

Adoption of B2B e-commerce by the SMEs in Bangladesh

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Abstract—Like many other countries around the world Bangladesh's SMEs play strong role in employment generation as well as ensuring country's economic development. Although SMEs have the potentials, at the rapidly increasing age of internet, to utilise the newly emerged technology dependent communication and transaction medium, e-commerce, in acquiring their competitiveness, the slow rate of adoption is evident. The paper looks at the adoption of B2B electronic commerce by the SMEs exploring diversified factors and measures the effects of those factors in explaining the adoption rate. A descriptive research study was designed with the data collected from 222 SMEs through a self administered structured questionnaire. A multiple regression model was estimated to assess the factors influencing the adoption of e-commerce and estimate their effects, where adoption intention is considered as explained variable and business experience, internet usage, number of computer literate officer and revenue of company have been added with six attributes of innovation, relative advantage, compatibility, complexity, trialability, observability, and uncertainty are considered as explanatory variables. The study reports the effects of perceived compatibility, complexity, observability and uncertainty, company internet usage and number of computer literate officer appear as significant with the overall regression explaining 34.2% of willingness to adopt e-commerce. The paper concludes with some policy implications.

Keywords: B2B; E-Commerce; SMEs

1. Introduction

The adoption of newly innovated information and communication technology and its wide usage by the individuals, groups and organisations have made changes the way of communication as well as the processes through which human being traditionally perform their exchange functions. The seemingly increasing trend of information and communication technology usage around the globe, particularly the internet, influences different individuals, groups and organisations to be connected with the recently developed and exponentially increased community. The business organisations are, one of the advantageous groups, achieving their competitiveness in utilising the interactive media to perform their promotion, communication,

customer service and exchange functions. In developing countries the manufacturing, service and trading functions are largely dominated by Small and Medium Sized Enterprises (SMEs). It is popularly stated that the multinationals in today were SMEs in yester years (Kendall et al, 2001). In Bangladesh about 90% of the manufacturing and service industries are fallen under SMEs category. SMEs account for about 45% of manufacturing value addition in Bangladesh. They account for about 80% of industrial employment, about 90% of total industrial units and about 25% of total labour force. Its total contribution to export earnings varies from 75- 80% based on the Economic Census 2001-2003 (The New Nation, 2008). According to the Bangladesh Bureau of Statistics, SME's provide about 44 percent employment of the country. It contributes Tk 14,940 crore (149.40 billion) to the GDP during the fiscal year 2006-07 (Habib, 2008).

In another statistics we find that the total number of SMEs is estimated at 79754 establishments, of which 93.6% are small and 6.4% are medium. The 2003 Private Sector Survey estimated that about 6 million micro, small, and medium enterprises defined as enterprises with fewer than 100 employees, contributed around 20-25% of GDP (The New Nation, 2008). On the above statistics it is evident that the small business enterprises are very strong in terms of the number and their contributions, thus the overall development of Bangladesh's SMEs are depending largely on the development of small scale enterprises.

However, the ongoing opportunities created through the operation and usage of different connected technologies, such as computer, internet and other information and communication technology, are the driving forces of the adoption and usage of the business and transactions through internet i.e the operation of electronic commerce. Like the developed world, among different models of e-commerce, the business to business (b2b) operation has high potentials in developing countries particularly in the Small and Medium Sized Enterprises (SMEs) sector. Easy global reach and searching the opportunities in international market, convenient and intensively connected with the customers regardless of time and place as well as getting the opportunities to serve the customers directly with initiating specialized treatments are the stimulating factors of adopting e-commerce.

Higher growth of the SMEs can help eradicate poverty to a satisfactory level by removing various prejudices against labour intensive approach and creating jobs for the skilled manpower. Thus exploring the avenues and adoption of the technology dependent transaction medium by the business enterprises particularly by the SMEs would have been done automatically and rapidly.

