The relationship between information technology acceptance and organizational agility in Malaysia

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Abstract

We examined the influence of information technology (IT) acceptance on organizational agility. The study was based on a well-established theoretical model, the Technology Acceptance Model (TAM). We attempted to identify the relationships between IT acceptance and organizational agility in order to see how the acceptance of technology contributes to a firm’s ability to be an agile competitor. Structural equation modeling techniques were used to analyze the data. Results from a survey involving 329 managers and executives in manufacturing firms in Malaysia showed that actual system or technology usage had the strongest direct effect on organizational agility. Meanwhile, perceived usefulness and perceived ease of use of IT influenced organizational agility indirectly through actual systems or technology use and attitudes towards using the technology. The results have several implications for IS management.

Keywords: IT acceptance; IT adoption; Organizational agility; Structural equation models; Malaysia

1. Introduction

Information Technology (IT) has emerged as an essential element in developing countries such as Malaysia in supporting the need for regular, real-time, and dependable information in business and industry [18,55]. As developing countries expand industrially and commercially, the volume of domestic consumption, export production, and imports have been
growing at a very high rate. This phenomenon will create and expand the demand for and use of information [38,51].

As IT is a major factor in shaping the industry characteristics within which firms compete, it is radically altering the balance of power between institutions, governments, and people by broadly disseminating useful information [21,30]. Recent advances have brought significant changes to organizations. The successful use of IT depends on the technology itself and the level of expertise of the individual using the technology. The impact of IT on user productivity and user satisfaction is said to be an indicator of the success of computer utilization [14,39]. To study the nature and extent of IT utilization, research in computer utilization and acceptance and how the technology contributes to a firm’s competitiveness in a developing country environment was undertaken. Much of the past research explored the various aspects of perceived usefulness, ease of use, and user acceptance of IT, e.g. [1–4,6,8] without examining the impact of these variables on organizational performance. Thus, this study is exploratory in nature since it represents a first attempt at investigating the relationship between IT acceptance by managers and executives in their organization and organizational agility.

1.1. Malaysian business environment

Malaysia is a member of the Association of Southeast Asia Nation (ASEAN) with a population of 25 million (estimated for 2003). After gaining her independence from Britain in 1957, the country went through rapid economic growth which transformed the economy from an agricultural exporter to a major exporter of electronic and electric machinery, petroleum and LNG, textiles, clothing and footwear, palm oil, and wood products [7,52]. After passing thorough the East Asian financial problems of 1997, the country, in 2003, enjoyed a robust growth driven by strong domestic demand and sturdy export performance. The real GDP grew by 5.2%, an increase from 4.1% in 2002. The country’s market-oriented economy (with a strong emphasis on k-economy), supportive government policies, and a large local business community ready to do business with international corporations made Malaysia a highly competitive manufacturing and export base. In 2004, the country was ranked by the Institute for Management Development as the fifth most competitive country in the world (in countries with a population of greater than 20 million), ahead of countries such as Germany, the UK, Japan, and Mainland China. This performance of its economy over the years has been attributed to the country’s political stability, the sound financial and economic policies adopted by the government, and the efficient management of natural resources, including oil and gas.

1.2. Information technology acceptance

In Malaysia, the introduction of personal computer technology in the early 1980s offered various facilities (and opportunities) to government departments in improving work efficiency and productivity [53,54,56]. This is evident from the studies conducted by the Modernization and Management Planning Unit (MAMPU) of the Prime Minister’s Department. However, despite the increasing importance of the IT industry in Malaysia, very little attention was paid to understanding the IT acceptance or its adoption. The assimilation of IT and astute management of information resources are keys to survival in the modern business world. IT is used to streamline operations and introduce innovative products to the marketplace in order to increase the profitability of firms. According to Pink [44], the adoption of IT has often been cited as a significant factor in sustaining economic growth. He said that motivations for adopting IT included increasing productivity and improving efficiency, protecting market share, assisting in innovative activities, and increasing profitability. Technology adoption depends on the way it is perceived rather than on a rational analysis of business or technological advantage [16]. This has been considered similar to the concept of perceived usefulness, as both emphasize individuals’ cognitive properties.

According to Meyer [40], acceptance is a measure of the positive influence that an object has on its recipient. There is a large body of academic research focused on examining the determinants of computer technology acceptance and use among users [25,28,41].
Rogers [46] suggested that future investigation ought to ask “What are the impacts of accepting or rejecting IT?” External variables, such as job characteristics, user characteristics, political influences, organizational factors, and the development process, are expected to influence technology acceptance behavior indirectly by affecting beliefs, attitudes, or intentions [36].

