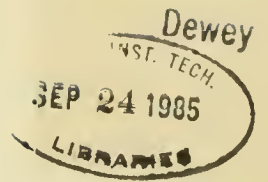


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INFORMATION TECHNOLOGY AND CORPORATE STRATEGY:
A RESEARCH PERSPECTIVE

John A.Y. Bakopoulos
Michael E. Treacy

March 1985

CISR WP # 124

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Center for Information Systems Research

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Information Technology and Corporate Strategy: A Research Perspective

John A.Y. Bakopoulos

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Abstract

The use of information technology (IT) as a competitive weapon has already become a popular cliché; but there is still a marked lack of understanding of the issues that determine the influence of IT on a particular organization and the processes that will allow a smooth coordination of IT and corporate strategy. This paper surveys the major efforts to arrive at a relevant framework and attempts to integrate them in a more comprehensive viewpoint. The focus then turns to the major research issues in understanding the impact of IT on *competitive* strategy. Relevant theory from corporate strategy is discussed and its application in understanding the use of IT is illustrated.

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1. Introduction

There is little disagreement between researchers in information systems and organizational theory about the strategic importance of information technology. Indeed, the potential use of IT as a competitive weapon has already become a popular cliché. Literature in this area abounds with a number of frameworks for categorizing opportunities and describing the impacts of information technology. There has been a notable absence, however, of testable models based on relevant theory. As this area of research matures, there is an increasing need to move beyond frameworks and toward explanatory models of the underlying phenomena. Only this type of research will allow us to build a cumulative tradition and to make normative statements that can correctly guide managerial actions.

In this paper we attempt to make a first step toward the development of such normative models by distinguishing three levels at which information technology impacts corporate strategy; the internal, competitive, and business portfolio levels. We discuss a number of relevant general theories and provide a link with the disciplines of organizational design and industrial economics. Furthermore we offer an operationalized definition of information technology, based on the concept of bounded rationality, which can be used to develop specific theories and models at each of the three strategic levels.

In section two we discuss the links between information technology and corporate strategy. In the following three sections we survey the literature addressing the identification of strategic opportunities for information technology. The results of these works are synthesized and extended to provide a more comprehensive structure for categorizing opportunities for the strategic application of IT. It is discovered that different methods and analyses are needed in each category to uncover *specific* opportunities for IT. We discuss specific actions at the strategic and tactical levels which can assist an organization in capitalizing on information technology. Finally, a program of research is proposed that can lead to a better understanding of how specific opportunities created by information technology can be identified, and what impact these opportunities may have in the long term on industrial structure.

2. Information Technology and Corporate Strategy

Senior executives, strategic planners, and information systems managers are increasingly turning their attention to opportunities for achieving competitive advantage through information technology (IT), in the form of innovative information and communications systems. There are several reasons underlying this recent trend, not the least of which is the publicity received by a few companies that have gained significant advantage through IT [4, 8, 9]. As well, the unstable economic conditions of the last few years have helped to create a challenging business environment and an "economic imperative" for information technology [2]. The technology is also offering a greater array of capabilities at a lower cost than ever before [20, 28, 33]. Finally, firms' abilities to utilize increasingly functional technology are also improving. The transaction processing and decision support systems already in place in most firms provide a base on which systems for competitive advantage can be built [20]. Without this base, many of these systems would not be possible.

Several authors have identified the underutilization of information technology for competitive advantage as a serious problem facing both information systems and business managers [2, 11, 29]. The most often cited causes of this problem include: (1) senior management's ignorance of information technology and its potential uses, (2) poor communications between the information systems group and the rest of the business, (3) resistance to change, among both information systems and business personnel, (4) a lack of focus on opportunities for competitive advantage, and (5) a lack of good measures of valuable impacts, which inhibits investment.

Many organizational and managerial remedies for these problems have been suggested, ranging from the development of better measures of the efficiency and effectiveness of organizational functions, to major changes in the current structure of organizations. For example, Gerstein and Reisman [11] identify a need for the development of measures of the impacts of information systems on specific functions. Keen [20] suggests that important changes in the fundamental nature of work and the structure of organizations are needed, so that better use of information technology can be made. He predicts that information technology will become the backbone of corporations, and that organizations will develop around their telecommunication systems. McFarlan and McKenney [26, 25] point out the importance of the proper management of information technology for its successful deployment. The mission and management of the information systems group should be consistent with the firm's dependency on technology and the opportunity for competitive

advantage that the technology represents. Similar suggestions are made by others about the need to reposition and expand the information systems function [2, 11, 21, 42] and the need for senior management education in IT [2, 11, 18, 20].

These recommendations for increasing the utilization of IT focus on correcting organizational deficiencies that have restrained its effective use. Another group of researchers have focused on the potential for information technology to improve strategic performance. They have worked to develop tools and methodologies to help the manager find valuable opportunities for IT within his or her organization. This is the perspective in the present paper.

