

The Relationship Between Perception of IS Issues and Forces that Drive IS

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ABSTRACT

The relationship between IS manager perceptions of key IS issues and the forces that drive the IS process is examined. Although key IS issues are widely addressed, there is little evidence about IS manager perceptions of what is important to translate into action. However, results of this nationwide survey show that four of the top five key IS issues are significantly related to forces that drive IS decisions. For example, when organizational learning about IS has a high priority in the firm, the IS decision making process that is primarily technology driven. When another issue — the use of the data resource — has a high priority, IS decision making is primarily driven by organizational needs.

INTRODUCTION

Substantial effort has been invested over the last several decades to determine the appropriate mix of information systems professionals, users, managers, and technology that will enhance the IS process. One stream of research about the IS process addresses the role and influence of the CIO (chief information officer) [5,8].

Despite the amount of research related to the CIO role, there is little convergence in the results. Research has concentrated largely on the CIO as the catalyst in the process of bringing IS to the forefront of the CEO's organizational plans. CIOs are expected to guide the organization's application technology and to initiate the integration of this technology into corporate business planning. One CIO suggests that senior IS managers should divide their time equally between technical issues, finance, and business administration. "Learn what your company does, why, and how. Tell (top management) how they can work better with what you know about their computer system" because CEOs want IS managers who are equally adept in the business of the company and technology [5, p. 82].

This is consistent with the long-standing view of IS as a liaison between organizational users and technology [6]. IS must make a match between what is currently possible and what is worth doing for the organization. The purpose of this study is to examine the relationship between CIO beliefs about what is important and CIO actions.

Actions are measured by four major forces that drive IS changes: organizational needs, technological advances, opportunistic matching of needs and technology, and formal planning [3]. Several studies have examined IS manager assessment of key IS issues [4,10], yet there is little evidence that these beliefs about what is important are consistent with IS managers' actions [1,7]. Without this, the information about perceptions of key issues is somewhat academic with little practical value.

BACKGROUND

Key IS issues and driving forces underlying IS decisions are discussed below.

Key IS Issues

The key IS issues addressed are developing an information architecture, use of data as a resource, strategic IS planning, human resource development, and organizational learning. These were chosen because they emerged in the Niederman, et al. [4] survey of IS managers and general managers as the five most important IS issues in the 1990s. The first three issues are closely related to the enterprise-wide use of IS, whereas the last two are more closely related to specific IS interests.

Developing an information architecture helps an organization identify its primary categories of information and how those categories fit with business processes. The archi-

ecture provides an ideal vision of all technology to guide organizational planning. Applegate and Elam [1] indicate that IS managers spend up to 20 percent of their time developing a corporate information architecture, regardless of background, experience, and tenure with their companies. Thus, this seems to be a widely addressed issue in practice.

Improving IS strategic planning requires an organization to "align its long-range IS plan with its strategic business plan" [4, p. 496]. In today's technology dependent corporate world, a corporate strategic plan must include the role and contribution of IS. Many senior IS executives serve active roles on corporate strategic planning committees [7], and new IS executives spend up to 27 percent of their time helping to develop corporate strategy [1]. Therefore, IS strategic planning seems to be another widely addressed issue in practice.

Making effective use of the data resource requires the development of a climate within the IS department and throughout the entire organization that "values the data resource as a corporate asset" [4, p. 496]. This facilitates organizational sharing and management of the data resource. Thus, these three issues address the role of IS throughout the entire organization and the integration of IS into the top level of the organization.

Specifying, recruiting, and developing human resources for IS has become increasingly important to the IS department's ability to address the current and future shortages of good IS professionals. Human resource management includes clarifying career paths and developing business skills in addition to simply filling positions. This takes a large proportion of the IS budget [9] and a substantial proportion of the CIO's time [1]. It is small wonder that the human resource aspect of IS has become perceived as one of the most important issues in IS today.

Facilitating organizational learning and the use of IS technologies requires IS to "demonstrate its own ability to learn and use new technology" [4, p. 497]. Organizations must learn to use appropriate new IS technologies in order to remain successful, and it is largely up to IS to facilitate that learning. Many IS executives emphasize the importance of developing an information technology infrastructure for their organizations [1]. Executives who pursue these are attempting to facilitate organizational learning in their firms. Although this issue and the human resource issue affect IS's ability to serve the organization, they are more specifically related to and have more effect on the IS area than on the organization as a whole or any other subunit.

