and the dimensions of IS planning capability. So, a significant association is hypothesized.

H3 : Each type of information requirement have a different amount of association with each dimension of IS planning capability.

IV. Research Method

4.1. Independent Variables

In this study, three types of information requirements were identified as independent variables: strategic information, managerial information, and operational information. To test the overall relationship between information requirement and IS planning capability, information requirement(IR) was defined as the independent variable, to represent the organizational information requirement.

In order to test the extent of differences in the six dimensions of IS planning capability by the three types of organizational information requirements. This information requirement(IR) variable is identified as three independent variables again: strategic information(SINFO), managerial information(MINFO), operational information (OINFO). It is proposed that all three information requirements will influence the extent to which IS managers perceive the importance of designing the IS planning capability. Three variables of information requirements within a organization were provided in Table 2.

Table 2. Three Types of Information Requirement in this Study

Type of Information Requirement	The Content of Information
Strategic Information	Competitor's new product development and equipment Price policy of product Market share by product (by region) Performance of new product development Regulation and deregulation policy of government Merge & Acquisition of competitors Entrance strategy to new market
Managerial Information	Procurement of raw material and inventory control Sales performance by product (by region) Cost accounting about product and service Short-term Cash flow Change of organizational management rule Operation performance in a department or a division Human relations and personnel management
Operational Information	Daily transaction with customers Daily product delivery and sales performance Bill of material by product Absence and vacation of employee Daily Cash flow Daily booking and closing

4.2. Dependent Variables

IS planning capability in this study represents the amount of capability which is caused by the typology of information in the task environment. This capability is perceived by a decision maker when he or she considers the six dimensions of IS planning capability: resources provided for IS planning, quality of business planning, IS maturity, internal planning capability, IS planning methodology, change management.

Most studies, on resources provided for IS planning, considered the degree of organizational support in the form of budget, duration, involvement of top management and end user, IS staff in planning, etc.[King & Cleland, 1978; Ramanujam et al., 1986; Raghunathan et al., 1990, 1994; Premkumar & King, 1992, 1994]. This study, also, uses 9 measurement items, to measure the degree of organizational support for the resources of IS planning; through a five-point Likert-type scale ranging from "Very insufficient" to "Very sufficient".

The business planning inputs for subsequent IS planning, in a top-down planning approach, is an important indicator of the impact to the quality of IS planning capability[King, 1978; Vitale et al, 1986; Johnston & Carrico, 1988; Goodhue et al, 1988; Martin, 1989, Raghunathan & Raghunathan, 1990]. Premkumar & King[1994] found that the quality of strategic business planning influenced the quality of IS planning processes and the effectiveness of IS planning. Thus, this study used 4 items, extracted from existing literature, in order to measure the degree of provision in the form of documentation to show strategic directions for the IS function; through a five-point Likert-type scale ranging from "Very insufficient" to "Very sufficient".

Internal capability refers to the degree of attention to organizational factors such as leadership, planning capability, functional coverage, communication, etc, in order to predict and formulate the strategic directions within the organization. Most research, in the area of internal capability, considered the degree of organizational aspects to internal capability[Ramanujam et al., 1986; Venkatraman et al., 1987; Premkumar & King, 1992; Raghunathan et al, 1990]. They argued that plans often fail due to inadequate or incorrect assessment of an organization's internal aspects and internal capabilities[King & Cleland, 1978; Raghunathan et al, 1990]. Thus, this study used the 7 items, extracted from existing literature, in order to measure the degree of attention to internal considerations for IS planning; through a five-point Likert-type scale ranging from "Very insufficient" to "Very sufficient".

IS maturity in an organization may be an important variable influencing the direction for future IS. Nolan[1979] argued that the knowledge of the current stage of IS in the organization provides the foundation for developing appropriate strategies. Also, he suggested that an important part of the long-range plan is the technology

plan, which identifies the computer-based technologies important to the company's competitive position[Nolan 1982]. Thus, this study used 5 benchmarks from Nolan[1979], with the exception of the IS budget ratio against sales revenue extracted from existing literature, as a measure of the degree of maturity of the existing IS to support organizational information requirements in IS planning process; through a six-point Likert-type scale.

