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Linking the Information Technology Structure With Organizational Competitive Strategy: A Survey¹

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Abstract

In a study involving 52 large organizations in the computer components industry, the relationship between information technology structure and organizational competitive strategy was examined. The results indicate that the information technology structure, as measured by the locus of responsibilities for information systems, is strongly related to competitive strategy. For example, an organization with a conservative competitive strategy possesses a more centralized information systems function than an organization with an aggressive competitive strategy. This means that user departments in a conservative organization have less control over their information technology function than user departments in an aggressive organization. These findings provide additional support for the organizational fit concept — that the conformity between information technology structure and overall organizational context variables, including competitive strategy, is instrumental to the successful implementation of information technology systems.

Keywords: IT structure, user, competitive strategy, centralization/decentralization, locus of responsibilities

ACM Categories: K.6.4, K.7.2

¹ A portion of this article was presented at the Northeast Decision Sciences meeting, Newport, Rhode Island, March 1988 and was the recipient of the outstanding paper award.

Assessing the appropriateness of a particular information technology (IT) structure for an organization helps to eliminate organizational mismatch and political friction. "Appropriateness" is partially a matter of how IT structure matches an organization's competitive strategy. This study investigates the relationship of information technology structures to competitive strategy and provides guidelines to assist information systems administrators in evaluating the suitability of various IT structures for their organizations.

Background

Recent progress in information technology has enabled user departments to assume an increasing share of responsibilities for their information technology systems. Furthermore, as information technology advances, this diffusion of responsibilities will probably continue (Dearden, 1987). But some organizations have been less eager than others in transferring the responsibilities for IT systems to their user departments. As a result, different organizations subscribe to various IT structures ranging from highly centralized to highly decentralized (Fried and Umbaugh, 1985; Golub, 1975).

Proponents of the "organizational fit" concept (Ein-Dor and Segev, 1982; McFarlan and McKenney, 1982; Olson, 1978; Wheelock, 1982) argue that the variance in IT structures is attributable to the difference in overall organizational context variables in corporations (Ein-Dor and Segev, 1982; Olson, 1978; Tavakolian, 1987). They maintain that to avoid causing organizational friction, an organization *should* structure its IT systems to conform with its overall organizational context variables, such as organizational decision-making structure, managerial philosophy, organizational form, and organizational competitive strategy (Cash, et al., 1988; McFarlan and McKenney, 1982).

Organizational decision making

Some proponents of organizational fit maintain that the IT structure tends to reflect the organizational decision-making structure (Ein-Dor and Segev, 1982; Poppel, 1980; Wheelock, 1982) — that the degree of centralization of IT systems reflects the degree of centralization of an organizational decision-making structure. An organization, then, with a centralized overall deci-

sion-making structure would have a more centralized IT structure than an organization with a decentralized overall decision-making structure. This proposition is supported by studies conducted by Ein-Dor and Segev (1982) and Wheelock (1982), but is disputed by studies undertaken by Olson (1978), Olson and Chervany (1981), and Olson and Davis (1981).

Organizational form

Organizational form is another variable believed to affect the locus of responsibilities for IT systems (Cash, et al., 1978). In the *functional* organizational form, an organization's structure is aligned with basic business functions such as marketing, finance, and accounting. In the *product* organizational form, the activities are grouped around the product or market lines. Proponents argue that an organization with a functional organizational form tends to rely on a centralized IT structure because a centralized IT function fits the organizational philosophy of structuring activities around functional departments. On the other hand, an organization with a product organizational form tends to have a decentralized IT function because a decentralized IT function fits its organizational philosophy of distributing the functional activities around the product/market divisions.

Organizational size

Organizational size is said by some to indirectly influence the IT structure. The supposition is that since size is an important determinant of other organizational context variables, especially organizational structure, it should be related to IT structure. A study by Ein-Dor and Segev (1982) shows that size, as measured by *total revenue*, is positively related to the degree of centralization of IT function; however, Ein-Dor and Segev did not find a significant relationship between the *number of employees* and the degree of centralization of IT function.

