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Factors Influencing the Information Technology Adoption of Micro, Small and Medium Enterprises (MSME) : An Empirical Study

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ABSTRACT

Micro, Small and Medium Enterprises (MSMEs) forms an important part of Indian economy, contributing through industrial output, exports, employment, investments, innovations etc. There are approximately 30 million MSME Units in India . MSME's Contribution towards GDP in 2011 was 17% which is expected to increase to 22% by 2012. Due to the increased globalization of the Indian economy, MSMEs are facing new challenges while many MSMEs are struggling hard to survive. MSMEs faces vast number of problems and few of them are limited knowledge, non-availability of suitable technology, ineffective marketing strategy, inability to identify new markets, constraints on modernization & expansions, absence of highly skilled labour, these lacking can be effectively work-out through technology improvement and skill development, by provision of Information Technology (IT) infrastructure. The current investigation is an attempt to establish the relationship between MSMEs competitiveness and Information Technology Comprehensiveness. This study examines the Information Technology Adoption of Micro, Small and Medium Enterprises (MSME) in North India. The data were collected through personal inquiry and semi structured questionnaire, thereafter responses of 36 successful MSMEs were analyzed. The empirical results suggest that Information Technology Adoption is primarily influenced by information exchange with customers, intense competition , Government Incentive Schemes and as well as Enterprises sector, size and age.

KEYWORDS : information technology, , small and medium enterprises

INTRODUCTION

Information technology initiatives that are not aligned with business strategies often end in failure. IT initiatives that do not capture business requirements may not achieve the estimated benefits and may face unexpected problems. Managers must understand and evaluate IT's potential impact to obtain numerous benefits . Thus by aligning IT with their business environments, they can avoid failure. IT infrastructure provides opportunities to increase revenue, reduce costs, and improve customer responses through e-businesses. IT infrastructure can develop new products and services that have a high degree of knowledge component therein with addition of skill enhancement may lead to significant improvement in productivity and competitiveness.

Basic IT infrastructure such as Internet, websites, free to use application software (Open Office) can make them more competitive. Internet provided numerous and inexpensive opportunities for MSMEs to compete with large companies. Internet provision enables them to communicate with their customers and suppliers both at national & international level. They can perform timely update or renew their brochures for products and services via websites and communicating through e-mails. Numerous MSMEs have adopted IT infrastructure to conducting business.

Its very obvious that not all IT infrastructure are identical. Some enterprises have sophisticated infrastructure while others have simple ones.. Some have integrated various business functions, such as promoting products , online ordering, online payment, and customer information, whereas some uses basic standalone applications. Some empirical results indicate that intensity of competition and enterprise size are the significant influences on Internet based information technology adoption while others did not . There is not consistent conclusions on the influencing factors of IT adoption. This arena requires many more empirical studies to clarify the real phenomenon.

Consequently, this study examines the profiles of MSMEs' Information Technology Adoption and discusses the influence considering three internal factors (enterprises sector, size and age) and three external factors (information requirements, competition intensity & Government incentive schemes). From the case of North Indian MSMEs, we can provide some opinions and suggestions for managers.

Researchers noted that the most sophisticated IT infrastructure interacted with customers, partners and employees. Various previous studies have focused on the influential factors of Internet marketing and electronic commerce . However, few studies have focused on factors influencing MSMEs' Information Technology Adoption. MSMEs have limited abilities to control their external factors . They generally adjust themselves elastically to turbulent environments. This study proposes that the external factors, information requirements, competition structures and Government incentives scheme would influence MSMEs' Information Technology Adoption. These influencing factors are briefly reviewed below, considering internal & external factors and the hypotheses of this study are then proposed.

EXTERNAL FACTORS :

Information Requirement

Basically Information Requirements is concerned with requirements derive from promoting products and services to customers and communicating with business partners. Many researchers stated that the greatest impact

of the Internet was in facilitating "informational access." The Internet can immediately and simultaneously provide information to employees, customers, and suppliers. To summarize, information exchange requirements (with customers & suppliers) impel enterprises to provide IT based services , setting up in-house Automated Query center to provide answers to queries and requirements of the customers, developing dynamic web sites to provide product and service information, updating product brouchers, information regarding design changes, feedback from customers etc.

