Organizational Factors Affecting the Evaluation of Information Systems Performance[1]

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This paper reports a Delphi study aimed at exploring organizational factors affecting the evaluation of information systems (IS) function performance. Information System Executives (ISEs) and corporate planners identified and rated factors influencing the prioritization of performance evaluation dimensions. The factors included IS function structure, impact of computer downtime, industry, and organization size. The variations in dimension rankings and measurement usage based upon these factors are consistent with the respondents' perceived value of the factors. A framework is presented to focus the development of pragmatic approaches to IS function performance measurement.

Escalating information systems (IS) expenditures and increasing dependence on IS for maintaining organizational performance in highly competitive environments serve to emphasize the importance of IS function performance. Top IS executives continue to rank gauging MIS effectiveness to be among the top issues facing them in the next three to five years (Dickson, Leitheiser, Nechis and Wetherbe, 1984; Brancheau and Wetherbe, 1987). In line with this executive focus, a survey of IS personnel and academics rated MIS evaluation as the second most critical issue facing IS management (Ball and Harris, 1982). Further review of current IS literature shows that many other authors (Davis and Olson 1985; Dickson and Wetherbe, 1985; Lane and Hall, 1987; Wilkes and Dickson, 1987) increasingly support claims about the importance of assessing the IS organization.

However, measurement of IS function performance is complicated by the diverse goals and competitive environments of today's organizations. These dissimilar goals and environments appear to preclude the unilateral application of a common set of IS function performance measures. Instead, critical contingencies promote the application of varied approaches and measures across organizations. For example, one might expect evaluation of the IS function to differ in organizations with dissimilar missions or in disparate competitive environments. Or performance may be evaluated differently in manufacturing than in service industries. This latter rationale was actually used by Miller and

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Doyle (1987) to stress the need to concentrate study of IS effectiveness to specific industries.

There are additional organizational factors that might affect the selection of evaluation dimensions. For instance, the Raghunathans (1989) found that the formal position of the IS manager in the organizational hierarchy influenced the evaluation of effectiveness of the organization's IS function. Organizational size, management support, and IS function structure may also affect IS function assessment. For example, Rockness and Zmud (1989) found that the frequency with which critical success factors were mentioned differed in eight firms varying across firm size, organizational environment, IS structure, and information technology (IT) management strategy. Ball and Harris (1982) suggested that needs and critical issues may vary across industry and by organizational size. And recently, Saunders and Jones (1992) proposed that organizational factors such as the organization's industry and mission affect the selection and prioritization of IS performance dimensions.

Purpose

This study is designed to investigate the affect of organizational factors on prioritizing IS function performance dimensions. But first, just exactly what do we mean by the term "IS function?" In some organizations, the IS function is synonymous with the IS department. In other organizations, the manager of the corporate IS group may also have indirect responsibility for division IS groups. For this study, we define the IS function to include all IS groups and departments within the organization. A three-round Delphi approach is used to assess differences in dimension value and measurement use across organizations. In the next two sections, the Delphi study used to assess the affect of organizational factors is described and its findings summarized. The discussion section presents implications of the Delphi study findings and extends implications of these findings to the evaluation of IS performance.

Methods

First Round

Procedures: In the first round, IS executives directly responsible for the IS function and corporate planners were asked to rank eleven dimensions of IS performance. Ten dimensions are regularly cited in the IS literature: (1) IS contribution to organizational financial performance—e.g.,budget performance, return on investment, costs, (2) IS operational efficiency—e.g., system response time, downtime, (3) adequacy of system development practices— e.g., percentage of projects completed on schedule, (4) managerial and user attitudes toward IS performance, (5) IS personnel competence, (6) IS personnel development, (7) IS planning, (8) information quality, (9) IS impact on strategic direction, and (10) integration with related technologies across other organizational units. An eleventh dimension, the ability of the IS function to identify and assimilate new technologies, was added as a result of a pilot test of the questionnaire among IS executives.

In addition to ranking the eleven dimensions in importance, respondents were also asked to modify the rationale provided for using these dimensions and to suggest any additional dimensions they felt should be included in IS function assessment. Space was provided for their suggestions. Three new dimensions of IS performance emerged from this first round: adequacy of data security administration, end user training and support, and adequacy of contingency planning. Rationales for the dimensions were updated to reflect respondent comments.

Since the critical dimensions were expected to vary by industry (Miller and Doyle, 1987), participants ranked dimensions used by their organization. If respondents thought that their organization's dimension rankings differed from those of most firms, they were asked, in an open-ended question, to indicate the factors distinguishing the rankings for their firm from the rankings of other organizations.

Participants provided demographic data about their organizations: size (total revenue and number of full-time equivalent employees), IS budget as a percentage of revenues, percentage of budget allo-

cated to new systems development, organizational reporting position immediately above the IS manager, and industry.

Sample: Questionnaires were sent to IS executives in 62 organizations with over 1,000 full-time employees headquartered in three major Texas cities. Thirty IS executives completed the first round questionnaire, for a response rate of 49%. The head of business planning in 25 participating organizations also completed the questionnaire.

