FACTORS INFLUENCING THE INFORMATION TECHNOLOGY ADOPTION IN MICRO, SMALL AND MEDIUM ENTERPRISES (MSMEs): 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. MSME’s contribution towards GDP in 2011 was 17% that was anticipated to increase upto 22% by 2012. However, because of increased globalization, 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 workforce. Although these shortfalls can be worked-out through Information Technology (IT) infrastructure and skill development training. The current investigation is an attempt to establish the relationship between MSMEs competitiveness and information technology (IT) comprehensiveness. This study examines IT adoption in MSMEs of North India. The data were collected through personal inquiry and semi-structured questionnaires, thereafter, responses of 36 MSMEs were analyzed. The empirical results suggest that IT adoption is primarily influenced by information exchange with customers, intense competition, government incentive schemes and as well as enterprise sector, size and age.

Keywords: Information Technology, IT adoption, MSME.

1. Introduction

Information technology initiatives that are not aligned with business strategies often end in failure. IT initiatives if do not capture business requirements may not achieve the estimated benefits and would face unexpected problems. Managers must understand and evaluate information technologies potential to obtain numerous benefits. Thus by aligning IT with their business environments, they can perhaps avoid failure (Chappell and Feindt, 2010). IT infrastructure provides opportunities to increase revenue, reduce costs, and improve customer responses through e-businesses. IT infrastructure develops new products and services having high degree of knowledge component with addition of skill enhancement for significant improvement in productivity and competitiveness (Gatignon and Robertson, 1999). Basic IT infrastructure such as Internet, websites, free to use application software (open office) make MSMEs more competitive. In present era, internet provides numerous and inexpensive opportunities to compete with large corporate (Mathiyalakan, 2010). Internet enables them to communicate with customers...
and suppliers both at national & international level. MSMEs can perform timely update or renew their brochures for products and services via websites and communicate through e-mails. Numerous MSMEs have adopted IT infrastructure in their business process.

However, it is very obvious that not all IT infrastructures are identical in nature. Some MSMEs have sophisticated infrastructure while others have simpler versions. Few have integrated various business functions, like promoting products, online ordering, online payment, and customer information, whereas others use basic standalone applications (Fallon and Moran, 2009). Although empirical results indicate that intensity of competition and enterprise size have significant influences on internet based information technology adoption, while others did not. There is absence of consistent conclusions in literature on the influencing factors of IT adoption (Hamill, 2007). Therefore, this arena requires many more empirical studies to clarify the real phenomenon. Consequently, our study examines the profiles of MSMEs towards IT adoption and discuss the influences with respect to three internal factors (enterprise sector, size and age) and three external factors (information requirements, competition intensity & government incentive schemes). Based on North Indian MSMEs, we attempt to provide some opinions and suggestions for managers.

Researchers have already noted that most sophisticated IT infrastructure normally interacted with customers, partners and employees. Several previous studies have focused on the influential factors of internet marketing and electronic commerce. However, few studies focused on factors influencing MSMEs towards IT Adoption. In this regard, MSMEs have limited abilities to control their external factors (Kowtha and Choon, 2001). They generally adjust themselves elastically to turbulent environments. Our study proposes that the external factors (information requirements, competition structures and Government incentives schemes) perhaps influence MSMEs towards IT adoption. These influencing factors are briefly reviewed below, thereafter hypotheses of this study are proposed.

2. External factors

2.1 Information Requirement

Basically information requirements are concerned with requirements derived from promoting products and services to customers and communicating with business partners. Many researchers concluded that the greatest impact of the internet is facilitating "informational access." The internet can immediately and simultaneously provide information to employees, customers, and suppliers (Coccia, 2009). To summarize, information exchange requirements (with customers & suppliers) often impel enterprises to provide IT based services, by setting in-house automated query center (call center) that provides answers to queries and requirements of the customers (Levy and Powell, 2008). Further, dynamic web-site provides product and service information, enables them to update product information, if any, or design changes and also vital feedback from customers, etc.

