JOURNAL OF

GLOBAL INFORMATION MANAGEMENT

An official publication of the Information Resources Management Association

VOLUME 7, NUMBER 3 JULY-SEPTEMBER 1999

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BOOK REVIEW


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Determinants of Information Technology Adoption: An Extension of Existing Models to Firms in a Developing Country

Subhashis Dasgupta
Fairleigh Dickinson University, USA

Derraj Agarwal
KPMG Peat Marwick LLP, USA

Anthony Ioannidis
University of La Verne - Athens Campus, Greece

Shanthi Gopalakrishnan
Fairleigh Dickinson University, USA

Advances in new information technology and changes in the global environment have made it increasingly difficult for organizations to make decisions regarding information technology adoption. Moreover, information systems in a global environment are influenced by different cultures, laws, information technology infrastructure, and the availability and role of skilled personnel. Information systems research has traditionally focused on organizations in US and UK without considering how these frameworks and models can be applied and extended to developing countries. In this study of 46 firms we examine the determinants of process-based information technology adoption in the Indian manufacturing sector. Although there are many differences like the type of organizations, and the technology available, between developing and developed countries, we found that factors that influence information technology adoption are similar. Our results showed that organizational factors like a firm’s culture and size, and environmental factors like competition faced by firms, government policies, and market forces like exchange rates and computer prices, have a significant impact on information technology adoption decisions made by firms. We also found that the role of management information systems personnel has a negative impact on adoption.

Recent advances in information technology have changed the way organizations work. Personal computers do the work done earlier by mainframes. Computers are networked together in organizations and users share programs, files and electronic messages. Telecommuting is on the rise with the ability to connect to organizational computer systems from home. The Internet has provided an environment in which information can travel across organizational as well as national boundaries. Such has been the advance in new technology that organizations find it increasingly difficult to make decisions regarding information technology adoption. To complicate matters further, there have been significant changes in the world trade and political climate due to the North American Free Trade Agreement (NAFTA) and the General Agreement on Tariffs and Trade (GATT). These changes have opened new doors for firms to invest and expand to other countries. There has been an emergent need for a reassessment of firms’ existing information technology (IT) and the need for global information systems. Carefully crafted investments in global information technology offer firms an opportunity to increase control and enhance coordination (Ives and Jarvenpaa 1991). Organizations use information systems as competitive weapons due to decline in the cost of supporting information technologies and structural changes in the economy caused by global competition (Ives and Learmonth 1984). Confining information technology to local boundaries would be naïve because information technology has supported and enabled the globalization of businesses (Cash, McFarlan et al. 1988; Feeny, Earl et al. 1990). As the global environment and information systems change, information technology management practices must also change (Boynton and Zmud 1987).

Manuscript originally submitted December 12, 1997; Revised November 30, 1998; Accepted January 20, 1999 for publication.
IS research has traditionally focused its attention predominantly on USA and UK organizations without concerns for how applicable the models and frameworks developed from this research would be in an international context. (Elliot 1996)

Information systems adoption is greatly dependent on contextual and environmental characteristics like national cultures, laws, information technology infrastructure and the availability of skilled personnel (Shore 1998). Global companies in the new world marketplace have to develop large integrated global (or international) information systems linking its subsidiaries in different countries. Therefore, countries should be studied individually so that information technology adoption practices that exist can be known and understood, and new and efficient information systems developed. Although there have been a number of international studies that have identified various country-specific information systems issues, there is a dearth of knowledge regarding factors that influence its adoption in developing countries.

In this paper, we investigate the reasons why a firm adopts information technology. The country considered here is India, a populous nation with a mixed economy. The economy consists of a vibrant private sector as well as a large public sector. The Indian economy is a mixture of traditional village farming on one hand, and modern industries on the other. India’s GDP was $295 billion, with a real growth rate of 5% in 1997. Imports totaled $38.5 billion, whereas exports grossed $30.0 billion in 1997. Policy reforms since 1991 have extended earlier economic liberalization and greatly reduced government controls on production, trade, and investment, as well as privatized parts of the large government-owned public sector (State Department, 1998).

The organization of this paper is as follows. In the next section, we present an outline of the theoretical framework on which we build this study. Then, we present research hypotheses, followed by details of the research methodology. This is followed by the results and a discussion of the implications of the results.