Competition Intensity

The intentions of competitors to adopt new technology and the intensity of industry competition will influence the attitudes of managers towards accepting the new technology . In a highly competitive market, competitors or business partners may place pressure on firms to adopt new technologies. In order to compete more effectively, MSMEs' managers seek advanced information exchange methods for acquiring and sustaining competitive advantage. Thus it can be concluded that Information Technology Adoption allows MSMEs to improve their competitiveness.

Government Incentives Schemes

Pressure for adopting the Information Technology may come from Government , business partners and associates. During the earlier days of IT , it was recognized that MSMEs rarely realize the requirements to adopt advanced IT technology, therefore, some of their needs to use the innovated IT technology are not effectively translated into demand. A decade after , it was found that user awareness of adopting advanced IT could be enhanced by government support such as provision for incentives and rebates in taxes along with aggressive support from business partners and associates.

INTERNAL FACTORS:

Enterprise Sector, Size and Age

Researches have demonstrated that a positive relationship exists between IT adoption and firm size. Some researchers have demonstrated that firm size positively influences firm commitment to IT infrastructure & E-commerce. Furthermore, other researchers identified significant links between business size and level of IT adoption. Few asserted that size represents ability to assume risk, with bigger size facilitating the adoption and diffusion of new technology. Finally specific sector or cluster in which enterprise is operating is also under some influential factor and it was found that negative relationship exists between enterprise sector and Information Technology Adoption. Besides, the age of an enterprise may lead to conservative ideas and thinking owing to the existence of mature and accepted work types in the longer established organizations .

Based on the above inferences study proposes the following six hypothesis:

H-1 A positive relationship exists between information requirements and IT Adoption.

H-2 A positive relationship exists between intense competition and I T Adoption.

H-3 A positive relationship exists between Government incentives scheme and I T Adoption.

H-4 A positive relationship exists between enterprise size and Information Technology Adoption.

H-5 A negative relationship exists between enterprise age and Information Technology Adoption.

Also from above inferences the conceptual model is developed ,shown in Table 1 below :

Enterprise Sector	**Information Technology Adoption**	**Information Requirement**
Enterprise Size		**Competition Intensity**
Enterprise Age		**Government Incentives Schemes**

METHODOLOGY

Sample

Since IT infrastructure may require a considerable part of the budget of MSMEs, it is reasonable to expect that MSMEs that do not perform well may decide not to put too many resources into their IT development. To avoid the effect financial resources of MSMEs might have on Information Technology Adoption, this study focuses on the MSMEs which do have the financial ability to cover the cost of a IT infrastructure. This study selects outstanding North Indian MSMEs companies with after-tax surpluses and continuing sale revenue growth for the past three years as samples. We attempt to explore the determinants of Information Technology Adoption for the MSMEs outstanding in financial performance.

Data Collection

This study collects data from two sources: personal inquiry and a mail questionnaire survey. Firm sector, age and size were obtained from personal inquiry. The Information Technology Adoption, information requirements, intensity of competition, and incentives and supports, are obtained from the self-report questionnaire. We examined Commerce associations and various Internet sources to identify the names of MSMEs firms outstanding in financial performance. 84 outstanding MSMEs were identified. However, there were 14 firms did not participate in the questionnaire survey. The major reason given for failure to participate in the survey was "lack of time." Questionnaires were mailed to the 70 MSMEs which participated voluntarily in the survey. Of these 36 completed and returned the questionnaire, representing a response rate of 51.4 %.

Measures for -Information Technology Adoption.

This study used a fourteen-item dichotomous scale to measure the Adoption of a firm's website. The total scores of the 10 dichotomous items assess a firm's adoption on the IT infrastructure . The higher the score, the more the firm is likely to adopt Information Technology. This study measured information requirement using a two-item scale, including: "We use IT to

(1) to promote products/services and sell services to customers
(2) to communicate with business partners, and

The items used in the research instrument are based on a seven-point Likert scale, with scores ranging from one (strongly disagree) to seven (strongly agree).