Competitive strategy

The role of competitive strategy in the design of IT systems has been argued by Bakos and Treacy (1986), Bowman, et al. (1983), Cash and Konsynski (1985), Johnston and Carrico (1988), King (1978), Parsons (1983), Porter and Millar

(1985), and Pyburn (1983). McFarlan (1984) argues that competitive strategy should be considered as a *decisive* factor in the IT systems' strategic planning stage because IT systems play an important role in the implementation of contemporary organizations' competitive strategy.

Although the existence of a relationship between competitive strategy and IT systems' strategic planning has been generally accepted, the relationship between the IT structure and competitive strategy has not received the same amount of attention. Camillus and Lederer (1985) and McFarlan and McKenney (1983) first cited this relationship. Camillus and Lederer use three typologies of generic strategies, including the Miles and Snow (1978) typology, to illustrate the influence of generic strategies on IT structure. However, there is no empirical evidence to support the theory that competitive strategy and IT structure are related.

The Theory

Because modern-day organizations use information technology to gain competitive advantage (Bakos and Treacy, 1986; Cash and Konsynski, 1985; Johnston and Carrico, 1988; McFarlan, 1984; Parsons, 1983; Porter and Millar, 1985; Pyburn, 1983), it seems logical to infer a strong relationship between competitive strategy and IT structure. In this study, Miles and Snow's typology (Miles and Snow, 1978) is used to distinguish strategies. Miles and Snow's typology identifies defenders, prospectors, analyzers, and reactors as the basic strategic types of organizations.

A *defender* is an organization with a conservative competitive strategy and engages in little or no new product development. A defender has: (a) a tendency to rely on both a centralized decision-making and an autocratic management style; (b) a tendency to structure its activities around basic business functions; and (c) an orientation toward efficiency (cost-saving). A defender relies on centralized control and a bureaucratic organization to ensure both high quality and low prices for its products.

A *prospector* is an organization with an aggressive competitive strategy that attempts to pioneer in product/market development. A prospector has: (a) a tendency to rely on both a

decentralized decision-making and a participative managerial philosophy; (b) a tendency to structure its activities around product/market divisions; and (c) an orientation toward effectiveness (profit-making). In order to rapidly change its product/market, a prospector has a decentralized control structure with minimal bureaucracy.

An *analyzer* is an organization with a moderate competitive strategy that makes fewer and slower product/market changes than a prospector and is less committed to stability than a defender. An analyzer has: (a) a tendency to rely on a balanced decision-making structure; (b) a tendency to subscribe to a matrix form of organizational structure; and (c) an orientation toward a combination of both efficiency and effectiveness. An analyzer enjoys a control structure that is less centralized than that of a defender and more centralized than that of a prospector.

Finally, a *reactor* is an organization with no distinct competitive strategy. A reactor makes decisions in a random fashion, and its actions are taken in a reactive rather than a proactive mode. As a result, there is no reason to include reactors in this study.

Based on this discussion, it is logical to expect the IT structure of a defender to be more centralized than that of a prospector. It is also logical to expect the IT function of an analyzer to be less centralized than that of a defender and more centralized than that of a prospector (Camillus and Lederer, 1985). To test this "logic," the IT function must be broken down into its activities.

IT Activities

Traditionally, the IT-related activities of organizations have been divided into three types: (a) systems development and maintenance, (b) systems operations, and (c) systems administration (Jenkins and Santos, 1982; Lucas, 1982; Norton, 1973; Olson, 1978). Systems development and maintenance activities are necessary for both the development of new systems and the maintenance of existing ones (e.g., feasibility studies, systems analysis, systems design, programming, user training, testing, systems evaluation). Systems operations activities are related to the operation of existing systems (e.g., data entry, job scheduling, output production and distribution,

and database operations). Systems administration activities involve managing both systems development and systems operation activities (e.g., policy setting, personnel management, and planning).

