



# A Study of Information Systems Planning and Its Effectiveness in Taiwan

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**The main objectives of this research were to compare and contrast the findings of the relationships among different stages of information systems (IS) strategic planning, system planning, plan implementation, and IS effectiveness across various organizations in Taiwan. The intent was to take a broad look at the key concerns of IS planning across cultures. The relationships among three phases of planning (strategic planning, systems planning, and plan implementation), and their relationships with user satisfaction were examined. Five hypotheses are used to examine the relationships. The correlation analysis results support the following hypotheses: (1) the extent of IS systems planning is positively associated with the extent of IS strategic planning; (2) the extent of plan implementation is positively associated with the extent of IS systems planning; and (3) the extent of IS strategic planning is positively associated with the extent of user satisfaction. IS systems planning has no effect on user satisfaction. IS plan implementation has no relationship with user satisfaction. Copyright © 1996 Elsevier Science Ltd**

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## Introduction

Both information systems (IS) successes and failures, coupled with hardware and software advances, have promoted increased user demands and expectations. Often, these demands cannot be met by the IS staff in a timely fashion and may even be viewed as being unrealistic. User expectations that have not been met by information system professionals have led to credibility gaps between users and IS professionals who must share the burden of fulfilling the technology needs of their users. Designing and operating an IS is a costly and difficult undertaking whether the system is oriented toward transaction processing activities or toward higher-level decision support. These difficulties have continued to lead to further IS failures and unmet user expectations.

The increased interest in higher-level IS has generated a corresponding increase in expenditures for strategic planning efforts related to IS<sup>1</sup> and the increase in expenditures will surely generate even greater expectations from the IS user groups. The effectiveness of the IS function continues to be a key concern of both IS managers and researchers.<sup>2</sup> One of the surrogates for IS effectiveness is user satisfaction.<sup>3</sup> User satisfaction has been defined as the extent to which users believe the IS available to them meets their information requirements.

The main objectives of this research were to compare and contrast the

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<sup>3</sup>IVES, B, OLSON, M H AND BAROUDI, J J (1983) 'The measurement of user information satisfaction' *Communications of the ACM* **26** 785-793

<sup>4</sup>PORTER, M E AND MILLAR, V F (1985) 'How information gives you competitive advantage' *Harvard Business Review* **63** 149-160; KING, W R AND SABHERWAL, R (1992) 'The factors affecting strategic information systems applications' *Information & Management* **23** 217-235; KETTINGER ET AL, *op cit*, Ref 1

<sup>5</sup>BALL, L AND HARRIS, R (1982) 'SIS members: a membership analysis' *IS Quarterly* **6** 19-38; DICKSON, G W, LEITHEISER, R L, WETHERBE, J C AND NECHIS, M (1984) 'Key information systems issues for the 1980s' *IS Quarterly* **8** 135-159; HARTOG, C AND HERBERT, M (1986) '1985 opinion survey of IS managers: key issues' *IS Quarterly* **10** 351-361; BRANCHEAU, J C AND WETHERBE, J C (1987) 'Key issues in information systems management' *IS Quarterly* **11** 23-45; HENDERSON, J C AND SIFONIS, J G (1988) 'The value of strategic IS planning: understanding consistency, validity, and IS markets' *IS Quarterly* **12** 187-199; RAGHUNATHAN, B AND RAGHUNATHAN, T S (1989) 'Rank of information systems executive role of information systems' *Journal of Management Information Systems* **6** 111-126; WATSON, R T (1990) 'Influences on the IS manager's perceptions of key issues: information scanning and the relationship with the CEO' *IS Quarterly* **14** 217-231; NIEDERMAN ET AL, *op cit*, Ref 2; WANG, P (1994) 'Information systems management issues in the Republic China for the 1990s' *Information & Management* **26** 341-352