Second Round

Procedures: In the second round, participants were asked to rerank the eleven original and the three new dimensions. Since some participants indicated that dimensions important to their organization's IS evaluation differed from those of a generic IS organization, the questionnaire was designed to explore differentiating organizational factors. Hence, second-round participants were asked to rate factors that may influence the ranking of dimensions. The factors rated in Round 2 were considered by one or more respondents in Round 1 to explain differences in their firm's ranking of dimensions from the rankings of other firms. The factors that respondents thought influenced the variation in dimension rankings across firms are listed in Table 1

Sample: The second round questionnaire was sent to all executives contacted in the first round. Completed questionnaires were received from 28 IS executives and 18 planners. Twenty-six of the IS executives who participated in the second round also had participated in the first.

More than half of the 32 companies surveyed in rounds 1 and 2 employed 5,000 or more full-time employees and had annual revenues of at least $500 million. Fourteen organizations had revenues greater than $1 billion. A number of industries were represented, including manufacturing (10 firms), finance/real estate (4 firms), wholesale/retail (5 firms), petroleum (4 firms), and other (9 firms). Thirty-one firms described their IS function's organization. The IS function was centralized in seventeen firms, distributed in thirteen firms, and decentralized in the remaining firm.

Third Round

Procedures: IS executives were asked in the final round to indicate measures used by their organization in evaluating IS function performance for each of the top ten dimensions identified from analysis of second round returns. A list of measures frequently cited in the IS literature was provided for each dimension. Respondents were asked to rate the value of each measure actually used by their organization on a five-point scale; and they were instructed to add, in space provided under each dimension, other specific measures used by their organizations, but not included on the provided list.

Sample: A number of analyses were performed on the first, second, and third round responses to test for differences across various subsamples— i.e., IS executives and corporate planners, second round respondents and nonrespondents, SIM and non-SIM members, etc. In only a few instances did significant differences across subsamples emerge. The analyses are de-

FACTOR
Top Management Support
IS Function Structure
Placement of the IS Department Head in the Organization's Hierarchy
Competitive Environment of the Organization
Organization Size
The Organization's Industry
The Size of the IS Function Staff and Budget
Impact of Computer Downtime on the Organization's Performance
Organization Mission

Table 1: Influence Factors on IS Performance Evaluation

Delphi Round	Test	Focus of Analysis	Findings
1	Kolmogorov-Smirnov two-sample test	First round rankings of IS executives and corporate planners	No significant differences
2	Kolmogorov-Smirnov two-sample test	First round rankings of second round respondents and non-respondents	No significant differences
3	Chi-Square with Yates correction factor where appropriate	Number of full-time employees, revenues, structure of IS function of organizations participating in third round only and organizations participating in earlier rounds as well	No significant differences
3	Chi-Square with Yates correction factor where appropriate	Use of measures by organizations participating in third round only and organizations participating in earlier rounds as well	The original sample uses cost allocation significantly more often
3	T-tests	Value of measures by organizations participating in third round only and organizations participating in earlier rounds as well	Respondents participating in first two rounds valued time for the IS function to respond to user complaints and the complaint logs significantly more than companies participating only in the third round
3	Chi-Square with Yates correction factor where appropriate	Use of measures by SIM and non-SIM members	No significant differences
3	T-tests	Value of measures of SIM and non-SIM members	SIM members valued the measure of return on management less, and formal appraisal systems more, than non-SIM members

Table 2: Tests for Differences in Subsamples

scribed in more detail in Appendix A and summarized in Table 2.

Twenty-eight of the thirty-two IS executives who participated in one or both of the first two rounds completed a third round of questionnaires. Twenty-four IS executives completed all three rounds.

The third round questionnaire was sent to 51 additional IS executives of large companies headquartered in major Texas cities. These additional executives were included to ensure a lack of bias in the perceptions of measure usage due to respondents participating directly in the earlier selections of dimensions. Sixteen usable questionnaires were returned from this additional set of IS executives who participated only in the third round. There are no significant differences in number of full-time employees, revenues, and structure of the IS function between the organizations represented by these two sets of respondents. The differences between the two samples in the use and valuation of the measures are significant in only three instances. (The significant differences are summarized in Table 2.) Thus, the third round summary results are based on the combined sample of 44 IS executives.

Results

The top ten IS evaluation dimensions derived from the three-round Delphi study are listed in Table 3 in order of their importance rankings. The first round coefficient of concordance is .23. The coefficient of concordance, W, among the second

round rankings is much higher (W=.51), indicating strong agreement among respondents. Table 3 also summarizes responses about measure usage and value for the ten highest-ranked dimensions. (An extensive discussion of the relative rankings of the dimensions and associated measures can be found in Saunders and Jones (1992)).

Factors Influencing Selection of IS Performance Dimensions

In the second round, respondents rated the nine organizational factors in Table 1 that might influence the relative ranking of the performance dimensions. All nine influence factors were at least moderately important in ranking the performance dimensions—i.e., all factors have a mean rating greater than 3 on a five-point scale. Top management support has the highest mean rating (4.7), and placement of the chief information executive in the organization's hierarchy is viewed as the second most important influence (mean rating=4.0). Organization size and industry have the lowest mean influence ratings (i.e., 3.24 and 3.29, respectively).