Measures for -Intensity of competition.

To assess the extent of the intensity of competition, SME managers were asked to quantify their agreement with the statement of "the intensity of competition is great". This

item is also measured on the seven-point Likert scale, with scores ranging from one (strongly disagree) to seven (strongly agree). Support and incentive. SME managers were asked two questions. The first question is "are there any government supports for MSME e-business activities?" A four-item dichotomous (Yes / No) scale was used to measure government support. They are:

(1) Has the company ever participated in e-business workshops or seminars organized by government?
(2) Has the company ever participated in training courses offered by government?
(3) Has company ever gathered information regarding the IT development provided by government?
(4) Has the company accepted consultation, guidance and assistance provided by government?

The total score on the scale assessed a firm's level of supported from government. To obtain the scores of "Support and incentive", this study calculated the total number of government support services (min.=O and max. (4), and then multiplied this total by 7/4 for the sake of consistency with the maximum value of the seven-point Likert scale. By summing the weighted government support service scores and the score of the seven-point Likert scale, this study derived the score of the "government incentive scheme "

Variable - Enterprise sector, Size and Age.

Enterprise sector size and age were measured as the natural logarithm of the total number of full-time employees in the enterprise and the years the enterprise has operated and cluster in which enterprise is operating. For Enterprise sector differentiation 10 Leather product industries sector and Casting sector are compared for analysis.

DATA VALIDITY AND RELIABILITY

Validity.

In order to base measurement in well-grounded theory, we examined the literature of the past ten years on related themes (IT influential factors, MSME, etc.). Two academics with expertise in E-business were asked to assess the face and content validity of the survey items. The resulting measurement instrument was then pretested by three MSME managers. The interviews yielded useful suggestions to strengthen the face arid content validity of the instrument.

Reliability.

To analyze test-retest reliability, questionnaires were mailed again to 64 subjects. The retesting was done ten weeks after the first questionnaires were received from respondents. 30 usable responses were received. As Table 2 pointed out, the Spear-man correlation coefficients for these repetitions for the seven sub-scales ranged from 0.883 to 0.966 ($p<0.05$ for all), and indicated the measures had adequate test-retest reliability.

Variables	***Test-Retest Reliability***
Information Technology Adoption	***0.940***
Information requirements	
(1) with customers	***0.966***
(2) partners	***0.950***
Intensity of competition	***0.96***
Incentive Schemes from Government	***0.906***

Table 2: Test-Retest Reliability of Variables

STATISTICAL ANALYSIS AND RESULTS

Activities for Information Technology Adoption	**Frequency (36)**	**Percentage**
(1) Provision for product and service information . (website, email, Forum)	**25**	**69.44**
(2) Provision for product and service information . (Automated answering machine, In-House Query Operator)	**22**	**61.11**
(3) Provision for customers to order on line , through e-mail. (Static web site)	**12**	**33.33**
(4) Provision for customers to order on line & also allows customers to track their orders on line.(Dynamic web site)	**6**	**16.67**
(5) Provision for customers to make payments on line. (Paypal, Online Banking)	**6**	**16.67**
(6) Provision for e-Marketing.	**11**	**30.55**
(7) Provision for managers to make decisions using information systems or decision support systems.	**2**	**5.55**
(8) Provision for Employees to access Professional/Business Organization or Knowledge Warehouses.	**2**	**5.55**
(9) Provision for supply chain information sharing with suppliers /vendors (forecast, order, inventory)	**12**	**33.33**
(10) Partial / Total Absence of Information Technology infrastructure.	**11**	**30.55**

Table 3 lists the results of the Information Technology Adoption scale.

It demonstrates that most SME participants (69.44%) stated that their websites provide product and service information to customers. The second most popular applications Provision comes out to be product and service information through Automated answering machine, In-House Query Operator (61.11%). Few participants reported that their websites provide online payment service (16.6%) and supply chain integration (33.33%). Numerous MSMEs have created "brochure" websites that introduce their firms and provide customers with information. However, few MSMEs have integrated their websites with back-office systems.

