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Processes of Change in Information Systems Development: A Multiple Case Study Analysis

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The construct of information systems (IS) development has intrigued researchers for the past three decades and a sizeable body of literature has evolved. Conceptual frameworks specifying the effects of organizational, task, and individual factors upon the success of an IS development or implementation effort have been proposed (Ives et al., 1980; Lucas et al., 1990). However, reviews of that body of literature reveal that the majority of studies have emphasized the effect of individual factors (Alavi and Joachimsthaler, 1992), without examining constraints that could be due to an organization's context. Since the ultimate objective of IS implementation research is to provide guidelines for the management of IS implementation (Lucas et al., 1990), it is important to understand constraints that could impede change in IS development.

Organizational constraints upon IS development may result in less flexibility to accept change. For example, the predominance of an organization's past procurements of computer hardware and software or its commitment to future procurements from one vendor, the employment of a particular programming environment, off-the-shelf software, a key employee, or a given brand or specific model of equipment may create constraints or different types of loyalty that could impede change. These types of loyalty may also limit an organization's ability to apply policy recommendations supported by IS research, such as the policy implications reported in IS implementation studies (Delone, 1988; Montazemi, 1988; Raymond, 1985, 1990).

This paper attempts to identify the existence of different types of loyalty relationships as they relate to IS development behavior within organizations. A specific type of loyalty that relates to IS procurements is emphasized. It refers to the selection of IS hardware and software only from the previously successful vendor, without considering alternative solutions. The specific reasons for that type of constrained behavior are extensively analyzed and the factors identified are compared to those reported in the marketing literature to contribute to industrial source loyalty. The organizational procurement environment may present similar constraints or forces that apply to industrial procurement decisions. Recommendations for managing change in IS development can be strengthened by such a comparison.

The decision to investigate loyalty constraints that exist in an organizational context was based on their potential importance as inhibitors to change in IS development. The findings of the study reported in this paper provide support for that assumption. Current IS development decisions were found to be influenced by the presence of loyalty constraints. These findings can be useful in recommending appropriate managerial responses to effectively manage change in IS development. The data in the study were obtained from small to medium sized firms. The generalization of the findings to large firms should await replication in that domain.

In the next section, pertinent research examining the construct of source loyalty is reviewed and implications are drawn for IS research. Studies that offer suggestions about the use of the loyalty construct in IS development research are reviewed next. The paper then continues with the development of the research questions and presentation of the study's findings.

REVIEW OF LITERATURE ON SOURCE LOYALTY

An extensive research effort has been carried out in marketing in order to define, measure and test consumer reactions to brand loyalty (Jacoby and Chestnut, 1978; Jacoby and Kyner, 1973). A few studies have examined industrial source loyalty, or the equivalent of consumer brand loyalty at the organizational procurement level.

Industrial source loyalty relates to firm buying behavior. Source loyal relationships are longer-term and require more time to establish than consumer brand loyalty. In addition, they may not be as easily dissolved once established (Morris and Holman, 1988). In Wind's (1970) source loyalty model, a number of factors are assumed to contribute to a buyer's loyalty toward a supplier. These mainly include (a) satisfaction with the supplier, (b) past experience with the supplier, (c) cost of identifying, evaluating and switching to a new supplier, (d) risk associated with switching to a new supplier, and (e) product users' recommendations about suppliers.

In Jacoby and Kyner's (1973) conceptual definition, loyalty is assumed to be expressed over time by some decision making unit. Brand loyalty is reported by DuWors and Haines (1990) to be transitory and time dependent. Consumers were found to follow a period of habitual purchasing, to enter a period of learning, to learn, and on the basis of what they have learned, to start a new period of habitual purchasing. McCarthy et al. (1992) define two types of consumers: loyals and shoppers. Switching between these two types during a given time period indicates the temporal nature of loyalty.

At any given time period, therefore, a firm or individual exhibits a certain degree of loyalty. The intensity with which loyalty is expressed may be captured by the different classifications cited above. In the IS arena, sourcing of hardware and software can follow a similar pattern. Consider a firm with an automated IS that further develops its IS with a procurement of goods or services. If only the previously successful vendor in past development is considered, that selection process is defined as "narrow selection." If a different vendor or multiple vendors are considered, that selection process is defined as "wide selection." The forces that induce a firm to enter, remain in a particular system selection process, or switch between the two processes are examined in this paper.