A variety of IS planning methodologies have been developed to aid managers in identifying and dealing with strategic decisions and problems[Grant & King, 1979; IBM, 1984; Andersen, 1985; Martin, 1989; Rockart, 1979; Premkumar & King, 1991; Earl, 1993]. The extent of reliance on planning techniques is thus an important dimension of the planning system. Use of these techniques is one indication of the extend of formalization of a planning process[Ramanujam & Venkatraman & Camillus, 1986]. Thus, this study used the 13 items, customized as IS planning methodology or extracted from the IS existing literature, in order to measure the degree of emphasis given to the use of IS planning methodologies, through a five-point Likert-type scale ranging from "No Consideration" to "Very Useful".

Table 3. IS Planning Methodologies used in This Study

Planning Methodology	Vendor & Researcher
Business Systems Planning	IBM[1979, 1984]
Critical Success Factors	Rockart[1982]
Method/1	Andersen Consulting[1985]
Value Chain	Porter[1985]
Strategic Thrust	Ulrich et al.[1985]
Portfolio Approach	McFarlan & McKenney[1984]
Information Engineering	Martin[1989]
4 FRONT	Delloitte Consulting
NAVIGATOR	Earnst Young
SUMMIT	Cooper & Lybrand
Growth Stage Model	Nolan & Norton

Change management is a very important factor required in the IS development process as well as IS planning. Early studies on planning systems emphasized the importance of identifying and overcoming sources of resistance to organizational planning[Steiner, 1979; Steiner & Schollhammer, 1975; Ramanujam & Venkatraman & Camillus, 1986]. Resistance to the idea and processes of planning can be expected to exert a negative influence on the IS planning process. Thus, this study used the 5 items, extracted from the IS literature, in order to measure the degree of resistance to planning and to create a favorable climate for IS planning; through a five-point

Likert-type scale ranging from "Very Insufficient" to "Very Sufficient".

4.3. Instrument Design

This study uses the corporate-level as the unit of analysis, which requires data from firms. Because the selection of respondents for data collection is very important in this study, questionnaires were sent to IS managers who have an overall understanding of the firm's corporate status.

The questionnaire for this study had an introduction explaining the goals of the study and two survey sections. Existing measures from past studies of organization theory and IS theory were adapted for the IS planning capability section. The three types of information requirement are unique to this study.

The introduction provided the overall purpose of the study and the guidelines for filling out the questionnaire. The introduction also collected the respondents' current position, sales volume, number of employee, number of employee in the IS department, annual budget of the IS department, IS planning time horizon, user involvement in IS planning, cost of IS planning, IS plan report decision level, etc.

The first section of the questionnaire asked respondents to judge the type of information requirements within a organization through a five-point Likert-type scale. This study defined three types of information requirements: strategic information, managerial information, operational information. However, there are no available measures for information requirement in the current IS literature. Thus a new measurement scheme for this construct was developed for this study. To measure the extent of information requirements when considering IS planning within a organization, respondents were asked to answer five-point Likert-type scale ranging from "Never considered" to "Considered very important" for each item of information requirement.

The IS planning capability discussed earlier were operationalized using sets of multiple terms. Respondents were asked to indicate, one to five Likert-type scale, the extent to which there were changes(in emphasis, involvement, perception, usage, etc) with respect to the issues addressed in each question, when they performed IS planning in the past. The items used for the operationalization procedure and the prior research from which these items were derived are described, in Table 4.

The study population was defined as large private sectors companies found in the 1994 Corporate 1000 list, which was published by Korean Investors Service(KIS), Inc.. This population was selected for its importance, the availability of information and the relative homogeneity of the business boundary, as compared to the public sector and small business.