Data for this study were not collected on the level of top management support, the organization's competitive environment, the size of the IS function staff and budget, nor the organization's mission. So further analyses of these factors was not performed beyond the basic rankings. However, questionnaire responses were further analyzed on the basis of IS function structure—i.e., centralized, distributed, decentralized, impact of computer downtime, industry, and organization size[2]. Since only one organization in this sample had the IS executive reporting directly to the CEO, this factor was not used in further analyses.

Dimensions: From Tables 4 and 5 we see that while dimension rankings are similar across the four organizational factors of industry, organization size, IS function structure, and impact of computer downtime, some interesting differences do surface. For instance, respondents from energy companies and from organizations with more than 10,000 employees consider IS contribution to financial performance to be the most important dimension. Ability of the IS function to identify and assimilate new technologies is also ranked higher by respondents from energy companies. Integration with related technologies across other organizational units is less important to centralized organizations than it is to distributed or decentralized organizations. On the other hand, adequacy of system development practices is ranked higher by centralized organizations and organizations more immediately impacted by computer downtime. Respondents from financial organizations place adequacy of the system downtime contingency plan among the top ten. Likewise, centralized organizations and those that feel the impact of computer downtime after four hours also place this dimension in the top ten. Other respondents give this dimension a rank of 13th. Finally, manufacturing and service organizations, and organizations with 1,000 to 10,000 employees rank end-user training and support as more important than other respondents

Measures: Differences in measure usage patterns based on IS function structure were assessed using chi-square analysis for each of the thirty-seven measures on two levels of usage (use or no use) across two categories [(1) centralized; and (2) decentralized or distributed]. Differences in computer downtime impact, industry usage pattern, and organization size were also assessed using chi square analyses for each of the thirty-seven measures on the two levels of usage across two computer downtime impact times [(1) within four hours, and (2) greater than four hours], across two industry categories [(1) service: finance/real estate, wholesale/retail/trade, transportation, government, and other; and (2) manufacturing - including pharmaceutical and energy], and across two categories of organization size [(1) 1,000-4,999 employees, and (2) greater than 5,000 employees]. T-tests were used to test for significant differences in the value of the measures by IS function structure and computer downtime impact. Separate one way analyses of variance also were performed to test for significant differences in value of the measures to the respondent's organization. Four conditions of the

Rank	Dimension	Measures		Using	No. of Co. Value	Mean*
1	IS Impact on Strategic Direction. An effective IS function enhances the organization's competitive position through the development of new systems and the maintenance of systems that support overall organizational goals. IS should take the lead in the application of IS resources.	Market share increases attributable to IS function	16	3.31		
		Profit increases attributable to IS function	24	3.63		
		Organization would be out of business without IS	29	4.10		
2	Integration of IS Planning with Corporate Planning. To promote the achievement of organizational goals, IS planning must be tied to organizational planning and must allow for inputs from top executives.	IS documented plan is designed to support the corporate strategic plan		35	4.20	
		Forecasts of IS capabilities exist		32	3.72	
		Corporate and IS plans jointly developed		25	3.56	
3	Quality of Information Outputs. IS functions are designed to provide information. They should be judged on accuracy, usefulness and timeliness of information they produce. They are also indirectly responsible for the quality of user-generated output.	End user surveys (in-house)		31	3.68	
		Customer/Client surveys (individuals not in organization)	17	2.77		
		Log of errors encountered by users maintained		30	3.17	
4	IS Contribution to Organizational Financial Performance. Financial measures are widely used in organizations to determine performance	Return on investment	24	3.75		
		Return on assets			13	3.00
		Cost allocation (method of accounting for systems operations and development)		35	3.69	
		Value added by information technology (return on management)		14	3.00	
		Industry average comparison of IS budgets as a percentage of revenue			29	3.35
		Budget performance (ability to meet IS budgets)		42	4.45	
		Cost of maintaining systems		31	3.81	
5	IS Function Operational Efficiency. As computers become more a part of the daily business cycle, system availability, reliability, and responsiveness of hardware and software become critical. The IS function must ensure high quality and close to zero defects.	Log of system availability		40	4.45	
		Users' perceptions surveys	31	3.94		
		User turnaround time (batch)	39	3.97		
		Log of computer and communication up/downtime	40	4.25		
		System response time (on-line)		44	4.59	
6	User/Management Attitudes about IS Function. In today's environment of end-user computing, user satisfaction and perceptions of IS responsiveness, service level, and quality of IS products determine IS effectiveness.	Management and user perceptions of IS performance	37	4.24		
		User surveys of user participation in systems development			15	3.07
		User surveys of IS responsiveness to user needs		20	3.60	

Table 3: Summary of Third Round Responses - Frequencies and Means (n=44)