Table 3 also shows that on average B2C and B2E activities are more popular than B2B activities in MSMEs websites. This means that most MSME IT are adopted for servicing customers and employees. B2B transactions are not so popular on MSMEs websites.

Variable	Mean	S.D	1	2	3	4	5	6
1. Information Adoption Score	7.45	3.34	1					
2. Firm size	4.85	0.6	0.21	1				
3. Firm age	2.68	0.5	-0.4*	0.1	1			
4. Communication requirement	3.27	1.3	0.50*	-0.01	-0.09	1		
6. Government Support	3.51	1.4	0.31*	0.01	0.05	0.47*	1	
6. Intensity of competition	5.36	1.5	0.29*	0.05	0.05	0.18	0.1	1

***p<0.05**

Table 4. Descriptive Statistics and Pearson Correlations

Model Testing

To understand the relationship between the Information Technology Adoption score and each influential factor, this study first calculates the correlation coefficients between the Information Technology Adoption scores and the influential factors. Table 4 lists the Pearson correlation coefficients. A significant negative relationship was found between firm age and Information Technology Adoption. Additionally, all external factors this study proposed, i.e. information requirement, intensity of competition, and support and incentives, were significantly and positively related with Information Technology Adoption.

Following the correlation analysis, this study employed regression analysis to test the hypotheses proposed in this study. Because a significant positive relation (n=0.47; p<0.01) exists between independent variables of "information requirement" and "support and incentives," a multi-collinearity phenomenon exists if both the two independent variables were arranged in one regression equation. Consequently, "information requirement" and "support and incentives" are not contained in the same model. This study applied the four regression models shown in Tables 5 for exploring the impact of influential factors on the Adoption of website activities.

Table 5. Results of the Regression Analysis

	Model 1	Model 2	Model 3	Model 4
Constant	1.540	-0.720	3.064	2.936
Firm size	1.303***	0.826***	1.311***	1.430***
Firm age	.2.421***	-1.299**	-2.749*	-2.847**
Communication requirements with customers	1.080***	1.443***		
Communication requirements with partners		0.126		
Support and incentives from government			0.679***	
Intensity of competition	0.476**	0.363**	0.562**	0.541**
R2	0.458	0.790	0.365	0.401
F-Value	12.389***	34.794***	8.765***	8.216***

***p<0.1 **p<0.05 ***p<0.01**

Testing of Hypothesis HI (information Requirement)

Hypothesis H-1 was stated as "A positive relationship exists between information requirements and Information Technology Adoption". The regression coefficient (re) was positive and significant (rc=1.08, p<0.01) as shown in Table 5. Therefore, we can conclude that there is a statistically significant relationship between the dependent variable "Information Technology Adoption" and the independent variable "information requirement". That is, firms with information requirements are more likely to have Information Technology. Additionally, the independent variable of "information requirement" was comprised of three items, information with customers, partners (suppliers). This study placed three items of the information requirement into the regression to identify the influence of these three items on Information Technology Adoption. The regression model 2, listed in Table 5, revealed that only the information requirement with customers exhibits a positive relationship with Information Technology Adoption (rc=1.44, p<0.01). The information requirements with partners (suppliers) did not exhibit any statistically significant relationship with Information Technology Adoption.

Testing of Hypothesis H2 (Intensity of competition)

All of the regression coefficients of the four regression models are positive and significant (p<0.05) for Hypothesis H2, "A positive relationship exists between competitive intensity and Information Technology Adoption," as shown in Table 5. Therefore, we can conclude that there is a statistically significant relationship between the dependent variable "Information Technology Adoption" and the independent variable "intensity of competition". That is, in a higher competitive environment, firms were more likely to develop comprehensive websites.