The Theoretical Framework

Information technology adoption has been considered within the areas of information technology planning, diffusion and implementation. Boynton and Zmud (1987) in their review of information technology planning methodologies mentioned that there is no one best method to view information technology planning or information technology implementation. We briefly review literature that may be relevant to information technology adoption. From a technological diffusion perspective Cooper and Zmud (1990) considered adoption as a part of their framework on information technology implementation. They used a stage model of information technology implementation which involves five stages: initiation, adoption, acceptance, routinization and infusion. McFarlan and McKenney (1982) considered information technology identification and investment as the first step in the diffusion of information technology within an organization. As an extension of Cooper and Zmud’s six stage information technology implementation model, Umanath and Campbell (1994) provided a general model for differential diffusion of information systems in multinational enterprises. Information technology adoption is characterized by adoption decision making and the subsequent investment.

MIS literature on information technology investment shows that most studies have utilized overall information systems budgets which included hardware as well as software spending (Nolan 1973; Lucas and Sutton 1977; Nolan 1979; Benbasat, Dexter et al. 1984; King and Kraemer 1984; Gurubaxani and Mendelson 1987; Schaeffer 1987; Gurubaxani and Mendelson 1990). Although information technology investment has been studied in great detail, it is important that we make a distinction between information technology adoption and information technology investment as considered in literature. In MIS literature, adoption is implicitly assumed as a decision to adopt new information technology whereas information technology investment is considered as the total investment in hardware, software, and personnel.

Most studies on information technology adoption have been conducted in developed countries like the US and Western Europe. The focus of our study is to extend existing models used in developed countries and see whether the determinants of information technology adoption are similar in developing countries. There are significant differences between organizations in developed and developing countries. Organizations in developed countries have access to more resources and face more competition than organizations in developing countries. In addition, organizations in developed countries have greater access to technology than those in developing countries. Since there are inherent differences between organizations in developed and developing countries, we consider it important to examine the applicability of models developed for information technology adoption in developing countries.

There are a few studies that have considered information technology planning and implementation in the specific countries (Paves and Ang 1995). Countries and regions studied include China (Harrison and Farn 1980), Egypt (Kamel 1995), Estonia (Dexter, Janson et al. 1995), Hong Kong/China (Elliot 1996), Jamaica (Barrett and Walsham 1995), Mexico (Mahnood, Gemoets et al. 1995), The Middle East - Gulf States (Badr 1992), Pakistan (Hassan 1994), Slovenia (Dekleva and Zapanic 1993), Uruguay (Hernandez, Gibson et al. 1996). While most studies have concentrated on identification of key issues in MIS in these countries, some studies have investigated strategic planning aspects of MIS (Azuma and Mole 1994; Paves and Ang 1995). Studies on information systems in Indian organizations have identified important information systems issues facing managers in India (Palvia and Palvia 1992), and the implication of policy changes in the Indian telecommunication sector on management decision makers (Jain 1993). While studies have been conducted on information systems issues in specific countries, there has
been a serious dearth of studies that have investigated the impact of information technology adoption.

Research in information technology adoption has suggested that individual factors like leadership, organizational factors such as size, centralization, specialization, and contextual factors like competition and external environmental variables are predictors of information technology adoption (Kimberly and Evansisko 1981). A study of U.S. banks has found a causal relationship between adoption of process-based and product-based information technology, and firm performance (Floyd and Woolridge 1990). According to Zmud (1982) product-based innovations refer to introduction of new products or services that shift or expand an organization’s domain, while process innovations refer to the introduction of new methods, procedures or responsibilities within existing domains. Process-based technology helps product based technology function more efficiently, and enables synchronous adoption of information technology throughout the organization, thereby increasing its overall effectiveness. Moreover, studies in developed countries have identified a “productivity paradox” in information technology which states that investments in process-based information technology have no or negligible effect on firm productivity and performance (Brynjolfsson and Hitt 1996; Rai, Panayakini et al. 1997). In this study we investigate the determinants of process-based information technology adoption in Indian companies, in an attempt to understand whether they impact productivity and performance in a different context.

In a model for the diffusion of information systems technology in multinational enterprises, Umanath and Campbell (1994) identified environmental factors like condition of the economy, political climate and national culture; and organizational factors like business strategy, organizational culture, economic posture and organizational politics, as factors influencing information technology adoption and its subsequent diffusion in organizations. Based on the models described above, we identified two sets of factors for this study: contextual factors like organizational culture, individual (leadership) characteristics of MIS personnel, and environmental factors like competition, government policies, market forces (including currency exchange rate fluctuations). A detailed description of the variables in this study is provided in the following section.

It is evident that there are comprehensive theoretical models for analyzing the information technology diffusion process in organizations. We also identify the absence of empirical research investigating the factors that influence any, or all stages of information technology diffusion. This research attempts to fill this gap in the diffusion literature and global/international information systems research by analyzing the determinants of information technology adoption in a developing country, India.

