

December 1997

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## Recommended Citation

Farhoomand, Ali and Drury, D., "A Model Of Organizational Adoption Of Information Technology" (1997). *PACIS 1997 Proceedings*. 41.  
<http://aisel.aisnet.org/pacis1997/41>

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# A Model Of Organizational Adoption Of Information Technology\*

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- This project was partially supported by a grant from The University of Hong Kong's Committee on Research and Conference Grants.

## **Executive Summary**

As a growing number of firms allocate a larger portion of their budgets to the acquisition of different types of information technology (IT), it has become increasingly important to understand (a) what factors motivate and influence organizational adoption of IT, and (b) why some organizations are more predisposed to IT adoption than others.

In this paper we provide an organizational model of IT adoption that explains how technology push, on the one hand, and demand pull, on the other, drive adoption of IT in companies. On the supply-side, the advent of new technologies prompts firms to upgrade their IT utility for competitive reasons, such as fear of being left out of the mainstream of technological developments, or for economic reasons such as improving efficiency of their existing operations.

In contrast, the demand forces are driven by the four major stakeholders of IT. The first force, termed strategic or opportunistic motive, is usually triggered by the firm's top management in anticipation of gaining long-term competitive advantage. The thrust from top management in instigating a strategic motive is prompted by top-down organizational strategy, on one hand, and by bottom-up opportunistic or innovative pressures from MIS department and user groups, on the other. This driving force is directly related to management's attitude toward risk associated with technology.

The second force is motivated by institutionalized demand and is driven by the MIS department. The extent of presence of IT by itself requires continual maintenance and upgrade of hardware and software, irrespective of changes in technology.

The third force is related to the treatment of computers as a political resource. Through influencing top management, MIS department, and their own constituencies, subunits exert and maintain their political posture vis-à-vis IT. This political force, in turn, affects the IT acquisition policies of the firm.

The last demand-pull force is based on personal and innovative grounds as users seek to obtain newer technologies to perform their jobs more effectively or creatively.

In light of these driving forces, we postulate that the adoption of IT is motivated by (a) the availability of new technologies, (b) the degree of proliferation of the existing IT in the firm, (c) the political pressures from various subunits, (d) the innovative pressures from the users, and (e) the strategic exigencies of IT recognized by top management. These driving forces are invariably influenced by the type of organization in terms of its management philosophy, strategy and stakeholders.

## **Abstract**

As a growing number of firms allocate a larger portion of their budgets to the acquisition of different types of information technology (IT), it has become increasingly important to understand a) what factors motivate and influence organizational adoption of IT, and b) why some organizations are more predisposed to IT adoption than others. Using relevant theories in organizational theory, innovation and information systems, this paper provides a synthesis of the IT adoption process. A model of organizational adoption of IT is introduced to motivate a set of propositions related to the forces that drive the IT adoption process.

## **1. Introduction**

Historically, the economies of scale brought about by IT seem to have provided their own justification of performance. In recent years, however, companies have become increasingly sceptical regarding the efficacy of IS spending (Moynihan 1990). They want to know what factors lead to the successful adoption and implementation of IT, and why some companies are more predisposed to IT adoption than others.

The central importance of this issue has not escaped MIS researchers. However, the literature in the area of IT adoption is still fragmented, and has generally focused on the process of IT assessment and adoption at a micro-level. These studies have provided descriptive models of how companies go about evaluating and acquiring new information technologies, but have ignored the environmental or organizational forces that drive the adoption process.

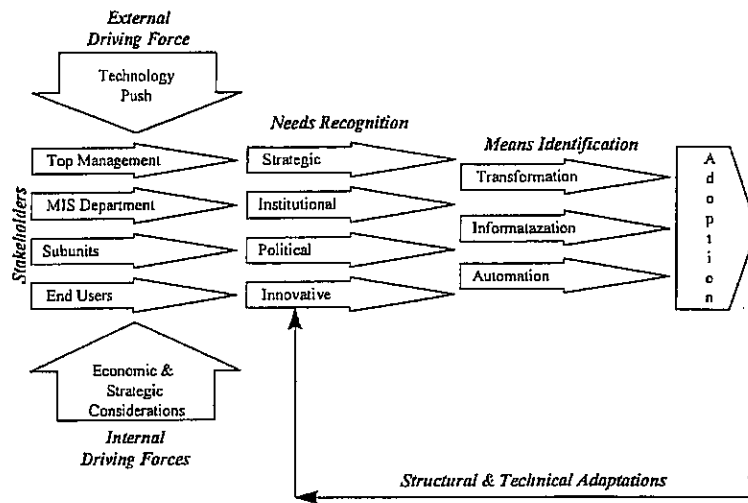
Our knowledge of the IT adoption process has been hampered because (a) little is known about specific characteristics of IT, (b) the existing literature is loosely grounded in the fundamentals of reference disciplines such as organizational theory, and c) the related research has mainly focused on bivariate relationships between IT and some organizational variables.