Opportunities arising from information technology can be viewed from three perspectives: (1) that of an organizational designer trying to improve the efficiency and effectiveness of the current organization, (2) that of an industry insider trying to out-manuever other participants in a competitive game, and (3) that of an outsider investigating whether to enter an industry. These three perspectives are consistent with our treatment of corporate strategy in this paper, as having three major component strategies: internal, competitive, and business portfolio. *Internal strategy* is concerned with the development of an efficient and effective organizational structure for achieving goals and objectives. *Competitive strategy* focuses on competitive moves within the industries in which the organization does business. *Business Portfolio strategy* concerns the choice of which industries to compete in and how to position the organization in those industries.

These components of corporate strategy are closely related and information technology can affect all three. For example, a firm in the distribution business may build an on-line order entry system, and place terminals in customer's purchasing departments. This system can improve the efficiency of the firm's operations, which is an element of internal strategy. The terminal can supply the customer with useful information, and by speeding orders can help the customer to reduce inventories. These effects make it more difficult for other distribution firms to compete, and contribute to the competitive strategy of the firm. The order entry system may also be an important asset in other industries, such as mail-order retailing. Thus, the firm might enter this industry on the strength of its technology, which would impact the business portfolio strategy.

3. IT and Internal Strategy

Organizations are designed to carry out their goals and objectives efficiently and effectively. This is the subject of internal strategy, and the primary focus of the organizational design literature, which has identified two relevant domains: organizational structure (form) and process (function). Organizational structure is concerned with the study of alternative organizational forms at both the corporate and work group levels. Organizational process, the dual problem to organizational form, is concerned with systems for getting the work done, or what Perrow defines as organizational technology [30].

Improving the efficiency and effectiveness of organizations is the traditional domain of the Information Systems function. Rockart and Scott Morton [33] have suggested that the impacts of traditional information systems can have important implications for the competitive position of the firm. They employ a modifications of Leavitt's organizational model [22] to show that these systems can affect competitive performance through their impact on management processes, roles and people, and organizational structure. Thus, by improving the design of an organization through internal strategy, one can also affect competitive strategy. In this section we review a number of conventional approaches to improve organizational performance through information technology, and proceed by proposing a framework to link Information Systems to the theory of organizational design.

3.1. Internal Strategy and MIS

There are more than two hundred published techniques for identifying opportunities to support management processes with information technology. Several detailed reviews have been published [1, 5, 7, 27, 32, 39]. The techniques differ in focus, emphasis, and applicability to particular areas of concern.

Traditional approaches to identify areas for the application of information technology have focused on its capability to improve the efficiency and effectiveness of specific functional areas of the firm. The first generation of methodologies utilized a strictly operational view of the firm, with an objective to improve the efficiency of requisite business processes. Representative of this approach are Business Systems Planning [16], and Office Automation Methodology [14, 15, 37, 38]. These techniques represent ways of formally modeling the operations of the enterprise so that potential improvements in efficiency and effectiveness can be analyzed. They are not easily applied

to poorly structured functions, such as senior management roles, because these areas are not amenable to formal modeling. In these types of functional areas, the Critical Success Factors (CSF) methodology [3, 32] has been used successfully to discover latent structure. This structure, composed of business goals and related causal success factors, substitutes for a formal model of the functional area. It can be analyzed for opportunities to improve operating performance through the application of information technology.

These traditional MIS approaches focus on improving organizational efficiency and effectiveness. They identify opportunities for using information technology to improve the internal strategy of the organization. As one moves toward techniques for analyzing unstructured functional areas, corporate objectives grow in importance as they provide a starting point for discovering latent structure. Yet, they fall short of treating strategic considerations as the driving force for the identification of IT opportunities. Furthermore, each of these approaches is based on an implicit, idiosyncratic theory of organizations that stands apart from the main body of organizational design literature. Although some of these theories are inventive, they neither contribute to, nor are leveraged by, the accumulated knowledge of organizational theory. They are only “private theories” of organizational design, embedded within traditional MIS techniques.

3.2. Information technology and organizational design

We believe that within the organizational design literature, a *general theory* for studying the implications of IT for the internal strategy of the firm can be found. Such a general theory would provide a framework of models for generating specific, testable hypotheses. It would identify the key, relevant variables and provide a methodological tradition within which to work. We propose that the construct of *bounded rationality* provides a major link between information technology and organizational design. Bounded rationality refers to neurophysiological limits on the computational and communication capacities of an individual [34, 35]. It is demonstrated in limits on the complexity and size of problems that can be solved by humans. Information technology can directly affect the computational and communication abilities of a decision-maker, thus shifting the limits to rationality.