2.2 Competition Intensity

The intentions of competitors to adopt new technology and intensity of industry competition also influence attitude of managers towards accepting/adopting new IT technology. In a highly competitive market, competitors or business partners place pressure on to adopt new technologies (Ching and Ellis, 2009). For prolonged sustainability, MSMEs seek advanced information exchange methods for acquiring competitive advantage. Thus it can be concluded that IT adoption allows MSMEs to improve their competitiveness.

2.3 Government Incentives Schemes

To create new employment opportunities, pressure for adopting the IT probably comes from Government, business partners and associates. During the earlier days of IT, it was recognized that MSMEs rarely realized the
requirements to adopt advanced IT technology, therefore, some of their needs to use the innovated IT technology are not effectively translated into demand (Gatignon and Robertson, 1999). A decade later, it is found that awareness of adopting advanced IT might have been enhanced by government support such as incentives provisions and rebates in taxes along with aggressive support from business partners and associates.

3. Internal Factors

3.1 Enterprise Sector, Size and Age

Researchers have already demonstrated that positive relationship exists between IT adoption and firm size. Some researchers have demonstrated that firm size positively influences firm’s commitment to IT infrastructure and e-commerce. Furthermore, other researchers identified significant links between business size and level of IT adoption (Mehrtens et. al., 2009). Few asserted that size represents ability to assume risk, with bigger size facilitating the adoption and diffusion of new technology more conveniently. 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 IT adoption (Coleman, 2008). Besides this, the age of an enterprise may lead to conservative ideas and thinking owing to the existence of mature and accepted process in the longer established organizations, which lead to resistance towards IT adoption.

3.2 Based on the above inferences study proposes the following six hypotheses:

H-1 A positive relationship exists between information requirements and IT adoption.
H-2 A positive relationship exists between intense competition and IT adoption.
H-3 A positive relationship exists between Government incentives scheme and IT adoption.
H-4 A positive relationship exists between enterprise size and IT adoption.
H-5 A negative relationship exists between enterprise age and IT adoption.
H-6 A negative relationship exists between enterprise sector and IT adoption.

Table 1: Factors influencing the IT adoption

<table>
<thead>
<tr>
<th>Enterprise Sector</th>
<th>Information Technology Adoption</th>
<th>Information Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Size</td>
<td></td>
<td>Competition Intensity</td>
</tr>
<tr>
<td>Enterprise Age</td>
<td></td>
<td>Government Incentives Schemes</td>
</tr>
</tbody>
</table>

4. Methodology

4.1 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 much resource for their IT development. This study selects outstanding North Indian MSMEs companies as samples, whose performance was outstanding for the past three years. We attempt to explore the determinants of IT adoption for these MSMEs.

4.2 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 IT adoption, information requirements, intensity of competition and government incentives schemes 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, 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 other 70 MSMEs which participated voluntarily in the survey. Of these, 36 completed and returned the questionnaire, representing a response rate of 51.4%.

4.3 Measures for – IT adoption.

This study used dichotomous scale to measure the website adoption of firms. 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. promote products/services and sell services to customers.
2. communicate with business partners.

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).

4.4 Measures for - Intensity of competition.

To assess the extent of the intensity of competition, MSME 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). MSME managers were asked if there were any government supports for MSMEs 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 the level of support from government. To obtain the scores of "Support and incentive", this study calculated the total number of government support services (min.0 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".

4.5 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 sector and Casting sector are compared for analysis.