Rank	Dimension	Measures		No. of Co.	Mean* Using Value
		Time for IS function to respond to user complaints	29	3.83	
		Complaint logs		22	3.46
7	IS Staff Competence. An effective IS function is able to recruit and maintain a technically and managerially competent staff, and is able to interface successfully with users and management throughout the organization.	Number of managerial and technical education programs for IS staff	23	3.52	
		Career ladder(s) for IS staff exist	31	3.52	
		Formal performance appraisal system used	40	4.38	
		Level of education of IS staff: degrees and professional certification	29	3.62	
8	Integration with Related Technologies Across Other Organizational Units. IS continually interacts across all business functions. There must be a smooth, cost-effective flow of information across the entire organization. Stand-alone pockets of technology may inhibit the flow of information in the organization.	User/IS development of user/IS budget	26	3.50	
9	Adequacy of System Development Practices. An IS function is more effective if it promotes an organized approach to system design, development, and documentation throughout the organization. The development should be on-time, within the budget, and deliver the right product.	Percentage of projects completed on-schedule and/or within budget		35	3.94
		Standard methodology for system analysis and design exists	35	4.06	
		Evaluation of user and IS function documentation is performed	24	3.58	
		Estimates of number of manyears in backlog of system development requests	38	3.11	
10	Ability of IS Function to Identify and Assimilate New Technologies. The IS function must promote an innovative climate that encourages its staff and organizational users to capitalize upon new technologies. Consolidation of new technologies must update obsolete systems, be cost-effective, and not reduce service.	Formal reward system for innovative thinking and suggestions using information technology		13	2.69
		Number of technical breakthroughs	13	2.62	

*Responses range from 1 to 5, where 1 is no value and 5 is great value

Table 3: Summary of Third Round Responses - Frequencies and Means (n=44) (contd.)

independent variable industry were employed: financial, energy, manufacturing (including pharmaceutical), and service(including transportation, government, wholesale/ retail/trade, and other). A separate set of analyses were performed on the measure values using organization size as the independent variable. Three conditions of organization size were used (1,000-4,999 employees, 5,000-10,000 employees and more than 10,000 employees). A summary of results is presented in Table 6. Only fifteen of the 296 analyses yield differences significant at the .05 level or better. Because of compounding alpha, fifteen "significant" results is actually less than would be suggested by chance.

Thus, none of the four influence factors appear to have a marked affect on the use and valuation of

IS performance measures. The moderate ratings of the respondents on the influence of industry and organization size on a dimension's ranking appear supported by these additional analyses. IS function structure and computer downtime impact also have limited influence on this sample's responses. Hence, we conclude that the contingency key in IS function performance evaluation is the selection of the dimensions and not how to measure the dimensions.

Discussion

In completing the initial set of rankings, respondents indicated that they felt uneasy about developing a ranking of performance evaluation dimensions that could be commonly applied to all IS organizations. Their write-in comments suggested that IS function performance rankings depend upon a number of situational factors. Several factors were reported that affect the application of performance measures across various organizations, including top management support and hierarchical position of the top IS executive. Hence, an objective of the second round questionnaire was to have the respondents elaborate upon their comments by rating the importance of these and the other organizational factors found in Table 1 in the ranking of the IS function performance dimensions.

The results from this exercise are consistent with a myriad of studies reporting the importance of top management support. Top management support is rated by our managers as the most critical factor in assessing IS performance. Management input is especially critical in determining the strategic direction and aligning IS planning with corporate planning, the two top-ranked performance dimensions (See Table 3). But although at first intuitively appealing, the organizational factors of IS function structure, computer downtime impact, industry, and organization size appear less than critical in influencing the selection and prioritization of performance dimensions and measurement usage as previously reported. However, selective differences are noted across these variables. In particular, the variance in our study suggests that more in-depth investigation of the industry structure relationship with performance dimension ranking is required. For some industries, IS is strategically critical to the organization's competitive position; these organizations cannot afford to be evaluating their IS function from an operating efficiency viewpoint. On the other hand, there are industries where IS contributes nothing strategically; IS only affects operating efficiencies. For these organizations, IS should not be run as though it were strategically critical. In this situation, IS people should not be handed a blank check.

Dimension Influence Factors

The results of this study suggest that it is clearly myopic to concentrate solely on a universal ranking of dimensions. The evaluation of IS function performance must also include consideration of the contingency factors in selecting performance dimensions and the individuals involved in the evaluation process. However, the critical organizational factors to be considered are as yet not entirely known.

Figure 1 expands the IS function performance evaluation model of Saunders and Jones (1992) that relates IS evaluation dimensions to organizational factors influencing their ranking. Based on analyses of the Delphi questionnaire responses reported in Tables 4 and 5, eight general relational propositions are defined on the Figure 1 framework to serve as an initial foundation on which future empirical-based research can be designed. For example, (P2) firms in financially troubled industries (such as energy) may devote more attention to short-term operational considerations than to long-term IS strategic impact. Or, (P1) end user training and support is more critical in service and manufacturing industries than in financial and energy industries (And, (P8) it can also be inferred from Table 5 that large organizations with large IS staffs place less emphasis on end-user training and support than smaller organizations). Other propositions of interest summarized on Figure 1 that attempt to relate influence