Bounded rationality has been a key concept in the development of organizational theory. The information processing view of organizations, advanced by March and Simon [24, 36], Cyert and March [6], Galbraith [10] and others, has asserted that human limitations on information processing

interact with environmental factors such as environmental complexity and uncertainty to give rise to organizational problems. From this school's perspective, organizations are designed to marshal sufficient information processing and communications capabilities, to be able to manage the complexity and uncertainty inherent in the environment. In the more recent transaction cost view of organizations, Williamson [40] asserts that constraints on human information processing are a major reason for the very existence of organizations. An alternative to organizations is to have economic agents act independently and contract to sell their services to one another in a marketplace. With unbounded rationality, every participant could counteract the effect of other participants' deceptive, self-interested behavior. In a world of bounded rationality, however, such opportunistic behavior in small marketplaces creates inefficiencies in the form of excessive contracting and transaction costs. To avoid these costs, individuals form organizations where interests are pooled.

In both the information processing and the transaction cost schools of organizational theory, bounded rationality plays a pivotal role. It is also a central construct in our understanding of the impact of information technology. IT relaxes the constraints on individual and group information processing. To exploit the link between information technology and organizational design we need to characterize IT in terms that are relevant to bounded rationality. Studies of group decision-making behavior indicate two major limitations on performance are individual cognitive ability and interpersonal communications skills. A natural taxonomy of information-related technologies is created by differentiating *communications* technology from *processing* technology. Each of these categories maps directly onto a limitation in human performance. Within each category, at least three characteristics of the technology are relevant to performance, namely *capacity*, *quality*, and *unit cost*. Figure 1 illustrates this taxonomy.

It should be noted that this definition of information technology excludes applications of electronic technology that do not affect the ability of an organization to process information. Thus, replacing a group of data entry operators with optical character reader devices, would fail to meet our criteria to qualify as information technology. This issue, and similar ones related to the need for a rigorous definition of information technology, will be addressed in a forthcoming paper.

The major premise of this discussion is that information technology affects the efficiency and effectiveness of the organization primarily by reducing the bounded rationality of individual and group decision making. Research is needed to confirm or disprove this causal relationship. In

	Communications	Processing
Capacity		
Quality		
Unit Cost		

Figure 1: Categorization of information technologies

particular, we need to study the impact of different forms of information technology, as categorized in Figure 1, on the factors that constrain the performance of individual and group decision makers. A good deal of effort has already been expended studying the link between information systems and managerial performance [12, 13, 23]. More headway could be made in this important area if a common characterization of information technology was used across studies and if the intervening variables that bound rationality, and hence managerial performance, were identified and included in the study.

Our understanding of the link between limits on human information processing and organizational design was greatly expanded by the work of Jay Galbraith [10]. He argued that new organizational structures are created to close the information gap between requisite information processing needs of a firm and available information processing capacity. Further research is needed to understand what new organizational forms will be facilitated by future generations of information technology.

4. IT and Competitive Strategy

4.1. The link between IT and Competitive Strategy

A number of authors have addressed the task of identifying opportunities for the application of information technology to create competitive advantage. They generally have recognized the importance of the link between IT and competitive strategy, although this has not always been their primary focus. Two general approaches can be identified in this literature, distinguished by their underlying models: a value-added chain analysis of the firm's operations and Porter's framework for competitive analysis [31].

Rockart and Scott Morton [33] have introduced the use of the value-added chain to describe the potential opportunities arising from IT. They identify three types of opportunities that can create competitive advantage: (1) improve each value adding function, (2) link with customers and suppliers to increase their switching costs, and (3) create new businesses through service or product. Ives and Learmonth [17] further this effort by using a generic, thirteen function resource lifecycle model to identify competitive opportunities. It should be noted that these value-added chain analyses, geared toward operational efficiency and functional effectiveness, are closely related to internal strategy.

Porter [31] advanced the idea that competition in any industry is rooted in its underlying economic structure, and thus it is more than a superficial game of moves and countermoves among participating firms. This approach is reflected in the framework he proposed to explain the dynamics of competition in an industry. As Figure 2 illustrates, it includes five major forces underlying competition: rivalry among existing competitors, threat of new entrants, threat of substitute products or services, bargaining power of suppliers, and bargaining power of customers.

An important implication of this framework is the idea of *extended rivalry*. To understand competition in an industry, one must look beyond current competitors to include customers, suppliers, firms producing substitute products, and potential entrants. Firms generally try to manipulate the competitive forces in their industry, in order to achieve comparative advantage over competitors. There are certain generic strategies that can be employed to that end. Porter [31] has identified cost leadership and product differentiation as two such strategies. He identifies a third strategy, the pursuit of niche markets, which is similar to product differentiation strategies from the perspective of IT-related opportunity. Other such strategies may include the exploitation of