In reality it has not been expanded automatically rather slow trend of IT utilization and adoption is evident in the sector in both developing and developed part of the globe (Quaddus and Hofmeyer, 2007, Azam & Lubna, 2008a). In Bangladesh it is not exercised differently although the technology is existent and the Government of the Peoples Republic of Bangladesh has declared the information and communication technology as one of the thirist sectors of the country and taken diversified initiatives to motivate different enterprises to be connected and start operation of the technology. The government's incentives to boost up the technology appeared in many functions such as withdrawal of all taxes and customs duties from the computer and its peripherals, provision of easier loan to the entrepreneur in this sector and encouraging software industry, enactment of ICT policy and planning to utilise the ICTs potentials to its different sectors by utilising e-governance phase by phase and finally, although late, establishment of sub marine cable network (Azam, 2006c, Azam & Lubna, 2008b). The newly elected government of the Peoples Republic of Bangladesh has declared their mission to develop the digital Bangladesh by 2021.

On the abovementioned context it is evident that small businesses are slow to apply technology to improve their competitiveness as they are affected by their sheer small size and limited resources (Quaddus and Hofmeyer, 2007). Although the trend is analysed in developed country perspective, the situation of the developing countries in similar sectors are not observed quite different. Thus the paper looks at the adoption of B2B commerce by the SMEs and exploring the effects of diversified factors. The study also measures the effects of those factors in explaining the adoption of b2b e-commerce.

2. Theoretical Framework and Model Specification

Adoption of innovation has been obtained a countable attention in the previous researches (Rogers, 1983, Davis, 1986, Davis, 1989, Davis, 1993, Moore and Benbasat, 1991, Premkumar and Potter, 1995, Agarwal and Prashad, 1997, Agarwal and Prashad, 1998, Agarwal and Prashad, 1999, Taylor and Todd, 1995, Tan and Teo, 2000, Kendall et, al., 2001, Sathye and Diana, 2001). Many studies are still being initiated to investigate the adoption of newly innovated technologies both in individual and organisational perspective (Ramayah et. al., 2003, Ramayah, Jantan and Aafaqi, 2003, Azam, 2004, Ramayah, Ignatius and Aafaqi, 2004, Azam, 2006a, Ramaya et, al., 2006). The previous studies utilised different models to address innovation adoption particularly technology adoption, mostly derived from Rogers innovation diffusion

theory, Theory reasoned Action by Ajzen Feishbein, Theory of Planed Behaviour or Technology Acceptance Model (TAM). Although Rogers theory is the oldest theory among these four and TAM is the youngest, every theory has the utility and still are being used, some times replicated, in different adoption researches.

According to Rogers (1983), the decision process begins with the knowledge of the existence of the innovation and matures observing persuasion, decision and implementation stage. During the knowledge stage consumer is exposed to the innovation's existence and gains some understanding of how it functions, persuasion stage refers to that period when consumer forms favourable or unfavourable attitude towards the innovation. Often, early adopters who are typically innovators themselves, or in some cases change agents, attempt to convince the general user population of the benefits of the innovation. In the stage of persuasion the adopters are largely influenced by the innovation characteristics. According to Rogers (1985) the innovation characteristics account for 49% to 85% rate of adoption.

Understanding its applicability at the innovation stage, Rogers theory of innovation diffusion has been utilised to study different technology innovations. The model has been successful in examining the e-commerce adoption by the SMEs in many countries around the world (Limthongchai and Speece, 2002, Tan and Teo, 2000, Kendall et, al., 2001, Sathye and Diana, 2001). This study undertakes a part of Rogers innovation diffusion theory as theoretical framework for study of e-commerce adoption behaviour in Bangladesh and extends its scope creating the opportunity to examine the joint effects of organisational forces. It is believed that the perceived innovation characteristics and some organisational forces like company age, firms' internet usage experience, firms IT resources and revenue earnings would have significant effect on the adoption of e-commerce since it is abundantly technology dependent media of communication, transaction or business.

3. Variables and Hypotheses

3.1 Innovation Characteristics:

Using Rogers's theory of diffusion of innovation as the theoretical foundation, this study considers willingness to adopt or in other word adoption rate of e-commerce by the SMEs as exogenous variable and relative advantage, compatibility, complexity, trialability, and observability of innovation perceived by the adopter as indigenous variables. The model specified for the research include one additional variable uncertainty with the perceived innovations characteristics explained in Rogers model. Thus hypotheses are developed as follows:

Hypothesis:1 Perceived relative advantage has a direct positive effect on the adoption intention of e-commerce.

