Asian Academy of Management Journal, Vol. 7, No. 2, 67–86, July 2002

STRATEGIC INFORMATION SYSTEMS PLANNING IN THE BANKING SECTOR—A PATH ANALYTIC MODEL STUDY IN THE INDIAN CONTEXT

A. M. Rawani
M. P. Gupta
Govt. Engineering College,
Raipur, India

ABSTRACT

This paper presents a path analytic model showing the cause and effect relationships among various Information Systems (IS) planning variables for the banking sector in India. In recent years, there has been an increased awareness among banks of the potential of Information Technology (IT) and the use of information systems. Strategic information system planning (SISP) becomes an important issue in the use of IS strategically. In India, banks have now started realizing the importance of SISP. In this study, 11 IS planning variables for the banking sector in India are examined and the influence of one over the other is investigated using path analysis. Data for the study are collected from 52 banks operating in India. The results of the study indicate that top management involvement in IS planning greatly influences the whole planning exercise. Moreover, top management involvement is higher when they foresee greater future impact of IS. The study also highlights the need and importance of user training in the banking sector. Change in the focus and orientation of user-training will make the users competent to conceive with innovative IS applications.

INTRODUCTION

SISP has become an increasingly important issue for both researcher and practitioner (Earl, 1993; Sass and Keefe, 1988). In the supply of key issues over the past ten years, SISP has consistently remained among the top ten issues (Caudle, Gorr and Newcomer, 1991; Teo, Ang James and Pavri, 1997). One main reason is that many organizations are currently looking for innovative use of IT to lower cost and differentiate products/services in order to compete more effectively in the technology-led competitive environment. However, Palvia and Palvia (1992) found that SISP is ranked as the eighteenth issue in India. They argue that developing countries like India, being in the initial stage of Management Information System (MIS) growth, are still struggling with operational issues and seem to have little vision for strategic issues.

Lederer and Sethi (1992) have given two simultaneously performed approaches to SISP. SISP helps organizations use IS in innovative ways to build barriers against new entrants, change the basis of competition, generate new products and build in switching cost (Porter 1985). As such SISP promotes innovation and creativity. SISP is also a process of

identifying a portfolio of computer-based applications to assist an organization in executing its current business plans and thus realizing its existing business goals. The distinction between the two approaches results in the former being referred to as attempting to impact organizational strategies and the latter as attempting to align MIS objectives with organizational goals (Lederer and Sethi 1992). Therefore, SISP is considered as the combination of two processes:

- Innovative and creative process to use IS for competitive advantage.
- Process of identification of opportunities to use IS to assist the organization in performing its current business and thus achieving business goals.

There are many studies on SISP, but most of these studies have tried to find out the various IS planning variables and made comparisons among industry groups (Premkumar, 1992; Premkumar and King, 1991; Raghunathan and Raghunathan, 1990). Previous research have highlighted the importance and influence of various IS planning variables on planning effectiveness and the impact of IS on an organization's performance. Very few studies have examined IS planning variables in Asian countries (Teo et al., 1997). Kanungo (1995) has conducted a study of the service sector in India with the aim of assessing the nature of IT use with special reference to the management of IT. Ramraj (1996, 2000) has conducted an empirical study to test the hypotheses related to flexibility, user involvement and MIS success for effective MIS planning. Kanungo and Chouthoy (1998) have investigated the critical nexus between IT planning and IT effectiveness in the Indian corporate world. Walsham and Sahay (1999) describe the efforts made in India to develop and use Geographical Information Systems (GIS) to aid district level administration giving in-depth analysis of GIS initiatives. But to the best of the author's knowledge, there is no study that tries to correlate various important SISP variables. Therefore, this research aims to correlate and find the influence of one variable on the other. For this research, the banking sector has been selected because banking operations are heavily dependent on information systems. Banking is no longer a business confined to money transactions but is perceived as a business related to information flow. In the Indian banking sector, a phenomenal growth has taken place in the size, spread and activities undertaken by banks over the last three decades. With the entry of new banks, the competition for customers is intensifying. Against this background, the use of computers and allied technologies by banks has become inevitable to achieve satisfactory levels of customer service. With the increased level of IT infusion and diffusion, there is a need for SISP in the banking sector. This study focuses on the variables of SISP in the Indian banking sector. Specifically, an attempt is made to identify SISP variables and to discover how the variables influence each other.

SISP VARIABLES

SISP variables, which are well studied by most of the researchers are *Information Input* (Premkumar and King, 1991; Premkumar, 1992), *Role of Information Systems* (Raghunathan and Raghunathan, 1990; Premkumar and King, 1991; Premkumar, 1992; Premkumar and King, 1992), *Planning Formalization* (Sabharwal and King, 1995; Premkumar and King, 1994; Lederer and Sethi, 1996; Segars et al., 1998; Segars and Grover, 1999), *Quality of Support Mechanisms* (Premkumar and King, 1991; Premkumar, 1992), *Top Management and User Involvement* (Raghunathan and Raghunathan, 1990; Premkumar, 1992; Conrath et al., 1992; Premkumar and King, 1992; Walsham and Waema, 1994; Teo et al., 1997; Segars et al., 1998; Segars and Grovers, 1999), *Business Domain Analysis and Technology Domain Analysis* (Premkumar and King, 1991; Premkumar, 1992), *Planning Effectiveness* (Premkumar and King, 1991; Premkumar, 1992; Conrath et al., 1992; Premkumar and King, 1992; Segars et al., 1998; Segars and Grover, 1999) and *Contribution of IS to Organization's Performance* (Raghunathan and King, 1988; Premkumar and King, 1991; Premkumar, 1992; Premkumar and King, 1992; Teo et al., 1997). These variables are also relevant to the banking sector and are discussed below.