It is argued that IT development, operations, and administrative activities may be independently structured with different degrees of centralization (Davis and Olson, 1985; Norton, 1973; Olson, 1978). For example, user departments may be responsible for the operation of existing systems while the central IT department is responsible for the development of new systems and the maintenance of existing ones. The purpose of this study is to examine the relationship between the degree of centralization in each of the three types of IT activities mentioned above and organizational competitive strategy.

Hypotheses

Based on existing literature (Camillus and Lederer, 1985; McFarlan and McKenney, 1983) and the conceptual assessment of the relationship between the degree of centralization of IT activities and Miles and Snow's (1978) competitive strategies, the following research hypotheses were constructed.

H: IT structure of an organization is related to the strategy of organization.

H1: The three strategic types of organizations (defenders, analyzers, and prospectors) differ with respect to the degree of centralization of all three types of IT activities.

H1a: A defender is more centralized than a prospector with respect to all three types of IT activities.

H1b: A defender is more centralized than an analyzer with respect to all three types of IT activities.

H1c: An analyzer is more centralized than a prospector with respect to all three types of IT activities.

In the hypotheses the degree of centralization of IT activities refers to the locus of responsibilities for the IT activities. The higher the degree of centralization, the lower the users' responsibilities.

Research Method

A mail survey was conducted to test the hypotheses. The survey was limited to a single industry — computer components — to reduce industry influence. The target population was comprised of all organizations in computer components industries that satisfied the following criteria inclusively:

1. Strategically independent;
2. Profit seeking;
3. Non-conglomerate;
4. Large size (500 or more employees);
5. Successful in-house information systems.

Several sources of corporate data, including *Standard and Poor's Register of Corporations* (1986) and *The Corporate Finance Blue Book* (1985), yielded a list of 102 organizations in the computer component industry.

Measures

Two questionnaires were used to collect data. One questionnaire was developed to discover the perception of information technology managers concerning the degree of centralization of IT activities. The instrument contained six questions on IT development activities, eight questions on IT operations activities, and 19 questions on IT administrative activities (see Appendix A for some sample questions). Twenty organizations were employed to pretest the validity and reliability of the questionnaire. The instrument was modified according to the feedback obtained from the twenty organizations and was then sent to the 102 organizations.

The responses were scored on a five-point scale. For example, one of the items asked IT managers, "To what extent is the central IS department responsible for performing systems analysis activities in your organization?" Possible responses ranged from 5 (to a great extent = primarily centralized), to 3 (to some extent = moderately centralized), to 1 (to no extent = primarily decentralized). A score of one meant that the IT director perceives the activities to be performed primarily by functional or staff departments, while a score of five meant that the IS director perceives these activities to be performed primarily by the centralized IT department.

A second questionnaire — for the presidents of participating organizations — was used to assess the competitive strategies of the organizations (see Appendix B). This questionnaire was originally developed by Miles and Snow (1978) and has since been used in other studies (Glenn, 1985; Snow and Hrebiniak, 1980). The questionnaire contains four definitions of Miles and Snow's strategies. Each president was asked to check one of the definitions that seemed the closest to his or her organization's competitive strategy.

Finally, the data concerning the number of employees for the participating organizations was obtained from *The Corporate Finance Blue Book* (1985).

Data Analysis

Table 1 presents the response rate to both questionnaires. From 72 returned questionnaires on competitive strategy and 76 returned questionnaires on IT structure, 52 matching pairs of questionnaires were available for further analysis. Table 2 shows the breakdown of the 52 organizations based on their competitive strategies.

Table 3 breaks down the three strategic types into three sizes — small (500 to 1500 employees), medium (1500 to 4000), and large (over 4000). The chi-square test was used to examine whether the three strategic types represented the same size categories. The calculated chi-square was not significant, which indicated that the three strategic groups were homogeneous with respect to size.