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<sup>7</sup>GALLAGHER, C A (1974) 'Perceptions of the value of a management information system' *Academy of Management Journal* **17** 46-55; LARCKER, D F AND LESSIG, V P (1980) 'Perceived usefulness of information: a psychometric examination' *Decision Sciences* **11** 121-134

<sup>8</sup>GALLETTA, D F AND LEDERER, A I (1989) 'Some cautions on the measurement of user information satisfaction' *Decision Sciences* **20** 419-438; GATIAN, *op cit*, Ref 6

<sup>9</sup>INSTITUTE FOR INFORMATION INDUSTRY (1992) *Computer Usage in Taiwan. Market Information Center Annual Report* Taipei, Taiwan; EXECUTIVE YUAN (1994) *Computer Usage in Taiwan. Accounting and Statistics Annual Report* Directorate General of Budget, Taiwan

findings of the relationship among different stages of IS strategic planning, system planning, plan implementation, and IS effectiveness across various organizations in Taiwan. The intent was to take a broad look at the key concerns of IS planning in Taiwan.

## Literature review

Many companies have spent considerable time and money for IS strategic planning efforts, yet they still have problems during implementation. The significance of IS strategic planning is not only to integrate organizational strategic planning with IS planning, but also to recognize information technology as a means of a gaining competitive advantage in the marketplace.<sup>4</sup> The importance of strategic planning is reflected in a series of research efforts to identify IS key issues where 'improved IS strategic planning' has perennially been the top-ranking topic.<sup>5</sup>

Systems planning integrates the discrete IS subsystems into an effective integrated whole. Systems planning is directed toward the integration of systems and the compatibility of hardware and software. This is necessary because of the increasing rate of change of technology and the availability of different systems for a particular application within the specific organizational context. If this integration is not planned well, a firm may find itself using a number of independent systems which cannot be aggregated or compared, thus preventing the production of the consolidated perspective of the firm, consequently leading to a loss of control.

The implementation of an IS plan is an important phase which links planning and its effectiveness. Even a good plan, if not properly implemented, is expected to lead to dissatisfaction.

The effectiveness of IS planning has received a great deal of attention from researchers. Still, there is no unique evaluation on IS effectiveness. Different factors have been used to measure IS effectiveness.

User satisfaction has been used as a surrogate for systems effectiveness in many research studies.<sup>6</sup> Various instruments have also been developed to measure IS user satisfaction.<sup>7</sup> Moreover, research<sup>8</sup> indicates that the selection of the dependent variable is largely because more direct measures of management information systems utility may be difficult, if not impossible, to obtain. Although it may appear much easier to measure user satisfaction than the impact of IS on profitability. Therefore, user satisfaction will be considered as a primary indicator of IS effectiveness in this study.

Taiwan's total foreign exchange reserves have grown to more than US\$90 billion. It has joined the industrialized nations of the world as well. Companies in Taiwan must struggle to maintain their advantage in a global market that has become increasingly competitive. Adoption of the computer as an efficient tool for business operations is a world-wide phenomenon. It is not surprising that business organizations in Taiwan demonstrate the same strong need for using IS. Increasing international and domestic competition has forced Taiwan business organizations to computerize various information processing activities in the hope of sustaining competitiveness through productivity gains brought by this computerization. The perceived importance is reflected in the increasing installation rate and computer usage.<sup>9</sup> Furthermore, the service sector of the economy in Taiwan is growing at a faster rate than is the

industrial sector. Many services, such as stock investment, portfolio management, law, and medicine involve the transfer of large amounts of information. It is likely that greater applications of information technology will increase significantly in a number of other professional or service industries.