Information Input

IS planning is an information intensive exercise (Premkumar, 1992) that is primarily dependent on information input from strategic business planning to provide guidelines and directions. The need to derive IS strategy and plans from business strategies and plans have been emphasized in the literature (King, 1988). The business mission, objectives, strategies and plans of the bank provide the necessary information to guide the IS strategic planning process. Informational input to IS planning comes from users, top management and IS planning staff (Premkumar and King, 1991). In the banking sector, there are various user departments such as retail banking, corporate banking, international banking and treasury operations. These user departments can provide input to IS planning functions regarding IS requirements related to their business. Such input can be obtained through a series of interviews. Some education and training of participants may be required to help them understand the planning process and the potential of IS technology in their operations so that they can provide useful input to IS planning.

Role of IS—Impact of Present and Future IS

For some organizations, IS activities represent an area of great strategic importance, while for others they play only supporting roles. McFarlan, McKenny and Pyburn (1983) have first identified different roles and represented them on a *'Strategic Grid'*. A strategic grid is a 2 x 2 matrix formed by representing the strategic impact of present information system on one axis and impact of future information system on the other axis. The identified four roles of an information system are *Strategic*, *Factory*, *Turnaround* and *Support*.

Planning Formalization

Formalization refers to the existence of written guidelines and procedures for the planning process and also output of the planning process. A highly documented and formalized planning process is more rationalized for constructing strategic plans (Sabharwal and King, 1995; Premkumar and King, 1994). Ideally, formalized procedure produces efficiency gains by systematic identification of strategic issues. However, gains in efficiency accruing from documented procedure must be balanced against reduction in flexibility. Documented formalized procedure retards prompt and efficient elimination of strategic issues, once they become unimportant (Lederer and Sethi, 1996). Planning must be so designed that a wide variety of opportunities for supporting strategy and creating new strategic opportunities are identified and at the same time the planning process facilitates the rapid resolution of strategic issues in order to adapt plans to ever-changing competitive and technological conditions (Earl, 1993; Sabherwal and King, 1995; Lederer and Sethi, 1996).

Quality of Support Mechanisms

The support mechanisms are used to help integrate the business plans with IS plans. This can be achieved by the active interaction of business planning systems with IS planning systems. The biggest problem in IS planning is the lack of understanding of top management's objectives and business plans by IS planners. This can be reduced by facilitating mechanisms such as the participation of IS managers in the business planning process and the interaction of business planners and IS planners.

Top Management and User Involvement

Involvement of top management provides the general direction for IS planning and also communicates a positive signal to other members in the organization and helps in getting greater commitment and involvement from users (Premkumar, 1992). Lederer and Mendelow (1986, 1987) noted that understanding top management's objectives facilitate the IS planning process. It is important to get a clear statement of commitment from senior management, and if they are convinced that competitive advantage can accrue by means of a new/revised IS, they are prepared to share their objectives with IS executives. An equally important issue is the involvement of users in the planning process. The systems are developed for the users, therefore their involvement in the planning and development phase facilitates the implementation of plans (Premkumar, 1992). Active participation and involvement of various user departments of banks such as retail banking, corporate banking, international banking and treasury etc., will help to align IT with the bank's business.

Business Domain Analysis

It identifies and evaluates the various alternatives for using IS to support the bank's business objectives and also explores various opportunities of using IS for the bank to gain competitive advantage. Exploring the business environmental opportunities and threats to the use of IS will also fall under this category.

Technology Domain Analysis

It converts the bank's business requirements into a set of project plans to achieve the bank's objectives. In India, it is believed that there was more focus on the technological aspects of IS planning compared to business aspects, the reason being that IT implementation was greater at the initial stage. Gradually, the importance of business aspects in IS planning is realized by organizations like banks that have significant IS stake in their business. However, there is no empirical support to this belief. Our research aims to uncover the facts.

Planning Effectiveness

The planning is initiated to fulfill certain key objectives and the extent of fulfillment of these objectives can be considered as planning effectiveness (King, 1988). In the case of banks, key objectives can be the identification of new service delivery channels such as Automatic Teller Machines (ATM), Internet banking, Mobile banking, identification of new back office applications, better planning and control of software, hardware and human resources, increasing user satisfaction, etc.

Contribution of IS to Bank's Performance

The ultimate impact of IS planning is felt in the bank's performance. Top management would also be keen to know this. Quantification of the benefits of planning cannot be reduced to simple financial measures such as return on investment, payback or internal rate of return. As has been pointed out in the literature, SISP renders many benefits that are intangible (King, 1988). Therefore, measuring the impact of SISP is a complex exercise and must incorporate consideration of these intangible benefits. Instead of evaluating the impact based on absolute financial measures, which could be influenced by many other factors, a better approach would be to obtain perceptions of IS contribution to some of these measures. In the case of banking, the measures could be the bank's operational efficiency, the speed of handling per customer per service, the controlling of non-performing assets, inter-branch transaction efficiency, etc.