USE OF THE LOYALTY CONSTRUCT IN *IS* RESEARCH

Only a few studies have considered types of loyalty in IS development. McKenney and McFarlan (1982) describe technological diffusion in organizations in terms of four decisions: (a) decision to initiate a project with new technology, (b) decision to further experiment with the technology, (c) decision to control the technology, and (d) decision to transfer the technology to other parts of the organization. The choice, not to proceed at each of the four junctures, is described as stagnation. The reasons for stagnation are all management failures: too little management, too focused an implementation, and too much standardization. Stagnation is McKenney and McFarlan's term for a constraint imposed by loyalty to existing technology. McFarlan (1984) has also identified situations in which adoption of technical change would increase the later cost of changing alternatives.

King (1982) has argued that IS design methodology should facilitate consideration of alternative (or multiple) designs for a given system. Similar to a wide selection process, two or more alternative designs multiply the design costs and stretch out development time. Although incremental benefits may outweigh the added costs, those benefits may not be easily identifiable and evaluated in advance. As in the process in which a consumer moves from habitual purchasing to learning about new alternatives (DuWors and Haines, 1990), a firm would employ a single design and then learn about the benefits of considering a larger set of alternatives. For example, King noted that alternative designs

would greatly enhance user involvement by allowing users more control over tradeoffs in the design process. Griese and Kurpicz (1985) identified types of firms that could correspond to the habitual purchasing and learning styles. In line with King's argument about the benefits of alternative designs, Griese and Kurpicz report that decision makers in "learning" firms are more active and interested in IS than other decision makers in firms following a habitual purchasing style.

The above studies might suggest that a firm would enter a wide selection process once it has reached a particular stage of maturity. Alternative explanations, however, might suggest different reasons about the decision to enter, remain, or switch between system selection processes. Loyalty relationships, for example, could be embedded in organizational culture and foster organizational inertia (Cooper, 1994). Particular organizational norms could create a conditioning process and foster a "programming" of individual decision making (Huber, 1981). In addition, economic reasons could inhibit change. Williamson's (1979) transaction cost theory has been applied in the industrial procurement area. In cases in which two parties commit to transaction-specific investments, governance structures characterized by loyalty are reported as more efficient in the long run (Heide and John, 1988). A supplier's leadership status in a market is often associated with the maintenance of customer loyalty or achieving excellence in Treacy and Wiersema's (1993) "customer intimacy" path to market leadership. IBM's position as a market leader in IS procurements, for example, could imply more long-term and enduring dependence on its products. In just-in-time (JIT) exchanges, sole sourcing, long-term relationships, strong interorganizational linkages, and frequent communications between buyer and supplier are the norm (Frazier et al., 1988). Empirical findings also indicate that sole sourcing is a critical factor of JIT implementation success (Mehra and Inman, 1992). JIT exchanges incorporate aspects of a dependency relationship that indicate constrained behavior. In conclusion, the implementation of technology cannot be adequately explained if such constraints upon existing organizational procedures, perspectives, or philosophy are not considered. This paper is an attempt to analyze such potential constraints.

RESEARCH QUESTIONS

This study emphasizes a single type of loyalty relating to the narrow selection of hardware and software from a single vendor and explores issues relating to such constrained behavior. The exploratory nature of the study necessitated the use of a multiple-case study design, as the strength of that design is in answering what Yin (1984) calls "Why Questions."

The research questions are as follows:

Research Question #1: Why do firms enter the narrow selection process?

Research Question #2a: Why do firms remain in the narrow selection process and is this situation considered permanent?

Research Question #2b: Why do firms remain in the wide selection process?

Research Question #3: Why do firms leave the narrow selection process and what differences between firms explain this return to the wide selection process?

METHOD

Small-and medium-sized firms were randomly selected from Dun and Bradstreet's **Million Dollar Directory**. Consensus is important with the multiple-case study design (George, 1979; Yin, 1984).

In order to make consensus possible, some similarity of circumstances is needed and the firm's size was restricted for that reason.

Respondents to this study were the information systems operations managers from each firm. These managers were responsible for IS development within their firms. Some information on firm characteristics was obtained by mail questionnaire. The major source of information, however, was telephone interview. The principal investigator served as the sole interviewer and analyzer of the taped conversations. An interview protocol with standardized explanation of terms was used.