Hypotheses

Cooper and Zmud (1990) have provided a model for the information technology implementation process in a organization based on a technological diffusion perspective. They define adoption as the process that involves national and political negotiations which ensure organizational backing for implementation of an information technology application. Since successful adoption involves commitment of organizational resources for organizational success, this commitment culminates in an information technology adoption decision.

Most information technology diffusion models have identified adoption as one of the early stages of the diffusion process in which a commitment is made to acquire technology. McFarlan and McKenney (1982) considered information technology identification and investment as the first step in their model. A detailed explanation is provided in the methodology section of this paper.

Environmental Factors

Competition

The type of competition a firm faces influences the extent of information technology adoption. Porter (1980) identified five competitive forces: rivalry among competing firms in the industry, the threat of new entrants, threat of substitute products or services, the bargaining power of suppliers and the bargaining power of customers. In the current competitive environment, “information systems offer a unique opportunity for organizations to gain competitive advantage in the new business climate” (Ives and Learmonth 1984). Factors such as the decline in the cost of supporting information technologies, and structural changes in the economy caused by global competition have increased the external use of information systems as competitive weapons. As competition increases within an industry, firms may find themselves investing in information technology to achieve cost efficiencies. For example, if one manufacturing firm automates its assembly line (using information technology), it may be able to reduce labor costs, thus attaining cost efficiency. This may force other companies in the same industry to make information technology investments of their own.

A firm could face competition from local as well as foreign firms operating in the same environment. Information technology may be a critical element of competition in certain industries (McFarlan and McKenney 1982). Intense competition may require firms to invest more in information technology. Therefore:

Hypothesis 1
Information technology adoption will be higher in firms that face more competition.

Government Policies

Information technology adoption in an organization is influenced by the policies of the government in the country in which the organization operates. Several countries including Brazil, Mexico, Singapore, Malaysia, India, and Argentina have developed national policies on informatics. Such poli-
cies are used to: 1. Establish trade policies and tax incentives to accelerate technology adoption; 2. Emphasize and identify the industrial sectors in the country that have priority in the use of information technology; 3. Encourage research into adaptation of information technology for the country's needs (Perez 1992). These policies can be considered to be of two types: trade policy and government incentives. Trade policy includes import and export duties, and bilateral and global trade agreements the host country government is party to. Government incentives include those provided by the government for companies to invest in information technology, and in most cases, technology in general. Such incentives could include an investment tax credit and export incentives. If countries have no (or lower) import tariffs on computer hardware and software, and/or government provides investment tax credit to the companies, companies will be encouraged to make more investments in information technology. We consider such a policy to be a liberal government policy and the lack of such a policy a restrictive government policy. Therefore, Hypothesis 2: Information technology adoption will be higher in firms that perceive government policies to be liberal.

Market Stability

Some market forces (other than competition, which we have already considered earlier) like currency exchange rates, and computer prices in the domestic as well as international market have an impact on information technology adoption. Cheaper computers are an incentive for investment, and a stronger host-country currency makes imported computers cheaper. Therefore, stable prices and stable currency exchange rates reduce uncertainty and encourage organizations to invest in technology particularly imported hardware. Hypothesis 3: Information technology adoption will be higher for firms that operate in a stable market.

Organizational Factors

MIS Personnel

MIS personnel play an important role in information technology adoption decisions. In most cases, top management and user support are prerequisites for a successful adoption decision. It is necessary to have a product or technology champion to educate people on the new technology, garner support, and facilitate its adoption. Existing literature states that champions are an important factor in information technology and interorganizational systems adoption (Beath 1991; Grover 1993). Here, we consider the role played by MIS personnel in all decisions: small or large, departmental or organization-wide. We propose that information technology adoption is related to the extent to which MIS personnel are involved in adoption decision making. Hypothesis 4: Companies in which MIS personnel are more involved in information technology adoption decisions will have higher information technology adoption.

Ownership

National culture influences organizational culture. Higher individualism, lower uncertainty avoidance, lower power distance, and lower masculinity-femininity differences, are representative of the national cultures of the U.S.A. and European countries in comparison to the Indian culture (Hofstede 1983; Hofstede 1984). Organizational cultures of companies in India which have some form of strategic alliance with a foreign company are affected by both the national (Indian) culture as well as the culture of the foreign company. Since most multinational companies in India have alliances with European and American companies, the company's cultures reflect influences from the national cultures of those countries. Therefore it is logical to assume that the organizational culture of multinational companies in India will have higher innovation, detail orientation, team orientation, and outcome orientation than in domestically-owned Indian companies. Cultures of Indian companies will exhibit higher people orientation, stability and easygoingness than those of foreign companies (Chatman and Jehn 1994). Although prior research has not identified the importance of ownership on information technology adoption, we examine the relationship in this research. Hypothesis 5: Information technology adoption will be greater in Indian companies with foreign ownership than in companies with no foreign alliances.