RELATIONSHIPS AMONG VARIABLES–HYPOTHETICAL MODEL

IS planning is a future-oriented activity and hence the contingent nature of planning is better emphasized in a future-oriented IS environment than in a current-oriented IS environment. In the past empirical studies (Premkumar and King, 1992) of assessment of IS planning and the role of IS in organizations, it has been emphasized that out of the two dimensions of the strategic grid, the future impact dimension plays a predominant role. The organizations that foresee a significant role of IS in the future (strategic/turnaround groups) have significantly better quality of support mechanisms and planning processes.

As per the general management thinking and critical success factor (CSF) approach, top management allocate their time on few things that are important for successful performance of the firms. Therefore, it is expected that top management involvement in banks is affected by the present and future impact of IS on the banks.

The support mechanisms are used to help integrate the business plans with the IS plans. This can be achieved by the active interaction of business planning systems with IS planning systems. The biggest problem in IS planning is the lack of understanding of top management's objectives and business plans by IS planners. This can be reduced by facilitating mechanisms such as the participation of IS managers in the business planning process and the interaction of business planners and IS planners.

Teo and Ang (1999) found that top management commitment to the strategic use of IT is the number one CSF for business IS alignment. Involvement of top management in IS planning has been repeatedly found to be an important facilitator for effective IS planning. Therefore, top management involvement is expected to affect the quality of support mechanisms.

Planning must be so designed that a wide variety of opportunities for supporting strategy and creating new strategic opportunities are identified, and at the same time the planning process must facilitate the rapid resolution of strategic issues in order to adapt plans to ever-changing competitive and technological conditions. Banks that foresee greater future impact of IS are expected to have more formalized IS planning process.

In India, IS executives focus on IS issues, whereas business managers focus more on business issues because IT is thought of as the responsibility of IS managers. In such an environment, the interaction of the two groups will lead to explicit formal procedures to safeguard the interest of the two groups. Therefore, planning formalization is expected to be influenced by the quality of support mechanisms and the future impact of IS. Formal planning procedures will improve the information input to the planning process from external environment. In banks, user departments are the bank's functional departments such as individual/corporate banking, treasury and foreign exchange functions, investment banking, etc. When there is increased level of interaction between IS planners and business

planners, users i.e. functional departments will be motivated to get involved to protect their own interests. Therefore, user involvement is expected to be influenced by the quality of support mechanisms.

A highly documented and formalized planning process is more rationalized for constructing strategic plans. In India, most of the IS are still in the developmental stage; focus being on technology domain analysis. Therefore, increased formalization will cause increased technological analysis. Once the technological aspects of the analysis are covered in detail, the business aspects will be taken care of. Therefore, technology domain analysis is expected to affect the business domain analysis.

Technology domain analysis in banks is concerned with the analysis of information requirements of the bank, the analysis of fraud risk associated with the IS projects and the analysis of hardware and software requirements by the bank. This can be better analyzed by the proper interaction of business planners with IS planners. In other words, the support mechanisms will influence the extent of technological aspects of IS planning. The systems are basically developed for the users, therefore users can better understand and explain their requirements, hence user involvement in IS planning is also expected to influence the technological aspects of planning. Banks that foresee a significant IS stake in their business in the future, are expected to concentrate more on the business aspects of IS planning.

As stated earlier, informational input to IS planning come from users, top management and IS planning staff. Hence, increased interaction of IS planners with the bank's business planners i.e. quality of supporting mechanisms will help to give more information input to IS planning. A formal planning process is also expected to result in better information input.

Literature review suggests that planning effectiveness is affected by environmental conditions such as competitive trends, customer and supplier trends and business conditions. Knowledge about internal and external environments are covered in the information input variable. Therefore, information input will affect planning effectiveness. In India, planning effectiveness is also expected to be governed by the technology domain analysis, because here focus of IS planning is more technology-oriented.

The ultimate impact of IS planning is felt in the organizational performance. This measure is of interest to top management. The impact of IS on the banks' performance would be better for those banks that conduct detailed analysis of the business aspects of IS planning, because this analysis explores using IS for competitive advantage. In addition, this measure also analyses the external opportunities, threats and critical success factors for the bank's success. Similarly, the fulfillment of IS objectives and goals will also increase the impact of IS on the banks' performance. Therefore, the impact of IS contribution to the

banks' performance is expected to be influenced by planning effectiveness and business domain analysis.

As a result, expected relationships between various variables can be expressed in the form of the following functions:

Function 1: Top Management Involvement	=	f (Present Impact of IS, Future Impact of IS)
Function 2: Quality of Support Mechanisms	=	f (Top management involvement, Future Impact of IS)
Function 3: Formalization	=	f (Future Impact of IS, Quality of Support Mechanisms)
Function 4: User Involvement	=	f (Future Impact of IS, Quality of Support Mechanisms)
Function 5: Business Domain Analysis	=	f (Future Impact of IS, Technology Domain Analysis)
Function 6: Technology Domain Analysis	=	f (Quality of Support Mechanisms, Planning Formalization, User Involvement)
Function 7: Information Input	=	f (Quality of Support Mechanisms, Planning Formalization)
Function 8: Planning Effectiveness	=	f (Information Input, Technology Domain Analysis)
Function 9: Contribution of IS to Bank's Performance	=	f (Business Domain Analysis, Planning Effectiveness)

The above relationships are shown in Figure 1 and can also be expressed in the form of the following hypotheses:

Hypothesis I : Top management involvement is influenced by the present and future impact of IS.

Hypothesis II : The quality of support mechanisms is influenced by top management involvement and the future impact of IS.

Hypothesis III : The extent of IS planning formalization is influenced by the future impact of IS and quality of support mechanisms.