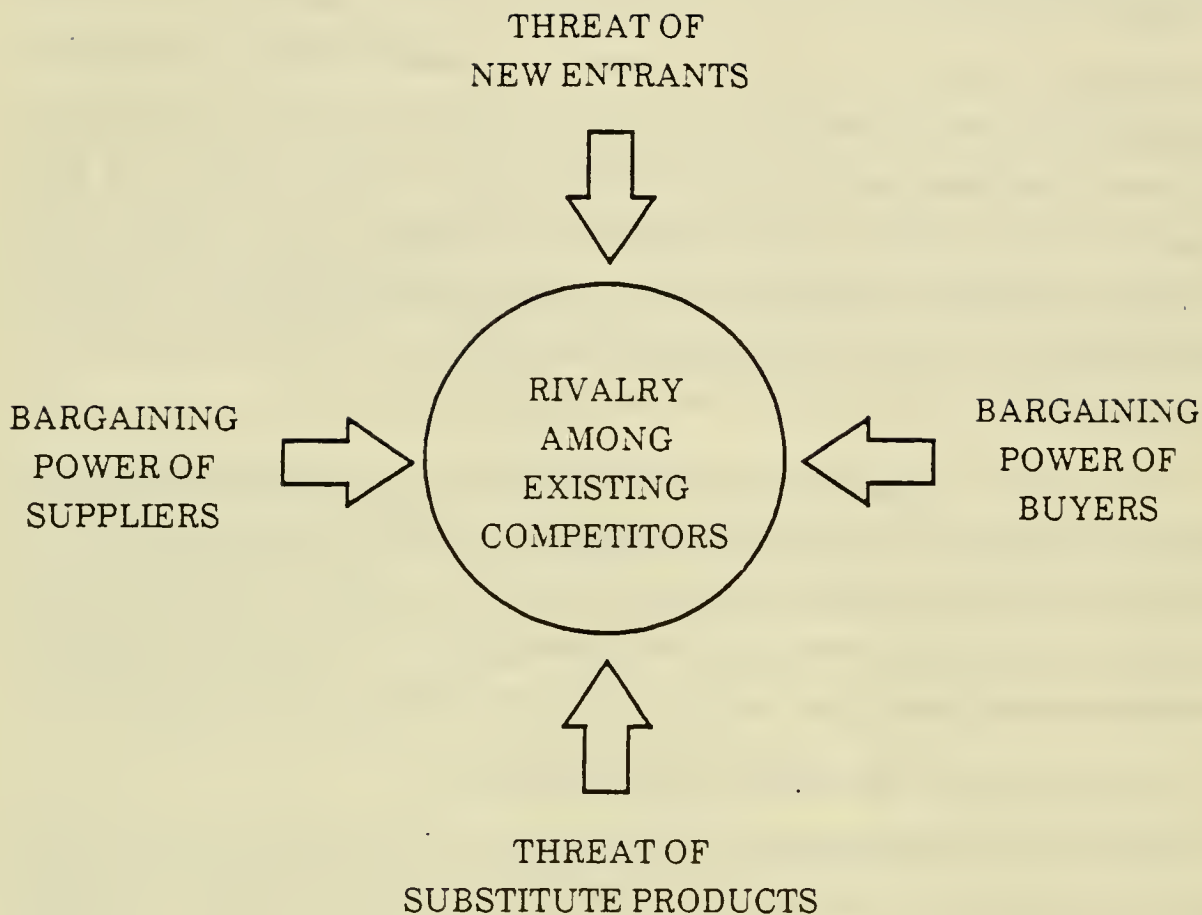


Figure 2: Porter's framework for competitive forces

potential synergies with a firm's customers or suppliers, or the notion of gaining bargaining advantage against one's customers and suppliers.

Parsons [28] uses Porter's competitive forces framework to identify six generic categories of opportunities for competitive advantage: (1) increase customer's switching costs through value adding IT-based information or service, (2) decrease own switching costs against suppliers, (3) use of IT to support product innovation, for purposes of maintaining one's position or deterring potential substitutes, (4) cooperation among rivals through shared IT resources, (5) substitute information technology for labor, and (6) use information to better segment and satisfy one's customer base.

4.2. Four areas of opportunity

Parsons, Rockart and Scott Morton, Ives and Learmonth, and others each have different categorizations of competitive opportunities created by information technology. From these we have distilled four areas of opportunity for IT to support competitive strategy. These categories may not be comprehensive; new ways of employing IT to support strategy will be found. Nevertheless, they represent a useful starting point for someone trying to identify specific opportunities within their firm. They can be seen as tactics to support competitive strategies. For example, when a firm employs information systems to improve the efficiency of operations, it is making a tactical move that can support a cost leadership strategy.

The four areas of opportunity that have been identified are: (1) improvement of operational efficiency and functional effectiveness, (2) product innovation with IT, (3) acquisition of bargaining advantage against one's customers and suppliers, and (4) exploitation of interorganizational synergies. In the next four subsections, we briefly discuss each of these areas of opportunity, which competitive strategies they support, and how one can begin to identify specific opportunities.

4.2.1. Improve operational efficiency and functional effectiveness

Systems to improve operations are the traditional focus of information technology applications and central to the support of the internal strategy of the firm. These systems can also lend support to the competitive position of the firm to the extent that they are industry innovations that can be turned into competitive advantage. Usually this requires that the system be applied to critical functional areas of the firm and that it is a new type of application in its industry. Simply following the industry leaders does not lead to any advantage.

