INFORMATION SYSTEM ADOPTION AND USAGE: VALIDATING UTAUT MODEL FOR BANGLADESHI SMES

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Small and medium enterprises (SME) are an integral part of any country's economy. Therefore, their existence, operational efficiency and effectiveness must be ensured. Implementation of information system (IS) in business value chain allows organizations to enhance this efficiency thus enables organizations to grow and sustain. This research explores 255 Bangladeshi SMEs to conceptualize current trend of IS usage and validates four constructs of unified theory of acceptance and use of technology (UTAUT) model to explain IS adoption behavior. The outcome of the study shows that, though a number of Bangladeshi SME's are exposed to computer based IS, their usage, in most cases, are limited to operational level of activities. SMEs are also less concerned about the further development of IS and allocated a minimum budget for IS development. It is also found that the adoption and usage of IS by the Bangladeshi SMEs are strongly influenced by performance efficiency, effort efficiency and facilitating condition and moderately influenced by social influence.

Key words: Information system adoption, SME, UTAUT, TAM, Behavioral intention.

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1.0. Introduction:

The ability to successfully espouse information system allows organizations to enhance its operational efficiency and effectiveness. Large organizations and multinationals are investing heavily on information system research and adoption. Comparatively weaker in financial capabilities, small and medium enterprises (SMEs) are playing a conservative role in making investment in information systems. As small businesses are an important and integral part of every nation's economy, their survival and growth contributes to the creation of jobs and wealth in that economy (Hambrick & Crozier, 1985). Therefore, it is important to motivate SME's to adopt information system in-order to gain competitive advantages to maintain their strong existence in the market place. It appears that if small businesses are able to use information systems effectively, they can grow, potentially reap the benefits from their technology, and become profitable (Qureshi & York, 2008).

Significant studies have been conducted to discover the information system adoption behavior of the SMEs. These studies uncovered several factors that affect proper implementation of information system by the SMEs. One very important finding is, the implementation effort of information system may fail in one context and yet succeed in another (Warschauer, 2003). Besides, as the SMEs start their venture with a limited amount of capital, it is important to conceptualize the factors that affect information system adoption behavior of SMEs. This research addresses three key issues regarding Bangladeshi SMEs' information system adoption and usage: (a) the current trend in information system usage (b) major financing sources for information system adoption and (c) factors affecting the adoption behavior of information system and validating the factors following previously developed theories.

2.0. Literature Review:

Over the years scholars from different discipline developed and validated several models that could explain the technology adoption behavior of individuals. These models are being developed using either psychology based theories or information technology based theories. Ajzen & Fishbein (1980) concluded year long research of several researchers with a psychology based model

theory of reasoned action (TRA). TRA explains that the behavioral intention of an individual depends on attitude towards performing the behavior and the subjective norms related to performing the behavior. The key application of the theory of reasoned action is prediction of behavioral intention, spanning predictions of attitude and predictions of behavior (Ajzen, 1980). Theory of planned behavior (TPB) is an extension to TRA proposed by Icek Ajzen in 1985. The theory of planned behavior differs from the theory of reasoned action in its addition of the perceived behavioral control (PBC) component that accounts for situations where an individual has less than complete control over the behavior. This can vary across situations and actions (Ajzen, 1991). TPB is further extended to decomposed theory of planned behavior (DTPB) by Taylor & Todd (1995).

Another influential extension of TRA is the technology acceptance model (TAM) introduced by Davis (1986). TAM, an information technology theory based model, replaces the key TRA's attitude with the two technology acceptance measures perceived usefulness (PU) and perceived ease-of-use (PEOU): PU referring to the degree to which a person believes that using a particular system would enhance his/her job performance; and PEOU referring to the degree to which a person believes that using a particular system would be free from effort (Davis, 1989). Number of researchers tried to justify the relationship exists between PU, PEOU and the system use by providing empirical evidence through their researches (Adams, Nelson & Todd 1992; Bagozzi & Warshaw 1992; Hendrickson, Massey & Cronan 1993; Segars & Grover 1993; Subramanian 1994; Szajna 1994). In-spite of some criticisms (Chuttur, 2009; Benbasat & Barki, 2007; Bagozzi, 2007) TAM is widely accepted and used by the researchers to determine the technology acceptance behavior of individuals. The original TAM model was extended by Venkatesh and Davis (2000) to explain perceived usefulness and usage intentions in terms of social influence and cognitive instrumental processes. The extended model, referred to as TAM2, was tested in both voluntary and mandatory settings and the test results showed strong support for TAM2 (Venkatesh & Davis, 2000). Extension of TAM2, TAM3 has been proposed (Venkatesh & Bala, 2008).