Hypothesis IV : User involvement is influenced by the future impact of IS and the quality of support mechanisms.

Hypothesis V : The business domain analysis is influenced by the future impact of IS and technology domain analysis.

Hypothesis VI : The technology domain analysis is influenced by the quality of support mechanisms, planning formalization and user involvement.

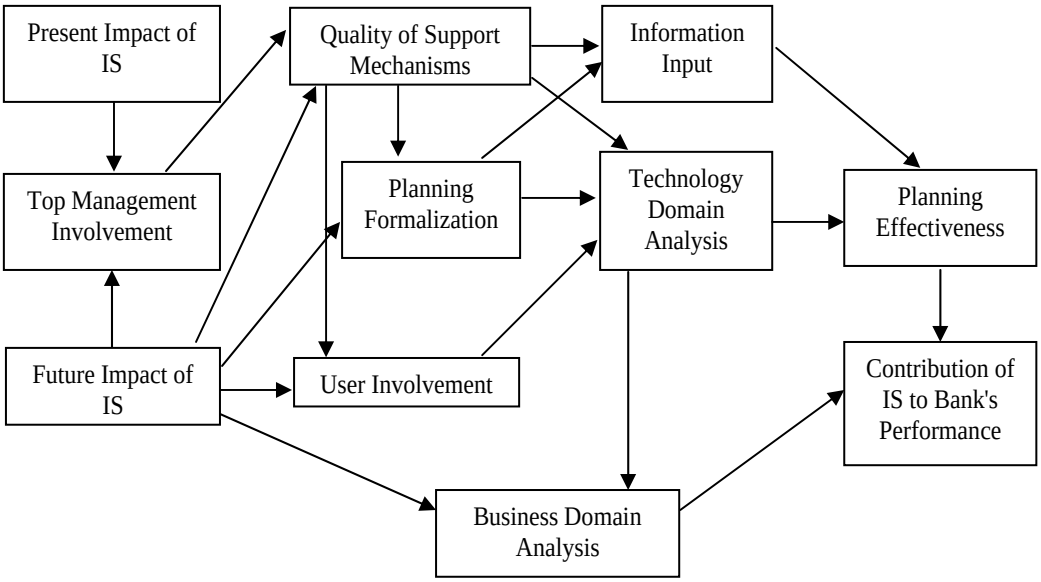

Figure 1. Hypothetical model showing relationships between IS planning variables

Hypothesis VII : Information input is influenced by planning formalization and quality of support mechanisms.

Hypothesis VII : Planning effectiveness is influenced by information input and technology domain analysis.

Hypothesis IX : The contribution of IS to bank's performance is influenced by the planning effectiveness and business domain analysis.

RESEARCH METHODOLOGY

Measurement

The research variables were measured using multi-item indicators. For all the constructs, a five point Likert-type scale was used. Information input was measured using four items that assessed levels of awareness among IS planners on the bank's business strategy, objectives and goals, extent to which the Computer Policy and Planning Department (CPPD) or IT department of the bank is provided with a clear mission of the department,

the extent to which business plans provide directions to IS planning, and the extent of awareness of IS planners about IT applications of the competitors.

The role of IS was assessed using two dimensions of the *'Strategic Grid'*, described by Cash, McFarlan, McKenny and Vital (1988). The multi-item construct was used to measure the present and future impact of IS in banks. Initially, as per the guidelines provided by McFarlan et al. (1983) and in consultation with IS executives of the banks, four items were suggested to measure the present impact and five items to measure the future impact of IS. Subsequently, two items had to be dropped due to problems in convergent validity. Hence, seven items were used to measure the two dimensions—present and future impact of IS on banks. The impact of one-hour shutdown of computer services, feasibility of manually processing of data related to deposit and withdrawal of cash and the bank's critical dependency on present IS are used to determine the present impact of IS. For finding the future impact of IS, items such as whether banks are developing new systems for efficiency improvement, whether systems are developed to create new service delivery channels/products (e.g. ATM, Net banking, etc.), whether IS are providing new ways to compete by offering technology-based efficient payment systems or reaching more customers at lower costs, whether IS applications under development are vital for the bank's strategic objectives, etc. are used.

Formalization of planning process was measured using four items. The extent of using formal planning techniques like Business Systems Planning (BSP) or CSF, the extent to which planning process is structured, the existence of written guidelines for carrying out planning exercise and the formal documentation of output of planning were used to measure the degree of formalization in the planning process. The flow of the planning process is measured using three items indicating the initiator in the planning exercise. The quality of support mechanisms was measured using two items that assessed the degree of participation of IS managers in strategic business planning and the level of interaction between IS planners and business planners. User-involvement in strategic IS planning is measured by three items to assess whether users come up with creative ideas to use IS strategically, whether suggestions are invited from users to use IS or whether users are involved to define only the system specifications. Top management involvement was measured using three items, namely management's perception, vision and views about IT.

The business domain analysis dimension was measured by evaluating the analysis of IT aspects related to the bank's business. Four items used for evaluation are; the extent of analysis of the bank's strengths and weaknesses in IS, CSF, exploring opportunities for gaining competitive advantage using IS and the extent of analysis of environmental opportunities and threats. The technology domain dimension was measured using four items that evaluated the extent of analysis of the bank's information requirements, hardware and software requirements, fraud risks associated with the projects and forecasting of technology development, and its importance for banking business.