Research in the area of IT adoption seems to be in the concept development stage of theory building; as such, there is a need to identify the key variables, as well as the relationships among them. This paper provides a synthesis of the IT adoption process. A model of organizational adoption of IT is developed to identify the key drivers behind the IT adoption process. This model is then used as a springboard to formulate several propositions related to driving forces behind the IT adoption process.

## **2. A Model Of Information Technology Adoption**

The explanatory model of organizational impact of IT adoption shown in Figure 1 is concerned with the identification of the influential variables that drive adoption of IT, and the relationships among these forces. It advocates an organizational role for IT by arguing that the traditional technical role of IT (the storage, processing, and communication of information) does not provide an accurate picture of interactions between IT and an organization's strategy, structure, processes, and stakeholders (Bakos 1985). The model traces down the adoption process of IT, and shows how strategic and economic considerations, in one hand, and the technology supply-push, on the other, influence various stakeholders in their need recognition process. After a need has been recognized, the technology environment is searched to find an appropriate means for achieving the desirable objectives. This process of matching the need and the means, in turn, is influenced by the stakeholders' perceptions and attitudes toward the benefits and problems of the desired technology. If the resultant dispositions are positive, then the attitudes are transformed into the intentions, which could ultimately lead to the adoption of that technology.

Figure 1. A Model of Organizational Adoption of Information Technology



The model identifies two major driving forces behind IT adoption: a) the supply push created by the advent of new technologies (Gibson and Nolan 1974, Nolan 1979) and b) the demand pull engendered directly or indirectly by the stakeholders of IT (King and Kraemer 1984). The extent of influence of these two driving forces is governed by the perceived or real short-term economic justification of the technology under consideration and/or its perceived ability in improving the firm's bottom line.

### 2.1. Technology Push

On the supply-side, the advent of new technologies prompts firms to upgrade their information systems utilities for competitive reasons such as fear of being left out of the mainstream of technological developments, or for economic reasons such as improving efficiency of their existing operations. Technology push is most effective if a new IT helps a firm (a) understand its positions vis-à-vis the industry structure, (b) improve its product differentiation, or (c) lower its production and/or coordination costs. In other words, apart from non-economic strategic issues, the real or perceived capital equivalency ratio of a technology, which is defined as the cost of a technology divided by the cost of labor (Benjamin and Scott Morton 1986) should be sufficiently low to justify the adoption of that technology.

### 2.2. Demand Pull

The demand forces are driven by the major stakeholders of IT (El Sway 1985). Organizations are increasingly trying to explore various ways of utilizing IT to improve productivity or to achieve competitive advantage. In this context, the MIS department is under pressure not only to cope with the supply-push factors, but also to reckon with top management, functional departments and users who seek innovative opportunities in IT.

#### 2.2.1. Strategic pull

The first force can be termed strategic or opportunistic motive. Firms generally follow the market positioning model (Porter 1980) or the value-added chain model (Porter and Millar 1985) to enhance their competitive advantage. From an economic perspective, the improved capital equivalency ratio of IT motivates firms to explore the possibilities of adopting new technologies in order to reduce cost of their products and/or increase functionality of their products (Benjamin and Scott Morton 1986). Obviously

lower capital equivalency ratio affects organizations in varying degree, depending on their business strategy (e.g. differentiation versus cost leadership), organizational structure (e.g., centralized versus decentralized decision making), as well as some mediating variables (e.g., the type of industry within which the firm functions).

From a strategic perspective, certain strategies and structures are more fertile to risky, but innovative activities. Depending on their organizational culture and strategy firms adopt certain information technologies in anticipation of gaining long-term competitive advantage. In this context, the immediate or transparent economic merits of an IT are overshadowed by the long-term advantages expected from that technology (Wiseman 1988).

The process within which the strategic motive of IT adoption takes place involves a host of organizational variables. The thrust from top management in instigating a strategic motive is prompted by top-down organizational strategy, on one hand, and by bottom-up opportunistic or innovative pressures from MIS department and user groups, on the other. This driving force is directly related to management's attitude toward risk associated with technology. The need recognition of a certain technology is formed based on the decision makers' perceptions about economic and strategic benefits and problems related to that technology. These perceptions are then translated into formation of attitudes toward that technology, which are in turn lead to intention to adopt (Farley et al. 1987).