As discussed in the previous section, opportunities for operational efficiency are found in supporting organizational structure and management processes. Techniques for identifying them are well established, but unrelated to the body of organizational theory. Although opportunities to improve operational efficiency and effectiveness are the best understood, they are also, quite possibly, the least important for targeting IT to support competitive strategy.

4.2.2. Product innovation with information technology

Information technology is providing firms with unique opportunities for product innovation. In many industries, from automotive to consumer electronics, information technology is being built into existing products to enhance their value. In other industries, such as banking, insurance, and

consulting, the technology is providing a development and delivery vehicle for new service-based products. The technology can provide an important means for differentiating existing products and developing new and unique ones.

There would appear to be two distinct types of methodologies needed to identify opportunities for product innovation using IT. Building IT into products is largely an engineering function. As such, methodologies for identifying such opportunities are outside the context of present discussions. Developing and delivering new products using information technology is an area that has received little study. How these opportunities are identified and how they *should be* identified are two topics worthy of much further study.

4.2.3. Acquisition of bargaining advantage against customers and suppliers

An important tactic for improving one's bargaining position relative to customers is to provide unique and valuable information and services that makes switching to a competitor more costly. Information technology can facilitate unique information or service offerings, previously unavailable and potentially of very great value to customers. The higher the perceived value of the offerings, the higher the switching cost imposed on the customer.

Every supplier is a customer of another supplier in an unbroken value-added chain. Thus, the opportunity to gain bargaining advantage can be pursued by one's suppliers to the firm's disadvantage, unless tactics are devised to avoid the problem. Two specific tactics present themselves: avoid becoming dependent on supplier-controlled information and service, and create an efficient "electronic marketplace" between you and your suppliers.

There is no methodology available for identifying specific IT opportunities within this area. Some fundamental research is needed before a methodology can be developed. We must better understand how and when information and service creates sufficient dependency to impose a switching cost. We also need to understand how potential opportunities for developing new information and innovative service can be identified.

4.2.4. Cooperative information systems

Competitive strategies for exploiting synergies with customers or suppliers generally concentrate upon opportunities for better coordination. Through better coordination, operations can be made more efficient and this benefit can be shared between the two participants. Coordination can be achieved with information systems that couple functional areas in two distinct firms. For example,

one might tightly couple the production planning system of a firm with the order entry system of suppliers to lower the amount of inventory in process and the turnaround time for new orders.

Interorganizational systems are a new phenomenon. They allow firms to vertically integrate from an information perspective without disturbing the legal boundaries of the entities. Eventually, they may redefine the boundaries of entire industries. Methodologies to identify opportunities for cooperative systems may be quite similar to those used to improve operational efficiency and functional effectiveness, the main difference being in the unit of analysis –two organizations instead of just one.

4.3. A theoretical framework

The categorization of opportunities identified above can provide a useful framework for a planner concerned with taking advantage of information technology, but its value is limited by the lack of an underlying general theory. In the rest of this section, we attempt to help in closing this gap. We start by proposing that future research starts from a simplified theory of competitive advantage, derived from industrial economics.

Competitive advantage, generally related to the concept of market power, refers to the ability of a firm to create and exploit monopoly or monopsony power. The two major sources of competitive advantage are *bargaining power* and *comparative efficiency*, as shown in Figure 3. Bargaining power refers to the ability of a firm to resolve zero-sum bargaining situations, usually against its customers or suppliers, to its advantage. Comparative efficiency refers to the ability of a firm to produce a product at a lower price relative to ones perceived as equivalent. These two sources are more or less orthogonal.

4.3.1. Bargaining power

In most game-theoretic situations, each side can improve its position, that is, develop competitive advantage, by increasing the number of available alternatives. This number is limited by the cost of the search process, which is determined by two primary factors: the information processing capacity of the player in question, as it relates to its efficiency in exploring the space of feasible alternatives, and the characteristics of the underlying search set, in terms of the number of feasible alternatives available for a given search effort. It is important to distinguish between alternatives available *before* and *after* a relation is established, as that event may impose restrictions on one or both parties. *Ex-ante* alternatives are primarily determined by unique product features, while *ex-post*