Organizational Size

According to Kwon and Zmud (1987) structural characteristics of an organization affect information technology adoption. One such structural characteristic, organizational size, was found to have a positive effect on technology innovation adoption. This is possible because increasing size creates a "critical mass" which would justify some technology adoption (Kimberly 1976). Another explanation is that organizational size may necessitate technology adoption, e.g., a larger organization may have a greater need to use communication technology to coordinate activities within the organization. Hypothesis 6: Information technology adoption will be greater in larger companies.

Organizational Culture

An organizational determinant of information technol-
ogy adoption we examine in detail is organizational culture. Organizational culture is a shared set of values which is typical of the people within an organization (Punnett and Ricks 1990). Boynton and Zmud (1987) identified the importance of studying organizational culture in information technology planning in the 1990’s. According to them organizations must assess existing culture and its impact on information technology planning. According to Chatman and Jehn (1994), every organization has some core values that are shared across the organization. Norms, symbols, rituals, and other cultural activities are dependent on these values which are the defining elements of culture (Erez 1988). Culture can also be a source of competitive advantage since it is valuable, rare, and unique in each and every organization. Organizations also use culture internally to instill pride in membership, intensity, and feelings of loyalty among organization members (Chatman and Jehn 1994). Therefore, information systems must be built with a respect for diversity of cultures, both national and organizational. Here we focus on the effect of organizational culture as a determinant of information technology adoption.

As an organization’s culture can be characterized by innovativeness and ability to take risks, attention to detail, orientation towards outcomes or results, emphasis on growth and rewards, and team orientation. Organizational cultures that display high innovativeness will have members who take more risks. Work might involve non-routine problem solving or decision making under uncertainty (Pisano and Krammer 1993). Information technology adoption will be higher in such organizations. Using these characteristics, organizational culture can be considered to be either performance-oriented or stability driven (Chatman and Jehn 1994).

Since performance-oriented cultural values reflect an orientation towards outcomes, people, teams, innovativeness, and an attention to detail, we propose that organizational cultures with higher performance-oriented cultural values will have higher information technology adoption. Since adoption of information technology causes change in all organizations, organizational cultures which display higher stability-oriented cultural values will resist information technology adoption, and therefore display a lower rate of adoption. Using the two components of organizational culture, performance-oriented and stability-oriented cultural values, we state our hypotheses as follows:

**Hypothesis 7**
Information technology adoption will be higher in organizations with cultures that have high performance-oriented cultures.

Change causes uncertainty in organizations, and members of a stable organization resist uncertainty. Therefore,

**Hypothesis 8**
Information technology adoption will be lower in organizations with cultures that have high stability-oriented cultures.

### Methodology

#### Sample
We identified 200 large public companies in India with more than 500 employees and sales more than US $100,000 or Indian Rupees (Rs.) 4,000,000 (This is based on the foreign exchange conversion rate of US $1 = Rs. 40.00) in the manufacturing sector. A survey instrument which was mailed to the Chief Executive Officer (CEO) with a request that the questionnaire be forwarded to the head of the information systems department of the organization. A total of 46 usable responses were received, a response rate of 23 per cent.

Additional information regarding the sample in this study is provided in Table 1. Almost one-third of the companies in this sample had number of employees between 1000 and 2000. Ten companies (21.7 % of the total) had less than 1000 employees, 5 companies (10.9%) had between 2000 and 3000 employees, 7 companies had between 3000 and 4000 employees, and 10 companies (21.7 %) had more than 4000 employees. In terms of sales, exactly half of the companies, 25 out of 46, companies had sales between $100 and $300 million. There were 7 companies (15.2 % of total) which had sales less than $100 million, and 8 companies (17.4 %) each with sales in the $300 million to $500 million, and above $500 million category.