Hypothesis:2 Perceived compatibility has a direct positive effect on the adoption intention of e-commerce.

Hypothesis:3 Perceived complexity has a direct negative effect on the adoption intention of e-commerce.

Hypothesis:4 Perceived trialability has a direct positive effect on the adoption intention of e-commerce.

Hypothesis:5 Perceived observability has a direct positive effect on the adoption intention of e-commerce.

Hypothesis:6 Uncertainty has a direct negative effect on the adoption intention of e-commerce.

3.2 Organisational Factors: Several previous studies prove that organisational characteristics have the direct effect on firms' adoption of e-commerce as like as the innovation characteristics (Yoong and Huff, 2000, Wang and Cheung, 2004). The effects of organizational characteristics account for e-commerce

adoption are also evident in Bangladesh (Azam and Lubna, 2008c). Among many other forces it is predicted that the business experience of the organisation, internet usage experience of the organisation, organisations IT resources (number of computer literate officer) and the financial strength of the organisation or the revenue earnings of the organisation have the

direct effect on SMEs adoption of e-commerce. Thus four additional hypotheses are developed as follows:

Hypothesis:7 Company's business experience has direct negative effect on the adoption intention of e-commerce.

Hypothesis:8 Company's Internet usage experience has a direct positive effect on the adoption intention of e-commerce

Hypothesis:9 Number of computer literate officer of the company has a direct positive effect on the adoption intention of e-commerce.

Hypothesis:10 Company's revenue has a direct positive effect on the adoption intention of e-commerce.

4. Methodology

A descriptive research was designed to test the hypotheses with data collected from different SMEs in Bangladesh through a self administered structured survey instrument. The questions have been developed as to get responses specific to hypotheses that are proposed to test. The questionnaire was divided into three parts where Part A contains questions to understand respondents' perceptions on independent variables, Part B incorporates questions to understand dependent variable and Part C incorporates questions related to demographic variables. Several factors were brought into consideration in determining the population for this research. The population was limited to only firms which fall under the definition of Small and Medium Scaled Enterprises according to the Industrial Policy 1999 of Bangladesh. Bangladesh's firms are selected as the study is dedicated to investigate the e-commerce adoption behaviour of Bangladesh's SMEs.

Table: 1 Respondent's profile

Description	F	Percent
Number of Employees		
Upto 10	17	7.7
11-25	30	13.5
26-50	39	17.6
51-100	30	13.5
101 and above	106	47.7
No. of Computer Literate officer		
Upto 5	74	33.3
6-10	17	7.7
11-20	44	19.9
21-30	19	8.6
31-40	25	11.3
41 and above	43	19.4
Revenue of the Company		
Less 5,00,000	48	21.6
5,00,000-1000,000	30	13.5
10-15	6	2.7
"15-20 Lakh"	9	4.1
"20-30 Lakh"	12	5.4
More Than 30 Lakh	117	52.7
Profit of the Company		
profit 5% or more	142	64.0
profit less than 5%	53	23.9
break even	15	6.8
loss more than 5%	12	5.4
Nature of the Company		
Service	94	42.3
Manufacturing Industry	79	35.6

Enterprise	49	22.1
Company's Internet Experience		
upto 2 Years	36	16.5
3 Years - 4 Years	59	27.1
5 Years - 6 Years	63	28.9
7 Years - 8 Years	54	24.8
9 Years and Above	6	2.8
Mode of Internet Usage		
Dial up	91	41.0
Broad Band	153	68.9
Office Automation	56	25.2

A stratified sampling technique was used by categorising the total population into three business groups according to their types of business operation as:

Manufacturing Industry, Service Industry and Business Enterprise. Total 222 sample units were considered for the survey. The firms located only Dhaka were selected for investigation since considering its high internet penetration¹ and maximum organizations have the coordinating unit at Dhaka. The study utilizes disproportionate stratified sampling technique as the number of units under Service Industry, Manufacturing Industry and Business Enterprise are different². Sample units were selected among the SMEs listed in the publications of Bangladesh's SMEs Fair 2005, Bangladesh export directory and BGMEA members' directory. Respondent profiles are presented in table 1. The study utilised a combination of different analytical tools to accomplish the results. Principle component analysis, varimax rotation and inter-item correlation have been used to perform reduction, purification and checking the reliability of collected data. Finally a multiple regression model has been estimated to examine the relationship and effects of various factors in e-commerce adoption by the SMEs in Bangladesh.