Apart from these, several other models e.g. Roger's diffusion of innovation, DOI (1983), Bandura's Social Cognitive Theory, SCT (1988), Deci & Ryan's Motivational Model, MM

(1985), and Triandis's Model of PC Utilization,MPCU (1979) has significant contribution in the discipline of technology adoption behavior research. Aggregating above mentioned theories (TRA, TPB, TAM, combined TPB – TAM, DOI, MM, SCT and MPCU) Venkatesh et al. (2003) formulated unified theory of acceptance and use of technology (UTAUT), an unified model to explain the technology acceptance behavior. The theory elucidates individual's technology usage intention and behavior with four direct constructs: performance expectancy, effort expectancy, social influence and facilitating conditions which are being mediated by age, gender, experience and voluntariness of use. The UTAUT is a definitive model that synthesized what is known and advances cumulative theory while retaining a parsimonious structure. Subsequent validation of UTAUT model in a longitudinal study resulted 70% of the variance in behavioral intention (BI) and above 50% in actual use (Venkatesh et al., 2003).

To some extent, all the above mentioned models, their extensions and combinations are used by researchers in their respective study of technology adoption behavior. However, the TAM, Extension of TAM and UTAUT model has been emphasized more. Research on adoption behavior of information system and technology, e-commerce, online banking, mobile banking, ERP system, telemedicine technology and several other information systems (Ramayah et al., 2006; Pavlou & Fygenson, 2006; Wilson et al., 2008; and some others) are done extensively using these models. The studies were conducted focusing different user groups like online banking users, mobile banking users, corporate professionals, IT specialists, university teachers, students etc. Almost all the cases the models were successful in explaining the adoption behavior. However, the entrepreneurs have different personality traits than this group of people and their psychology is somehow different. Because of the remarkable traits a separate TAM test, which also investigates the moderation effect of these traits on entrepreneurs' technology usage, is warranted (Ndubisi & Richardson, 2002).

Ndubisi & Richardson (2002) illustrated the traits of entrepreneurs, suggested by empirical research of a number of researchers, are: (1) high need for achievement (Decarlo & Lyons, 1979; Hornaday & Aboud, 1971; among many others); (2) internal locus of control (Hornaday & Aboud, 1971; Miller, 1983); (3) high need for independence and effective leadership (DeCarlo & Lyons, 1979; Hornaday & Aboud, 1971); (4) high need for autonomy (DeCarlo & Lyons, 1979;

Sexton & Bowman, 1983, 1984); (5) information processing capability (McGaffey & Christy, 1975); (6) preference for moderate level risks (McBer & Co., 1986); (7) low conformity (DeCarlo & Lyons, 1979; Sexton & Bowman, 1983, 1984); (8) aggression, support, and benevolence (De-carlo & Lyons, 1979); (9) high energy level, risk-taking, and change (Sexton & Bowman, 1983, 1984); (10) dominance, endurance, innovation, self-esteem, low anxiety level, and cognitive structure (Sexton & Bowman, 1983); and (11) low interpersonal effect, social adroitness, low harm avoidance, and low succorance (Sexton & Bowman, 1984). However, reviewing a number of study, Ndubisi & Richardson (2002) assumed entrepreneurial traits as: innovativeness and per-severance or persistence, the two most common and consistent trait to moderate the relationship between perceived usefulness and perceived ease of use (on one hand) and ICT usage in their study of entrepreneur's technology adoption using TAM. They have concluded with another ex-tension of TAM, Entrepreneurs' Technology Adoption Model (ETAM). Robertson et al., 2007 and some other researchers have also used TAM for their respective technology adoption studies on different entrepreneur groups and successfully explained their adoption behavior.