5. Data Reliability

5.1 Reliability.

To analyze, test-retest reliability, questionnaires were mailed again to 64 firms. The retesting was done ten weeks after the first questionnaire was received from respondents. 30 usable responses were received. As Table 2 pointed out, the Spearman correlation coefficients for these repetitions on seven sub-scales ranged from 0.906 to 0.966 (p<0.05 for all), which indicates that measures had adequate test-retest reliability.
Table 2: Test-Retest Reliability of Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Test-Retest Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Technology Adoption</td>
<td>0.940</td>
</tr>
<tr>
<td>Information requirements</td>
<td></td>
</tr>
<tr>
<td>(1) with customers</td>
<td>0.966</td>
</tr>
<tr>
<td>(2) partners</td>
<td>0.950</td>
</tr>
<tr>
<td>Intensity of competition</td>
<td>0.960</td>
</tr>
<tr>
<td>Incentive Schemes from Government</td>
<td>0.906</td>
</tr>
</tbody>
</table>

Table 3: Results of statistical analysis

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

5.2 Technology Adoption scale.

Most of participants (69.44%) stated that their websites provide product and service information to customers. The second most popular applications comes out to be product and service information and automated answering machine, through 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 necessary information to customers. However, few MSMEs have integrated their websites with back-office systems. Therefore, it is concluded that on average B2C and B2E activities are more popular than B2B activities in MSMEs websites. This means that most of MSME adopts IT for servicing customers and employees, whereas B2B transactions are not so popular.

5.3 Model Testing

To understand the relationship between the IT adoption score and influential factors, this study first calculates the correlation coefficients between the IT adoption scores and the influential factors. Table 4 lists the Pearson correlation coefficients. A significant negative relationship was found between firm age and IT adoption. All external factors (information requirement, intensity of competition, and government support and incentive schemes) were significant and positively related with IT adoption.

Following the correlation analysis, this study used regression analysis to test the hypotheses proposed in study. Because a significant positive relation (n=0.47; p<0.01) exists between independent variables of "information requirement" and "government support and incentive schemes," a multi-colinearity phenomenon exists, if both the two independent variables were arranged in one regression equation. This study applied the four regression models as shown in Tables 4 in order to explore
the impact of influential factors on the adoption of website activities.

5.4 Testing of Hypothesis H1 (Information Requirement)

Hypothesis H-1 stated that positive relationship exists between information requirements and IT adoption. The regression coefficient was positive and significant (rc=1.08, p<0.01) as indicated in Table 4. Therefore, we can conclude that there is a statistically significant relationship between the dependent variable "IT adoption" and independent variable "information requirement". That is, firms which require more information are more likely to use information technology. Additionally, the independent variable of "information requirement" was comprised of three inputs: information from customers, partners and suppliers. This study placed three inputs of the information requirement into the regression to identify the influence of these three items on IT adoption. The regression model 2, listed in Table 4, revealed that only the information requirement from customers exhibits a positive relationship with IT adoption (rc=1.44, p<0.01). The information requirements with partners or suppliers did not exhibit any statistically significant relationship with IT adoption.

5.5 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 “intensity of competition” and “IT adoption”. Therefore, we can conclude that there is a statistically significant relationship between the dependent variable "IT adoption" and the independent variable "intensity of competition". That is, in a higher competitive environment, firms are more likely to develop comprehensive websites and use information technology.

5.6 Testing of Hypothesis H3 (Government Support and Incentive Schemes)

The regression coefficient is positive and significant (rc=0.68, p<0.01) for Hypothesis H3. A positive relationship exists between “government support and incentive schemes” and “IT adoption” as shown in Table 4. Therefore, we can conclude that there is a statistically significant relationship between the dependent variable "IT adoption" and the independent variable "government support and incentive schemes". That is, firms with "government support and incentives schemes" are more likely to adopt IT. The 4th regression model, illustrated in Table 4, reveals that government support and incentive schemes were significantly and positively related to IT adoption (rc=1.07, p<0.01) while support from business partners were not.

5.7 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 “firm size” and “IT adoption”. Therefore, we can conclude that there is a statistically significant relationship between the dependent variable "IT adoption" and the independent variable "firm size". That is, the larger sized firms are more likely to have comprehensive websites and use IT than the smaller ones.