Driving Forces Underlying IS Activities

Despite the abundance of research that addresses perception of key IS issues, there is a noticeable absence of any attempt to determine if the issues IS managers believe are

important are related to IS behavior. Without this information, there is a chasm between what is known about IS manager perceptions and the forces IS managers use to drive IS processes. If beliefs do not translate into action, then they have little practical value. However, if beliefs do translate to action then influences on IS manager perceptions of what is important merit substantial attention.

Huff and Munroe [3] propose that there are four basic underlying forces that drive the IS process: organizational needs, technological innovation, opportunistic matching of needs and technology, and formal IS planning. If perceptions drive actions, then when IS manager perceive particular issues to be important, they will also see particular driving forces as important.

We propose several research questions to examine the extent to which this occurs in practice. It is important to note that because of prior lack of attention, there is little theoretical foundation for the assessment of the relationship between IS managers' perception of key issues and the driving forces that underlie the IS process. Thus, this study is largely exploratory, and findings should be interpreted accordingly.

Organizational Need Driven Processes

Niederman, Brancheau, and Wetherbe [4, p.496] state that "IS must develop a climate within its department and throughout the organization that values the data resource as a corporate asset." If data are to be valuable to the organization, then they must meet some organizational need. Users must be able to use this resource to solve problems, identify opportunities, or evaluate options. IS is becoming more and more crucial to an organizations's ability to quickly access, summarize, and analyze enterprise-wide data. Thus the more importance IS places on the organization's use of the data resource, the more organizational needs are expected to drive the IS process.

Niederman, et al. [4, p.496] state that "it is increasingly critical to an organization's success that it align its long-range IS plan with its strategic business plan (and) underscore the need (for IS) to continue improving strategic planning skills." IS managers who perceive the importance of integrating IS plans with organizational plans are expected to also pursue an organizational need-driven strategy.

IS managers perceive the IS process to be primarily driven by organizational needs when they also perceive the following key issues to have a high priority:

H1a: the use of the data resource

H1b: strategic IS planning

The support and service division of a large corporation implemented a strategic planning process when IS emerged as a factor that was critical to the company's success [2]. The firm could not afford information that was inaccurate or not

easily accessible, thus management pushed for new systems that would better meet the needs of the organization. The specific mission of IS was to meet organizational needs by developing an integrated strategic plan that would allow the company to more effectively use the data resource to gain competitive advantage. Thus, in this need-driven process, the data resource and strategic IS planning both had a high priority.

IS Technology Driven Processes

Facilitating organizational learning and the use of IS technology is seen by many as crucial to organizational survival. "Organizations that will prosper will be those that make use of appropriate new IS technologies in their entire operation" [4, p. 497]. In order for this to be possible, IS must continually learn and use new technology. Thus, when senior IS managers perceive organizational learning as an important issue, it is expected that they will pursue a technology driven IS strategy in a effort to incorporate new technology into the organization.

IS managers perceive the IS process to be primarily driven by technology when they also perceive the following key issues to have a high priority:

H2: organizational learning about IS

One example of this relationship is seen in a technological change that many companies are currently undergoing — the implementation of Electronic Data Interchange (EDI). EDI is an automated communication system designed to reduce the paperwork and transaction processing time between customers and suppliers. Large companies often force suppliers to quickly implement the technology necessary to changeover to EDI. Not only must the technology be in place, but employees of the supplier must quickly learn how to use the software and procedures associated with EDI.

Opportunity Driven Processes

When data as a corporate resource and organizational learning gain top-level importance, the IS process may be largely driven by opportunistic matching of needs and technology. Although use of the data resource and organizational learning are two sides of the same coin, attempting to incorporate both may create a paradox for IS managers. The two are closely related because organizational learning may be a prerequisite for appropriate use of data as a corporate resource.

On the one hand, the IS area tries to meet organizational needs in order to make efficient use of the data resource. However, organizational needs that are met may be primarily short run requirements, thus not lending themselves to many technological innovations that take time to install and learn.