5. Findings

Regression analysis was performed to examine the effects of the hypothesized factors on the intention or adoption rate of e-commerce by the SMEs in Bangladesh, with the data validated and purified through factor analysis and inter item co-relation.

Table 2 depicts the reliability and validity of the constructs used in the study.

Table 2 Validity and reliability

Factor	No of item	Variance explained	Croanbach alpha	Eigen value
Perceived Complexity	5	25.251	.8838	4.798
Perceived Relative Advantage	4	14.891	.6743	2.829
Perceived Compatibility	4	10.107	.6996	1.920
Perceive Trialability	2	8.228	.6080	1.563
Perceived Observability	2	6.920	.7042	1.315
Perceived Risk	2	6.035	.6273	1.147
Adoption Intention	4	66.514	.8294	2.661

19 items were generated to obtain the respondents perceptions on different six perceived characteristics identified in the specified model. The perceived characteristics were judged by using those items. However, another 4 items were generated to measure the intention to adopt electronic commerce by the SMEs in Bangladesh.

To ascertain the correlation of the items associated with the six perceived characteristics specified in the

model, the techniques, thus, facilitates distillation of the items into six factors or components that are concerned with the models attributes. These factors embodying the essence of the items, grouped by attribute, then serve as independent variable in the proposed regression model. The result shows that all questions correlate well in varimax rotation. Table:3 depicts the result of factor purification and data validation.

Table:3 Factor Matrix

Item	Component					
	Perceived Complexity	Relative Advantage	Perceived Compatibility	Perceived Trialability	Perceived Observability	Uncertainty
Item 1	.806	.081	.086	.146	.062	.201
Item 2	.903	.010	-.097	.158	-.118	.007
Item 3	.847	.110	-.052	.035	.088	.034
Item 4	.742	.206	.108	.179	.398	.065
Item 5	.662	.010	.135	-.248	.312	.065
Item 6	.010	.715	.170	.126	-.243	.184
Item 7	-.046	.617	.041	.393	.172	.138
Item 8	.286	.784	.020	-.069	.103	.103
Item 9	.423	.609	.045	-.144	.046	-.191
Item 10	-.259	.515	.539	-.014	.069	.093
Item 11	.116	.041	.795	.132	-.091	-.149
Item 12	.037	.182	.653	-.256	.298	.100
Item 13	.032	.021	.739	.209	-.020	.388
Item 14	.082	-.037	.001	.021	.891	.100
Item 15	.463	.092	.082	.050	.615	-.051
Item 16	.121	-.059	.327	.810	-.066	.019
Item 17	.131	.163	-.150	.805	.092	-.156
Item 18	-.005	.291	.258	.089	.133	.811
Item 19	.293	.013	-.072	-.285	-.013	.763

Reliability of the data has also been judged through inter-item correlation. All dimensions are observed having satisfactory reliability with reliability alpha fallen in reference level given by Nunnally, 1978 (Table: 2). The reliability alpha for all constructs were observed satisfactory and acceptable ranging from .6080 to .8883 (Nunnally, 1978, Normark and Oslerbye, 1995, Tan and Toe, 2000, Magal, Carr and Waston, 1988, and Azam 2004, Van de Van, and Ferry, 1979). In addition to the predators the reliability alpha for exogenous construct is also very satisfactory as prescribed by Nunnally, 1978.

Regression Analysis

To administer the regression analysis, with due performance of factor analysis and reliability test, two assumptions should be justified that the distribution is normal and there is no multi-collinearity among the indigenous variables. Normality has been checked through histogram while the multi-collinearity has been examined through tolerance level and VIF value. The tolerance level and VIF value justify the absence of multi-collinearity among the predictors (Kendal et. al., 2001, Kothari, 1995, Sekaran, 2000, Azam, 2004, Azam, 2006b).3

In this study VIF value appeared in between 1.189 to 1.705 and tolerance level in between .586 to .841 which prove that the predictors in the multiple regression analysis are free from multi-collinearity. Thus the regression model run should be directly administered for examining the degree and magnitude of the effects of variables.