### **2.2.2. Institutional pull**

The second force is motivated based on institutionalized demand (Kling and Scacchi 1982) created by the existing information technologies in organizations. The extent of presence of IT by itself requires continual maintenance and upgrade of hardware and software, irrespective of changes in technology. The institutionalized motive appears to have the lowest degree of integration with other forces. This force is basically driven by the MIS department, which has to continually upgrade and maintain the existing information systems for operational purposes. The MIS group is the primary instigator of the institutionalized force; top management or user groups usually play a small role in this area.

### **2.2.3. Political pull**

The third force is related to the treatment of computers as a political resource (Kraemer 1980, Markus, 1980). The power of subunits has important implications for acquisition policies in organizations in that it governs the way scarce resources are allocated to different subunits. The strategic contingencies theory of intra-organizational power, for example, illustrates how subunits control contingencies for one another's activities and become powerful as a result of the dependencies thereby created (Hickson et. al 1971, Pfeffer and Moore 1980, Salancik and Pfeffer 1977).

According to these theories, IT is an effective vehicle for maintaining or enhancing departmental power structure. Because of political expediency or true centrality of IT to a subunit's activities, a department adopts different types of IT to maintain or improve its political posture. In this context, the acquisition policies of a given department are largely governed by its power in securing resources for developing, obtaining and maintaining the desired technologies. It is estimated that up to fifty percent of IT budget is spent by the user departments (Datamation 1987). In light of the proliferation of distributed computing in the last 10 years, it is safe to assume that this figure is higher today.

Subunits need to influence top management, MIS department, and their own constituencies to maintain their political posture vis-à-vis IT. First and foremost, a particular subunit should be able to convince the top management about its intra-organizational power. In other words, the basic premises<sup>1</sup> on which intra-organizational powers are established should unambiguously be communicated to the higher echelons of management in order to secure resources required for IT adoption. Second, a user subunit needs to

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<sup>1</sup> These premises are a) the ability of a subunit in dealing with uncertainty, b) unsubstitutability of its activities, and c) centrality of its activities (Hickson et al., 1971).

attract the support of the MIS department in order to fully realize the benefits of an adopted IT. As the overall organizational information processing becomes decentralized, user departments need the support of the MIS department in maintaining and servicing the related information technologies. Finally, a subunit requires the backing of its constituency in justifying the need for a particular IT. It is only through the justified use of an adopted IT, perceived or real, that a subunit can maintain its political posture for subsequent adoptions.

#### **2.2.4. Innovative pull**

The last demand-pull force is based on personal and innovative grounds as users may seek to obtain newer technologies to perform their jobs more effectively or creatively. Different subunits including MIS department are custodians of the political force, user groups are the major drivers of the innovative force, and top management is responsible for the strategic force. These forces are not mutually exclusive, and there is a dynamic link among individual motives and various stakeholders. The extent of prevalence of each driving force is determined by a combination of relationships among the major actors behind the adoption process.

The relationships among the determinants of the innovative motive are very complex. Although there is a paucity of empirical work in this area, there appears to be some evidence showing that creative use of IT by end users is playing an increasingly important role in the adoption process (Wiseman 1988). Cultivation of any innovative process requires certain specific organizational climate that is conducive to creative activities. The adoption of IT for innovative purposes therefore requires favorable organizational climate such as favorable top management and MIS support.

#### **2.3. Means Identification**

Zmud (1980) used push-pull theory to construct a model of innovative behavior. According to this model, innovation is most likely to occur when a need and a means to resolve that need is simultaneously recognized. Similarly, Huff and Munro (1985) presented a framework for study of IT assessment and adoption, in which they identified "issues" and "technology" as the two major driving forces underlying the adoption process. According to this framework, an organization usually identifies the issues that it should deal with, then tries to find the appropriate technology that will improve the severity of these issues.

The need recognition for a certain technology is generally followed by scanning of the environment to find an appropriate technology that matches that need. The primary actors in the need recognition are usually motivated by one of the demand-pull forces in anticipation of short-term economic gains or long-term strategic gains. In cases where a match can not be found, the firm is forced to either review its need requirements or exerts sufficient pressure, probably in conjunction with other firms in similar situation, on manufacturer to deliver the desired IT. A demand-motivated adoption, nevertheless, begins with need recognition then proceeds to means identification, and could eventually lead to adoption of a matched technology.