Table 4. Summary of Variables and Measures used in This Study

Variable Type	Variable Class(Variable)	Operationalization
Independent	Total Information Requirement(TIR)	$TIR = (SINFO + MINFO + OINFO) / 3$
	Strategic Information(SINFO)	$SINFO = \sum(\text{score}) / 7 \text{ items}$
	Managerial Information(MINFO)	$MINFO = \sum(\text{score}) / 7 \text{ items}$
	Operational Information(OINFO)	$OINFO = \sum(\text{score}) / 6 \text{ items}$
Dependent	IS Planning Capability(ISPCAPA)	$ISPCAPA = (ISPRESO + QUALSTR + INTCAPA + ISMATUR + ISPMETH + CHNGMGT) / 6$
	IS Planning Resources(ISPRESO)	$ISPRESO = \sum(\text{score}) / 9 \text{ items}$
	Quality of Business Planning(QUALSTR)	$QUALSTR = \sum(\text{score}) / 4 \text{ items}$
	Internal Planning Capability(INTCAPA)	$INTCAPA = \sum(\text{score}) / 7 \text{ items}$
	IS Maturity(ISMATUR)	$ISMATUR = \sum(\text{score}) / 5 \text{ items}$
	IS Planning Methodology(ISPMETH)	$ISPMETH = \sum(\text{score}) / 13 \text{ items}$
	Change Management(CHNGMGT)	$CHNGMGT = \sum(\text{score}) / 5 \text{ items}$

V. Data Analysis

5.1. Sample Profile

The target population included 920 companies, chosen from the list of Corporate 1000. The survey instrument was mailed to the head of the IS department. One hundred and eighty seven respondents were received for a response rate of 20.3%. However, of the 187 respondents, 13 respondents were omitted from this study, because the same response was given for each question or too many nonresponse for question items. This leaves a final sample of 174 respondents for this study.

The characteristics of the sample are shown in Table 5. Responses were received from 4 industries, and from organizations varying widely in size, thus providing greater validity to the findings and enhancing the ability to generalize the results to a wider cross-section of the population. Responses were received from 5 types of planning time horizons. This item means the scope of IS planning indirectly.

An analysis of the respondents who provided their organizational title(73.5%) indicates that an overwhelming proportion were indeed IS managers. Generally speaking, senior IS managers are responsible for firm's IS management in Korean firm.

These evidences provide greater credibility and validity to the survey data.

Table 5 Sample Characteristics

Profiles	Frequency	Percentage
Sales Revenue(Won-base, N=150)		
Less than 50 billion	10	6.7
50 billion - 100 billion	32	21.3
100 billion - 200 billion	41	27.3
200 billion - 500 billion	28	18.7
500 billion - 1000 billion	19	12.7
Greater than 1000 billion	20	13.3
Number of Employee(N=174)		
Less than 200	18	10.3
200 employee - 500 employee	29	16.7
500 employee - 1000 employee	43	24.7
1000 employee- 2000 employee	47	27.0
2000 employee- 5000 employee	28	16.1
greater than 5000 employee	9	5.2
Industry(N=174)		
Manufacturing	89	51.1
Banking/Insurance	34	19.5
Wholesale/Distribution	27	15.5
Construction	24	13.8
Planning Time Horizon(N=172)		
within 6 months	15	8.7
within 1 year	38	22.1
within 2 year	46	26.7
within 3 -4 year	64	37.2
within 5 year	9	5.2
Title of Respondents(n=170)		
Supervisor	45	26.5
Manager	74	43.5
Senior Manager	32	18.8
General Manager	18	10.6
Director	1	0.6

5.2. Reliability and Validity Assessment

The items used for measuring the various constructs were tested for validity and reliability using factor analysis and Cronbach-Alpha test procedure. While validity measures the extent to which the indicator measures the underlying construct, reliability measures the stability of the scale[Nunnally, 1978].

Content validity of the constructs, which evaluates if all the dimensions of the construct are being measured[Churchill, 1979], was established through the various phases of the pilot test. Construct validity was evaluated using factor analysis to determine if all the items measuring the construct cluster together and measure a single construct. Initially, the correlation matrix of the items measuring the construct was analyzed to identify outliers that have very low interitem correlations.