Table 4 depicts the result of regression.

Table 4 Regression Statistics

Model		Coefficients	t	Collinearity Statistics	
				Toleranc	VIF
1	(Constant)	3.971	.461		
	Perceived relative Advantage	.175*	2.643	.730	1.370
	Perceived Complexity	-.294**	-4.256	.673	1.486
	Perceived Compatibility	.385**	-5.714	.706	1.416
	Perceived Trialability	.105	1.517	.667	1.499
	Perceived Observability	.204*	3.104	.740	1.351
	Uncertainty	-.356**	-5.448	.750	1.333
	Date of incorporation	-.068	-1.098	.841	1.189
	Internet usage	.281	4.492	.820	1.219
	Computer literate officer	.195*	3.020	.771	1.297
	Company revenue	.011	.151	.586	1.705
	R ²	34.2**			
	F value	10.658			
	Durbin-Watson	1.478			

** p< .001, * p< .001

a Dependent Variable: Adoption intention

The regression model shows a good fit with F value 10.658 and p value 000. Taking .001 significance level, the model run results indicate that 10 characteristics considered in the model account for 34.2% for Electronic Commerce adoption by the SMEs in Bangladesh.

Discussions and Conclusions

The study reports that a significant correlation exist in-between Perceived Compatibility, Perceived Complexity, Perceived Observability, Perceived Uncertainty, Internet usage experience, Number of computer literate officer of the organisation with the adoption intention of e-commerce where Perceived Observability, Perceived Compatibility, Internet experience and Number of Computer literate officer are positively correlated which means that the positive perceptions of these characteristics led to higher adoption rate. On the other hand, Perceived Complexity and Uncertainty are negatively correlated with adoption rate, which means that the perceptions of more Complexity and Uncertainty led to lower adoption rate of e-commerce.

Regression analysis further investigated which factors of innovation best predict the adoption intention of e-commerce in terms of degree and significance. The results show that Perceived Compatibility, Uncertainty, Perceived Complexity and Internet usage experience of the SMEs are equally important in explaining the adoption intention of e-commerce by the SMEs in terms of significance (.000 level of significance) while Perceived Compatibility have the strongest effect followed by Uncertainty in terms of degree of contribution.

Perceived relative advantage was hypothesized to be positively related to the adoption of e-commerce. Rogers mentioned that diffusion scholars have found relative advantage to be one of the best predictors of an innovation's rate of adoption (Rogers, 1995). In previous studies undertaken on e-commerce adoption and on other technology innovation the hypothesis was duly supported (Limthongchai and Speece, 2002, Kendall et al. 2001, Sathye and Diana, 2001, Azam, 2004, Azam 2005, Azam, 2006b).

Compatibility emerged as an important factor affecting the adoption of ecommerce by the Bangladesh's SMEs. The compatibility issue is significant because it deals with their perception on the importance of the innovation to various tasks to be performed at present and future. If e-commerce is compatible with the traditional way of performing various activities of the business enterprises, with the existing values and mentality of the professionals, and is compatible with the different parts to be communicated for conducting day to day operations and their future development, higher rate of adoption would be occurred.

Complexity inversely affects the rate of adoption of e-commerce by the SMEs in Bangladesh. This implies that business enterprises perceived conducting business through online with high complexity. People in Bangladesh are still not familiar with the computer operation. As the e-commerce is computer, internet and specialised software driven media of business, organisations normally face scores of problems in operating business and transacting through internet. With respondents negative perception on complexity refers its inverse relationship with the adoption rate.

Trialability is said to be same effect as Compatibility and other perceived innovation characteristics. This supports the idea that grants/ subsidies may matter in individuals' decision to adopt e-commerce adoption (Kendall et. al, 2001). In this study the hypothesis is found as rejected. It may be happened since, in withdrawal of all taxes from computer hardware in 1998, Bangladesh witnessed a boom in computer selling and its usage behaviour. Interestingly all companies, except only 4 companies, are connected with internet and online communication having various kinds of innovated technological supports. That may neutralise organisations thirst for trial. In addition, Bangladesh has already experienced in adoption of online money transfer in many commercial banks that provide the opportunity for online communication and transaction.