	RANKINGS							
	Overall	Industry				Size & No. of Full-Time Employees		
Dimension		Manufacturing[a]	Financial	Service[b]	Energy	1,000-4,999	5,000-10,000	>10,000
IS Impact on Strategic Direction	1	1	1	1	4	1	1	2
Integration of IS Planning with Corporate Planning	2	2	2	2	3	2	2	4
Quality of Information Outputs	3	3	3	3	2	3	3	3
IS Contribution to Organizational Financial Performance	4	4	5	4	1	4	5	1
IS Function Operational Efficiency	5	5	4	5	5	5	4	5
User/Management Attitudes about IS Function	6	6	8	6	6	6	6	6
IS Staff Competence	7	7	6	8	9	7	7	7
Integration with Related Technologies across other Organizational Units	8	9	9	11	8	11	12	8
Adequacy of System Development Practices	9	10	10	10	10	9	9	10
Ability of IS Function to Identify and Assimilate Technologies	10	11	12	9	7	10	11	9
End-User Training and Support	11	8	11	7	12	8	8	13
IS Staff Development	12	12	13	12	11	12	13	11
Adequacy of System Downtime Contingency Plan	13	13	7	13	14	13	10	12
Adequacy of IS Security Administration	14	14	14	14	13	14	14	14

a. Includes pharmaceuticals
b. Wholesale/retail/trade, transportation, government and other

Table 4: Rankings Across Organizations in Different Industries and of Different Sizes

Dimension	Overall	Time for Computer Downtime to be Felt		IS Organization	
		Within 4 Hours	Greater Than 4 Hours	Centralized	Decentralized Distributed
IS Impact on Strategic Direction	1	1	1	1	1
Integration of IS Planning with Corporate Planning	2	2	2	2	2
Quality of Information Outputs	3	3	3	3	3
IS Contribution to Organizational Financial Performance	4	4	4	4	4
IS Function Operational Efficiency	5	5	5	5	5
User/Management Attitudes about IS Function	6	6	6	7	6
IS Staff Competence	7	7	7	6	7
Integration with Related Technologies across other Organizational Units	8	8	9	12	8
Adequacy of System Development Practices	9	10	13	8	11
Ability of IS Function to Identify and Assimilate Technologies	10	9	11	11	9
End-User Training and Support	11	12	12	13	12
IS Staff Development	12	11	8	9	10
Adequacy of System Downtime Contingency Plan	13	13	10	10	13
Adequacy of IS Security Administration	14	14	14	14	14

Table 5: Rankings Across Organizations With Different Computer Downtime and Different IS Organization Structure

factors to performance dimension ranking include: (P3) top management support for IT in general and the IS function in particular is vital to organizations that rank IS impact on strategic direction high, (P4) adequacy of system development practices is more important to centralized organizations and (P5) to organizations with minimum downtime requirements, (P6) operational efficiency is more important in less mature IS organizations as these organizations struggle to become efficient in their IS activities — IS function costs must be in hand and output error free, (P7) IS contribution to the organization's financial performance becomes more important to large organizations, and (P8) end-user training and support is less critical in large organizations. Research aimed at testing the validity of these eight proportions should yield a much better understanding of the relationships between the contingency factors and performance dimension importance to specific organizations.

Figure 1 pairs influence dimension factors with IS evaluation dimensions. However, it is more likely that groups of dimensions must be considered and balanced. For example, financial institutions which promote financial transfers may value strategic impact and contingency downtime plans more highly than energy companies when evaluating IS performance. Energy companies, especially in an era of low oil prices, may look toward financial contribution for cash flow infusions, and may seek information of a high quality to enhance the likelihood of successful drilling. Thus, while Figure 1 focuses on bivariate relationships, we do not wish to preclude research on multivariate relationships in which multiple factors result in a balanced set of indicators. It is very possible that in developing this balance of indicators, dimensions that tend to oppose one another, such as strategic impact and operational efficiency, may both be valued to some extent.

Not only should future research investigate the validity of the relationships suggested by the propositions delineated in Figure 1, but this research should also aim at uncovering and exploring additional influence factors and their affect on the overall use of IS evaluation dimensions. But just what other type of contextual factors might serve to influence dimension rankings beyond those found in Table 1? Observations, interviews, and analyses made during our study of IS function performance assessment revealed three additional contingency factors that require further exploration: perspective of the evaluator, IS value-added, and role of the business unit within the organization's portfolio of businesses.

Evaluator Perspective: Building on previous research (Brancheau and Wetherbe, 1987; Lane and Hall, 1987; Wilkes and Dickson, 1987), Saunders and Jones (1992) propose that the selection and prioritization of performance evaluation dimensions is affected by the unique perspectives of the people performing the evaluation. Hence, one dimension worthy of additional exploration is just exactly who's doing the evaluation.

Some of the dimensions cited during the research very clearly look at IS performance from an internal cost and efficiency viewpoint. Examples of internal dimensions found in Table 4 include IS operational efficiency, user and management attitudes about IS, IS staff competence, and the quality of information output. On the other hand, the dimensions of IS impact on strategic direction, integration of IS planning with corporate planning, and IS contribution to organizational financial performance carry a clear, external, business-plan flavor.