On the contrary, Qureshi & York, 2008; Chooprayoon et al., 2007; Suhendra et al., 2009 and several other researchers has used UTAUT model to explain the technology adoption by dif-ferent entrepreneur groups. The reason behind using UTAUT for this kind of study is it is consi-dered as the most recent and comprehensive coverage of a range of IT Adoption/Acceptance models (Qureshi & York, 2008). The outcome, however, demonstrated strong support for the model. Ramsey at al. (2008) used simple factor analysis with several factors to study the impact of technology innovation adoption among Irish professional service sector small and medium en-trepreneurs (SME).

According to the Bangladesh Economic Review 2009, around 6 percent of the country's $ 90 billion economy comes from SMEs, which is also the largest sector in terms of employment generation. For last few years, the SME sector of Bangladesh has shown tremendous growth. Popularity of microfinance and Banks' aggression in SME loan selling created huge potential for the sector in future. As the performance of any business can be enhanced by adopting information system, Bangladeshi SME owners are gradually showing their interest in information system im-

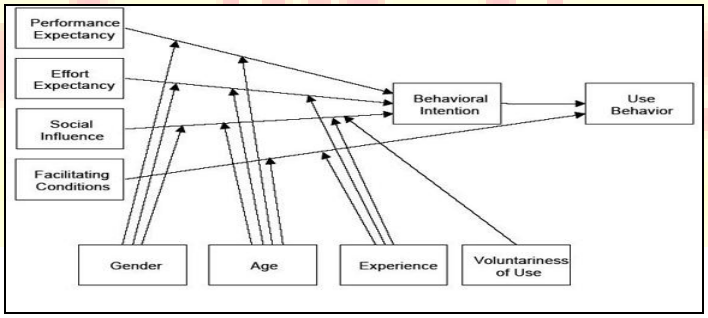
plementation. Therefore, it became vital to identify the major factors affecting the information system adoption decisions of Bangladeshi entrepreneurs in order to provide better theoretical support for the action. This study tests several factors that are already proven to have some sort of significance over information system adoption decision in developed countries and tries to conceptualize a theory that could explain information system adoption decision by Bangladeshi SMEs.

3.0. Methodology:

3.1. Research model:

The current research uses the unified theory of acceptance and use of technology (UTAUT) model because of its frequent use in recent years for same kind of researches. According to the model, the technology usage intention and behavior is influenced by four direct constructs: performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC) which are being mediated by age, gender, experience and voluntariness of use (illustrated in figure - 3.1).

Figure – 3.1: UTAUT model - Source: Venkatesh et al. (2003)



3.2. Research variables and hypothesis:

Based on the UTAUT model (Venkatesh et al., 2003), this research uses four independent variables and measures their influence over one common dependent variable. The variables and their definitions are listed in table - 3.1.

Table – 3.1. Variables used in the research - Source: Venkatesh et al. (2003)

Variable	Type	Definition
Performance expectancy (PE)	Independent	The degree to which an individual believes that using the system will help him or her to attain gains in job performance
Effort Expectancy (EE)	Independent	The degree of ease associated with the usage of the system.
Social influence (SI)	Independent	The degree to which an individual perceives that important others believe he or she should use the new system.
Facilitating condition (FC)	Independent	The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.
Behavioral intention (BI)	Dependent	An indication of an individual's readiness to perform a given behavior.

As this is the initial research on Bangladeshi SMEs about their information system usage, this study ignores the impact of moderators on the independent variable for maintaining simplicity. Based on the variables defined in the table – 3.1, four hypotheses are developed (illustrated in the table – 3.2).

Table – 3.2: Proposed hypotheses for the study:

	Hypothesis	Independent variable	Dependant variable

H1	Performance expectancy has positive influence over behavioral intention	Performance expectancy	Behavioral intention
H2	Effort expectancy has positive influence over behavioral intention.	Effort expectancy	Behavioral intention
H3	Social influence has positive influence over behavioral intention.	Social influence	Behavioral intention
H4	Facilitating conditions has positive influence over actual usage.	Facilitating conditions	Actual usage
H5	Behavioral intention has positive influence over actual usage	Behavioral intention	Actual usage

Note that facilitating conditions is measured directly against actual usage rather than behavioral intention because it has a direct influence on usage beyond that explained by behavioral intentions alone (Venkatesh et al., 2003).