The centralization score for each category of IT activities was computed by summing the scores for all the questions comprising that category and then dividing the total by the number of questions. For example, the centralization score for the systems operations activities was computed by summing the scores for each of the eight questions and then dividing the total by eight.

The one-way analysis of variance was used to compare the mean score of defenders, analyzers, and prospectors on each type of IT activity. Then Sheffes' multiple pair-wise comparison test was used to compare the mean score of defenders, prospectors, and analyzers on each type of IT activity.

Table 1. Rate of Response to Both Questionnaires (n = 102)

	Frequency	Percent
Information Systems	76	75
Competitive Strategy	72	71
Matching (both)	52	51

Table 2. Distribution of Sample by Competitive Strategy (n = 52)

Competitive Strategy	Frequency	Percent
Analyzer	22	42.30
Defender	12	23.10
Prospector	18	34.60
Total	52	100.00

Table 3. Distribution of Defenders, Prospectors, and Analyzers by Size

Strategic Type	Small Size	Medium Size	Large Size	Total
Defender	5	4	3	12
Analyzer	6	6	10	22
Prospector	9	5	4	18
Total	20	15	17	52

X² = 3.1
df = 4

If the analysis of variance indicates that there is a significant difference among the mean score of defenders, analyzers, and prospectors on a particular type of activity, it means that at least one of the three strategic types of organizations differs from the other two with regard to the degree of centralization of that type of activity. Consequently, it can then be concluded that defenders, analyzers, and prospectors differ in the degree of centralization of that particular type of IT activity.

If Sheffes' multiple pair-wise comparison indicates that there is a significant difference between the mean scores of two strategic groups on a type of activity, then it can be concluded that the two strategic groups differ in the degree of centralization of that particular type of IT activity.

Table 4 presents the comparison of the mean centralization scores of defenders, analyzers, and prospectors, using the one-way analysis of variance. The F-values obtained from the analysis of variance were significant at .05 for all three classes of activities. Therefore, it was concluded that the three strategic types differ in the degree of centralization of IT operations activities, IT de-

velopment activities, and IT administrative activities.

Table 5 shows the pair-wise comparison of the mean centralization scores of defenders, analyzers, and prospectors. The mean scores of defenders were significantly different from that of prospectors for all IT activities. But the mean score of analyzers was not significantly different from either defenders or prospectors for most IT activities, which can be attributed to the small sample size.

Limitations

The data in this study were collected through two mail questionnaires. The data, therefore, are subject to the well-known limitations of such surveys. It is thus possible that some of the participants did not take the time to read the questionnaire or did not have a complete knowledge about some of the questions. Although efforts were made to reduce these problems in the design and pretest of the survey instrument, the risk of introducing some bias in the results cannot be eliminated entirely.

Table 4. Comparison of Mean Centralization Scores of Defenders, Analyzers, and Prospectors: Using One-Way Analysis of Variance (n = 52)

IT Activities	Defenders		Analyzers		Prospectors		F-values
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Development	3.70	0.82	2.87	1.00	2.19	1.04	4.66*
Operations	3.69	0.89	2.76	0.98	2.61	1.17	4.85*
Administrative	3.60	1.00	2.92	0.99	2.40	1.14	4.91*

* Comparison is significant at p < 0.05.

Table 5. Multiple Pair-Wise Comparison of Mean Centralization Scores of Defenders, Analyzers, Prospectors: Using Scheffe's Test (n = 52)

IT Activities	Defenders & Prospectors	Defenders & Analyzers	Analyzers & Prospectors
Development	*	*	
Operations	*		*
Administrative	*		

* Comparison is significant at p < 0.05.

Conclusion

The results of this study indicate that IT structure is strongly related to competitive strategy, and specifically that the degree of centralization of IT activities is significantly related to competitive strategies. Different IT structures seem to fit different competitive strategies in current practice. The results indicate that the IT of an organization with a conservative competitive strategy is more centralized than that of an organization with an aggressive competitive strategy. To be more specific, the user departments of a conservative organization have less responsibility for their IT activities than the user departments of an aggressive organization. Based on these findings, this article speculates that a conservative competitive strategy exerts pressure for the centralization of IT responsibilities, while an aggressive competitive strategy exerts pressure for the decentralization of IT responsibilities.