5.8 Testing of Hypothesis H5 (Firm Age)

All of the regression coefficients of the four regression models are negative (p<0.01) for Hypothesis H5. A negative relationship exists between “firm’s age” and “IT adoption”. Therefore, we can conclude that there is a statistically negative relationship between the dependent variable "IT adoption" and the independent variable "firm’s age". That is, the longer established firms are less likely to have...
comprehensive websites and use of IT than younger ones.

5.9 Testing of Hypothesis H6 (Firm Sector)

Again all of the regression coefficients of the four regression models are negative (p<0.01) for Hypothesis H-6. A negative relationship exists between “firm sector” and “IT adoption” Therefore, we can conclude that there is a statistically negative relationship between the dependent variable "IT adoption" and the independent variable "firm sector”. That is, the firm’s sector have no impact on IT adoption. All the sectors can avail the benefits of IT.

Table 4: Summary of hypothesis testing.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Empirical study results: Support or Not Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1. A positive relationship exists between information requirement and IT adoption.</td>
<td>Partial support. Information requirement from customers is significantly positive related to IT adoption.</td>
</tr>
<tr>
<td>H-2. A positive relationship exists between competitive intensity and IT Adoption.</td>
<td>Supports</td>
</tr>
<tr>
<td>H-3. A positive relationship exists between &quot;support and incentives” and IT adoption.</td>
<td>Partial support. Supports and incentives from government is significantly positive related to IT adoption.</td>
</tr>
<tr>
<td>H-4. A positive relationship exists between enterprise size and IT adoption.</td>
<td>Supports</td>
</tr>
<tr>
<td>H-5. A negative relationship exists between enterprise age and IT Adoption.</td>
<td>Does not supports</td>
</tr>
<tr>
<td>H-6. A negative relationship exists between enterprise sector and IT adoption.</td>
<td>Does not supports</td>
</tr>
</tbody>
</table>

6. Discussions

This study used samples of MSMEs with outstanding performance of North Indian MSMEs to investigate the factors influencing the adoption of information technology. According to empirical surveys, information requirement, intensity of competition, and government support and incentive schemes and size, influence the IT adoption. This study proves that there is a relationship between environmental factors and the adoption of IT, which increases with increasing information requirements. Highly competitive environments drive enterprises to adopt IT to acquire advantages, or to avoid being driven out of markets. MSMEs is a highly competitive sector, thus, they have no choice besides adopting sophisticated information technology. Government support and incentive schemes from the external environment also lead enterprises to pursue IT adoption. It is no surprise that the government around the globe is widely expanding usage of internet in business process (Chappell and Feindt, 2010). Since 1990s, to improve national competitiveness, countries like Singapore, Korea, Japan, Germany, and Canada have extended support to develop digital economies. Similarly, Government of India can also opt for development of e-MSMEs projects. The e-MSMEs project encompasses several sub-projects: Knowledge Management Plan, e-Learning Project, e-Business Operation Plan, and e-Marketing. All of these projects are important to help out MSMEs to develop IT strategy. Finally, the effectiveness of partnerships between government and MSMEs is empirically demonstrated in this study. Among the 6 elements of IT adoption proposed in this study, product or service information to customers and suppliers is the most popular activity performed by MSMEs.

7. References


Biography

Puneet Mangla is working as Associate Professor and Head of Department of Mechanical Engineering at Hindustan College of Science and Technology, Farah, Mathura, India. He earned his M.Tech. from Dayalbagh Educational Institute (Deemed University), Agra and is pursuing his Ph.D from SOET, IGNOU, New Delhi (INDIA) . His research areas include Industrial Engineering, Finite Element Analysis, Artificial Neural Networks, Non Conventional Manufacturing Techniques. He has been awarded prestigious “Production Engineering Division Medal” by Institution of Engineers (India) for his research paper. He has number of papers published in journals and conferences.

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