#### Operationalization of Measures
Data collection involved a 75-item survey instrument which was mailed to 200 CEOs of manufacturing firms in India. Diffusion literature shows that multiple measures have been used for information technology adoption; they include: number of technologies adopted, information technology investment, and number of people using new technology (Kimberly and Evanisko 1981; Zmud 1984). All of these measures other than information technology investment are surrogate measures. We also use a surrogate measure for information technology adoption. In this study we operationalized our dependent variable, information technology adoption, as the degree of computerization within the organization. Mitra and Chaya (1996) in their study of cost-effectiveness of information technology spending, proposed an automation effect of information technology, which they defined as the replace-

<table>
<thead>
<tr>
<th>Classification by Number of Employees</th>
<th>Number of Employees</th>
<th>Number of Companies</th>
<th>Percentage of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1000</td>
<td>10</td>
<td>10</td>
<td>21.7</td>
</tr>
<tr>
<td>1001 to 2000</td>
<td>14</td>
<td>14</td>
<td>30.4</td>
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<tr>
<td>2001 to 3000</td>
<td>5</td>
<td>5</td>
<td>10.9</td>
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<tr>
<td>3001 to 4000</td>
<td>7</td>
<td>7</td>
<td>15.2</td>
</tr>
<tr>
<td>More than 4000</td>
<td>10</td>
<td>10</td>
<td>21.7</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>46</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 1: Sample Characteristics
ment of labor with information technology. Examples provided include automated order entry and payroll where information technology can provide an automated system which can replace expensive labor with cheaper information technology, and provide significant savings in organizational processes. We define our surrogate dependent variable, degree of computerization, as a measure of the automation effect on organizational processes, i.e., the extent to which computers or information technology are used in the operations of the organization.

There are other practical reasons for the use of degree of computerization as the measure of information technology adoption. India is a developing country and it is likely that technology adopted in organizations is for “first-time” automation of work in different functional areas. Secondly, it is almost impossible to obtain reliable annual information technology adoption or investment data for companies in India, and most developing countries for that matter. To measure the degree of computerization, we collected perceptual data. Our subjects were asked to rate on a Likert scale the extent to which each functional area in their organization was automated. An average of these scores was used to calculate the degree of computerization.

As defined earlier, organization culture is a shared set of values which is typical of the people within an organization (Punnnett and Ricks 1990). To determine organizational culture or the shared set of organizational values, we used an instrument based on the Organizational Culture Profile (OCP) (O’Reilly, Chatman et al. 1991). The OCP uses a Q-sort process in which respondents have to rank a large number of items after dividing them into a definite number of categories based on some criterion. The OCP assesses attributes toward quality, respect for individuals, flexibility, and risk taking by using 54 value statements which respondents have to rank. Organizational members are told to sort the 54 value statements written on cards into nine categories ranging from “most characteristic of my firm’s culture” to “most uncharacteristic of my firm’s culture.” More cards are allowed in the middle categories and fewer in the categories at the two extremes. The number of cards that can be placed in each of nine categories are 2, 4, 6, 9, 12, 9, 6, 4, 2. Cards are placed according to rank within each category (O’Reilly, Chatman et al. 1991; Sheridan 1992; Chatman and Jahn 1994).

Although the Q-sort procedure provides some distinct advantages in determining the relative importance of each item with respect to all other items, we found it infeasible in the survey method that we utilized in this study. In our instrument, we included the same 54 value statements as defined in the OCP. Instead of ranking these items, respondents had to choose to what extent each value was a characteristic of the existing culture of their organization. A five-point Likert scale was used with “1” being “Least characteristic of the culture of the organization” and “5” being “Most characteristic.” According to this OCP, an organization’s culture can be characterized by (the dimensions mentioned within parentheses): innovation and risk taking (innovation), attention to detail (detail orientation), orientation towards outcomes or results (outcome orientation), aggressiveness on growth and rewards or the lack of it (easygoingness), and collaboration in teams (team orientation), orientation towards people (people orientation) and predisposition towards change (stability).

We used perceptual measures for our variables competition, government policies, market stability, and the role of MIS personnel. We received self-reported scores from respondents regarding whether the organization was facing intense competition, the extent to which government policies were perceived to be restrictive or liberal, the stability of prices and currency rates, and the extent to which MIS personnel influence the information technology adoption decision.

Although the number of employees has been the most common measure of size (Kimberly 1976), various other measures like number of beds (in hospitals), total assets, and number of personnel, and sales have also been used, depending on the industry studied (Kimberly and Evansisko 1981). Since our research considered manufacturing companies in India, we used sales as the measure of organizational size.

For ownership, organizations were categorized into two types: foreign and Indian. We classified companies as foreign if they were multinational organizations operating in India, or joint-ventures between Indian and foreign companies. Companies were classified as Indian if they were completely (100%) Indian owned, i.e., with no foreign ownership.