3.3. Data collection and analysis:

A questionnaire of 25 questions (combination of fixed choice and few open-ended questions) has been prepared based on the literature review and previously used questionnaire for same kind of study. A 5-point Likert-type scale is used for measurement. The questionnaire was sent to 300 SMEs through direct contact, e-mail, fax and posted mail. The contact details of the SEMs are collected from the SME division of four reputed banks operating in Bangladesh. 255 SMEs replied back out of which 220 are found useful for the research. The SMEs are selected randomly and represent various industries from different locations of Bangladesh. Table – 3.3 lists the details of the participating SMEs for the survey.

Information from 220 SMEs is used for hypothesis testing purpose. The sample size is aligned with the sample size used by the researchers for previous studies of similar type. SPSS

software is used for data analysis. Gathered data are analyzed to find internal consistency reliability (ICR) for the variables, mean response and corresponding standard deviation, correlation with respective variables and significance of correlation which ultimately leads the research to test hypotheses.

Table – 3.3: Types of participating organizations:

Organization type	Freq.	Percent
Clothing , Fashion and handicraft	58	22.8
Agro and/or food processing	48	18.8
Small manufacturing	53	20.8
Retail shop	59	23.1
Education and training	5	2.0
Others	32	12.5
Total	255	100.0

4.0. Findings and analysis:

4.1. Uses extent of IS:

The first thing that the current research intended to study is the extent to which SME's are exposed to the use of information systems. As table 4.1 refers, a number of 73 SMEs (28.6% of total) are using fully automated information systems or independent specific purpose application software for their business operations. A greater number of SMEs (147 in number and 57.6% of total) are using partially automated information system defined as a combination of some sort of general purpose application software and human effort. 23 SMEs (9.1% of total) are using manual (pen and paper base) information system and only 12 SMEs (below 5% of total) are not using any

sort of information system. A concluding remark can be drawn as, a major portion of SMEs (86.2% of total) in Bangladesh are somehow exposed to computer based information system.

Table - 4.1: Extend to which organizations are exposed to information system:

		Freq.	Percent	Valid Percent	Cumulative percent
Valid	Fully automated information system	73	28.6	28.6	28.6
	Partially automated information system	147	57.6	57.6	86.2
	Manual information system	23	9.1	9.1	95.3
	No information system is in use	12	4.7	4.7	100.0
	Total	255	100.0	100.0	

4.2. Level of information system use by the SMEs:

Generally, information system plays vital role over three levels of management activities as: operational management level, tactical management level and strategic management level (O'Brien & Marakas, 2006). However, following the research of Desanctis (1986), the IS used by the SMEs are measured against four levels in the current research (data illustrated in table - 4.2). A greater proportion of SMEs (112 in number and 50.9% in total) are using IS for record keeping purpose only while 88 SMEs (40% of total) are using IS for both record keeping and daily reporting purpose. Only 17 SMEs (7.7% of total) are using IS for record keeping, daily reporting and decision making purpose and 3 SMEs (1.4% of total) are using IS for strategic planning addition to all other mentioned purposes.

Table - 4.2: Level of information system use by SMEs:

	Freq	Per-	Valid	Cumulative

		.	cent	Percent	Percent
Valid	Record keeping only	112	50.9	50.9	50.9
	Record keeping & daily reporting	88	40.0	40.0	90.9
	Record keeping, daily reporting & decision making	17	7.7	7.7	98.6
	Record keeping, daily reporting, decision making & strategic planning	3	1.4	1.4	100.0
	Total	220	100.0	100.0	

Therefore, it can be concluded that, in significant number of cases IS plays role at the operational management level (200 in number and 90.9% of total). There are only few cases where information system plays role in tactical or strategic level (20 in number and 9.1% of total) of management. A point to be noted that, the organizations exposed to computer based IS are considered for this measurement.