Senior managers spend most of their time engaged in activities associated with organizational planning and control that focus on maintaining optimal alignment of the organization with its ever changing environment. The more complex and turbulent the environment, the more attention must be given to these activities. Hence it can be expected that senior managers want to measure the effectiveness of their IS function in terms of its impact on facilitating the accomplishment of the organization's business plan and its integration with existing planning systems and processes. The senior management view of functional areas is global. Unless the corporate planning process includes the IS function in an explicit way, IS function costs will be viewed as just another overhead cost to be

Measure Usage	Grouping Factor	Statistical Analysis	Adjustment	Results	Description
Return on Assets	Industry	Chi Square	--	$X^2 = 6.45^*$ df = 1	Used more often by manufacturing organizations than service organizations.
Cost Allocation	Industry	Chi Square	Yates Correction	$X^2 = 12.60^{**}$ df = 1	Used by all manufacturing organizations; used by only 55% of service organizations.
Log of system availability	Industry	Chi Square	Yates Correction	$X^2 = 4.65^*$ df = 1	Used by all manufacturing organizations; used by 80% of service organizations.
Organization would be out of business without it	Size	Chi Square	--	$X^2 = 6.05^*$ df = 1	Used more frequently by smaller organizations (i.e., organizations with 1000-4999 employees).
Number of managerial and technical education programs for IS staff	Size	Chi Square	--	$X^2 = 7.04^{**}$ df = 1	Used more frequently by larger organizations (i.e., organizations with more than 5000 employees).
Level of education of IS staff	Size	Chi Square	--	$X^2 = 4.63^*$ df = 1	Used more frequently by larger organizations (i.e., organizations with more than 5000 employees).
Log of system availability	Impact of Computer Downtime	Chi Square	--	$X^2 = 4.74^*$ df = 1	Used by all organizations impacted by computer downtime within 4 hours; used by 90% of organizations experiencing loss immediate impact.
VALUE:					
Organization would be out of business without IS	Industry Impact of Computer Downtime	ANOVA T-test	--	$F(3,24) = 7.37$ $t = 2.28^*$ df = 21	Energy companies value less. Organizations experiencing more immediate impact value more.
Management and user perceptions of IS performance	Industry	ANOVA	2^x transformation	$F(3,31) = 4.05$	Service and financial organizations value more than manufacturing and energy companies.
Career ladder for IS staff exists	Industry	ANOVA	--	$F(3,25) = 3.25^*$	Manufacturing organizations value more than others.
Log of system availability	Impact of Computer Downtime	T-test	--	$t = 2.42^*$ df = 35	Organizations experiencing more immediate impact value more.
User turnaround time	Impact of Computer Downtime	T-test	--	$t = 2.41^*$ df = 34	Organizations experiencing more immediate impact value more.
Log of computer/ communication up/downtime	IS Function Structure	T-test	--	$t = 2.19^*$ df = 36	Centralized organizations value more.
System response time	IS Function Structure	T-test	--	$t = 2.23^*$ df = 40	Centralized organizations value more.

$p \leq .05^*$ $p \leq .01^{**}$

Table 6: Summary of Significant Differences in Dimension Measurement Across IS Function Structure, Computer Downtime Impact, Industry, and Organization Size

minimized.

By contrast, information systems executives (ISEs) typically occupy staff positions and are responsible for the internal management of the IS function. Major ISE concerns are to justify budgets, help establish development priorities and allocate resources accordingly, and control the life-cycle costs. We could expect ISEs to focus on internal issues such as IS function costs.

Interestingly, we see from Table 3 that the respondents of our study perceive the most important dimensions for the evaluation of their IS function to be strategic in nature —e.g., IS impact on strategic direction, the integration of IS planning with corporate planning, and IS contribution to organizational financial performance. These dimensions ranked 1, 2, and 4 with our managers. The remaining seven dimensions have a strong internal operational efficiency focus. The responding corporate planners could be expected to have this strong strategic orientation. Yet, the ISEs in our sample hold a strategic orientation similar to that of the corporate planners. Their responses suggest that our set of ISEs clearly recognize the necessity of the IS function being an integral component of the organization's business plan. And the measures cited for these dimensions — e.g., increases in market share and profits — show that the ISEs understand how the contributions of IS application projects tied to accomplishment of the business plan will be evaluated by their senior line managers. However, our ISEs also recognize the importance of information quality to the line managers in regard to business plan accomplishment. As one manager commented: "cost and efficiency have to be in hand prior to beginning any strategic applications." Thus, the perspective of the evaluator must be considered in addition to such situational factors as those listed in Table 1 when ranking the importance of dimensions and their eventual operationalization in the evaluation process.

The evaluator's perspective based on organizational function alone may not always distinguish the relative ranking of dimensions. For example, in Wilkes and Dickson's study (1987), the preferences of ISEs and executive managers for IS function assessment were often quite similar. An additional understanding of the relationship between the ISE and CEO may clarify differences in the rankings of performance dimensions. Specifically, the strategic orientation evidenced by the ISEs in our sample may be influenced by the nature of communications with their CEOs. Watson (1990) found that managers who have two-way communications with their CEOs are less concerned with planning issues than those managers who have only one-way communication. He argues that managers who have two-way conversations with their CEOs have a better understanding of the organization's goals, objectives and direction. These managers consequently find the planning task less onerous. Only one of the ISEs in this study reports directly to the CEO, therefore, two-way communication between the study's ISEs and their CEOs may not be typical.