A manager of an aggressive decentralized unit may insist on gaining close control over IT activities in order to integrate it closely with the organization's business strategy.

In general, the findings of this study provide additional support for the organizational fit concept.

But it is important to note that competitive strategy is not the only organizational variable that may influence the IT structure. Overall decision-making structure and organizational form may influence the IT structure (Cash, et al., 1988).

However, the close association between competitive strategy and information technology makes competitive strategy an important factor that can be used by IS administrators in assessing the appropriateness of a particular IT structure for their organization.

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Appendix A
Sample Questions From the IT Structure Questionnaire —
IT Operations, IT Development,
and IT Administrative Activities

IT Development Activities

This section of the questionnaire contained six questions; two are presented:

1. To what extent is the central IS department responsible for performing systems analysis?

No Extent	Little Extent	Some Extent	Large Extent	Great Extent

1	2	3	4	5

2. To what extent is the central IS department responsible for performing systems design?

No Extent	Little Extent	Some Extent	Large Extent	Great Extent

1	2	3	4	5

IT Operations Activities

This phase of the questionnaire contained eight questions; two are shown:

1. To what extent is the central IS department responsible for performing data entry?

No Extent	Little Extent	Some Extent	Large Extent	Great Extent

1	2	3	4	5

2. To what extent is the IS department responsible for output production?

No Extent	Little Extent	Some Extent	Large Extent	Great Extent

1	2	3	4	5

IT Administrative Activities

This part of the questionnaire contained 19 questions; three are listed:

1. To what extent is the central IS department responsible for performing systems planning?

No Extent	Little Extent	Some Extent	Large Extent	Great Extent

1	2	3	4	5

2. To what extent is the central IS department responsible for performing capacity planning?

No Extent	Little Extent	Some Extent	Large Extent	Great Extent

1	2	3	4	5

3. To what extent is the central IS department responsible for making policies with regard to hardware (vendor selection)?

No Extent	Little Extent	Some Extent	Large Extent	Great Extent

1	2	3	4	5

Appendix B
Questionnaire Used to Measure Competitive Strategies
of Participating Organizations

* Please check one of the following types of competitive strategies that best describes your organization.

() **Type 1:**

An organization with this type of strategy attempts to locate and maintain a secure niche in a relatively stable product or service area. The organization tends to offer a more limited range of products or services than its competitors, and it tries to protect its domain by offering higher quality, superior service, lower prices, and so forth. Often an organization with this type of strategy is not at the forefront of developments in the industry — it tends to ignore industry changes that have no direct influence on current areas of operation and concentrates instead on doing the best job possible in a limited area.

() **Type 2:**

An organization with this type of strategy typically operates within a broad product-market domain that undergoes periodic redefinition. The organization values being “first in” in new product and market areas even if some of these efforts prove not to be highly profitable. The organization responds rapidly to early signals concerning areas of opportunity, and these responses often lead to a new round of competitive actions. However, an organization with this type of strategy may not maintain market strength in all of the areas it enters.

() **Type 3:**

An organization with this type of strategy attempts to maintain a stable, limited line of products or services, while at the same time moving out quickly to follow a carefully selected set of the more promising new developments in the industry. The organization is seldom “first-in” with new products or services. However, by carefully monitoring the actions of major competitors in areas compatible with its stable product-market base, the organization can frequently be “second-in” with a more cost-efficient product or service.

() **Type 4:**

An organization with this type of strategy does not appear to have a consistent product-market orientation. The organization is usually not as aggressive in maintaining established products and markets as some of its competitors, nor is it willing to take as many risks as other competitors. Rather, the organization responds in those areas where it is forced to by environmental pressures.