1.3. Organizational agility

A number of definitions for agility have been suggested. The definitions generally convey the idea of speed and the changing market environment. Agility is a response to the challenges posed by a business environment dominated by change and uncertainty. It involves a new way of doing business. It reflects a new mind-set on making, selling, and buying, an openness to new forms of commercial relationships, and new measures for assessing the performance of companies and people. According to Kodish et al. [35], organizational agility requires a firm to be quick in assembling its technology, employees, and management with communication infrastructure in responding to changing customer demands in a market environment of continuous and unanticipated change. Simply stated, it is a firm’s ability to generate the required information for management decision-making in a turbulent environment.

In the Malaysian environment, Eze and Mohamad found that significant advances in the technologies of computer and telecommunication have created new opportunities for business. However, despite this, the ability of businesses in Malaysia to apply and assimilate IT has not previously been investigated.

Although many researchers have identified key factors of IT acceptance, the literature shows no empirical examination of the relationships between external variables, IT acceptance, and organizational agility. According to DeLone and McLean [17], information systems impact on the organization is most difficult to define. Thus, there is also a need to explore why firms accept or reject IT. Therefore, the purpose of this paper is to examine the influence of perceived ease of use of IT and perceived usefulness of IT on IT acceptance and adoption and how the use of IT contributes to a firm’s ability to be an agile competitor.

2. The proposed research model

Fig. 1 presents the general research model. This emerged from adapting and expanding the technology acceptance model (TAM). Basically, the model posits that technology adoption influences a firm’s agility (as depicted by the bold arrow in Fig. 1).
The general research model hypothesizes that a user’s attitude towards using a given system is a major determinant of whether or not he or she actually uses it [15,20,50]. Attitude is a function of perceived usefulness and perceived ease of use. In our study, actual IT or systems use was the variable through which attitude towards using IT affected the main focus variable: organizational agility. Thus, the main premise was that actual system used by managers would allow them to obtain timely information which will allow them to respond rapidly to change. Organizational agility was assessed by the ability of the IS to provide information for decision making, to help create competitive advantage, to leverage people and information, and to organize during change and uncertainty [42].

Following Agarwal and Prasad, Al-Gahtani and King, Clegg et al. [13], Davis, Igbaria et al. [27,31], Hackman and Oldham [22], and O’Brien, some external variables were incorporated into the model; e.g., Agarwal and Prasad used: role of the technology, tenure in the workforce, level of education, prior and similar experience, and participation in training. Similarly, Clegg et al. used user involvement; Hackman and Oldham used task characteristics; Al-Gahtani and King, and Davis used systems characteristics; while Igbaria et al. used internal and external computing support, internal and external computing training and management support.

In assessing a firm’s agility, Lo [37] used seven organizational agility factors: customer enrichment, responsiveness, dynamic organization, teamwork and partnership, organize to create competitive advantages, leveraging people and information, and information content of the product. We employed all these and they were reclassified into four main factors based on Goldman et al.’s framework of organizational agility assessment: customer enrichment, organizing to create competitive advantages, leveraging people and information, and mastering change and uncertainty (responsiveness). The classification was based on the relation of Lo’s to Goldman et al.’s factors. Lo’s “responsiveness” and “dynamic organization” were related to “mastering change and uncertainty”; “teamwork and partnership” was related to “organize to create competitive advantages”; and “information content of product” was related to “leveraging people and information”.

The hypothesized linkages are shown in Fig. 2. It should be noted that past studies focused on the left hand side of the dotted line.

2.1. Research hypotheses

Three research hypotheses were enunciated as follows:

**Hypothesis 1.** External variables (user involvement, task characteristics, system characteristics, user experience, top management support, and demographic characteristics) will have a significant effect on IT adoption.

**Hypothesis 2.** There is a positive relationship between IT adoption (perceived ease of use, perceived usefulness, attitude towards using, and actual systems used) and organizational agility.

**Hypothesis 3.** There is a positive relationship between information quality and organizational agility.

3. Research methodology

3.1. Sample and procedure

The list of manufacturing firms published in [19] was used to obtain the sampling frame for this study. Firms in this list are grouped under the various manufacturing sub-sectors. They are classified as resource-based (including the food, rubber, basic and fabricated metal, non-metallic minerals, wood and paper manufacturing sub-sectors) and or non-resource-based (with firms in the electrical, electronic, textile, chemical, machinery, transport equipment and plastic manufacturing sub-sectors).

The study population included approximately 2000 manufacturing firms. The unit of analysis was those firms located in the Klang Valley of Malaysia, because most of the big and small manufacturing firms were located there. The population responders to the study were managers and executives working in the manufacturing firms in the valley. We made the assumption that they are the people who were aware of the overall business and corporate strategies of their firm. The questionnaires were mailed with a letter of explanation that the questionnaire should be com-
completed by managers and executives. A total of 600 questionnaires were distributed to various hierarchical levels in different departments of each of the firms. Altogether, 343 questionnaires were returned; this represents a response rate of 5%. Of the 343, 14 were incomplete and thus discarded leaving 329 usable questionnaires.