Eleven firms agreed to participate in the study. The firms can be briefly described as an automobile dealership (hereafter referred to as Auto), two contractors (Con1 and Con2), two common carriers (Trans1 and Trans2), a manufacturer (Manu), a grain milling company (Mill), a bank (Bank), a wholesale petroleum distributor (Dist), a property management firm (PMgr), and a farm cooperative (Coop). The average number of employees in these eleven firms was 174, with a standard deviation of 165 employees. The IS in nine of those firms were functioning in a multi-user computing environment.

RESULTS

Research Question #1: Entering the Narrow Selection Process

Similar factors as those reported to contribute to industrial source loyalty are also found to be relevant to vendor loyalty in IS procurements. Three major factors were identified: (a) satisfaction with the hardware/software vendor that was selected earlier using a wide selection process, (b) task difficulty associated with wide selection, with the majority of managers having a low level of technical ability in order to effectively carry out a wide selection process, and (c) time consuming nature of wide selection, even when a manager had the ability to perform that difficult task.

The Coop case illustrates the time consuming aspect of wide selection. The selection process took one year in which 15 alternatives received consideration. There had been active and thorough assessment during vendor demonstrations, as well as extensive communication with other Coops and with the regulatory agency to whom the Coop reported on its chemical sales.

The difficulty of wide selection was primarily due to the fact that most managers did not possess the technical ability to evaluate alternative solutions. Con2's manager developed its system by searching for a vendor who could provide a turn-key system. Given its limited ability to assess computers and software, Con2 concentrated on assessing vendor service and reliability. Con2's manager phoned six customers of the value added reseller (VAR) and three Con2 executives attended a demonstration of one system in the firm most similar to its own. They chose the vendor, not the system. Control was then turned over to the vendor to choose the system. This approach, of course, is used in other procurements besides IS (Mintzberg et al., 1976).

In contrast, Con1's manager had a twenty-year career heavily involving computers. Con1's manager would similarly make an on-site visit. However, this would only be made to assess new hardware. In addition, the emphasis of the questions would be directed at assessing the hardware and not the vendor. He chose the system, not the vendor.

Since the relative performance of individual hardware and canned software products continually changed in comparison with competing items, wide selection was necessary for Con1. Since Con2 had only assessed vendor service and reliability, its experience with the previously-successful vendor led management to opt to not examine other vendors.

Research Question #2a: Permanence of the Narrow Selection Process

The answers to the previous question also apply here. Satisfaction with the previous product/vendor and the difficult/time-consuming nature of wide selection were general rationales. Two additional factors identified here refer to the cost and risk associated with switching to a new product/vendor.

Trans1 and Manu had extensively-developed custom software that captured unique features of their firms' situations. Equivalent alternatives would require a major time expenditure to develop. Auto utilized a turn-key system from a VAR. About one-third of its employees interacted with that system on a day-to-day basis. Given widespread use of the system, organization-wide learning and other conversion costs of a system from a competing VAR would be quite high. In Lewin's (1947) change theory, these costs would represent forces inhibiting unfreezing towards change, which would imply switching from the narrow to the wide selection process.

Risk was related to permanence in the cases of Dist and PMgr. Dist's manager had been associated with two previous selections in which the software proved unsatisfactory in meeting the firm's needs. Since the present software did satisfy the firm's needs, entertaining new alternatives that might contain additional benefits was considered out of the question. PMgr's manager had considered six alternatives in the wide selection process. Later, he noted that some of these vendors had failed. He had selected software that was developed and distributed by PMgr's trade association. Software from that source did not possess this same risk of not being supported.

Research Question #2b: Firms in the Wide Selection Process

Two firms were in wide selection for reasons that were unique to them. The Bank adopted a middle position between the extremes of wide and narrow selection. The Bank's manager noted that the Bank offered many different services that did not necessarily require integration of the applications. With each application procured separately and sequentially, the Bank intentionally restricted its investigation to two choices from well-known vendors in the banking industry. With this restriction, the Bank did not consider system selection (mainly software selection) to be a difficult task.

Trans2 also chose a middle position. It had not recently made changes in its IS. Yet, Trans2's manager accepted all invitations to examine alternative software. He also discussed IS alternatives at trade association meetings. Passive search was the strategy he was following. He retained the old software because of no clearly-better alternative, even though passive search was occurring. The Bank's and Trans2's rationales were similar to the extent that wide selection had been made less difficult.

Research Question #3: Switching to the Wide Selection Process

In three cases, Con1, Mill and Coop, the IS was not adequately satisfying the firm's needs or could not continue to satisfy the firm's needs. Because of dissatisfaction with the existing IS, all three firms had switched to wide selection.