IS planning is initiated by any organization with certain objectives and the level of fulfillment of these objectives can be considered as planning effectiveness. Initially, eight items were used. Subsequently, one item was dropped due to problems in convergent validity. Seven items (objectives of IS planning), which have been finally included in the analysis are; identification of new IT-based service delivery channels (Internet banking, Mobile banking etc), identification of new back office applications, assessment of technology trends to make IT investment decisions, increased communications with top management and users, better planning and control of software, hardware and personnel, better alignment of IS strategies with business strategies, and increased user satisfaction. Banks may give more importance to one objective over the other. Therefore, respondents were asked to indicate the degree of importance of listed objectives as well as their levels of achievement. Planning effectiveness was calculated by obtaining the average of achievements of seven objectives weighted by their respective degree of importance.

The contribution of IS to the bank's performance was measured using five items i.e. the bank's operational efficiency, the speed of handling per customer per service, the bank's fraud protection, controlling non-performing assets (NPA) and improvement in return on assets & capital adequacy ratio and lastly inter-branch transactional efficiency. The first factor is related to improvement in back office efficiency, the second to customer service, the third to the bank's security issues because of less manual control, the fourth to the bank's financial position and returns and the last to how computerization has resulted in inter-branch connectivity. Here again, for a bank, one measure may be more important over than other. Therefore, respondents were asked to indicate the degree of importance of performance measures as well as the degree of contribution of IS to each one of them. Contribution of IS to the bank's performance was calculated by obtaining the average of contribution of five measures weighted by their degree of importance.

Data Collection

A detailed questionnaire was developed to measure the various research variables. The items in the questionnaire were derived from an extensive literature review. For content validity of the instrument, two senior faculty members from banking institutes in India and four faculty members (IT management) from educational institutes were involved. They suggested adding some of the items and rewording some of the questions. The questionnaire was duly corrected based on feedback obtained from the content validity exercise. Certain changes in the sequencing of the questions were also made at this stage to maintain the natural flow of thoughts. After incorporating all the suggestions, the questionnaire was administered.

For data collection, ten sets of the questionnaire were mailed (courier or e-mail) to the IT head of all commercial banks operating in India. The target population consists of 103 commercial banks, which includes 27 public banks, 33 private banks and 43 foreign banks. After one month, they were reminded through e-mail, fax and phone. In some cases

personal visits to the respondents were made. Subsequently, as shown in Table 1, 157 responses from 52 banks (or 50% of the target population) were deemed valid and included in the study.

TABLE 1
STATISTICS OF OBTAINED RESPONSES

Category	Responses obtained	No. of banks participated	Percentage of total banks participated
Public Banks	73	19	36.54%
Private Banks	51	19	36.54%
Foreign Banks	33	14	26.92%
Total	157	52	100

Validity and Reliability of the Research Construct

Multi-item indicators used for measuring the various research variables were tested for construct validity and reliability. Construct validity measures the extent to which indicator measures the underlying construct, whereas reliability measures the consistency of the instrument. The construct validity was evaluated using factor analysis to confirm whether all the items measuring the construct cluster together and measure a single construct. The method of principal component with varimax rotation was used for factor analysis. The results of validity testing are given in Table 2. The minimum factor loading for all the construct is more than 0.5. Reliability, which measures the internal consistency of the instrument, was assessed using Cronbach's alpha. The alpha values along with descriptive statistics of the entire construct are presented in Table 3. All alpha values are more than 0.6, which is an acceptable limit in a research of such nature (Premkumar, 1992; Teo and King, 1997). The results of the validity and reliability tests indicate that the used instrument is a valid and reliable instrument.

DATA ANALYSIS AND DISCUSSION

Data are analyzed using path analysis. Path analysis is a multivariate analytical methodology for empirically examining sets of relationships in the form of linear causal models (Duncan, 1986; Hsi-Peng Lu and Da-Chin Yeh, 1998). Regression analysis is merely an analysis of correlation, whereas path analysis looks explicitly at cause. Path analysis excels conventional regression analysis in terms of the former's ability to extend the single multiple regression equation treatment to a network of equations involving more than one equation (Li, 1975; Hsi-Peng Lu and Da-Chin Yeh, 1998). Specifying a path diagram is the first step in path analysis. Path diagram is an explicit hypothesis of cause and effect that is to be tested using the method of path analysis. The proposed model or path diagram for this study is shown earlier in Figure 1.

TABLE 2
VALIDITY OF THE CONSTRUCT

Construct	No. of items	Eigen value	Variance explained	Minimum factor loading
Present Impact of IS	3	2.04	18.55	0.65
Future Impact of IS	4	2.32	21.13	0.61
Information Input	4	3.25	29.53	0.75
Planning Formalization	4	2.96	18.52	0.74
Quality of Support Mechanisms	2	2.40	15.03	0.69
User Involvement	3	1.84	11.50	0.62
Top Management Involvement	3	2.16	13.53	0.62
Business Domain Analysis	4	3.40	28.34	0.75
Technology Domain Analysis	4	3.28	27.37	0.70
Planning Effectiveness	7	4.16	34.67	0.66
Contribution of IS to Bank's Performance	5	3.82	31.80	0.61

TABLE 3
RELIABILITY

Construct	No. of items	Mean	S. D.	Alpha
Present Impact of IS	3	3.673	0.871	0.746
Future Impact of IS	4	4.334	0.542	0.790
Information Input	4	4.080	0.675	0.882
Planning Formalization	4	3.548	0.817	0.865
Quality of Support Mechanisms	2	3.812	0.726	0.791
User Involvement	3	3.480	0.768	0.791
Top Management Involvement	3	4.242	0.781	0.809
Business Domain Analysis	4	3.709	0.919	0.913
Technology Domain Analysis	4	3.951	0.919	0.930
Planning Effectiveness	7	3.00	0.709	0.848
Contribution of IS to Bank's Performance	5	3.930	0.844	0.794