Data Analysis

To test all hypotheses and analyze the role of organizational culture the appropriate statistical technique chosen was multivariate regression analysis. We intended to estimate a single model, including all hypothesized variables. However, a small sample size (N=46) with 13 independent variables, made it impossible to test the proposed hypotheses without violating basic regression assumptions. We, therefore, tried to reduce the number of independent variables while maintaining the research model intact. First, we used Principal Component Analysis (PCA) to reduce the seven dimensions of organizational culture in our model. PCA is used to reduce a large set of original variables into a smaller set of linear combinations. The goal of PCA is to extract a few orthogonal factors that explain as much of the total variation in the data as possible (Dillon and Goldstein 1984). When subjected to PCA, the seven cultural dimensions were reduced to two principal components. The two components with their respective eigenvalues and factor loadings are presented in Table 2. The cumulative proportion of total variance explained by the two components is 74 percent. Component 1, which accounted for 33 percent of the total variance, is almost equally dominated by the five variables—people orientation, team orientation, detail orientation, innovativeness, and outcome orientation. Component 2, which accounted for 21 percent of the total variance, represents easygoingness and stability. We define Principal Component 1 to be a performance-oriented cultural values and Principal Component 2 to be stability-oriented cultural values.

The loading of variables on the principal components are
consistent. The predisposition towards change, or the lack of it (stability) loads on the stability-oriented cultural values principal component, whereas it has a negative relationship with performance-oriented cultural values. As expected, easygoingness loads on the stability-oriented cultural values component. An organizational culture that emphasizes stability displays a lack of risk taking and innovation, and a lack of stress on results. Our results confirm this as innovativeness and outcome orientation are positively related to performance-oriented cultural values and are negatively related to stability-oriented cultural values.

A multivariate regression model was developed to test the hypotheses. In this model, the dependent variable, degree of computerization, was regressed on the independent variables - performance-oriented cultural values (principal component 1), stability-oriented cultural values (principal component 2), market forces, country policy, competition, MIS personnel, sales, and ownership. Finally, we checked for any further data reduction possibility by running Backward Elimination procedure. This step removed ownership from the model. The resultant model with all other independent variables was found to be statistically significant.

Results

Descriptive statistics, Cronbach alpha coefficients, and zero-order correlation coefficients among the variables are presented in Table 3. The alpha values of 0.71 or more for all variables indicate a sufficiently high level of scale reliability and internal consistency. On closer examination of the variable correlations, no significant multicollinearity problems were identified. Only 10 out of 91 possible correlations had a value of 0.50 or greater, with no single correlation exceeding 0.75.

The results of the multivariate regression analysis are given in Table 4. Hypotheses testing was performed using one-tailed tests. Hypothesis 1 considers the impact of competition on the degree of computerization. As shown in Table 4, our hypothesis was supported at the $\alpha = 0.05$ level of significance. Therefore, we can state that companies facing intense competition have a higher information technology adoption. Hypothesis 2 was also statistically significant at $\alpha = 0.05$, from which we can infer that companies operating in an environment in which government policies are restrictive have low information technology adoption. We found support for hypothesis 3 ($p$-value = 0.05), which means that companies that operate in a market in which currency exchange rates, and computer prices in the domestic as well as international market are stable, will have a high degree of computerization. Hypothesis 4, which stated that greater involvement of MIS personnel in the information technology adoption decision will lead to a higher degree of computerization, was not found to be significant. On the contrary, we found a significant negative relationship between involvement of MIS personnel and the degree of computerization. We did not find support for Hypothesis 5, since the variable ownership was dropped from our model when the Backward Elimination procedure was run. Hypothesis 6, which stated that larger companies will have a greater degree of computerization, was found to be significant. Size of the companies was found to be positively related to the degree of computerization ($\alpha = 0.05$).

Mixed results were obtained during analysis of the organizational culture and its impact on the degree of computerization. We found support for hypothesis 7 which considered performance-oriented cultural values, whereas we did not find any support for hypothesis 8. With $p$-value $= 0.01$, hypothesis 7 was supported. Therefore, we can say that organizations with cultures that have high performance-oriented cultural values have a high degree of computerization. In the case of stability-oriented cultural values, we did not find any significant relationship with the degree of computerization. A comprehensive discussion of the results is provided in the following section.

Implications and Discussion

As stated in the results we found that companies that operate in an environment of intense competition, stable currency exchange rates and computer prices, and have a performance-oriented culture have high information technology adoption. Since investigation of the effect of culture on adoption was a major objective of this study, we discuss results regarding culture first.