The supply-push developed by technology, on the other hand, influences the adoption process differently. This type of driving force generally takes precedence over the need recognition stage. The stakeholder groups learn about the potentials of certain technologies, then try to find appropriate applications for that technology. These applications could be in efficiency-oriented areas with transparent capital equivalency ratio, in one extreme; or in strategic areas with uncertain economic merits, on the other extreme.

In general, IT can be used in three fundamental ways (Cash et al. 1994) to satisfy one or more of the needs mentioned above. Historically, IT has been used to substitute for labor by automating routine, clerical, and information processing jobs. Increasingly, however, IT has been used to complement human information processing capabilities. In this context, IT is said to informate individuals' work. Finally, we have witnessed increasing proliferation of business process reengineering in recent years as a mean to transform work.

## **2.4. Adoption Process**

When a need is recognized by the stakeholder groups, perceptions are formed about the benefits and problems associated with a particular IT that could satisfy that need. Two major determining factors in forming these perceptions are the economic justification of the technology under consideration in terms of its lower capital equivalency ratio, and the anticipated long-term potentials of the application in terms of enhancing the strategic posture of the firm.

The final decision to acquire the technology, however, depends on the ability of the primary actor behind the adoption in securing organizational resources required for the adoption. An intention to adopt translates into an acquisition only if there is a congruence between top management's perceptions and the primary actor(s)' perceptions about the technology under consideration. Irrespective of the type of motive behind an adoption, the principal instigator should be able to communicate the economic and non-economic merits of the application to top management.

## **2.5. Resulting Effects of IT Adoption**

An adopted IT influences organizational strategy in varying degree, depending on the origin of the driving force behind the adoption. Adoptions that are institutionally motivated usually do not effect any major changes in strategy. On the other hand, adoptions that are initiated for political, strategic, or innovative reasons, as well as adoptions that are motivated by the technology push do impact organizational strategy.

The implications of strategically motivated adoptions are may or may not be understood by management. Generally, a particular type of IT is adopted, its strategic effects are examined, and appropriate moves are made to optimize the strategic benefits of this type of technology in the future. In cases where there are incongruencies between management's prior expectations and the actual changes effected by an adopted IT, two things could happen: a) either a change in attitudes towards that technology would occur, or b) moves would be made to re-align organizational strategy vis-à-vis that technology.

The political or innovative adoptions as well as technology-pushed adoptions affect strategy more tacitly. The resulting changes are generally unexpected, and firms usually perform post-mortem analyses to understand the extent of the resulting changes. The bottom-up pressures exerted by user groups, however, play a significant role in subsequent adoptions as they influence and change the management's perceptions about certain types of IT.

The introduction of an IT also changes the technology composition of a firm. At a macro-level, IT replaces conventional technologies, because of its lower capital equivalency ratio. Over the last 20 years, cost of IT has decreased 30% annually, while cost of labor has increased approximately 5% annually. This has improved the capital equivalency ratio for IT 25times. In contrast, the capital equivalency ratio for six different product groups (processed foods, appliances, furniture, machinery and equipment, photographic equipment, and cars) has improved only by a factor of 1.4 among 1975 - 1985 (Benjamin and Scott Morton 1986).

At a micro-level, the bottom-up forces behind end user computing bring about changes within the IT configuration: the more efficient and innovative applications of IT substitute the older ones. The appealing cost/performance ratios of distributed PC-based networks and client/server architecture have particularly prompted a significant number of firms to favor end user computing, and to plan for the structural changes brought about these new computing environments.

## **3. Research Propositions**

In this section, we will provide some explanation about the dynamic inter-links among the influential forces that drive the IT adoption process. We will attempt to explore why some organizations are more predisposed to the adoption of IT than others, and what roles a firm's strategy and its stakeholders play in this process. We use the model of organizational adoption of IT to frame a set of propositions.

### **3.1. Technology-Push Adoption**

*Proposition 1: The economic justification of IT, as measured by its perceived capital equivalency ratio, will be related with organizational rate of IT adoption; the lower the capital equivalency ratio, the higher rate of adoption.*

Economic development is spurred by economic necessity, and economic structure dictates the level of technology adoption (Mansfield 1968). In other words, the real or perceived economic justification acts as probably the most significant driving force in IT adoption process. This justification is generally made based on lower capital equivalency ratio of IT compared to alternative technologies or comparable labor. In light of the scarcity of theoretical background in the area of information systems evaluation (Ahituv 1980), the *perceived* economic justification of a technology appears to play a more important role than its real economic rationalization.