3.2. Operational measures of study variables

Respondents were asked to include information about external variables (demographic characteristics, user involvement, task characteristics, systems characteristics, user experience, information quality, and top management support), IT acceptance, and organizational agility. The responses were based on nominal, Likert and semantic differential scales.

Demographic characteristics. Six demographic variables were used in this study: (1) age, (2) gender, (3) organizational level, (4) functional location, (5) number of years that the firm was in business and (6) size of the firm (number of employees).

User involvement. This was examined by using five items to measure the respondents’ commitment to
their computer systems. This measure was adapted from Clegg and his colleagues with some modifications to capture issues salient to use of the computer systems in the organization.

Job characteristics. Job Diagnostic Survey items, adapted from Hackman and Oldham, were used to measure the perceptions of respondents.

Systems characteristics. A single item instrument adapted from Al-Gahtani and King was used to measure the respondents’ perceptions of the overall characteristics of the computer systems.

User experience. This was assessed by six items asking (1) years working in their firm, (2) general experience in using computers, (3) writing computer programs, (4) using electronic mail systems, (5) skill level with electronic mail, and (6) typical use of the IS.

Top management support. This referred to the perceived level of support for using IT by top managers in the firm. The measure of organizational support developed by Igbaria et al., which included top management encouragement, allocation of resources, and MIS staff support was used in our study.

Information quality. The instrument involved a measure of information quality for three dimensions: time (timeliness, currency, frequency, and time period), content (accuracy, relevance, completeness, conciseness, scope, and performance) and form (clarity, detail, order, presentation, and media).

Perceived usefulness. The items used to construct this were adapted from prior research with modifications to make them relevant to computer systems. The five items were: giving control over work, enabling quick tasks accomplishment, making work easier, overall usefulness, and supporting critical aspects of work.

Perceived ease of use. This was measured by the six items scale developed by Davis with two items added to the scale later by Moore and Benbasat. It is a unidimensional multi-item variable.

Attitude towards using. Attitude towards using computer systems or IT was measured using five standard five-point semantic differential rating scales suggested by Ajzen and Fishbein for measuring attitudes and behaviors toward using IT. Individuals rated the five items on how they feel about using their computer systems.

Actual systems use. Based on other studies [29,45,48], actual systems use was measured by determining: actual daily use (time spent using computer systems), frequency of computer use, and number of business tasks for which the computer systems were used (i.e. the extent to which respondents use a computer in their work).

Agility. The questionnaire on agility was developed based on a self-assessment approach to measure organizational agility as suggested by Goldman et al. Goldman and his colleagues list 87 general questions that could influence the ability of a firm to be an agile competitor. These questions measured the contribution of IT towards the four principal dimensions of organizational agility: enriching customers, cooperating to enhance competitiveness, mastering change and uncertainty, and leveraging people and information. For this study, 78 questions were developed. These were re-phrased from the 87 questions suggested by Goldman et al. with 9 questions dropped due to their ambiguity from firms’ perceptions based on a pilot study carried out in order to assess the usefulness of measuring organizational agility in the Malaysian setting.

3.3. Data analyses

Structural equation modeling (SEM) analysis using AMOS software was performed to test the research model. Often loosely termed causal modeling, SEM was applied to test multivariate models with empirical data [43]. It is a statistical modeling technique widely used in the behavioral sciences [26]. SEM using LISREL, EQS, PLS, AMOS and other second generation data analysis software is often applied in MIS [12]. Such software is important because it provides powerful techniques to address key IS research problems. Chin and Todd believe that SEM techniques are useful and applicable to a wide class of problems. SEM goes beyond traditional statistical approaches, because it can confirm relationships and even help in gaining insights into the causal nature and strength of the relationships [10,11].

We used a two-stage approach [5]: first separately testing measurement models for each latent variable and then testing the whole structure. The measurement model involved reliability and construct validity. We thus determined the extent to which the operationalization of a construct actually measured what it purported to measure. This method specified the relationships between unobserved (latent) variables
and observed (manifest) variables. The reliability or internal consistency was assessed by computing Cronbach’s $\alpha$. The $\alpha$ values obtained ranged from 0.45 to 0.93 indicating that the scales for the constructs were reliable [34,49].

4. Results

All respondents held managerial or executives positions, with the majority in lower level positions. Most were males and most were aged between 25 and 39 years. Therefore, it is not surprising that all had experienced in the general use of computers, using e-mails (99%), and even to the extent of having experience in writing computer programs (72%). Therefore, it is safe to assume that their perceptions towards IT and organizational performance were based on experience.