We operationalized organizational culture using two dimensions: performance-oriented cultural values and stability-oriented cultural values. Performance-oriented culture emphasize people, team, detail and outcome orientation, and innovativeness. We found that companies with high performance-oriented cultures displayed a high degree of computerization. But, we did not find a significant relationship between stability-oriented cultural values and information technology adoption. Since adoption of information technology brings change to an organization, and since an organizational culture that displays high stability-oriented values resists change, it is logical to expect that stability oriented cultural values are negatively related to information technology adoption, but such a relationship did not find support in our model. Even stability oriented cultures probably need to adopt a minimal amount of information technology to be competitive in the
<table>
<thead>
<tr>
<th>Variables</th>
<th>Scale Reliabilities</th>
<th>Means</th>
<th>s.d.</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<th>5</th>
<th>6</th>
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<td>3. Easygoing</td>
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<td>3.24</td>
<td>0.66</td>
<td>.31*</td>
<td>.48***</td>
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<td>4. Detail Oriented</td>
<td>0.73</td>
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<td>0.79</td>
<td>.41***</td>
<td>.69***</td>
<td>.66***</td>
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<td>2.73</td>
<td>0.46</td>
<td>.63***</td>
<td>.64***</td>
<td>.28**</td>
<td>.41***</td>
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<td>6. Stability</td>
<td>0.81</td>
<td>2.93</td>
<td>0.51</td>
<td>.42***</td>
<td>.42***</td>
<td>.96**</td>
<td>.28**</td>
<td>.58***</td>
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<tr>
<td>7. Outcome Oriented</td>
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<td>0.55</td>
<td>.56***</td>
<td>.46***</td>
<td>.95**</td>
<td>.49***</td>
<td>.61***</td>
<td>.75***</td>
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<td>8. Market Force</td>
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<td>.58***</td>
<td>.38**</td>
<td>.14</td>
<td>.38**</td>
<td>.34**</td>
<td>.21</td>
<td>.08</td>
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<tr>
<td>9. Country Policy</td>
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<td>1.96</td>
<td>1.00</td>
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<td>.41***</td>
<td>.39**</td>
<td>.89**</td>
<td>.39**</td>
<td>.29**</td>
<td>.13</td>
<td>.21</td>
<td>.64***</td>
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<td>10. Competition</td>
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<td>2.98</td>
<td>1.19</td>
<td>.06</td>
<td>.25**</td>
<td>.14</td>
<td>.34**</td>
<td>.26**</td>
<td>.06**</td>
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<td>.37**</td>
<td>.39**</td>
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<td>.23**</td>
<td>.18**</td>
<td>.22**</td>
<td>.96**</td>
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<td>12. Degree of Computerization</td>
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<td>0.74</td>
<td>.29**</td>
<td>.44**</td>
<td>.29**</td>
<td>.49**</td>
<td>.74**</td>
<td>.09**</td>
<td>.18**</td>
<td>.27**</td>
<td>.34**</td>
<td>.07</td>
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<tr>
<td>13. Sales*</td>
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<td>0.40</td>
<td>0.07</td>
<td>.18</td>
<td>.08</td>
<td>.16</td>
<td>.12</td>
<td>.16</td>
<td>.10</td>
<td>.09</td>
<td>.02</td>
<td>.36**</td>
<td>.33**</td>
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<td>14. Ownership</td>
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<td>0.40</td>
<td>0.07</td>
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<td>.08</td>
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<td>.12</td>
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<td>.36**</td>
<td>.33**</td>
<td>.11</td>
<td>.04</td>
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</table>

N = 41
* Statistics use Cronbach's alpha.
* Statistic in millions.
* p < 0.10  ** p < 0.05  *** p < 0.01

Table 3: Descriptive Statistics and Correlations
Table 4: Regression Analysis Results

<table>
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<tr>
<th>Variables</th>
<th>Degree of Computerization</th>
<th>b</th>
<th>t</th>
<th>R²</th>
<th>F</th>
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<td>Market Stability</td>
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<td>1.75</td>
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<tr>
<td>Country Policy</td>
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<td>1.76</td>
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<tr>
<td>Competition</td>
<td>.18</td>
<td>1.66</td>
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<tr>
<td>MIS Personnel</td>
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<td>1.74</td>
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<tr>
<td>Sales</td>
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<td>1.82</td>
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<tr>
<td>Constant</td>
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<td>5.21</td>
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<td>43</td>
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</table>

*Value shown is standardized estimate

\* p < .10
‘ p < .05
‘’ p < .01

Current environment. Our findings agree on one aspect though, organizational culture is important in determining information technology adoption in organizations. This supports Boynton and Zmud’s (1987) recommendation emphasizing the importance of studying organizational culture in information technology planning in the 1990’s.