The SPSS Amos software (version 3.6) was used to evaluate the hypothesized model. The variance inflation factor (VIF) is also determined to detect the problem of multicolinearity, if any. Colinearity refers to the situation where correlation among independent variables are strong. Mean values of VIF found to be less than two, indicates that there is no problem of multicolinearity. In terms of goodness of fit indicators, the chi-square value is 44.8 (degree of freedom = 34) at probability level of 0.102. This indicates that the probability of getting a chi-square value as large as 44.8 is 0.1. In other words, departure of data from the model is significant at the 0.1 level.

The ratio of minimum discrepancy to degree of freedom (CMIN/DF) has been suggested as a measure of fit. This ratio should be close to one (James Arbuckle, 1997) for a correct model. In our model the ratio of 1.32 indicates a good fit. If the ratio of chi-square to

degree of freedom is more than two, it indicates an inadequate fit (Byrne, 1989). Other fitness indices such as Boolen's Relative fit Index (RFI), Boolen's Incremental Fit Index (IFI), Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI) should be close to one for a good fit (James Arbuckle, 1997). The Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI) are two more indices that were used for testing the goodness of fit of the model. The values of these indices should also be close to one.

The root mean square residual (RMR) is the square root of the average squared amount by which the sample variance and covariance differ from their estimates obtained under the assumption that the model is correct. The smaller the RMR, the better it is. An RMR of zero indicates a perfect fit. Table 4 presents the values of various indices of goodness of fit.

TABLE 4
EVALUATION OF FITNESS OF HYPOTHESIZED MODEL

Measures of Fitness of Model	Value
Chi-Square/Degree of freedom	1.32
Boolen's Relative Fit Index (RFI)	0.84
Boolen's Incremental Fit Index (IFI)	0.97
Tucker-Lewis Index (TLI)	0.96
Comparative Fit Index (CFI)	0.97
Goodness of Fit Index (GFI)	0.87
Adjusted Goodness of Fit Index (AGFI)	0.75
Root Mean square Residual (RMR)	0.04

The critical ratios for all the paths are more than 1.96 except for two paths, indicating that path coefficient are significantly different from zero at 0.05 level. The critical ratio for path from present impact of IS to top management involvement is obtained as 1.7, while that from user involvement to technology domain analysis is 1.4. These values indicate that the path coefficient for these two paths are not significant. Top management allocate their time on few things that are important for the successful operation of the bank. Therefore, the greater impact of present IS would cause greater top management involvement. Similarly, systems are basically developed for the users, hence their involvement in planning will provide accurate and timely information about the requirements of the bank's business. This would help the IS planners to carry out detailed analyses of the technological aspects of planning. Therefore, the importance of these two paths in the model cannot be overlooked. Figure 2 provides the values of path coefficients for all the paths of the hypothetical model.

The squared multiple correlation for each endogenous variable is calculated and presented in Table 5. A variable's squared multiple correlation is the proportion of its variance that is accounted for by its predictors. The values of squared multiple correlation suggest that business domain analysis, technology domain analysis, planning effectiveness and

contribution of IS to the bank's performance is highly accounted for by their predictor variables.

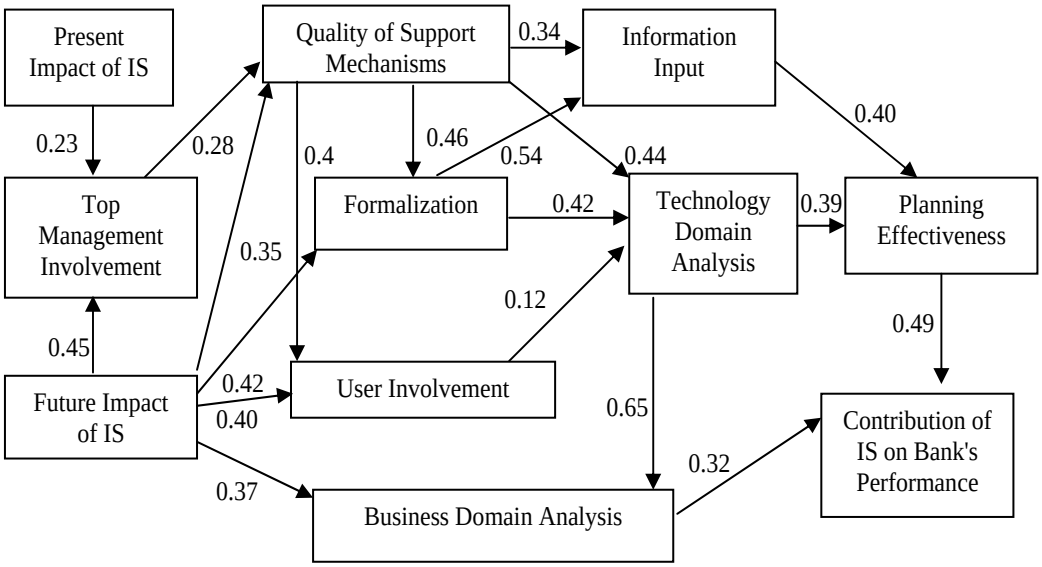

Figure 2. Model with path coefficients between IS planning variables

TABLE 5
SQUARED MULTIPLE CORRELATION OF ENDOGENOUS VARIABLES

Endogenous Variable	Squared Multiple Correlation
Top Management Involvement	0.39
Quality of Support Mechanisms	0.29
Planning Formalization	0.57
User Involvement	0.47
Information Input	0.65
Business Domain Analysis	0.82
Technology Domain Analysis	0.74
Planning Effectiveness	0.52
Contribution of IS to Bank's Performance	0.62