In this study, the construct on the content of information requirement and the construct on IS planning capability exhibited significant convergent validity. As a

result of factor analysis on IS planning capability, nine factors were identified. In order to enhance the explanation capability of the construct on IS planning capability, it is preferable to use six factors, by merging the related variables. Thus, the existing two construct were continuously utilized for the next test.

Factor analysis was also used to test the discriminant validity of the constructs. All the items, measuring multi-item constructs, that are not expected to be correlated were subjected to factor analysis to determine if the items were loaded onto the correct construct. Based on criteria of factor loading, eigenvalues, and explained variance[Zeller & Carmines, 1980], it was found that all the constructs exhibited significant discriminant validity.

Reliability, which measures the internal consistency of the instrument, was assessed using Cronbach-alpha, as shown in Table 6. As results of reliability test for each construct, Cronbach-alpha values were, 0.8207 for Information Requirement(TIR), 0.9107 for IS planning capability(ISPCAPA). Most of the variables, except managerial information marginally short by 0.02, had a value higher than a cutoff value of 0.6, the commonly accepted for empirical research in social science. Therefore, the constructs were considered to exhibit adequate reliability. The correlation matrix shown in Table 7 supports all the positive relationships for six dimensions of IS planning capability, with an alpha level of 0.001, with the exception of the relationship between IS maturity and IS planning methodology($r=0.14769$, $p=0.0539$).

Table 6. Reliability Test

Variables	Mean	Std. Dev.	Cronbach-Alpha
TIR	3.34	0.46	0.8207
SINFO	3.03	0.75	0.8346
MINFO	3.45	0.50	0.5847
OINFO	3.59	0.56	0.6604
ISPCAPA	2.97	0.48	0.9107
ISPRESO	4.02	0.73	0.7689
QUALSTR	3.43	0.72	0.7791
INTCAPA	3.28	0.59	0.8419
ISMATUR	3.77	0.80	0.6314
ISMETHO	2.14	0.75	0.8890
CHNGMGT	3.13	0.61	0.7559

Factor analysis was also used to test the discriminant validity of the constructs. All the items, measuring multi-item constructs, that are not expected to be correlated were subjected to factor analysis to determine if the items were loaded onto the correct construct. Based on criteria of factor loading, eigenvalues, and explained

variance[Zeller & Carmines, 1980], it was found that all the constructs exhibited significant discriminant validity.

Reliability, which measures the internal consistency of the instrument, was assessed using Cronbach-alpha, as shown in Table 6. As results of reliability test for each construct, Cronbach-alpha values were, 0.8207 for Information Requirement(TIR), 0.9107 for IS planning capability(ISPCAPA). Most of the variables, except managerial information marginally short by 0.02, had a value higher than a cutoff value of 0.6, the commonly accepted for empirical research in social science. Therefore, the constructs were considered to exhibit adequate reliability. The correlation matrix shown in Table 7 supports all the positive relationships for six dimensions of IS planning capability, with an alpha level of 0.001, with the exception of the relationship between IS maturity and IS planning methodology($r=0.14769$, $p=0.0539$).

Table 7. Correlation Analysis of ISPC

	ISPCAPA	ISPRESO	QUALSTR	INTCAPA	ISMATUR	ISMETHO
ISPRESO	0.73628 0.0001***					
QUALSTR	0.71166 0.0001***	0.50411 0.0001***				
INTCAPA	0.71586 0.0001***	0.51080 0.0001***	0.61810 0.0001***			
ISMATUR	0.51364 0.0001***	0.27852 0.0003***	0.37974 0.0001***	0.38081 0.0001***		
ISMETHO	0.75957 0.0001***	0.36945 0.0001***	0.32423 0.0001***	0.27785 0.0002***	0.14769 0.0539+	
CHNGMGT	0.71725 0.0001***	0.52049 0.0001***	0.55102 0.0001***	0.55577 0.0001***	0.30553 0.0001***	0.37333 0.0001***

+ P < 0.1 * P < 0.05 ** P < 0.01 *** P < 0.001

5.3. Results of Hypothesis Testing

5.3.1. Results of Hypothesis 1, 2

In order to test H1, which is hypothesized the influence of organizational information requirements on IS planning capability, Pearson correlation analysis was employed. As a result, correlation coefficient of information requirements on IS planning capability was 0.46902, at a significance level of 0.0001, as shown in Table 8. The result shows that the relationship between information requirements and IS planning capability is

very positive. The result supports rejection of the null for hypothesis 1.