4.3. Commonly used IS application:

A value chain is a chain of activities for a firm operating in a specific industry. All the activities of the value chain can be facilitated by IS applications to enhance efficiency and effectiveness. Figure – 4.3 illustrates a typical value chain for any organization. Table - 4.3 points up the commonly used IS applications used by the Bangladeshi SMEs in their respective value chain. Referring to table – 4.3, accounting and finance related application showed maximum frequency in use (203 in number and 92.3% of total) while other applications like customer account management, inventory management, sales and e-commerce and production/operation management demonstrated moderate use by the SMEs (48.6%, 44.1%, 33.2% and 29.5% respectively).

Table – 4.3: commonly used IS applications:

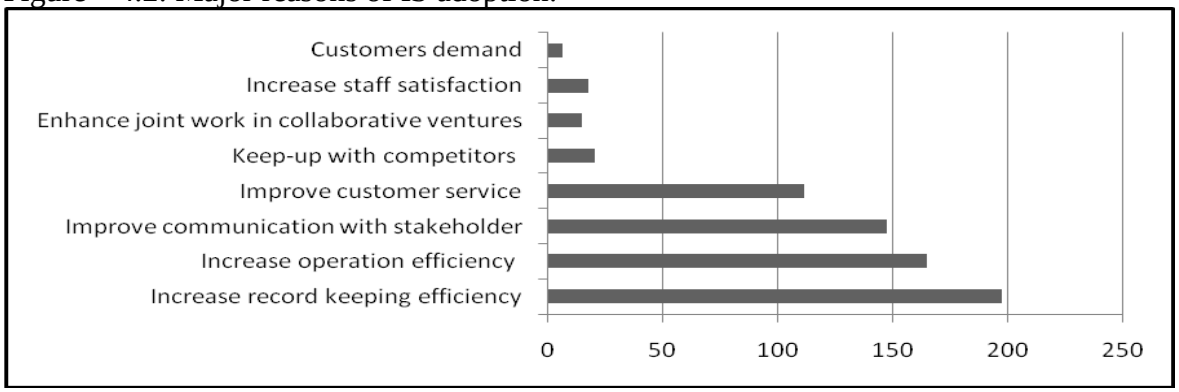
Application	Freq.	Percent
Inventory management	97	44.1
Production / operation management	65	29.5
Sales / e-Commerce	73	33.2
Customer account management / CRM	107	48.6
Accounting & finance	203	92.3
Research & design	35	15.9
HRM	27	12.3
ERP	3	1.4

Interestingly, only 3 SMEs reported to have adopted ERP systems to collaborate entire value chain activities. Note that, (i) the applications are not mutually exclusive and two or more application can be used by one SME and (ii) The research is conducted among 220 SMEs (somehow exposed to computer based IS).

4.4. Reasons for investment is IS:

Referring to the study of Harindranath et al. (2008), current research tries to identify major reasons for IS adoption by the SMEs and the outcome is presented in the figure - 4.2.

Figure – 4.2: Major reasons of IS adoption:



According to the information revealed, four major reasons for IS adoption by the SMEs are (i) Increase record keeping efficiency (190 in number and 90% of total); (ii) Increase operation efficiency (165 in number and 75% of total); (iii) improve communication with stakeholders (148 in total and 67.3% of total) and (iv) improve customer service (112 in number and 50.9% of total). However, the other reasons to some extent are also accounted by the SMEs.

4.5. Financing the IS projects:

As SMEs start their venture with comparatively small amount of capital, financing the IS project is a matter of concern. This study reveals that, a significant number of SME used retained profit (97 in number and 44.1% of total) and personal finance (89 in number and 40.5% of total) as the major source of investment. 21 SME used finance from family or friends (9.5% of total) while a few SMEs used SME loan or loan from customer or vendor (3.6% and 2.3% respectively) – refer to table – 4.4.

Table – 4.4: Major financing source used by the SMEs.