The analysis of the data fully supports all the hypotheses except hypothesis VI, which is partially supported. Surprisingly, the influence of user involvement on technology domain analysis was found to be insignificant. This could be because users in banks are not well aware of the technology and are not in a position to help IS planners to improve the level of technology domain analysis. Literature suggests that user involvement helps to arrive at innovative IS applications and expedite IS implementations. Therefore, the importance of user involvement in planning exercise cannot be overlooked.

As illustrated in Figure 2, the path coefficient of future impact of IS on top management involvement is more than that of the present impact on top management involvement. This indicates that the 'future impact of IS' is a predominant factor causing top management involvement in IS planning. This finding is in line with general management thinking. When top management perceive or foresee a greater impact of IS in future, they get themselves involved in planning to obtain the expected competitive advantage. Top management involvement is not fully explained by the present and future impact of IS. Table 5 reveals that a major portion of variance remains unexplained. This indicates that in the Indian banking sector, there could be other factors such as social, organizational and political factors that influence top management involvement.

Formal IS planning procedure causes improved information input. As a result of the existence of written guidelines and procedure, IS planners need detailed information about their competitors, use of IS in the banking sector and the business objectives of their own banks. These forces have formalized IS planning procedures. Ideally, formal procedures produce efficiency gains by systematic identification of strategic issues. However, gains in efficiency accruing from documented procedures need to be balanced against reduction in flexibility.

As indicated in Figure 2, path coefficient between planning effectiveness and technology domain analysis indicates that planning effectiveness is greatly influenced by technology domain analysis. This confirms our earlier findings that, in India, the IS planning goals are dominated by technology aspects and hence technology domain analysis influences planning effectiveness. The contribution of IS to the bank's performance is found to be influenced by planning effectiveness and business domain analysis. We have obtained perceptions of IS contribution instead of evaluating the impact based on absolute financial measures. Our findings support the general thinking that a greater business domain analysis influence the contribution of IS to the bank's business.

CONCLUDING REMARKS

This study is the first of its kind in India. It has attempted to find the influential relationships among various IS planning variables with specific focus on the information-intensive banking sector. It is concluded that 'Future impact of IS' is a predominant factor in the Indian banking sector influencing top management involvement in IS planning. Surprisingly, the influence of user involvement on technology domain analysis is insignificant and its value is very low. It seems likely that banking users in India do not have sufficient technological knowledge of the information systems to help the IS planners. This emphasizes the need of for users to undergo technology-based training so that they can conceive innovative IS applications and help map the information requirements of the bank. This further highlights the scope of improvement in training focus and orientation. Findings from this study have identified many new dimensions for

future research. Our findings indicate that top management involvement is the main factor influencing and guiding the whole IS planning exercise in banks. Future research may be related to finding of facilitators/inhibitors for promoting top management and user involvement. The reasons for lack of involvement in Indian banking could be uncovered and guidelines to improve the same could be formulated. It is also seen that top management involvement is not fully explained by the present and future impact of IS. A major portion of variance remains unexplained. This indicates that in the Indian banking sector, there could be other factors such as social, organizational and political factors that influence top management involvement. Future research may examine other factors influencing top management involvement and their relative importance.

This study does have some limitations that need to be recognized. We have collected data from IT executives of the bank. In the IS planning, the interests of many other stakeholders are involved. They are the users of the systems, business planners and customers. Future researchers may collect the opinions of all these stakeholders and analyze them to gain a better insight of IS planning practices. The other limitation is the generalizability of the results. A number of factors inherent in the culture, government, and economy determine which IT applications are feasible within the country and how they should be implemented. Therefore, IS planning practices in India might be different from other developed countries. A similar study can be conducted in other countries to gain confidence on the generalizability of the results.

REFERENCES

Arbuckle, J. (1997). *Amos User's Guide–Version 3.6*. USA: Smallwaters Corporation.

Brancheau, J. and Wetherbe J. (1987). Key Issues in Information System Management. *MIS Quarterly* 11 (1): 23–45.

Byrne, B. M. (1989). *A Premier of LISREL: Basic Application and Programming for Confirmatory Factor Analytic Models.* New York: Springer-Verlag.

Cash, J. I., McFarlan, W. E., Mckenny, J. L. and Vital, M. R. (1988). *Corporate Information Systems Management: Texts and Cases.* Illinois: Irwin Homewood.

Caudle, S. L., Gorr, W. L. and Newcomer, K. E. (1991). Key Information Systems Management Issues for the Public Sector. *MIS Quarterly* 15 (2): 171–188.

Conarth, D. W., Ang, J. K. and Mattay, S. (1992). Strategic Planning for Information Systems—A Survey of Canadian Organizations. *INFOR* 30 (4): 364–378.

Duncan, O. D. (1986). Path Analysis—Sociological Examples. *The American Journal of Sociology* 72: 1–16.

Earl, M. J. (1993). Experiences in Strategic Information System Planning. *MIS Quarterly* 17 (1): 1–24.

Galliers, R. D. (1991). Strategic Information System Planning–Myths and Reality. *European Journal of Information System* 3: 199–213.