Table 8. Correlation Analysis For H1, H2

Sample Characteristics	Correlation Coefficient	P-value
Information Requirement & IS planning capability	0.46902	0.0001 ***
Information Requirements		
Strategic Information	0.48697	0.0001 ***
Managerial Information	0.27376	0.0005 ***
Operational Information	0.25399	0.0011 **

* P < 0.05 ** P < 0.01 *** P < 0.001

For testing H2, which hypothesized the influence of three types of information requirements on IS planning capability, Pearson correlation analysis was also employed. As a result, correlation coefficient of strategic, managerial, operational information requirements on IS planning capability was 0.48697 (p=0.0001), 0.27376 (p=0.0005), 0.25399 (p=0.0011), respectively, as shown in Table 8. This results indicate that strategic information requirements have higher positive association with IS planning capability, relative to other information requirements. The result supports rejection of the null for hypothesis 2.

Additional regression analyses shown in Table 9 support the positive linear relationships between information requirements and IS planning capability. Specifically, strategic information requirements are positively correlated to IS planning capability, at a significance level of 0.001. As a result of testing, it is concluded that information requirements are positively associated with IS planning capability.

Table 9. Result of Regression Analysis for H1, H2

Regression Model	R-square	Adjusted	F-Value	Prob.>F
① ISPCAPA = 1.34 + 0.49 IR (0.00)	0.2200	0.2150	44.558	0.0001
② ISPCAPA = 1.60 + 0.28 SINFO + 0.05 MINFO + 0.09 OINFO (0.00) (0.52) (0.18)	0.2545	0.2401	17.749	0.0001

① Durbin-Watson D = 1.956; 1st Order Autocorrelation = 0.021

② Durbin-Watson D = 1.947; 1st Order Autocorrelation = 0.024

5.3.2. Results of Hypothesis 3

In order to test H3, which hypothesized the influence of three types of information requirements on six dimensions of IS planning capability, correlation analysis and regression analysis were employed. As the result of correlation analysis, correlation coefficients of information requirements on six dimensions of IS planning capability show positive relationships at a significance level ($p < 0.05$), except for two relationships: the relationship between MINFO and ISMATUR, the relationship between OINFO and ISMETHO, as shown in Table 10.

In the case of strategic information requirements, correlation coefficient on six dimensions of IS planning capability is higher than other types of information requirements. It means that the more strategic the information requirements are, the more IS planning capability is required.

Table 10. Correlation Analysis

	SINFO	MINFO	OINFO
ISPRESO	0.27466 0.0003 ****	0.18426 0.0171 *	0.20153 0.0086 **
QUALSTR	0.44036 0.0001 ****	0.18557 0.0160 *	0.18821 0.0140 *
INTCAPA	0.35562 0.0001 ****	0.17839 0.0203 *	0.26803 0.0004 ****
ISMATUR	0.26668 0.0004 ****	0.10065 0.1942	0.20262 0.0081 **
ISMETHO	0.34501 0.0001 ****	0.23470 0.0021 ***	0.09049 0.2378
CHNGMGT	0.41424 0.0001 ****	0.24123 0.0016 ***	0.28698 0.0001 ****

* $P < 0.05$ ** $P < 0.01$ *** $P < 0.005$ **** $P < 0.001$

The differences of managerial information requirements and operational information requirements appear in only two dimensions of IS planning capability: IS maturity and IS planning methodology. Because managerial information requirements are implemented through a integration process which integrate individual systems, IS planning methodology for systems integration is essential. Meanwhile, the more mature IS developments are, the more IS staffs are experienced, because operational information requirements require skill and capability needed for IS development, such as systems analysis and design techniques, programming skill, and so forth.