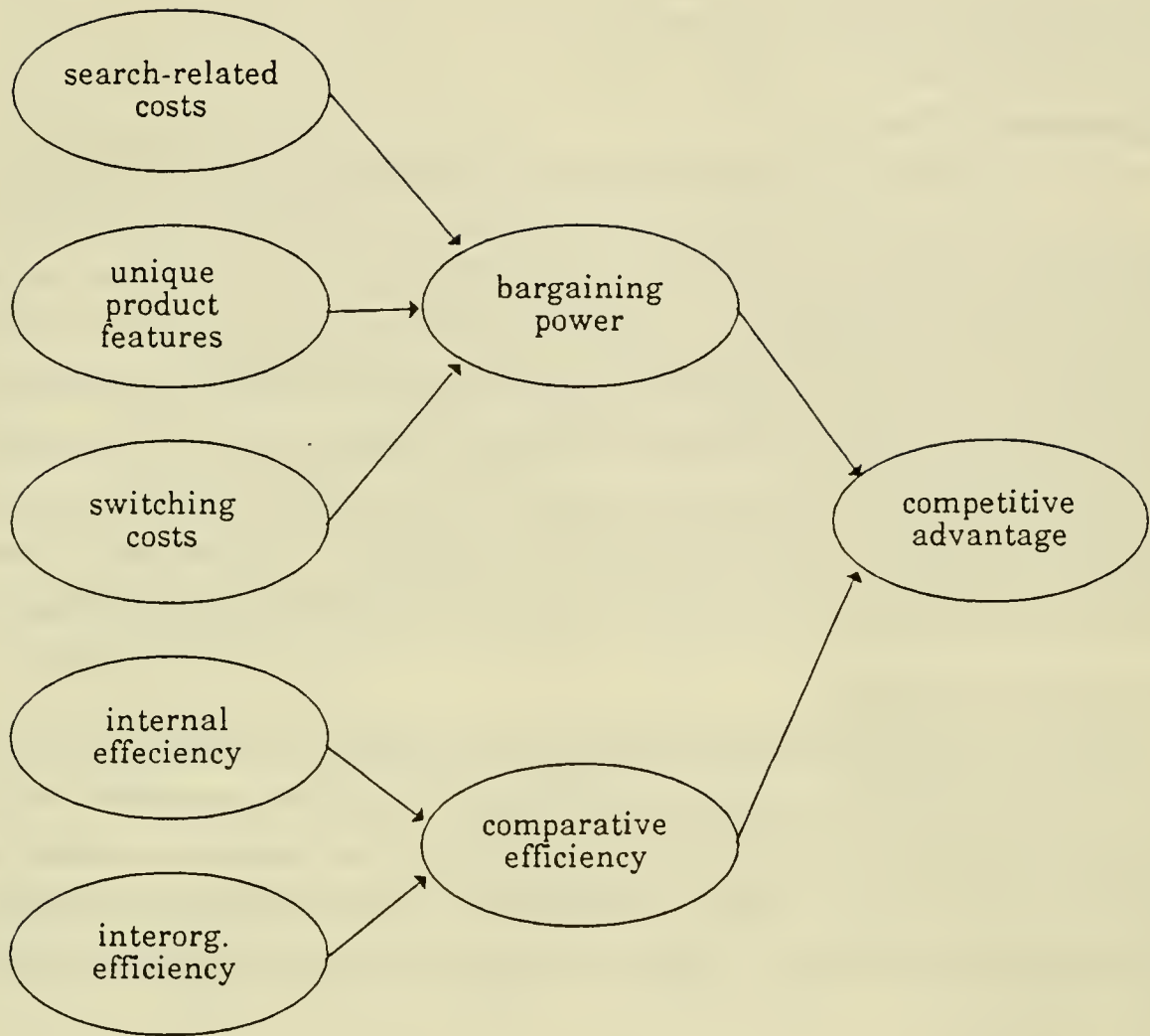


Figure 3: A causal model of competitive advantage

alternatives are also affected by switching costs arising from the imperfect transferability of assets specific to a transaction.

We have thus derived three primary determinants of bargaining power: the search-related information processing capacity, unique product features, and switching costs. These factors, illustrated in Figure 3, have symmetric implications for a firm's relationship with its customers and its suppliers. Thus a firm will increase its monopoly power by increasing its customers' relative cost of search for alternative suppliers, by incorporating unique features in its products, and by increasing its customers' cost of switching to alternative suppliers. It can increase its monopsony

power by reducing its cost of locating alternative suppliers, its dependence on unique inputs, or its costs of switching to alternative sources of supply.

4.3.2. Comparative efficiency

We see two major aspects of comparative efficiency: internal (intraorganizational) efficiency, and external (boundary spanning, interorganizational) efficiency. Internal efficiency considerations are essentially those examined in the section on internal strategy, and hence the frameworks developed in that section will be adequate for the categorization and analysis of the impacts on information technology in this area. Methodologies for opportunity identification in this area, however, should adopt a comparative point of view, and focus on critical organizational functions. The transaction cost theory pioneered by Williamson [40] provides a natural device to study the impact of information technology at the boundaries between organizations. This work will be further discussed in the next section, in the context of industry-level impacts of information technology.

4.3.3. Dynamic considerations

The above two dimensions create a static picture of the competitive situation, which, like a flat view of the world, fails to capture the dynamic richness of the competitive game as it unfolds. The missing third dimension is timing, and both disciplines of game theory and industrial economics can provide relevant literature. Nevertheless, translating the static impacts of information technology into dynamic competitive moves, is an aspect of strategy formulation that has been left outside the scope of this paper.