Mill's manager was dissatisfied with the capabilities of his canned software. He considered the firm to have reached the size to hire a programmer. The manager did not mention the possibility of hiring an external consultant to develop software as in the case of Trans1 and Coop or to allocate development time within the work schedule of an employee as with Manu.

Con1 adopted a wide selection process because of its new manager. As previously described, he had high technical ability, confidence, and interest in computers. Con1 had a minicomputer and custom software for its systems. The manager, representing a new regime, assessed the custom

software as being inflexible. Canned software replaced the custom software for financial transaction processing and a PC-based LAN was added, with the minicomputer to be replaced next.

Coop switched to wide selection because of two major reasons. First, the present hardware configuration (stand-alone PCS) had reached its capacity and there was a desire to catch up technologically. Second, new regulations called for different reporting requirements on chemicals and major software changes were thus made necessary. As previously described, the wide selection process was a difficult task for the Coop. The Coop's manager was satisfied with both the past hardware vendor and the consultant/custom programmer and intended to continue using their services for parts of the new system. Although the manager desired to retain the flexibility of custom programming, no single VAR could be identified that could provide a complete software and hardware solution.

In Coop's case, technological change and the new government reporting requirements had created new needs and, consequently, dissatisfaction with the existing system. Mill's manager was always dissatisfied with the old canned software solution. Firm growth finally allowed Mill to replace that solution. In Con1's case, dissatisfaction with the existing system was due to a change in management. Dissatisfaction is, therefore, revealed as a general condition in switching to wide selection although the reasons for dissatisfaction vary among firms.

An important characteristic of Con1 was management turnover. This was also a characteristic in the case of PMgr, which had entered the wide selection process soon after a new manager was hired. PMgr's new manager worked vigorously during the first six months in order to win approval to automate and, after the initial automation, remained in the narrow selection process. Management turnover was thus associated with switching to the wide selection process.

Table 1 summarizes the results for the four research questions by showing the main factors identified to relate to the particular system selection strategy.

IMPLICATIONS FOR SUCCESS FACTOR RESEARCH

Constraints created by loyalty to a vendor or product have been largely ignored in much of the past IS literature. Table 2 outlines IS success factors identified in the small business literature and corresponding factors identified in the technological innovation/diffusion literatures. Such factors are characterized by Kwon and Zmud as "key forces contributing to successful efforts to introduce technological innovations into organizations" (1987, p. 233).

Ein-Dor and Segev (1978) classify factors influencing IS success as controllable, partially controllable, and uncontrollable. Controllable factors are the ones that can be best employed to enhance the likelihood of success for an IS. Beginning in Table 2 with the general organizational category, for example, the sophistication of a firm's IS (Raymond, 1985, 1990) could be controlled by expanding time allocated to systems development and by having a competent consultant assess the appropriate technology and conduct an adequate requirements analysis. Also, in-house computing (versus service bureau) would likely be controllable. The other categories in Table 2 may also contain important controllable variables. These include adoptable technology, use of a system analyst, adequate development planning, involvement, and knowledge. For successful

TABLE 1
SUMMARY OF MAJOR FINDINGS

Why Do Firms Enter the Narrow Selection Process?

1. Wide system selection is difficult and time consuming

2. Low technical ability of IS managers

3. Satisfaction with vendor service and reliability

4. Industry standardization

Why Do Firms Remain in the Narrow Selection Process?

1. Reduced risks

2. Switching costs (learning and conversion costs)

3. Software satisfies system needs (selected software was the result of a previous wide selection process).

Why Do Firms Remain in the Wide Selection Process?

1. Experience with vendor offerings reduced task difficulty associated with wide selection

Why Do Firms Switch to the Wide Selection Process?

1. Existing IS not satisfying the firm's needs

2. Technological change

3. New government reporting requirements

4. Management turnover

TABLE 2
SUCCESS FACTORS IN THE LITERATURE

IDENTIFIED SUCCESS FACTORS IN THE SMALL BUSINESS LITERATURE	KWON AND ZMUD'S (1987) REVIEW OF THE IMPLEMENTATION AND TECHNOLOGICAL INNOVATION LITERATURE

Technology

Interactive Application Sys (Raymond, 1985; Montazemi, 1988)	Compatibility, Relative Advantage, Complexity

Task

	Task Uncertainty, Autonomy, Variety,

Process

Presence of System Analyst (Montazemi, 1988) Level of Infor Require Analy (Montazemi, 1988) User Involvement (Montazemi, 1988) or Planning/Control (DeLone, 1988) User Involvement (Montazemi, 1988) or CEO Involvement (DeLone, 1988)	