Testing of Hypothesis H3 (Support and Incentives)

The regression coefficient is positive and significant (rc=0.68, p<0.01) for Hypothesis H3, "A positive relationship exists between 'support and incentives' and Information Technology Adoption," as shown in Table 5.

Therefore, we can conclude that there is a statistically significant relationship between the dependent variable "Information Technology Adoption" and the independent variable "support and incentives". That is, firms with "government incentives schemes " are more likely to conduct Information Technology Adoption. The 4th regression model, illustrated in Table 5, reveal that government support and incentives were significantly and positively related to Information Technology Adoption (rc=1.07, p<0.01), while support and incentives from business partners were not.

Testing of Hypothesis H4 (Firm Size)

All of the regression coefficients of the four regression model are positive and significant (p<0.05) for Hypothesis H4, "A positive relationship exists between enterprise size and Information Technology Adoption," as shown in Table 5. Therefore, we can conclude that there is a statistically significant relationship between the dependent variable "Information Technology Adoption" and the independent variable "firm size". That is, the larger sized firms are more likely to have comprehensive websites than the smaller ones.

Testing of Hypothesis H5
(Firm Age)

All of the regression coefficients of the four regression models are negative and significant (p<0.01) for Hypothesis H5, "A negative relationship exists between enterprise age and Information Technology Adoption," as shown in Table 5. Therefore, we can conclude that there is a statistically significant relationship between the dependent variable "Information Technology Adoption" and the independent variable "firm age". That is, the longer established firms are more likely to have comprehensive websites than younger ones.

Testing of Hypothesis H6
(Firm Sector)

Again all of the regression coefficients of the four regression models are negative and significant (p<0.01) for Hypothesis H-6, "A negative relationship exists between enterprise sector and Information Technology Adoption," as shown in Table 5. Therefore, we can conclude that there is a statistically significant relationship between the dependent variable "Information Technology Adoption" and the independent variable "firm age". That is, the longer established firms are more likely to have comprehensive websites than younger ones.

Table 6 is the summary of hypotheses testing.

Hypotheses	**Empirical study results : Support or Not Supported**
H-1. A positive relationship exists between information requirement and Information Technology Adoption.	**Partial support.** Information requirement to customers is significantly positive related to Information Technology Adoption.
H-2. A positive relationship exists between competitive intensity and IT Adoption.	**Supports**
H-3. A positive relationship exists between "support and incentives" and IT adoption.	**Partial support.** Supports and incentives from government is significantly positive related to IT adoption.
H-4. A positive relationship exists between enterprise size and Information Technology Adoption.	**Supports**
H-5. A negative relationship exists between enterprise age and IT Adoption.	**Supports**
H-6. A negative relationship exists between enterprise sector and IT Adoption.	**Supports**

DISCUSSION

This study used a sample of MSMEs with outstanding performance of North Indian MSMEs to investigate the factors influencing the Adoption of their Information Technology Adoption . According to empirical surveys, information requirement, intensity of competition, and support and incentives, size and age influence the Information Technology Adoption . This study proves that there is a relationship between environmental factors and the adoption of ICT. Information Technology Adoption increases with increasing information requirements. Highly competitive environments drive enterprises to adopt the IT to acquire first mover advantages, or to avoid being driven out of markets. MSMEs in highly competitive industries have no choice but to follow their competitors in adopting information technology. Government Support and incentives from the external environment also lead enterprises to pursue Information Technology Adoption. It should come as no surprise to learn that the government is the greatest champion of the business use of the Internet. Since the 1990s, to improve national competitiveness, countries like Singapore, Korea, Japan, Germany, and Canada have endeavored to develop their digital economies. Government of India can opt for development of e-MSMEs project.

The e-MSMEs project encompasses several sub-projects: Knowledge Management Plan, e-Learning Project, e-Business Operation Plan, Broadband to MSMEs, and e-Market. All of these projects are important in helping MSMEs develop their IT strategy. The effectiveness of partnerships between government and MSMEs is empirically demonstrated in this study. Among the 9 elements of Information Technology Adoption proposed in this study, providing product or service information is the most popular activity

performed by MSMEs.

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