Additional regression analyses shown in Table 11 support a positive or negative

linear relationships between the three types of information requirements and six dimensions of IS planning capability. Specifically, strategic information requirements have positive linear relationships for all the six dimensions of IS planning capability. However, managerial and operational information requirements have insignificant relationships for each dimension of IS planning capability, except for a positive linear relationship between operational information requirements and internal capability (beta=0.210, p=0.02). As a result of regression analysis, it is concluded that strategic information requirements are positively associated with six dimensions of IS planning capability. The result supports partial rejection of the null for hypothesis 3.

Table 11. Additional Analysis using Regression for H3

ISPCAPA	SINFO	MINFO	OINFO	R-square	Adjusted	F-Value	Prob.>F
① ISPRESO	0.173 (0.00)	0.029 (0.77)	0.144 (0.12)	0.0965	0.0791	5.552	0.0012
② QUALSTR	0.407 (0.00)	-0.010 (0.94)	0.078 (0.48)	0.1901	0.1746	12.208	0.0001
③ INTCAPA	0.269 (0.00)	-0.058 (0.58)	0.210 (0.02)	0.1689	0.1529	10.565	0.0001
④ ISMATUR	0.280 (0.00)	-0.138 (0.36)	0.229 (0.08)	0.0894	0.0719	5.105	0.0021
⑤ ISMETHO	0.315 (0.00)	0.211 (0.12)	-0.074 (0.53)	0.1382	0.1216	8.337	0.0001
⑥ CHNGMGMT	0.292 (0.00)	0.068 (0.52)	0.151 (0.11)	0.1947	0.1792	12.574	0.0001

- * ① Durbin-Watson D = 1.613; 1st Order Autocorrelation = 0.186
- ② Durbin-Watson D = 2.154; 1st Order Autocorrelation = -0.078
- ③ Durbin-Watson D = 2.270; 1st Order Autocorrelation = -0.136
- ④ Durbin-Watson D = 2.040; 1st Order Autocorrelation = -0.025
- ⑤ Durbin-Watson D = 1.983; 1st Order Autocorrelation = 0.004
- ⑥ Durbin-Watson D = 2.042; 1st Order Autocorrelation = -0.023

VI. Conclusion

Because of poor explanation of the dimensions of IS planning construct, the study on the influence of the typology of information requirements on IS planning capability remains incomplete until now. The purpose of this study is to test a two-fold proposition: 1) to identify the typology of information requirements and the dimensions

of IS planning capability; 2) to identify the relationship between the typology of information requirements and IS planning capability.

The results of data analyses indicated that the relationship between information requirements and IS planning capability was very positive. Also, strategic information requirements have higher positive association with IS planning capability, relative to other information requirements. Additional regression analyses support the positive linear relationships between information requirements and IS planning capability. Specifically, strategic information requirements are positively correlated to IS planning capability at high significance level.

The relationship of three types of information requirements with six dimensions of IS planning capability was positive at high significance level, except for two relationships: managerial information and IS maturity, operational information and IS planning methodology. Specially, the more strategic the information requirements are, the more IS planning capability is required. In additional regression analyses, strategic information requirements have positive linear relationships for all the six dimensions of IS planning capability. However, managerial and operational information requirements have insignificant relationships for each dimension of IS planning capability, except for a positive linear relationship between operational information and internal capability.

These results provide some very useful implications for improving the IS planning process design of an organization. In order to fulfill IS planning objectives, first, it needs to classify the organizational information requirements, such as top management's information needs. Second, it needs to design IS planning process appropriate to the typology of organizational information requirements. This implies that an organization can prioritize its objectives and then provide a better focus to its IS planning efforts by emphasizing the design elements of IS planning that are more closely linked to those two objectives.

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