Individual

User Computer Knowledge (Montazemi, 1988) or CEO Computer Knowledge (DeLone, 1988)	Job Tenure, Cosmopolitanism, Education, Role Involvement

General Organizational

Size (Raymond, 1990)
Structure (Decentralization)(Montazemi, 1988)
Time Frame (Strat Decis Cycle) (Raymond, 1990)
IS Resource Level (Raymond, 1990)
Maturity (Formalization) (Raymond, 1990)
IS Sophistication (# of Admin Applic, IS Staff Size,
    IS Mgr Rank)(Raymond, 1985, 1990)
In-House (vs. Service Bureau)(DeLone, 1988;
    Raymond, 1985)
	Centralization
	
	Formalization
	
	Specialization, Informal Network

Environmental

	Heterogeneity, Uncertainty, Competition, Concentration/Dispersion, Inter-Organizational Dependence

implementation in smaller organizations, for example, the CEO should develop his or her computer knowledge and be involved in IS development. For the larger firms in the small- to medium-sized category, the manager of computer operations, as well as other managers and users of computer

information, should develop his/her computer knowledge and become involved in development.

Partially controllable factors may relate to a firm's resource level and level of maturity in IS development (Raymond, 1990). Such resources should be in line with requirements for support of technical and administrative functions. Explicit policies and procedures regarding the IS should also be developed. Increasing the rank of the IS manager will show increased top management support for computing, which in turn may increase the involvement of users in system development. Noncontrollable factors relate to an organization's context, for example, organizational size (Raymond, 1990), structure (Montazemi, 1988), and decision time frame (Raymond, 1990). These factors lie outside the organization's direct control and represent unavoidable constraints in the design of an IS.

Small firms may spend most of their automated existence in a narrow selection process in which they only do business with one software and/or hardware vendor or consultant as described in the cases. If a firm is within the narrow selection process, one implication is that the likelihood of implementing technical innovation is reduced. The above recommendations may not be easily implemented in such firms, as both the number and nature of available alternatives are constrained to a limited set.

The recommendation to change to a systems analyst, for example, will not likely be applied if the systems manager (or other employee) has previously developed the firm's custom software. The recommendation to assess (and adopt) appropriate software technology will not likely be applied if an intellectual investment has been made in competing technology, if risks are perceived in migrating to new software, or if learning costs are high in the change. If risks or learning costs support the current canned software, the recommendation of an adequate requirement definition loses its potential benefit. The recommendation to assess (and adopt) appropriate hardware technology will not likely be applied if inferior hardware is offered by a vendor or VAR with a prior record of good service and reliability.

It is therefore suggested that recommendations of success-factor research could be difficult to implement in a firm following the narrow selection process. If the narrow selection process is significant and prevalent, the seemingly controllable, success-factor variables are more similar to Ein-Dor and Segev's (1978) uncontrollable organizational variables.

DISCUSSION

The present study identified the concepts of narrow and wide system selection as two classifications relevant to source loyalty in IS procurements. These were successfully employed to capture a firm's degree of loyalty to the previously successful hardware and software vendor. Six of the eleven firms interviewed (Con2, Trans1, Manu, Auto, Dist, and PMgr) followed a narrow system selection process, while the other five firms (Con1, Mill, Coop, Bank, and Trans2) followed a wide selection process.

The major purpose of this study was to identify the existence of constraints inhibiting change in IS development that could be due to a narrow system development strategy. The results indicate that in small- to medium-sized firms, narrow selection is indeed a prevalent system development strategy. Besides satisfaction with the existing IS and its vendor, other major factors identified to contribute to source loyalty in IS procurements include difficulty with, and time consuming nature of, wide selection, perceived risk, learning, and conversion costs associated with switching, and experience with the successful vendor. These factors are consistent with those proposed in marketing as contributing to vendor loyalty in the industrial procurement process. The external validity of the present findings is therefore enhanced by consistency of the findings with a set of factors determining behavior in a different context.

Future research could build upon the case study evidence reported in this study and develop a

framework incorporating the effect of a number of factors upon the adoption of a particular style of system development. Alternative styles of system development should also be investigated in future research in order to empirically test their potential effect upon the adoption of technical innovations and perceptions of IS success. Results from those investigations could contribute to a better understanding of system development behavior undertaken within organizational contexts.

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