Although there are strong needs for IS development, some factors existed increase the difficulty for implementation, such as:

1. *National infrastructure.* In Taiwan, specific infrastructure components such as communication and transportation networks are not well developed. Although some firms use PC Local Area Networks (LAN)/Wide Area Networks (WAN) for communication, the smaller availability and higher cost of Taiwan developed software makes facsimile transition the main communication tool.<sup>10</sup> Electrical power output is also a problem in Taiwan, and it is reported that the power supply is getting worse.<sup>11</sup> An unreliable power supply, coupled with environmental problems, may also create serious problems for IS development and subsequent operations. The perceived importance can be seen in that both telecommunication and power supply issues are included in the government's US\$303 billion Six-Year National Development Plan (1991–1996) with US\$14.4 billion set aside for upgrading the island's telecommunication infrastructure over the next five years.
2. *Educational factors.* One of the most visible pressures for IS development is the scarcity of IS professionals.<sup>12</sup> A shortage of IS professionals, such as programmers and system analysts, exists. To further complicate this situation, the training of application-oriented system analysts and business-oriented application programmers is disproportional relative to needs.<sup>13</sup>

## Research methodology

Two survey instruments were used in this study. The first one was used to assess planning activities. Planning activities were measured by Raghunathan and King's IS planning questionnaire.<sup>14</sup> The IS planning questionnaires were used to evaluate the extent of IS strategic planning, IS systems planning, and plan implementation. The second was used to address user satisfaction. User satisfaction was measured by the questionnaire adopted from Ives *et al's* research.<sup>15</sup>

The two different questionnaires were mailed to the top 500 business organizations in Taiwan. For one complete usable data set, a matched pair of these questionnaires from the same organization was required. The top 500 organizations were chosen from the Annual Report produced by the China Credit Information Service Ltd.<sup>16</sup>

There were five hypotheses tested: (1) the extent of strategic planning for IS is positively associated with user satisfaction; (2) the extent of systems planning is positively associated with user satisfaction; (3) the extent of systems planning is positively associated with the extent of IS strategic planning; (4) the extent of plan implementation and user satisfaction is positively associated; and (5) the extent of plan implementation is positively associated to the extent of systems planning.

### *Statistical techniques*

The usable IS planning questionnaires were coded on the basis of the

<sup>10</sup>LEE, C H AND CHIN, C K (1989) 'Initialization of a computerization project in small business' *Information and Computer Magazine* **102** 80–89

<sup>11</sup>LIU, Y C (1988) 'What to do when power is gone?' *Information and Computer Magazine* **100** 116–117

<sup>12</sup> TSAI, C C AND LEE, C H (1989) 'The demand and situation of information technology strategy in small business' *Information and Computer Magazine* **102** 49–64

<sup>13</sup>IGBARIA, M (1992) 'An examination of computer usage in Taiwan' *Information & Management* **22** 19–28

<sup>14</sup>RAGHUNATHAN AND KING, *op cit*, Ref 6

<sup>15</sup>*Op cit*, Ref 3

<sup>16</sup>CHINA CREDIT INFORMATION SERVICE LTD (1992) *The Largest Corporations in the Republic of China—Top 500* Taipei, Taiwan

Table 1 Industry classification profile

Industry	Number of companies	% of total
<b>Manufacturing</b>		
Food	14	11%
Chemicals/Plastic	10	8%
Textile	9	7%
Metal/Steel	7	6%
Miscellaneous	8	7%
Finance, Banking and Insurance	11	9%
Wholesale and Retail	8	7%
Transportation, Communication and Utilities	10	8%
Construction	9	7%
Electrical/Electronic	25	20%
Government Agency	12	10%
<b>Total</b>	<b>123</b>	<b>100%</b>

responses giving values between 1 (for strongly disagree) and 5 (for strongly agree). In the case of user satisfaction questionnaires the scores ranged from 1 (for bad) to 7 (for good). Each of these matched pairs were checked for their appropriateness before they were added to the sample set.

The reliability of the two questionnaires was tested. The degree of measurement error for each questionnaire was tested by Cronbach's Alpha test. The five research hypotheses for this study were tested by correlation analysis.