IS Value Added: Another potential contingency factor that could affect the IS valuation process is how IS adds strategic value. To us, "strategic value" enhances goal accomplishment and results from external activities with Porter's (1985) five competitive forces that determine profitability: suppliers, buyers or customers, competitors, potential new entrants to the industry, and substitute manufacturers. It can be measured by organizational profits, market share, market size, growth, and the like. Hence only IS function applications that can be measured for strategic value is IS work that impacts business plan activities directly. Thus, IS work that influences the manner in which business is conducted with one's suppliers, customers, or competitors adds strategic value. All other IS work is evaluated with the internal overhead control type dimensions and measures delineated in Table 3. Hence, a high performing IS function along the strategic dimensions of Table 3 will be involved in applications that have a direct impact on the manner in which goal accomplishment line activities are conducted. These applications might enhance customer and/or supplier relations, improve order entry, enhance advertising effectiveness, improve warranty terms, or improve inventory management.

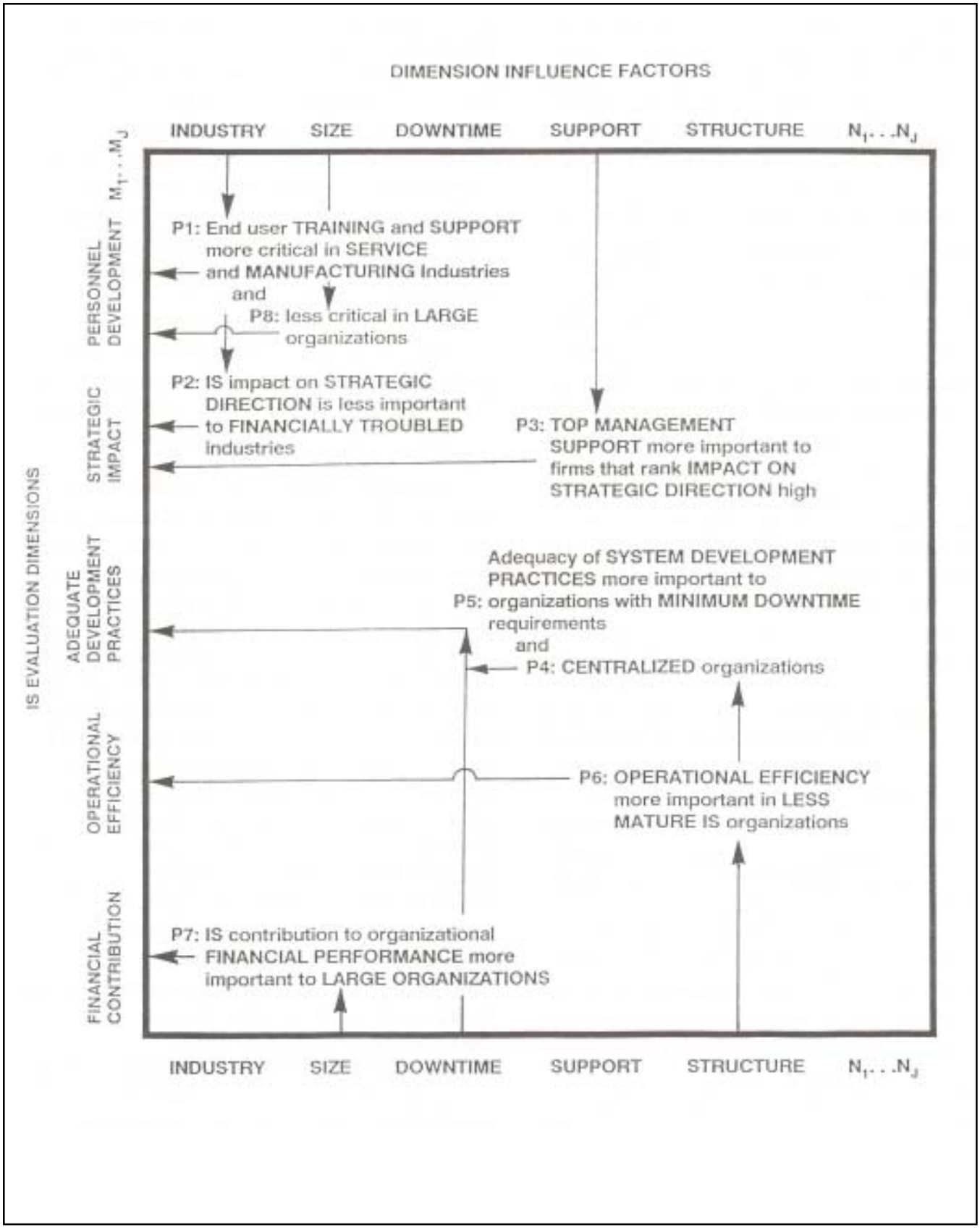

Figure 1: A Framework to Integrate IS Evaluation Dimensions and Dimension Influence Factors

The more the IS function contributes to strategic value the more we should expect strategic dimensions and measures to be employed to measure IS function performance.