Sources	Frequency	Percent
Personal Finance	89	40.5
SME loan	8	3.6
Friends and family	21	9.5
Loan from customer or vendor	5	2.3
Retained profit	97	44.1
Government grants	0	0
Total	220	

Interestingly, very few number of SME has planned to spend 5% or more of their total budget for further IS development (14 in number and 6.4% of total). However, 93 SMEs reported that they have a plan to spend up to 5% of their total budget for IS development. A large number

of SMEs are either still in the planning phase or kept the information hidden. Table – 4.5 illustrates the allocation of budget for IS development by the SMEs. Note that, both the information are collected from 220 SMEs having some sort of exposure to computer based IS.

Table – 4.5: Allocated budget for IS development

Allocated Budget	Frequency	Percent
More than 10% of total budget	2	0.9
5 to 10% of total budget	12	5.5
2 to 5% of total budget	25	11.4
Less than 2% of total budget	68	30.9
Not decided by the entrepreneur	56	25.5
Not disclosed by the entrepreneur	41	18.6
No fund allocated	16	7.3
Total	220	

4.6. Hypothesis testing and analysis:

In order to justify UTAUT model for explaining Bangladeshi SMEs' IS adoption behavior, the research data is measured in two phases. Firstly the inter-variable correlations of the latent variables are calculated to study the relationship among the prescribed variables by UTAUT model. Secondly, the relationship between the dependent variables with their corresponding independent variables are determined and justified to draw remarks about the hypothesis (table – 3.2). Table - 4.6 illustrates the calculated inter-variable correlations. Note that, the calculations are performed on the data gathered from 220 samples somehow exposed to computer based IS.

Table – 4.6: Inter-variable correlation:

	ICR	Mean	SD	PE	EE	SI	FC	BI
Performance expectancy (PE)	0.93	4.86	0.62	1.00				
Effort expectancy (EE)	0.91	4.54	0.77	0.42	1.00			
Social influence (SI)	0.86	3.12	1.40	0.11	0.15	1.00		
Facilitating conditions (FC)	0.89	4.28	0.98	0.33	0.31	0.18	1.00	
Behavioral Intention (BI)	0.92	4.19	1.08	0.54	0.52	0.20	0.38	1.00

Note: For all the data $p<0.05$

The internal consistency reliability measured with Cronbach's alpha produces excellent result for performance expectancy, effort expectancy and behavioral intention and good result for social influence and facilitating conditions. The mean and SD refers the average value for the variables. Interestingly, an average person remained neutral about the effect of social influence over IS adoption while showed some extent of support for the effect of other variable over IS adoption. All the variables demonstrated significant positive correlation of some extent with other variables. The summery of the hypothesis test is pointed up in table – 4.7. Referring to the table, performance expectancy and effort expectancy are has strong positive effect on IS behavioral intention of an entrepreneur while social influence has moderate positive effect on the same. Both behavioral intention and facilitating condition strongly affects the IS use intention of the entrepreneur.

Table – 4.7: Summery of the hypothesis test:

	Hypothesis	r	Significance	Remarks
H1:	PE ---> BI	0.54	< 0.05	Strong support for the hypothesis
H2:	EE ---> BI	0.52	< 0.05	Strong support for the hypothesis
H3:	SI ---> BI	0.20	< 0.05	Moderate support for the hypothesis

H4:	FC ---> UB	0.45	< 0.05	Strong support for the hypothesis
H5:	BI ---> UB	0.48	< 0.05	Strong support for the hypothesis

Note: PE: Performance expectancy; EE: Effort expectancy; SI: Social influence;

FC: Facilitating condition; BI: Behavioral intention; UB: Use behavior;

Therefore it can be concluded that, the adoption of the information system by Bangladeshi SMEs are strongly affected by performance expectancy, effort expectancy and facilitating condition and moderately affected by social influence.

5.0. Conclusion:

The research confirms the positive effect of four-direct constructs advised in UTAUT model over IS adoption behavior of Bangladeshi entrepreneurs. That is, the findings of the study validate the UTAUT model for Bangladeshi SMEs. Though the study ignores the effect of moderators over these four constructs, which can be considered as the limitation of the study, this study can be considered as the pioneer study for similar kind of researches. Future studies can focus on indentifying moderators' effect on these direct constructs as well as identifying new constructs based on organizational, financial or demographical context that can create different extensions of UTAUT model.

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