4.4. Theoretical links between information technology and competitive advantage

We have used industrial economics as the source of theories to study competitive advantage. We shall now propose two theoretical links between information technology and competitive advantage, that can serve as the basis for specific theories examining the impact of information technology on competitive strategy.

Bounded rationality can serve once again as a major theoretical link in studying the competitive impacts of information technology. Improving the bounds of organizational rationality has direct implications for both bargaining power and comparative efficiency. In particular it affects the cost of search (by improving the generation and evaluation of alternatives), as well as transaction costs in organizational interfaces. According to Williamson [40], transaction costs arise from environmental constraints, opportunism, and small numbers exchange situations, *coupled with bounded rationality*.

Information technology can have a direct impact on these variables through its effect on bounded rationality, for example by reducing contracting and monitoring costs (thus mitigating the effect of opportunism), improving the generation and evaluation of alternatives (thus mitigating the effect of environmental uncertainty and complexity), and either decrease or increase information asymmetries (which are related to Williamson's notion of information impactedness).

The second theoretical link between information technology and industrial economics theory comes from the effects of IT on production processes. It is generally accepted that information technology is an inherently *flexible* technology, improving the adaptability of products, and allowing the realization of scale economies from smaller production runs. Information technology will thus affect asset specificity, and, in Williamson's transaction cost framework, have an impact on small numbers situations. This view of information technology will be instrumental in understanding its impact on two determinants of bargaining advantage identified earlier, product uniqueness and switching costs.

Finally it should be noted that the four categories of opportunities identified earlier in this section based on our review of the literature, can be explained by our competitive framework. In particular, improvement of operating efficiency and functional effectiveness would primarily address internally focused efficiency; exploitation of interorganizational synergies would primarily address externally focused efficiency; product innovation with information technology might attempt to improve comparative efficiency by reducing production costs, or increase product uniqueness and customer switching costs; acquisition of bargaining advantage against customers and suppliers would affect all aspects of bargaining power.

5. IT and Business Portfolio Strategy

In the previous sections we have focused our attention on the impact of information technology within an industry and its boundaries. It is likely, however, that information technology will have more macroscopic effects as well, affecting the structure of marketplaces. Information systems, for example, can help markets be more efficient by increasing the amount of available information, or lower certain barriers to entry while raising information-related ones. Thus, they can cause the restructuring of entire industries.

Industry-level impacts of information technology have important strategic implications for the portfolio of industries in which a firm is competing. Specifically, a firm may be able to improve this portfolio by taking advantage of structural changes catalyzed by the new technology. Alternatively, a firm can actively seek opportunities to exploit its technology-related skills and resources in new industries. Our understanding of the link between information technology and corporate strategy at this level is currently limited, as demonstrated by the scarcity of existing work on the subject. In this section we will discuss a number of relevant issues, that will point us toward the identification of appropriate frameworks and models.

5.1. Structural impacts of information technology

Williamson's "efficient boundaries" hypothesis [41] suggests that as asset specificity increases, at some point the transaction cost superiority of internal organization outweighs the market's advantage in production efficiency, thus driving some exchange relations out of the market and leading to internalization of the corresponding transactions. As Figure 4 illustrates, beyond a certain point of asset specificity, AS^* , the production cost advantage of market mechanisms vs internal organization, ΔPC , declines and is overshadowed by the lower transaction cost of internal organization, denoted by a negative transaction cost advantage of markets, ΔTC . Information technology can affect asset specificity by increasing the flexibility of the production processes, it can affect the production cost advantage of markets by changing production economics, such as economies of scale, and finally it can affect the transaction cost advantage of markets through an impact on transaction costs. Information technology will therefore shift the efficient boundaries of organization, affecting the economics of make vs buy decisions, and in the process creating some new markets and causing others to disappear.

Porter's framework of competitive forces [31], derived from industrial economics, suggests a point