On the other hand, IS managers are attempting to integrate new and innovative technology into the organization, which

may or may not be readily applicable to immediate organizational needs. IS managers are under pressure to quickly respond to changing technologies, but they also have a responsibility to create an environment to support organizational learning about these technologies. The former is a short-run pressure, while the latter has a longer time frame. However, quick responses and organizational learning must be integrated. Unless there is a clear direction from top management, these two may be difficult to simultaneously accomplish, and may result in opportunistic matching of needs and technology. Two hypotheses arise out of this discussion:

IS managers perceive the IS process to be primarily driven by opportunistic matching of organizational needs and technology when they also perceive the following key issues to have a high priority:

H3a: organizational learning about IS

H3b: the use of the data resource

The finance division of one corporation had an IS staff of about 60 people (out of 1000 employees) that largely engaged in reacting to daily crises instead of following a long-range plan [2]. The IS staff tried to match technology with organizational needs as the situation dictated and as the opportunity for doing so arose. The staff were forced to continually educate users about new systems or new technology (organizational learning). In addition, resources were not allocated in a logical manner, issues about the appropriate use of the data resource continually surfaced.

Formal Planning Driven Processes

When information architecture, use of the data resource, and IS strategic planning are perceived as important, the IS process will be driven by formal planning. Incorporating IS into the strategic plan and attempting to effectively utilize the data resource both imply a formal rather than an opportunistic approach to IS management. In addition, the presence of an information architecture to identify major information categories and their relationship to business processes prescribes a more formal IS process.

The following hypothesized relationships are examined:

IS managers perceive the IS process to be primarily driven by formal planning when they also perceive the following key issues to have a high priority:

H4a: information architecture

H4b: the use of the data resource

H4c: strategic IS planning

For example, the Logistics and Supply Agency (LSA) — a federal government agency that furnishes spare parts to other government agencies — implemented a formal planning process in an effort to coordinate and prioritize requests for

new systems [2]. LSA's objective was to implement a set of integrated systems across the firm, emphasizing strategic (mission-critical) functions. This agency wanted a set of systems that could have decentralized management (at the department level) yet provide the agency with a map (architecture) of crucial data. Formal planning was instituted in order to facilitate strategic functions, more effectively use the data resource, and provide the firm with a comprehensive view of its information architecture.

METHODOLOGY

Senior information systems managers in forty organizations nationwide were asked as part of a mail survey to indicate their perceptions of the importance of the top five key IS issues reported in [4] and the importance of four driving forces underlying IS decisions. Note that rather than CIO, some firms use titles such as MIS manager or senior vice president of IS. However, for clarity, the term CIO is used in this study to represent the senior IS manager in the firm regardless of title.

Firms in a variety of industries are included in the study. The most widely represented group is manufacturing (38 percent), followed by finance, banking, and insurance (35 percent). Wholesale and retail trade represent 12 percent of the respondents, and the utilities industry comprises the remaining 12 percent.

RESULTS

Means and standard deviations of each of the key issues and driving forces are provided in Table 1.

The most important key issue in this study is use of the data resource, followed by strategic IS planning and development of a corporate information architecture. The least important of these five issues is organizational learning about IS and the human resource management aspect of IS.

Organizational need is the most common driving force behind IS decisions, with formal planning second. Opportunistic matching of organizational needs and technology is third in importance. Interestingly, technological advances are fourth in importance to IS decisions. Thus, the often painted picture of the IS area as seeking the most advanced technology, regardless of user needs, is not supported.

A multiple regression model was used to assess the proposed relationships between senior IS managers' perceptions of key issues and each of the four triggering mechanisms (driving forces) underlying the IS process. Results are provided in Table 2.

Effective use of the data resource is significantly related to an IS process that is primarily driven by organizational needs. However, strategic planning is not significantly related to an organizational need driven process. The R² indi-

**Table 1
Means and Standard Deviations for Each Indicator**

Construct & Indicators	Mean*	Standard Deviation
Key IS Issues		
Information Architecture	3.53	1.34
Use of the Data Resource	4.00	1.47
IS Strategic Planning	3.65	1.29
IS Human Resource Management	3.33	1.46
Organizational IS Learning	3.50	1.40
Driving Forces Underlying IS		
Organizational Needs		
Technological Advances	4.43	1.30
Opportunistic Matching of Needs and Technology	3.23	1.10
Formal Planning	3.53	1.18
	3.58	1.36

*Response scale of 1 to 6 where 1 = very unimportant and 6 = very important. Note that a six-point scale does not allow respondent to express indifference or to state that the question does not apply. Because these are issues and forces found in the majority of firms (Huff and Munroe, 1987; Niederman, et al., 1991), indifference does not seem relevant. Thus, respondents were required to make a choice about the importance of each.

cates that almost 60% of the variance in the organizational need-driving force is explained by this model. This supports the notion that when IS managers place a high priority on improving the organizational use of data, they attempt to provide information systems' support that meets organizational data/information needs.