Business Unit Role: The appropriate areas within a company to seek strategic value through IS applications will vary with the business unit's strategic label. For example, business units carrying a cash cow label are primarily concerned with maintaining a strong competitive position in a relatively unattractive industry. Management attention is focused on efficiency and cash generation. IS applications should be directed toward the accomplishment of these goals and not drastically changing the manner in which business is conducted. Appropriate IS function performance measurement dimensions should then be the internal dimensions (See Table 3) that focus on overhead control.

On the other hand, a business unit carrying a star or question mark label would be appropriate outlets for IS applications aimed at adding strategic value. Here the establishment of a strong competitive position in a highly attractive industry is prime. Management attention is focused on optimizing supplier and customer relations; maximizing the effectiveness of competitive weapons such as advertising, price strategies, warranties, etc.; neutralizing potential entrants to the industry; and guarding against substitutes. Potential IS applications that can add strategic value abound in this environment. And strategic dimensions and measures should be employed accordingly to measure IS function performance in this environment.

Conclusion

There is no one set of dimensions that can be employed to measure IS function performance. Even during the first questionnaire administration, IS executives and corporate planners questioned the ability to develop a set of dimension rankings that could be commonly applied. And the results of this research strongly support their initial feelings. IS function evaluation must include a consideration of the contingency factors that affect performance dimension importance rankings. As rapid advances in IT provide more and better ways for organizations to compete and in many cases allow competitive boundaries to be redrawn, the importance of proper measurement of an organization's IS function performance becomes ever more critical. The Table 3 dimensions and measures provide an initial foundation on which to build a sound IS function control system. However, to successfully operationalize this set of dimensions, our understanding of the contingency factors that influence the relative rankings of these dimensions needs to be enhanced. And as our understanding of the critical contingency factors and their relationships to performance dimension ranking grows, then more efficient and effective IS functions will emerge in organizations

Endnotes

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[2]Organization size is based here on the questionnaire response about the number of full-time employees.

Appendix A: Analyses to Test Sample Biases

Differences between IS Executives and Corporate Planners

The first-round rankings employed the Kolmogorov-Smirnov two-sample test to analyze the level of agreement between the distribution of ranks of IS executives and corporate planners. Since no significant differences between these two groups were found, the responses were combined to yield the rankings used for the second-round evaluation.

Differences between Second-Round Respondents and Nonrespondents

There are no significant differences in the first-round rankings of second-round respondents and nonrespondents. The Kolmogorov-Smirnov two-sample test was used to analyze the level of agreement between the distribution of the

rankings of second-round respondents and nonrespondents. There are no significant differences between these two groups.

Differences in Responses by Organizations Participating in the Third Round Only and Organizations Participating in Earlier Rounds as Well

Sixteen usable questionnaires were returned from IS executives who participated only in the third round. The sample was split at the median into groups on the basis of each of the following organizational factors: full-time employees, revenues, and structure of the IS function. Chi-square analysis was used to test for significant differences between the organizations represented by these two sets of respondents (i.e., third round only and earlier round participants) for the organizational factors. Chi-square analysis was performed on each factor group for the two sets of respondents (i.e., third round only and earlier round participants). Yates correction factor was applied where appropriate. No significant differences exist between the two subsamples on any of the factors.

Chi-square analysis, with Yates correction factor where appropriate, was performed on two categories of use (i.e., use and no use) for each of the two groups (i.e., third round only and earlier round participants). The differences between the two samples in the use and valuation of the measures are significant in only three instances. The original sample uses cost allocation significantly more often than the third-round only sample (Chi-square = 6.28, df=1, p=.01).

Finally, t-tests were used to analyze differences in the value of measures by original and third-round only participants. Respondents participating in the first two rounds value time for the IS function to respond to user complaints (t=2.73, df=27, p=.011) and cost allocation (t=2.56, df=12, p=.025) more than third-round only respondents. The mean values of original participants for response to user complaints and cost allocation are 4.22 and 3.56, respectively. The value of cost allocation for third-round only participants for these measures are 3.18 and 2.00, respectively.

Differences Based on SIM Membership

It is possible that organizations with SIM members may be sensitized to evaluation concerns. SIM members responded to previous studies about key IS issues (i.e., Ball and Harris, 1982; Dickson, et al., 1984; Brancheau and Wetherbe, 1987). However, the results of this study appear generalizable to non-SIM members since only two significant differences are noted between the SIM and non-SIM samples in the use and valuation of measures. SIM members value the measure of return on management less (t=-2.31, df=12, p=.039), and formal appraisal systems more than non-SIM members (t=2.62, df=38, p=.013). The mean ratings for SIM and non-SIM members, respectively, are 2.64 and 4.33 for the value of the measure of return on management, and 4.53 and 3.50 for the value of formal appraisal systems.

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Organizational Factors Affecting the Evaluation of Information Systems Performance