Competition faced by a firm plays a significant role in a firm’s adoption of information technology. We found that companies that faced stiff competition had higher rates of information technology adoption. This supports past research where information systems were identified as an opportunity for competitive advantage, as well as a critical element of competition in certain industries (McFarlan and McKenney 1982; Ives and Learmonth 1984). Other non-competitive market forces like exchange rates, and computer hardware and software prices were also found to have an impact on information technology adoption.

Government policies like import and export duties, bilateral and global trade agreements, and investment incentives provided by the government were found to be related to information technology adoption by organizations. Companies that perceive government policies to be restrictive have a low degree of computerization. We also found that the size of organizations is positively related to information technology adoption. Our results support prior information technology adoption research which states that organizational size necessitates information technology adoption (Kimberly 1976; Kimberly and Evanisko 1981).

Involvement of MIS personnel in investment decisions was found to have a negative impact on information technology adoption. This might be due to the trend toward end-user computing in organizations. End-users not only require less support from MIS personnel, they are knowledgeable enough to make their own information technology adoption decisions. Ownership was not found to have a significant impact on information technology adoption. Both domestic (Indian), and foreign companies had the same determinants of information technology adoption.

The focus of our study was to extend existing models used in developed countries and see whether the determinants of information technology adoption are similar in developing and developed countries. Here we found that information technology adoption models initially proposed for developed countries are applicable in developing countries like India. Although there are significant differences between environmental and organizational factors in developed and developing countries, environmental factors like competition, government policy, and market forces, and organizational factors like culture, organizational size, and organizational culture which have been identified as determinants of information technology adoption in developed countries also have a similar impact in organizations in developing countries. Therefore, existing models initially proposed for information technology adoption in developed countries can be extended to organizations in developed countries.

Conclusion

Our study represents an important contribution in the area of information technology adoption. First, we found that the determinants of information technology adoption are similar in developed and developing countries. Existing information technology adoption models first proposed for organizations in developed countries are applicable in developing countries. Although this study deals with adoption in only one country, India, we found that existing models for information technology adoption intended for organizations in developed countries can be successfully extended to underdeveloped and developing countries. Second, we found that organizational culture is an important determinant of information technology adoption in organizations. An interesting result of this study was that only performance oriented, and not stability oriented cultures were determinants of information technology adoption in Indian organizations. Competition faced by firms, government policies on trade, and other market forces like currency exchange rates were also found to have an impact on information technology adoption. Third, no significant differences were observed in information technology adoption determinants in 100 percent Indian-owned companies and companies with some foreign alliance.

Implications For Researchers

Companies now operate globally and information travels across organizational and national boundaries. Since multinational firms operate in many countries both developing and developed, it is imperative that we study the information technology adoption not only in developed countries but in developing countries as well. In recent years, studies have proposed that organizational culture has a significant impact on information technology adoption. Our study supports the importance of studying organizational culture in information technology planning in the 1990’s. Since organizational culture may differ in different companies and in different countries, more cross cultural studies are needed to determine the importance of culture in all stages of information technology adoption. A number of areas of future research can be identified. First, research is needed into the longitudinal effects of environmental and organizational factors on information technology adoption. Second, researchers should
focus on comparative cross-cultural studies on the information technology adoption and diffusion process. Finally, information technology adoption and its subsequent diffusion is a continuous process. In this study we have found that environmental factors such as competition, government policies and market stability, and organizational factors like organizational culture affect information technology adoption. Technology adoption, in turn, has the ability to change the competitive environment and organizational culture. Therefore, it is important for research to explore the continuous process of information technology adoption.

Implications for Managers

This study provides some interesting insights for managers. Organizations have similar issues whether their ownership is domestic or foreign. Managers have little control over the environmental factors but have significant influence over organizational factors. Environmental factors such as increased competition, liberal government policies and market stability have a positive impact on information technology adoption. Although managers have little or no control over these factors, they should take note that these factors can have a significant impact on information technology adoption in organization. Another important finding is that information technology adoption can provide competitive advantage by enabling the organization to attain organizational efficiencies. Within the organization, managers should appreciate the role played by organizational culture. Performance-oriented organizational cultures have a significant positive effect on information technology adoption. Stability oriented cultures will make the information technology adoption decision more difficult. Moreover, with the move towards end-user computing, end-users have greater role in information technology adoption decisions, reducing the role traditionally played by MIS personnel in these decisions.

Limitations

This study also has its limitations. Here we investigated only one stage of the information technology diffusion process, that is, adoption of information technology in organizations. We recommend that additional research into other stages of information technology diffusion is necessary to validate existing models of diffusion of information technology in organizations. We also recommend extension of this study to other developing countries as well as developed countries.

References


Hofstede, G. (1984), “The Cultural Relativity of the Quality of