Hsi-Peng, L. U. and Da-chin Yeh (1998). Enterprises' Perceptions on Business Process Re-engineering A Path Analytic Model. *Omega International Journal of Management Science* 26 (1): 17–27.

Javenpaa, S. L. and Ives, B. (1991). Executive Involvement and Participation in the Management of IT. *MIS Quarterly* 15 (2): 205–227.

Kanungo, S. (1995). An Empirical Study of Information Technology Use in the Service Sector in India: Issues and Imperatives. *INFORMS* Singapore (June 1995): 15–19.

Kanungo, S. and Chouthoy, M. (1998). Information Technology Planning in India: Implications for IT Effectiveness. *Information Technology for Development* 8: 71–87.

King, W. R. (1988). How Effective Is Your Information Systems Planning? *Long Rang Planning* 21 (5): 103–112.

Lederer, A. L. and Mendelow, A. L. (1986). Issues in Information System Planning. *Information and Management* 10 (5): 245–254.

_____. (1987). Information Resource Planning: Overcoming Difficulties in Identifying Top Management Objectives. *MIS Quarterly* 11(3): 389–399.

Lederer, A. L. and Sethi, V. (1988). The Implementation of Strategic Information System Planning Methodologies. *MIS Quarterly* 12 (3): 444–461.

_____. (1996). Key Prescription for Strategic Information Systems Planning. *Journal of Management Information Systems* 13 (1): 35–62.

_____. (1992). Meeting the Challenges of Information System Planning. *Long Range Planning* 25 (2): 69–80.

Li, C. C. (1975). *Path Analysis: A Premier*. Grove, CA.: The Boxwood Press Pacific.

Mc Farlan, F. W., McKenny, J. L. and Philip Pyburn (1983). The Information Archipelago—Plotting a Course. *Harvard Business Review* (January–February '83): 145–156.

Padwal, S. M. (1999). Need for Redesigning Information Technology/Information Systems Architecture in Indian Banks. *Prajnan* 28 (4): 314–356.

Palvia, P. C. and Palvia, S. (1992). MIS Issues in India and a Comparison with the United States. *International Information Systems* (April '92): 100–110.

Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance.* New York: Free Press.

Premkumar, G. and King, W. R. (1991). Assessing Strategic Information Systems Planning. *Long Range Planning* 24 (5): 41–58.

_____. (1992). An Empirical Assessment of IS Planning and Role of IS in Organizations. *Journal of Management Information Systems* 9 (2): 99–125.

Premkumar, G. (1992). An Empirical Study of IS Planning Characteristics among Industries. *Omega International Journal of Management Sciences* 20 (5/6): 611–629.

Premkumar, G. and King, W. R. (1994). Organizational Characteristics and Information Systems Planning: An Empirical Study. *Information Systems Research* 5: 75–109.

Raghunathan, T. S. and King, W. R. (1988). The Impact of Information Systems Planning on the Organization. *Omega International Journal of Management Science* 16 (2): 85–93.

Raghunathan, B. and Raghunathan, T. S. (1990). Planning Implications of the IS Strategic Grid: An Empirical Investigation. *Decision Science* 21: 287–299.

_____. (1991). Information Systems Planning and Effectiveness: An Empirical Analysis. *Omega International Journal of Management Science* 19 (2/3): 125–135.

Ramraj, P. (2000). Empirically Testing the Relationship between MIS Flexibility and MIS Success. *Global Journal of Flexible Systems Management* 1 (1): 13–30.

Sabherwal, R. and King, W. R. (1995). An Empirical Taxonomy of the Decision-Making Process Concerning Strategic Applications of Information Systems. *Journal of Management Information Systems* 11 (1): 177–214.

Sass, C. J. and Keefe, T. A. (1988). MIS for Strategic Planning and a Competitive Edge. *Journal of System Management*, 14–17.

Segars, A. H. and Grover, V. (1998). Strategic Information Planning Success an Investigation of the Construct and its Measurement. *MIS Quarterly* (June '98): 139–163.

Segars, A. H., Grover, V. and Teng, J. T. C. (1998). Strategic Information System Planning: Planning System Dimensions, Internal Co-alignment and Implications for Planning Effectiveness. *Decision Science* 29 (2): 303–345.

Segars, A. H. and Grover, V. (1999). Profiles of Strategic Information Systems Planning. *Information Systems Research* 10 (3): 199–232.

Smits, M. T., Poel, K. G. and Vander Ribbers, P. M. A. (1997). Assessment of Information Strategies in insurance Co.'s in the Netherlands. *Journal of Strategic Information Systems* 6: 129–148.

Teo, T. S. H. and King, W. R. (1997). Integration between Business Planning and IS Planning: An Evolutionary-Contingency Perspective. *Journal of Management Information Systems* 14 (1): 185–214.

Teo, T. S. H., Ang James, S. K. and Pavri, Francis N. (1997). The State of Strategic IS Planning Practices in Singapore. *Information and Management* 33: 13–23.

_____. (1999). Critical Success Factor in the Alignment of IS Plan with Business Plan. *International Journal of Information Management* 19: 173–185.

Walsham, G. and Waema, T. (1994). Information Systems Strategy and Implication: A Case Study of a Building Society. *ACM Transactions on Information Systems* 12 (2): 150–173

Walsham, G. and Sahay, S. (1999). GIS for District-Level Administration in India: Problems and Opportunities. *MIS Quarterly* 23 (1): 35–65.