4.1. The measurement model

Testing the structural model would be meaningless until it has been established as a good measurement model. From our initial analysis, of the 11 independent constructs in the hypothesized model, user experience and demographic characteristics did not have any significant correlation with any of the four measures of organizational agility. A confirmatory factor analysis (CFA) for the balance was carried out to examine their psychometric properties. Measurement models for these nine constructs (latent variables) were quite acceptable; all values of TLI and CFI satisfied the cutoff value of 0.80–0.90 [9,23,24,32]; values of GFI exceeded the cutoff value of 0.90 and the values of RMSEA ranging from 0.04 to 0.31. In summary, the results demonstrated satisfactory convergent and discriminant validity of the measures.

4.2. Test of the structural model

The hypothesized or proposed model was next tested. The GFI indices for the hypothesized model reflected an acceptable model ($\chi^2$/d.f. = 1.69, $P \leq 0.001$, TLI = 0.93, CFI = 0.93; RMSEA = 0.05). To investigate the validity of the hypothesized or proposed model, alternative or competing models (first, second, and third competing models) were considered and analyzed and then compared with the hypothesized or proposed model. Table 1 displays the measures of fit for the competing models, suggesting that the third competing model was significantly better in acceptable fits of RMSEA and CFI. The AGFI, NFI, TLI, and GFI were also in the acceptable level, indicating further support for the third model over the others. Table 2 and Fig. 3 present the results to support the hypothesis testing.

Table 2 presents the path coefficients and $t$-values for the third, final model. The results indicate that information quality (INFOQ), actual systems use (USAGE), attitude towards using (ATTITUDE), and top management support (SUPPORT) were the significant factors affecting organizational agility (AGILITY) at both 0.01 and 0.05 levels. It is important to note that its coefficient of the determination ($R^2$) is 0.64. In other words, INFOQ, USAGE, ATTITUDE and SUPPORT explained 64% of the variance in AGILITY. Consistent with the study expectations, information quality and actual systems use (indicator of IT acceptance) were all positively related to organizational agility. The data showed that actual systems use had the
strongest direct effect on organizational agility ($\beta = 0.44$, $P < 0.01$). Further, information quality had a very strong positive effect on organizational agility ($\gamma = 0.39$, $P < 0.01$). The contribution of attitude towards using the systems or IT to organizational agility ($\gamma = -0.11$, $P < 0.05$) was substantially lower. It should also be noted that attitude towards using IT also had an indirect effect on organizational agility through actual systems use. The data also showed that the external variable, top management support, had a small direct effect on organizational agility ($\gamma = 0.09$, $P < 0.05$). The final model also demonstrated that actual systems use (USAGE) mediated the relationship between perceived usefulness of IT (USEFUL) and organizational agility, and perceived ease of use (EASE) influenced organizational agility (AGILITY) through attitude towards using IT (ATTITUDE). Thus the three hypotheses were accepted.

5. Discussion

The study examined the relationship between IT acceptance and organizational agility in manufacturing firms in Malaysia. Results indicated that a positive relationship existed between IT acceptance (usage) and the firms’ ability to be an agile competitor. The analysis provided strong support for the model. In particular, the results demonstrated that, of the six external variables (user involvement, job characteristics, system characteristics, user experience, top management support, and demographic characteristics), only two had significant direct effects (job and systems characteristics) on it. The study also found that many manufacturing firms in Malaysia had invested in IT, and had accelerated their investments in various computer applications.
Our findings are consistent with those of researchers such as Davis et al., Subramaniam [47], and Keil et al. [33]. Thus, perceived usefulness should be an important concern for managers and executives when implementing IT in their firm.

The results also demonstrate that information quality, top management support, attitude towards using IT, and actual systems or IT usage have significant and direct effects on the agility of the manufacturing firms in Malaysia. Information quality depends on how the information is perceived and used by users and customers. The continuing turbulence in the manufacturing industry makes organizational success more complicated and difficult to achieve. Central to success is having accurate and timely information. Therefore, the acceptance (and effective use) of IT has become a key component of organizational agility and success.

From the perspective of theory development, this study has posited and has found empirical support for a theory of how external variables and the acceptance of IT drive organizational agility through their influence on beliefs about IT.

6. Implications and conclusion

The key to increasing organizational agility is in improving the attitudes of managers and executives toward IT and to cultivate positive subjective norms for IT usage. Top management support is essential. Once the managers are committed to using IT, they will be able to generate timely information to help them make better decisions in a turbulent environment. In line with the increase in competitiveness of manufacturing firms throughout the world, manufacturing firms in Malaysia must be more competitive and agile. IT can contribute to their agility if it is well-perceived and utilized by employees. However, since this study is exploratory in nature, the validity of the finding applies to only Malaysian organizations or to organizations with environments that are similar.

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References


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