### **3.2. Institutional Adoption**

*Proposition 2: The extent of proliferation of IT in an organization will be positively related with organizational rate of IT adoption.*

The institutional motive behind IT adoption has the lowest degree of integration either with the major organizational elements or with the other driving forces behind IT adoption. Its influence is simply a function of the extant IT in an organization (King and Kraemer 1984).

### **3.3. Political Adoption**

*Proposition 3: The organizational power of the subunit(s) responsible for IT adoption will be positively related with organizational rate of IT adoption.*

We hypothesize that the rate of IT adoption is a function of the organizational power of the subunits, including the MIS department, that initiate the adoption process. Apart from the three major variables related to the strategic contingencies of intra-organizational power, heterogeneity of occupational types (Hickson 1971) also influences innovative adoptions motivated by subunits.

### **3.4. Strategic and Innovative Adoption**

*Proposition 4: The perceived potentials of IT in sustaining competitive advantage will be positively related with organizational rate of IT adoption. This relationship is influenced by the type of industry within which the firm functions.*

The perceptions of decision makers about the potentials of a new IT in effecting a sustainable competitive advantage would have bearings on the adoption of that technology. Firms have different degrees of strategic dependence on IT, depending on the type of industry within which they function. IT results in a sustainable competitive advantage only if it reduces costs or adds value for customers and users; entails substantial switching costs on part of users or customers; and has a small ratio of customer adoption time to competitor copy time (Clemons and Kimbrough 1986).

The type of an organization also influences the rate of IT adoption in that organization. Due to internal characteristics, certain organizations are more predisposed to strategic or innovative adoption of IT than others. For example, innovating adhocracies<sup>2</sup> need decentralized, sophisticated information systems to monitor performance, and potentially to locate and exploit new product and market opportunities. Interestingly, organizational innovation is associated with high differentiation, high professionalism, high decentralization, and low formalization. This relationship is mediated by size of the organization (Pierce and Delbecq 1977) and type of industry within which the firm functions.

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<sup>2</sup> These organizations are characterized by organic structure, high differentiation, high decentralization of power, and low formalization (Miller, 1986).



*Proposition 5: Differentiation is positively related with organizational rate of IT adoption. This relationship is influenced by the size of the firm and the type of industry within which the firm functions.*

*Proposition 6: Decentralization is positively related with organizational rate of IT adoption. The relationship is influenced by the size of the firm and the type of industry within which the firm functions.*

*Proposition 7: Formalization is negatively related with organizational rate of IT adoption. This relationship is influenced by the size of the firm and the type of industry within which the firm functions.*

In formulating the last three propositions we have not made a distinction between the top-down, strategically motivated adoptions and the bottom-up innovative adoptions. Instead, we have taken a holistic approach by arguing that certain organizations, due to their inherent organic nature, encourage end-user computing to the extent that it becomes a part of their strategic mandate. These firms are usually advanced consumers of IT; they continually evaluate and change their technology composition, seeking short-term economic benefits as well as long-term strategic advantage.

#### **4. Conclusion**

Progress in the area of IT adoption has not been significant because of the intricate organizational and economic issues related to technology. Researchers have traditionally focused on various contingencies between IT and other organizational variables, without considering the holistic implications of the ensuing impacts. Moreover, the literature in the area is still fragmented and loosely grounded in theoretical foundations. The majority of studies provide prescriptive guidelines for effective management of IT adoption process, without shedding light on why organizations acquire certain information technologies, or what factors influence their adoption decisions. These studies on the whole focus on bivariate relationships between IT and some organizational variables without considering the effects of the ensuing changes on the overall organizational equilibrium.

We believe that the area of IT adoption is in the concept development stage of scientific inquiry. The important issues as well as some of the key variables have been identified. However, the scant empirical evidence is based on case studies; the utility of the existing propositions is confined to contextual limitations; and more importantly, there is a discernible paucity of substantive, rigorous theories in the area. The next step is to identify all the major variables of IT adoption and the interrelationships among them in order to pave the way for hypothesis generation and testing.

In this paper, we sought to unravel some of the complexities surrounding the IT adoption process. We presented a model of organizational adoption of IT, identifying not only the driving forces behind adoption, but also some of the organizational effects resulting from the adoption. Through several propositions, we hypothesized that the adoption of IT is motivated by a) the availability of new technologies, b) the degree of proliferation of the existing IT, c) the political pressures from subunits, d) the innovative pressures from the users, and e) the strategic exigencies of IT recognized by top management. We suggested that these driving forces are invariably influenced by the type of organization in terms of its management philosophy, strategy, and stakeholders. We believe that these propositions should pave the way for the generation and testing of more robust hypotheses.

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