Observability is another predictor to explain the adoption of e-commerce by the SMEs in Bangladesh. It supports the idea that demonstration in various beneficial operations of e-commerce may influence in SMEs decision to adopt the technology.

Uncertainty was hypothesised to be inversely related with e-commerce adoption. The study found that the hypothesis is supported. It refers to a significant factor as various kinds of uncertainties and insecurities are associated with e-commerce operation in different levels from negotiation to transaction. It effects negatively as the digital signature is not legally valid to make any lawful contract as per the Evidence Act 1853 of Bangladesh, thus the contract made between the concerned parties through online are not legally valid in this country. By its nature, e-commerce negotiation and transactions face multi cultural and legal constraints since most of cases it inclines international operations. International dispute resolution mechanisms are not appeared as effective and sufficient. Furthermore hackers' interventions in monetary transactions are very usual

at present in online operation. Eliminating those insecurities and uncertainties may foster the adoption of e-commerce.

The model incorporates 4 organisational characteristics with the abovementioned variables. Organisations business experience (Age of the organisation), Internet usage experience of the organisation, Number of computer literate officer of the organisation, and Revenues earnings of the organisation were utilised as indigenous variable to examine the effects of the organisational forces in explaining the intention of adoption of e-commerce by the SMEs in Bangladesh. The age of the organisation was hypothesized to be inversely related with e-commerce adoption. The study found that the hypothesis was not supported. The case of rejecting the hypothesis may be discussed in the way that in Bangladesh the hype of e-commerce adoption by the SMES are not concentrated in a certain category in terms of age.

Internet usage experience of the organisation is another predictor to explain the adoption of e-commerce by the SMEs in Bangladesh. The hypothesis is supported. The result proves that the higher experience of

internet usage refer to the higher adoption rate of e-commerce. Similarly organisations technologically fit human resources have also the positive effect on the adoption of e-commerce. Since e-commerce is an information and communication technology driven transactions, the technological skill and competency of the organisations human resources was predicted to be positively related to the adoption of e-commerce. The hypothesis was supported. The study also examined whether the revenue earnings of the organisation had any significant co-relation with the adoption of e-commerce. Thus the revenue earnings of the organisation was hypothesised to be positively correlated with the adoption of e-commerce. The regression result rejects the hypothesis. The result of the hypothesis testing may be discussed in the way that e-commerce operation or adoption type does not appear as concentrated in the high revenue earning organisation or in the opposite. Regardless of their revenue earnings or financial capabilities SMEs in Bangladesh are interested in the adoption of e-commerce to achieve competitiveness.

The study explores positive scenario of the adoption of e-commerce by the SMEs in Bangladesh. Like many other countries around the world Bangladesh's SMEs have the potential to earn huge profit and revenues from B2B transaction particularly from exporting. The country's main player, the ready-made garment industry, is facing diversified problems to secure its competitiveness in exporting to Canada and USA. In this situation searching new market is prescribed as one of the effective modalities to conquer the threats. Adoption of e-commerce and its implementation may push forward the companies in the challenging environment. Thus government, appropriate authorities and concerned parties should look at the issue with due importance and proper modalities should be governed to foster the adoption rate. The legal mechanism, technological infrastructure, particularly the internet connectivity, financial infrastructure and delivery infrastructure of the country should be reformed and adequately developed for facilitating the smooth operation of e-commerce by the concerned sectors. It is hoped that the academic proponents would admit the research outcomes and the study would help develop the country's SMEs competitiveness in domestic as well as in international environment.

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Notes:

¹ 80% of the country's internet users are concentrated at Dhaka (Azam, 2006a).

² Although it was not possible to determine what are the extent of differences exist among the said three SMEs Categories because only two categories, Service Industry and manufacturing Industry, are described under SMEs definition in the Industrial Policy 1999 of Bangladesh

³ The higher the VIF value, mostly VIF = 10.00 and above and the lower the value of tolerance, .2 or less, indicates the existence of multicollinearity. The regression model run results proof the linearity.

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