## Results

There were 110 questionnaires returned from the first lot of 500 sets mailed; 86 of them had sufficient data to be included in this study. A follow-up questionnaire was mailed to those who did not respond to the first lot with a different cover letter; 50 questionnaires were returned from the second mailout and 37 of them were usable. In total, there were 123 matched pairs received for this study. Five of the unusable questionnaires showed no computing activities in those organizations. Other unusable questionnaires were either unmatched or incomplete. The usable response rate was 24.6 per cent. Both sets of questionnaires were coded to obtain industry type and additional information from the returned surveys. In addition, respondents were asked to record their job titles. The sample contains responses from a variety of industries and management levels. *Table 1* depicts the survey respondent profile by industry. *Table 2* depicts the survey respondent profile by job title.

First, the usable questionnaires were coded. Each of these matched pairs were checked for their appropriateness before they were added to the sample set. The following variables were measured with the use of the two questionnaires: (1) strategic planning consists of 20 items; (2) systems planning consists of 18 items; (3) IS implementation consists of 10 items; (4) user satisfaction consists of 66 items.

There is no correct value for a reliability measure; however, for exploratory research, reliability scores of 0.7 are assumed to be reason-

Table 2 IS planner and IS user classification profile

Job title	Number of respondents	% of total
<b>IS Department</b>		
Director/Assistant Director	9	7%
Manager	43	35%
Head	32	26%
Senior System Analyst	7	6%
Other	32	26%
<b>Total</b>	<b>123</b>	<b>100%</b>
<b>IS User</b>		
Chief Executive Officer/General Manager	2	2%
Vice-president functional/Assistant Vice-president	9	7%
Director/Assistant Director	15	12%
Manager/Assistant Manager	49	40%
Other	48	39%
<b>Total</b>	<b>123</b>	<b>100%</b>

ably significant.<sup>17</sup> A reliability assessment was carried out using Cronbach's Alpha test. All of the alpha scores are above 0.6.

The mean value of the responses to the multiple questions addressing each planning phase was taken as the measure for that construct. Table 3 reports means, standard deviations, and Pearson's product-moment correlation coefficients for each of the planning phases.

The correlation analysis results support the following hypotheses:

1. The extent of IS systems planning is positively associated with the extent of IS strategic planning.
2. The extent of plan implementation is positively associated with the extent of IS systems planning.

These results support the main hypotheses, which state that the three planning activities are expected to be positively and significantly related to one another. This means that Taiwan organizations who excel in conducting one phase of planning will also conduct the other phases; therefore, comprehensive planning for IS and the business will co-exist. Personnel from these Taiwan organizations perceive the importance of all the three planning phases since organizations which have paid adequate attention to planning activities have considered and im-

<sup>17</sup>NUNNALLY, T C (1978) *Psychometric Theory* McGraw-Hill, New York

Table 3 Mean and standard deviation and correlation coefficient for three planning phases

Dimensions	Mean	Standard deviation	STRAT	SYSTEM	IMPLEM
STRAT	3.95	0.40			
SYSTEM	3.96	0.39	0.84**		
IMPLEM	3.92	0.38	0.79**	0.84**	

Number of cases = 123

\*\*Significance < 0.01

STRAT, IS strategic planning; SYSTEM, IS systems planning; IMPLEM, IS implementation

Table 4 Mean and standard deviation for user satisfaction

Dimensions	Mean	Standard deviation
SATIS	5.34	0.65

Number of cases = 123  
 SATIS, user satisfaction

Table 5 Correlation coefficients for user satisfaction and three planning phases

Dimensions	STRAT	SYSTEM	IMPLEM
SATIS	0.22**	0.09	0.08

Number of cases = 123  
 \*\*Significance < 0.01

plemented all three. The concept and experience with IS planning in western society has had a positive impact on IS plan development in Taiwan. Recently, the study of IS planning has become an important issue in Taiwan.

Table 4 presents the mean value and standard deviation for user satisfaction. The high mean value, 5.34, indicates that Taiwan organizations express a relatively high degree of satisfaction with their planned information systems. Table 5 presents the Pearson's product-moment correlation coefficients between three planning phases and user satisfaction. Correlation analysis also supported the following hypothesis:

The extent of IS strategic planning is positively associated with the extent of user satisfaction.