Strategic planning is not significantly related to the organizational need driven process. Few organizations effectively incorporate IS planning into the strategy of the organization, and IS managers often feel removed from the planning process. Even though IS managers may perceive strategic planning as an important issue, most organizations are still a long way from incorporating IS into the business plan. Acting on this perception may not be possible in such a setting.

As expected, organizational learning is significantly related to a technology-driven IS process. The R² indicates that approximately 40% of the variance in the technology construct is explained by the IS manager's perception of the importance of organizational learning. Again, there is support for the belief that IS managers attempt to match actions with their perceptions of what is important. When they place a high priority on facilitating organizational learning and en-

Table 2
Multiple Regression Analysis Effects of Senior IS Managers' Perception of Key Issues on Driving Forces

Dependent Variable Driving Forces (overall p)	Independent Variable (Key IS Issues)	p	R ²
Organizational Needs (0.0001)	Use of the Data Resource	0.0005	0.5764
	IS Strategic Planning	0.1210	
Technology (0.0001)	Organizational IS Learning	0.0001	0.3732
Opportunistic Matching of Needs and Technology (0.0001)	Use of the Data Resource	0.0423	0.5001
	Organizational IS Learning	0.0021	
Formal Planning (0.0001)	Information Architecture	0.0003	0.4524
	Use of the Data Resource	0.1110	
	IS Strategic Planning	0.0146	

terprise-wide use of information technology, they presumably believe that innovative use of technology is the key to organizational survival [4]. Thus, they pursue a technology-driven strategy in an effort to incorporate technological innovation into the organization.

Support is also provided that a paradox arises when importance is placed on both the data resource and organizational learning. Both issues are significantly related to an IS process that is driven by the opportunistic matching of needs and technology. In addition, 50% of the variance in the opportunistic matching driving force is explained by these two issues.

Finally, the perception of the need to improve IS strategic planning is significantly related to an IS process that is driven by formal planning. R² indicates that 45% of the variance is explained by perception of the importance of an information architecture, use of the data resource, and strategic IS planning. This supports the idea that when IS is incorporated into the business strategy, then the IS process is more formalized.

Although many organizations find that an information architecture is too difficult to pursue [2], these findings support the idea that the perception of a corporate information architecture is positively associated with an IS process that is driven by formal planning. This finding may seem to be somewhat tautological. However, this is actually not the case. Despite the discipline it requires, an information architecture is a fundamental strategic component of managing information technology in an organization. However, it must not only be defined, it must be understood and accepted. This

requires a high degree of formal communication and formal planning throughout the firm.

Exploratory Data Analysis

The argument could be made, that in the absence of prior empirical evidence and specific theoretical support for our hypothesized relationships among the constructs, a significant relationship may have been omitted from the model. In the extreme, perhaps all key issues are significantly related to each of the driving forces. Because this is a plausible alternative explanation for the results, and because elimination of such explanations increases validity, an *ex post facto* exploratory analysis was performed after hypothesis testing was completed.

A multiple regression model was used to test the effects of each of the key issues simultaneously. None of the non-hypothesized relationships were found to be significant at $\alpha = 0.10$, 0.05, or 0.01. Furthermore, all of the significant hypothesized relationships were found to be significant at $\alpha = 0.10$ with the exception of the relationship of formal planning with information architecture and the use of the data resource. Therefore, only the findings about these two relationships should be interpreted subject to the *ex post facto* findings.

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Findings indicate that IS manager actions significantly differ with what they perceive to be important. In most instances, the IS manager's perceptions of the importance of

key issues influence driving forces of IS responses. The driving forces of organizational need, technology, opportunistic matching of technology and needs, and formal planning are each significantly influenced by what IS managers believe is important, therefore beliefs do lead to action. IS managers strive to move IS in the direction they believe it should go.

Thus, one key to influencing the direction of IS in an organization is to influence what the IS manager believes to be important. For example, when they place priority on corporate use of the data resource, they allow organizational information/data needs to drive IS more than other factors. Thus, if CEOs learn to help IS managers develop organizational priorities for crucial IS issues, they can more effectively manage the IS process.

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