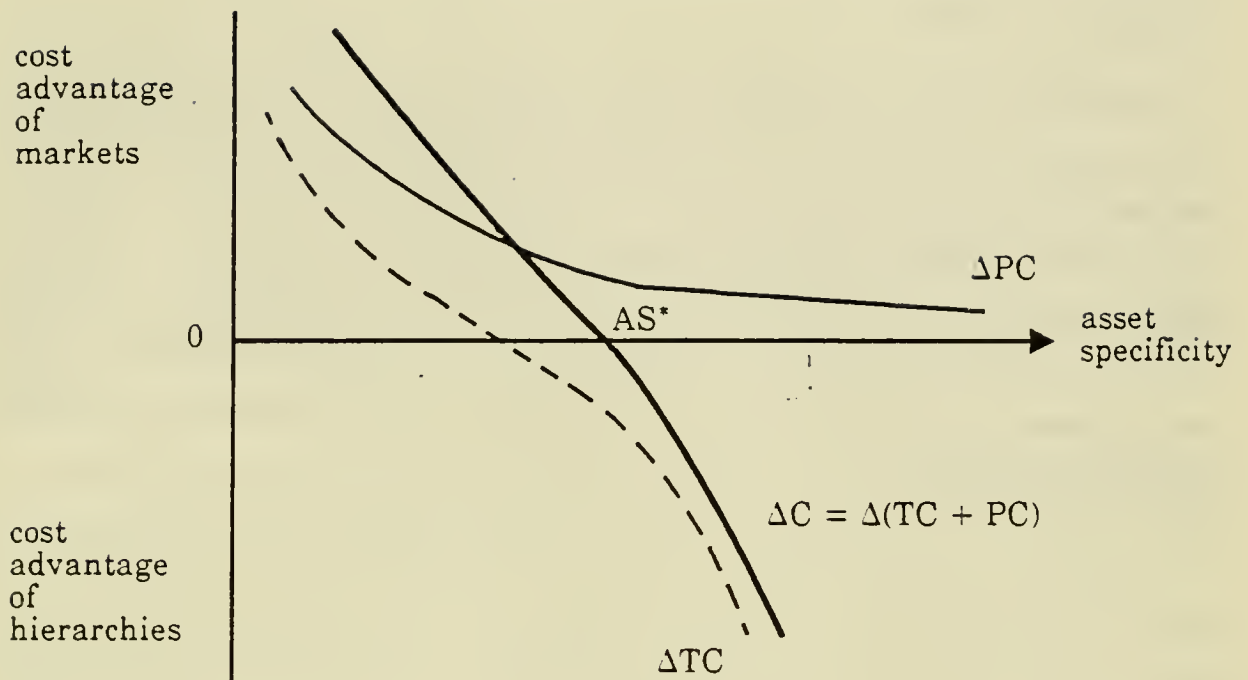


Figure 4: Williamson's efficient boundaries model

of view based on the dynamics of an economic game where participants include industry competitors, customers, suppliers, and potential entrants. In that framework, the structural implications of information technology for a particular industry will be determined by its effect on rivalry within the industry, its impacts on the industry's relations with its customers and suppliers, and its implications for prospective entrants and the threat of substitute products [28].

5.2. Exploitation of technology advantage

The impacts of information technology on industry structure create opportunities for a firm to improve its business portfolio. Exploitation of these opportunities requires a strategy formulation process sophisticated enough to identify them, as well as the capability for successful deployment of the appropriate technology. In other words, it is necessary to link strategy formulation with technology development. The most important aspect of this link is for the firm's strategy to provide direction for technological base-building. An alternative course is to translate technological superiority of the firm into opportunities for successful ventures in new industries. Once again, linking strategy formulation with the development of information technology is important; the

major aspect of this link is the ability to take technological potential into consideration during the formulation of corporate strategy.

In both these cases, exploitable technology advantage has two important characteristics: technological base-building, and the link between technology and strategy that can be achieved by strategy-literate information systems planners and technology-literate strategic planners. The development of specific theories and models for the creation and exploitation of technology advantage in the context of business portfolio strategy is an area yet to be explored. We see three likely sources of relevant models: organizational theories of technology assimilation, such as stage theories, industrial economic theories, such as economies of scope, and gaming theory, such as the importance of timing.

6. Concluding Remarks

As Keen notes in [19], a major problem with past information systems research is the proliferation of frameworks at the expense of explanatory models based on a general theory, and the lack of reference disciplines that can provide appropriate general theories. Much of the current work on the strategic impacts of information technology, despite dramatic references to “strategic tools” and “competitive weapons,” makes little or no use of bodies of theory related to either strategy or competition. As the field matures, the primary focus of academic research should move to a deeper level of analysis, characterized by specific, explanatory models connected to broader general theories.

Approaches drawing on appropriate reference disciplines can avoid idiosyncratic, private theories of the strategic use of information systems. Assertions and conclusions that are plausibly argued from an accepted point of origin, are seen as part of the larger fabric of corporate strategy. The overall result is a contribution to both fields of information systems and corporate strategy. Alternatively, frameworks based on private theories lacking this kind of foundation are of limited value. Two bodies of literature that come to mind as closely related to this area of study are organization theory and industrial economics, and we have proposed them as appropriate reference disciplines. Works on bounded rationality, human decision making, value of information, extraction of monopoly rents, functioning of markets under imperfect information, barriers to entry, and Williamson’s work on transaction costs and organizational boundaries, seem of particular relevance.

Finally, we have suggested three perspectives of the strategic impact of information systems: internal, competitive, and business portfolio. We believe this is a valuable distinction because each perspective identifies different issues of importance, suggests different theoretical frameworks as the basis for research, and is amenable to different methodologies for opportunity identification. These perspectives are also likely to differ in the appropriate methods for the validation of theories, which we believe is the *sine qua non* of valuable research.

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