This can be used to explain Taiwan's acceptance of the growing importance of IS as a strategic tool and a strategic resource. The current role of IS in Taiwan organizations has been found to emphasize a need for IS planning to be aligned with corporate goals and objectives. Thus, organizations have recognized the importance of IS strategic planning. Especially, due to significant declines in the cost of information technology and the greatly improved capability 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 advantages.

The concept of IS strategic planning has been discussed in the IS literature since the mid 1970s and has been given increased emphasis by practitioners and researchers during the 1980s. IS strategic planning, which is designed to coordinate IS with strategic planning of the organization, has not only a link with organizational performance, but also affects user satisfaction. As a result of similar US success, Taiwan organizations now view IS as having the capability to alter core organizational directions, reorient corporate strategy, and redefine industry structure.

Maintaining close agreement between the corporate goals and the IS goals is perceived as an important issue for Taiwan IS development. Also, the idea of creating and promoting IS activities which provide for or enhance competitive advantages for the organizations has been

adopted. There is no doubt that Taiwan organizations perceive the importance of IS strategic planning and that strategic planning has a positive impact on user satisfaction with information systems.

IS systems planning was found to have no effect on user satisfaction. Traditionally, Taiwan's information systems have been independently developed and operated. Consequently, a user's feeling of satisfaction with a previously developed system is not at all an equivalent measure of global information integration. User satisfaction of a single subsystem should not and cannot be used to measure the effectiveness of the entire IS system.

Next, IS plan implementation demonstrated no relationship on user satisfaction. Incentives and delegation of responsibility to those who are in charge of implementation is a key ingredient to promote an increase in implementation success. In Taiwan organizations, planning and control objectives are employed to facilitate wider functional uses of computers. Since control and planning of IS development is minimal, when problems are discovered, relative little attention has been directed toward resolving these problems.

The majority of Taiwan companies have a problem of lack of professional information systems personnel, and where the personnel are available, their skills are not fully developed. Also, the small size of the IS departments in Taiwan organizations prohibits wide-scale planning in practice. The size of the IS department also makes it difficult to develop standards for information activities and control mechanisms.

An egocentric outlook is often found in interdepartmental relationships in Taiwan organizations. As a result, it may be difficult to control IS activities and to obtain agreement from all departments with regard to IS priorities. A powerful IS department must exist in order to conduct appropriate IS plan implementation. However, this is rarely the case. Also, the IS manager may have difficulty communicating with top management in order to obtain management support. As far as the environmental conditions are concerned, the lack of involvement of top management and the egocentric outlook of departments are obstacles to IS plan implementation. Although user respondents indicated satisfaction with their systems, IS plan implementation did not contribute to the user satisfaction.

## **Summary and implication**

This study examined the relationship among three phases of planning (strategic planning, systems planning, and plan implementation), and their relationship with user satisfaction in the top 500 Taiwan business organizations. Five hypotheses were developed to examine the relationship. Two survey instruments were used to gather data for the hypotheses. After an examination for reliability and validity, Pearson's product-moment correlation coefficients were used to test the hypotheses.

This research dealt specifically with IS planning activities and user satisfaction in Taiwan's top 500 business organizations. For some organizations IS activities represent an area of great strategic importance, while for others they play a cost-effective supportive role. Depending upon the industries in which a firm competes, the relative importance of IS and its planning may vary. One potential area for

research would be to study the differences in the relationships in different industrial settings.

The increasing importance of information in all of society highlights the need for further examination of the planning processes. When this is accomplished, it may be possible to better manage, from both a cost and information content perspective, the infusion of technology in business environments. When and if this is done, both short-run and long-run payoffs can result. The importance of planning, particularly strategic planning for the IS resource in Taiwan, has been demonstrated in this study. Similar studies in other countries should also be pursued.